

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Porto do Forno rev - IBAMA

Consequencias

H01,03,05 Calculated Discharge

Base Case

CASE Name: Data

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

User-Defined Data

Material

Material Identifier N-OCTANE

Scenario

Building Wake Option None

Pipe

Line length 1 m

Vessel/Tank

Release Type Continuous

Location

[Release elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund No bund present
[Surface type Concrete]
[Height 0 m]
[Modelling of bund failure Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Method to use for explosions TNT
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 4,057 m/s
Droplet Diameter(1) 614,5 um
Duration of Discharge(1) 3600 s
Final Temperature(1) 25,01 degC
Release Rate(1) 6,667 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 2,098E7 kg

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Fireball Parameters

| | |
|----------------------------------|------------------|
| [Mass modification factor | 3] |
| [Calculation method for fireball | DNV Recommended] |
| [TNO model flame temperature | 1727 degC] |

Toxic Parameters

| | |
|---------------------------------|-----------------------------|
| [Indoor calculations | Unselected] |
| [Ventilation specification | Case Specified] |
| [Building exchange rate | 4 /hr] |
| [Tail time | 1800 s] |
| [Method of setting time | Use a fixed averaging time] |
| [Cut-off fraction of toxic load | 0,05 fraction] |
| [Cut-off concentration | 0 fraction] |

Geometry

| | |
|----------------|----------|
| Geometry shape | Point |
| Coordinates | Absolute |
| East(1) | 0 m |
| North(1) | 0 m |

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Consequence Results

Pool Vaporization Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | | DIA | NOITE |
|------------------------|-----------------------------------|----------|----------|
| | Release Segment 1 | | |
| Release Duration | s | 3600 | 3600 |
| Liquid Rainout | fraction | 0,985181 | 0,988384 |
| | Release Segment 1 Cloud Segment 1 | | |
| Cloud Segment Duration | s | 1048,14 | 1082,41 |
| Pool Vaporization Rate | kg/s | 0,696037 | 0,535955 |
| Total Vapor Flowrate | kg/s | 0,794829 | 0,613397 |
| | Release Segment 1 Cloud Segment 2 | | |
| Cloud Segment Duration | s | 457,299 | 464,046 |
| Pool Vaporization Rate | kg/s | 1,59491 | 1,25417 |
| Total Vapor Flowrate | kg/s | 1,69371 | 1,33161 |
| | Release Segment 1 Cloud Segment 3 | | |
| Cloud Segment Duration | s | 360,8 | 361,05 |
| Pool Vaporization Rate | kg/s | 2,02266 | 1,60854 |
| Total Vapor Flowrate | kg/s | 2,12145 | 1,68598 |
| | Release Segment 1 Cloud Segment 4 | | |
| Cloud Segment Duration | s | 312,316 | 308,55 |
| Pool Vaporization Rate | kg/s | 2,34784 | 1,88211 |
| Total Vapor Flowrate | kg/s | 2,44663 | 1,95956 |
| | Release Segment 1 Cloud Segment 5 | | |
| Cloud Segment Duration | s | 535,854 | 529,704 |
| Pool Vaporization Rate | kg/s | 2,72446 | 2,20632 |
| Total Vapor Flowrate | kg/s | 2,82325 | 2,28376 |
| | Release Segment 1 Cloud Segment 6 | | |
| Cloud Segment Duration | s | 885,59 | 664,8 |
| Pool Vaporization Rate | kg/s | 3,28392 | 2,63665 |
| Total Vapor Flowrate | kg/s | 3,38271 | 2,71409 |
| | Release Segment 1 Cloud Segment 7 | | |
| Cloud Segment Duration | s | | 189,44 |
| Pool Vaporization Rate | kg/s | | 2,92427 |
| Total Vapor Flowrate | kg/s | | 3,00171 |
| Maximum Pool Radius | m | 38,721 | 40,4583 |

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Distance to Concentration Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the cloud centreline height

| Concentration(ppm) | Averaging Time | | DIA | NOITE |
|--------------------|----------------|---|---------|---------|
| UFL (65000) | 18,75 | s | 2,08727 | 2,39358 |
| LFL (8000) | 18,75 | s | 10,239 | 12,1656 |
| LFL Frac (4000) | 18,75 | s | 18,677 | 21,1788 |

| Concentration(ppm) | Averaging Time | | DIA | Heights (m) for above distances NOITE |
|--------------------|----------------|---|-----------|--|
| UFL (65000) | 18,75 | s | 0,0496497 | 0 |
| LFL (8000) | 18,75 | s | 0 | 0 |
| LFL Frac (4000) | 18,75 | s | 0 | 0 |

Jet Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

Jet fire method used: DNV recommended

| Jet Fire Status | DIA | NOITE |
|-----------------|------------|------------|
| Flame Direction | Truncated | Truncated |
| | Horizontal | Horizontal |

Radiation Effects: Jet Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

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

| Radiation Level | | | DIA | NOITE |
|-----------------|-------|--|---------|---------|
| 3 | kW/m2 | | 17,5698 | 15,8477 |
| 18,3 | kW/m2 | | 11,9474 | 10,7791 |
| 36 | kW/m2 | | 10,6684 | 9,6061 |
| 71,2 | kW/m2 | | 9,73844 | 8,99559 |

Radiation Effects: Jet Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| DIA | Radiation Level (kW/m2) NOITE |
|-----|----------------------------------|
|-----|----------------------------------|

Early Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| Early Pool Fire Status | DIA Hazard | NOITE Hazard |
|------------------------|---------------|-----------------|
|------------------------|---------------|-----------------|

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Radiation Effects: Early Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | | | DIA | Distance (m) |
|-----------------|------|-------|---------|--------------|
| Radiation Level | 3 | kW/m2 | 39,229 | 39,0611 |
| Radiation Level | 18,3 | kW/m2 | 15,0819 | 14,9352 |
| Radiation Level | 36 | kW/m2 | 7,94144 | 7,92772 |
| Radiation Level | 71,2 | kW/m2 | | |

Radiation Effects: Early Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | DIA | Radiation Level (kW/m2) |
|--|-----|-------------------------|
| | | NOITE |

Late Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | DIA | NOITE |
|-----------------------|--------|--------|
| Late Pool Fire Status | Hazard | Hazard |

Radiation Effects: Late Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | | | DIA | Distance (m) |
|-----------------|------|-------|-------------|--------------|
| Radiation Level | 3 | kW/m2 | 124,081 | 127,422 |
| Radiation Level | 18,3 | kW/m2 | 41,4605 | 43,1612 |
| Radiation Level | 36 | kW/m2 | Not Reached | Not Reached |
| Radiation Level | 71,2 | kW/m2 | Not Reached | Not Reached |

Radiation Effects: Late Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | DIA | Radiation Level (kW/m2) |
|--|-----|-------------------------|
| | | NOITE |

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Flash Fire Envelope

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

All flammable results are reported at the cloud centreline height

| | | | | Distance (m) | |
|-----------------|------|-----|--------|---------------------------------|-------|
| | | | | DIA | NOITE |
| Furthest Extent | 4000 | ppm | 18,677 | 21,1788 | |
| Furthest Extent | 8000 | ppm | 10,239 | 12,1656 | |
| | | | | Heights (m) for above distances | |
| | | | | DIA | NOITE |
| Furthest Extent | 4000 | ppm | 0 | 0 | |
| Furthest Extent | 8000 | ppm | 0 | 0 | |

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Study Folder: Porto do Forno rev - IBAMA

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Explosion Effects: Late Ignition

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

| | | | Maximum Distance (m) at Overpressure Level | |
|--------------|------|-----|--|---------|
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 26,2062 | 54,2799 |
| Overpressure | 0,1 | bar | 20,0606 | 41,2805 |
| Overpressure | 0,3 | bar | 15,0236 | 30,6261 |
| Overpressure | 0,4 | bar | 14,2315 | 28,9507 |

| | | | Supplementary Data at 0,05 bar | |
|-------------------------|--|----|--------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,902464 | 8,54086 |
| Used Flammable Mass | | kg | 0,902464 | 8,54086 |
| Overpressure Radius | | m | 16,2062 | 34,2799 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 20 |
| - Cloud Front/Centre | | m | 10 | 20 |
| - Explosion Centre | | m | 10 | 20 |

| | | | Supplementary Data at 0,1 bar | |
|-------------------------|--|----|-------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,902464 | 8,54086 |
| Used Flammable Mass | | kg | 0,902464 | 8,54086 |
| Overpressure Radius | | m | 10,0606 | 21,2805 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 20 |
| - Cloud Front/Centre | | m | 10 | 20 |
| - Explosion Centre | | m | 10 | 20 |

| | | | Supplementary Data at 0,3 bar | |
|-------------------------|--|----|-------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,902464 | 8,54086 |
| Used Flammable Mass | | kg | 0,902464 | 8,54086 |
| Overpressure Radius | | m | 5,02362 | 10,6261 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 20 |
| - Cloud Front/Centre | | m | 10 | 20 |
| - Explosion Centre | | m | 10 | 20 |

| | | | Supplementary Data at 0,4 bar | |
|-------------------------|--|----|-------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,902464 | 8,54086 |
| Used Flammable Mass | | kg | 0,902464 | 8,54086 |
| Overpressure Radius | | m | 4,23154 | 8,95068 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 20 |
| - Cloud Front/Centre | | m | 10 | 20 |

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| | | | |
|--------------------|---|----|----|
| - Explosion Centre | m | 10 | 20 |
|--------------------|---|----|----|

Weather Conditions

Path: \Porto do Forno rev - IBAMA\Consequencias\H01,03,05 Calculated Discharge

| | | DIA | NOITE |
|-----------------------------|----------|---------|---------|
| Wind Speed | m/s | 3,84 | 3,69 |
| Pasquill Stability | | C | E |
| Surface Roughness Length | in | 37,4366 | 37,4366 |
| Surface Roughness Parameter | | 0,17 | 0,17 |
| Atmospheric Temperature | degC | 24,03 | 22,83 |
| Surface Temperature | degC | 29,03 | 22,83 |
| Relative Humidity | fraction | 0,8117 | 0,8615 |

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H02A,04A,06A Calculated Discharge

Base Case

CASE Name: Data

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

User-Defined Data

Material

Material Identifier N-OCTANE

Scenario

Building Wake Option None

Pipe

Line length 1 m

Vessel/Tank

Release Type Continuous

Location

[Release elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund No bund present
[Surface type Concrete]
[Height 0 m]
[Modelling of bund failure Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Method to use for explosions TNT
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 3,373 m/s
Droplet Diameter(1) 614,5 um
Duration of Discharge(1) 3600 s
Final Temperature(1) 25,01 degC
Release Rate(1) 0,4302 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 2,098E7 kg

Fireball Parameters

[Mass modification factor 3]

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[Calculation method for fireball] DNV Recommended]
[TNO model flame temperature] 1727 degC]

Toxic Parameters

[Indoor calculations] Unselected]
[Ventilation specification] Case Specified]
[Building exchange rate] 4 /hr]
[Tail time] 1800 s]
[Method of setting time] Use a fixed averaging time]
[Cut-off fraction of toxic load] 0,05 fraction]
[Cut-off concentration] 0 fraction]

Geometry

Geometry shape] Point
Coordinates] Absolute
East(1) 0 m
North(1) 0 m

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Consequence Results

Pool Vaporization Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | | DIA | NOITE |
|------------------------|-----------------------------------|-----------|-----------|
| | Release Segment 1 | | |
| Release Duration | s | 3600 | 3600 |
| Liquid Rainout | fraction | 0,963364 | 0,967276 |
| | Release Segment 1 Cloud Segment 1 | | |
| Cloud Segment Duration | s | 1027,2 | 1059,5 |
| Pool Vaporization Rate | kg/s | 0,0481971 | 0,0359053 |
| Total Vapor Flowrate | kg/s | 0,0639563 | 0,0499817 |
| | Release Segment 1 Cloud Segment 2 | | |
| Cloud Segment Duration | s | 455,048 | 461,498 |
| Pool Vaporization Rate | kg/s | 0,108709 | 0,0825584 |
| Total Vapor Flowrate | kg/s | 0,124468 | 0,0966348 |
| | Release Segment 1 Cloud Segment 3 | | |
| Cloud Segment Duration | s | 362,453 | 362,56 |
| Pool Vaporization Rate | kg/s | 0,137022 | 0,105167 |
| Total Vapor Flowrate | kg/s | 0,152781 | 0,119244 |
| | Release Segment 1 Cloud Segment 4 | | |
| Cloud Segment Duration | s | 312,9 | 311,363 |
| Pool Vaporization Rate | kg/s | 0,158309 | 0,122503 |
| Total Vapor Flowrate | kg/s | 0,174068 | 0,136579 |
| | Release Segment 1 Cloud Segment 5 | | |
| Cloud Segment Duration | s | 543,798 | 532,528 |
| Pool Vaporization Rate | kg/s | 0,182763 | 0,142785 |
| Total Vapor Flowrate | kg/s | 0,198522 | 0,156861 |
| | Release Segment 1 Cloud Segment 6 | | |
| Cloud Segment Duration | s | 898,599 | 674,355 |
| Pool Vaporization Rate | kg/s | 0,218537 | 0,169419 |
| Total Vapor Flowrate | kg/s | 0,234296 | 0,183495 |
| | Release Segment 1 Cloud Segment 7 | | |
| Cloud Segment Duration | s | | 198,194 |
| Pool Vaporization Rate | kg/s | | 0,187192 |
| Total Vapor Flowrate | kg/s | | 0,201268 |
| Maximum Pool Radius | m | 9,55705 | 10,0917 |

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Distance to Concentration Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the cloud centreline height

| Concentration(ppm) | Averaging Time | | DIA | NOITE |
|--------------------|----------------|---|---------|---------|
| UFL (65000) | 18,75 | s | 1,47177 | 1,34284 |
| LFL (8000) | 18,75 | s | 7,28947 | 7,36541 |
| LFL Frac (4000) | 18,75 | s | 12,0886 | 11,4842 |

| Concentration(ppm) | Averaging Time | | DIA | Heights (m) for above distances NOITE |
|--------------------|----------------|---|----------|--|
| UFL (65000) | 18,75 | s | 0,428457 | 0,376105 |
| LFL (8000) | 18,75 | s | 0 | 0 |
| LFL Frac (4000) | 18,75 | s | 0 | 0 |

Jet Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

Jet fire method used: DNV recommended

| | DIA | NOITE |
|-----------------|------------|------------|
| Jet Fire Status | Hazard | Hazard |
| Flame Direction | Horizontal | Horizontal |

Radiation Effects: Jet Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

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

| | | | DIA | NOITE |
|-----------------|------|-------|-------------|-------------|
| Radiation Level | 3 | kW/m2 | 7,53554 | 7,19564 |
| Radiation Level | 18,3 | kW/m2 | 4,87071 | 4,63812 |
| Radiation Level | 36 | kW/m2 | Not Reached | Not Reached |
| Radiation Level | 71,2 | kW/m2 | Not Reached | Not Reached |

Radiation Effects: Jet Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | DIA | Radiation Level (kW/m2) NOITE |
|--|-----|----------------------------------|
|--|-----|----------------------------------|

Early Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | DIA | NOITE |
|------------------------|--------|--------|
| Early Pool Fire Status | Hazard | Hazard |

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Radiation Effects: Early Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | | | DIA | Distance (m) NOITE |
|-----------------|------|-------|---------|-----------------------|
| Radiation Level | 3 | kW/m2 | 17,7299 | 17,5709 |
| Radiation Level | 18,3 | kW/m2 | 9,82537 | 9,61499 |
| Radiation Level | 36 | kW/m2 | 5,69255 | 5,57669 |
| Radiation Level | 71,2 | kW/m2 | 3,85004 | 3,69924 |

Radiation Effects: Early Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | DIA | Radiation Level (kW/m2) NOITE |
|--|-----|----------------------------------|
| | | |

Late Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | DIA | NOITE |
|-----------------------|--------|--------|
| Late Pool Fire Status | Hazard | Hazard |

Radiation Effects: Late Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | | | DIA | Distance (m) NOITE |
|-----------------|------|-------|-------------|-----------------------|
| Radiation Level | 3 | kW/m2 | 50,8958 | 51,7189 |
| Radiation Level | 18,3 | kW/m2 | 13,5882 | 13,3797 |
| Radiation Level | 36 | kW/m2 | Not Reached | Not Reached |
| Radiation Level | 71,2 | kW/m2 | Not Reached | Not Reached |

Radiation Effects: Late Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | DIA | Radiation Level (kW/m2) NOITE |
|--|-----|----------------------------------|
| | | |

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Flash Fire Envelope

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

All flammable results are reported at the cloud centreline height

| | | | | Distance (m) | |
|-----------------|------|-----|--|---------------------------------|---------|
| | | | | DIA | NOITE |
| Furthest Extent | 4000 | ppm | | 12,0886 | 11,4842 |
| Furthest Extent | 8000 | ppm | | 7,28947 | 7,36541 |
| | | | | Heights (m) for above distances | |
| | | | | DIA | NOITE |
| Furthest Extent | 4000 | ppm | | 0 | 0 |
| Furthest Extent | 8000 | ppm | | 0 | 0 |

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Explosion Effects: Late Ignition

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

| | | | Maximum Distance (m) at Overpressure Level | |
|--------------|------|-----|--|---------|
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 18,2521 | 20,0707 |
| Overpressure | 0,1 | bar | 15,1228 | 16,2518 |
| Overpressure | 0,3 | bar | 12,558 | 13,1217 |
| Overpressure | 0,4 | bar | 12,1547 | 12,6295 |

| | | | Supplementary Data at 0,05 bar | |
|-------------------------|--|----|--------------------------------|----------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,119146 | 0,216554 |
| Used Flammable Mass | | kg | 0,119146 | 0,216554 |
| Overpressure Radius | | m | 8,25211 | 10,0707 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 10 |
| - Cloud Front/Centre | | m | 10 | 10 |
| - Explosion Centre | | m | 10 | 10 |

| | | | Supplementary Data at 0,1 bar | |
|-------------------------|--|----|-------------------------------|----------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,119146 | 0,216554 |
| Used Flammable Mass | | kg | 0,119146 | 0,216554 |
| Overpressure Radius | | m | 5,1228 | 6,25177 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 10 |
| - Cloud Front/Centre | | m | 10 | 10 |
| - Explosion Centre | | m | 10 | 10 |

| | | | Supplementary Data at 0,3 bar | |
|-------------------------|--|----|-------------------------------|----------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,119146 | 0,216554 |
| Used Flammable Mass | | kg | 0,119146 | 0,216554 |
| Overpressure Radius | | m | 2,55799 | 3,12173 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 10 |
| - Cloud Front/Centre | | m | 10 | 10 |
| - Explosion Centre | | m | 10 | 10 |

| | | | Supplementary Data at 0,4 bar | |
|-------------------------|--|----|-------------------------------|----------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,119146 | 0,216554 |
| Used Flammable Mass | | kg | 0,119146 | 0,216554 |
| Overpressure Radius | | m | 2,15467 | 2,62953 |
| Distance to: | | | | |
| - Ignition Source | | m | 10 | 10 |
| - Cloud Front/Centre | | m | 10 | 10 |

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Study Folder: Porto do Forno rev - IBAMA

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| | | | |
|--------------------|---|----|----|
| - Explosion Centre | m | 10 | 10 |
|--------------------|---|----|----|

Weather Conditions

Path: \Porto do Forno rev - IBAMA\Consequencias\H02A,04A,06A Calculated Discharge

| | | DIA | NOITE |
|-----------------------------|----------|---------|---------|
| Wind Speed | m/s | 3,84 | 3,69 |
| Pasquill Stability | | C | E |
| Surface Roughness Length | in | 37,4366 | 37,4366 |
| Surface Roughness Parameter | | 0,17 | 0,17 |
| Atmospheric Temperature | degC | 24,03 | 22,83 |
| Surface Temperature | degC | 29,03 | 22,83 |
| Relative Humidity | fraction | 0,8117 | 0,8615 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

H07,10

Base Case

CASE Name: Data

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

User-Defined Data

Material

| | |
|---|---|
| Material Identifier | N-OCTANE |
| Type of Vessel | Unpressurized (at atmospheric pressure) |
| Pressure Specification | Pressure not used |
| Discharge Temperature | 25 degC |
| Volume Inventory of material to discharge | 30 m3 |

Scenario

| | |
|----------------------|----------------------|
| Type of Event | Catastrophic rupture |
| Phase | Liquid |
| Building Wake Option | None |
| Tank Head | 0 m |

Location

| | |
|--------------------------------------|-------------------|
| [Release elevation | 1 m] |
| Use ERPG averaging time | ERPG not selected |
| Use IDLH averaging time | IDLH not selected |
| Use STEL averaging time | STEL not selected |
| Supply a user defined averaging time | Not supplied |

Bund

| | |
|----------------------------|-------------------|
| Status of Bund | No bund present |
| [Surface type | Concrete] |
| [Height | 0 m] |
| [Modelling of bund failure | Bund cannot fail] |

Indoor/Outdoor

| | |
|---------------------|------------------|
| Location of release | Open air release |
|---------------------|------------------|

Flammable

| | |
|------------------------------|------------|
| Method to use for explosions | TNT |
| Jet Fire Method | Cone Model |

Dispersion

| | |
|--|--|
| Late Ignition Location | No ignition location |
| Mass Inventory of material to Disperse | 2,098E4 kg |
| Use Burst Pressure | No - Use release pressure for fireball |

Fireball Parameters

| | |
|----------------------------------|------------------|
| [Mass modification factor | 3] |
| [Calculation method for fireball | DNV Recommended] |
| [TNO model flame temperature | 1727 degC] |

Toxic Parameters

| | |
|----------------------------|-----------------|
| [Indoor calculations | Unselected] |
| [Ventilation specification | Case Specified] |
| [Building exchange rate | 4 /hr] |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

[Tail time 1800 s]
[Method of setting time Use a fixed averaging time]
[Cut-off fraction of toxic load 0,05 fraction]
[Cut-off concentration 0 fraction]

Geometry

Geometry shape Point
Coordinates Absolute
East(1) 0 m
North(1) 0 m

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

Discharge Data

User-Defined Quantities

Material N-OCTANE
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 20.975,94 kg
Scenario Catastrophic rupture
Fixed Duration n/a s

Calculated Quantities

Weather: Global Weathers\Dia

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

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 0,00 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice Velocity n/a m/s
Exit Pressure n/a bar
Exit Temperature n/a degC
Discharge Coefficient n/a
Expanded Radius n/a m

Weather: Global Weathers\NOITE

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

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 0,00 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | |
|-----------------------|----------|
| Release Duration | n/a s |
| Orifice Velocity | n/a m/s |
| Exit Pressure | n/a bar |
| Exit Temperature | n/a degC |
| Discharge Coefficient | n/a |
| Expanded Radius | n/a m |



Consequence Results

Pool Vaporization Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

N.B. Pool vaporization segments begin when the cloud has left the pool

| | | DIA | NOITE |
|------------------------|----------|-----------|-----------|
| Liquid Rainout | fraction | 0,999999 | 0,999999 |
| Initial Vapor Cloud | kg | 0,0222005 | 0,0181762 |
| Time Pool Left Behind | s | 17,45 | 31,45 |
| Cloud Segment 1 | | | |
| Cloud Segment Duration | s | 66,4225 | 115,563 |
| Pool Vaporization Rate | kg/s | 1,64957 | 1,81547 |
| Cloud Segment 2 | | | |
| Cloud Segment Duration | s | 31,0931 | 535,963 |
| Pool Vaporization Rate | kg/s | 3,54093 | 3,11112 |
| Cloud Segment 3 | | | |
| Cloud Segment Duration | s | 180,54 | 2948,47 |
| Pool Vaporization Rate | kg/s | 4,2175 | 2,74729 |
| Cloud Segment 4 | | | |
| Cloud Segment Duration | s | 3321,94 | |
| Pool Vaporization Rate | kg/s | 3,25236 | |
| Maximum Pool Radius | m | 43,5504 | 43,501 |

Distance to Concentration Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the cloud centreline height

| Concentration(ppm) | Averaging Time | | DIA | NOITE |
|--------------------|----------------|---|---------|---------------------------------|
| UFL (65000) | 18,75 | s | 3,12 | 3,21959 |
| LFL (8000) | 18,75 | s | 23,6286 | 20,4534 |
| LFL Frac (4000) | 18,75 | s | 40,2657 | 32,9959 |
| Concentration(ppm) | Averaging Time | | DIA | Heights (m) for above distances |
| UFL (65000) | 18,75 | s | 0 | NOITE |
| LFL (8000) | 18,75 | s | 0 | 0 |
| LFL Frac (4000) | 18,75 | s | 0 | 0 |

Late Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

| | DIA | NOITE |
|-----------------------|--------|--------|
| Late Pool Fire Status | Hazard | Hazard |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Radiation Effects: Late Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

| | | | DIA | Distance (m) |
|-----------------|------|-------|-------------|------------------|
| Radiation Level | 3 | kW/m2 | 134,319 | NOITE 133,241 |
| Radiation Level | 18,3 | kW/m2 | 44,6673 | 44,6268 |
| Radiation Level | 36 | kW/m2 | Not Reached | Not Reached |
| Radiation Level | 71,2 | kW/m2 | Not Reached | Not Reached |

Radiation Effects: Late Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

| DIA | Radiation Level (kW/m2) |
|-----|-------------------------|
| | NOITE |

Fireball Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

| | DIA | NOITE |
|-----------------------|-----------|-----------|
| Fireball Flame Status | No Hazard | No Hazard |

Flash Fire Envelope

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

All flammable results are reported at the cloud centreline height

| | | | DIA | Distance (m) |
|-----------------|------|-----|---------|---------------------------------|
| Furthest Extent | 4000 | ppm | 40,2657 | NOITE 32,9959 |
| Furthest Extent | 8000 | ppm | 23,6286 | 20,4534 |
| | | | | Heights (m) for above distances |
| | | | DIA | NOITE |
| Furthest Extent | 4000 | ppm | 0 | 0 |
| Furthest Extent | 8000 | ppm | 0 | 0 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Explosion Effects: Early Explosion

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

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

| Supplied Flammable Mass | | | DIA | NOITE |
|---------------------------------------|------|-----|-----------|-----------|
| | | kg | 20975,9 | 20975,9 |
| Distance (m) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | No Hazard | No Hazard |
| Overpressure | 0,1 | bar | No Hazard | No Hazard |
| Overpressure | 0,3 | bar | No Hazard | No Hazard |
| Overpressure | 0,4 | bar | No Hazard | No Hazard |
| Used Mass (kg) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 0 | 0 |
| Overpressure | 0,1 | bar | 0 | 0 |
| Overpressure | 0,3 | bar | 0 | 0 |
| Overpressure | 0,4 | bar | 0 | 0 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Explosion Effects: Late Ignition

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

| | | | Maximum Distance (m) at Overpressure Level | |
|--------------|------|-----|--|---------|
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 43,3333 | 46,9536 |
| Overpressure | 0,1 | bar | 36,2503 | 36,7324 |
| Overpressure | 0,3 | bar | 33,121 | 28,3551 |
| Overpressure | 0,4 | bar | 32,6289 | 27,0377 |

| | | | Supplementary Data at 0,05 bar | |
|-------------------------|--|----|--------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 2,69345 | 4,15176 |
| Used Flammable Mass | | kg | 2,69345 | 4,15176 |
| Overpressure Radius | | m | 23,3333 | 26,9536 |
| Distance to: | | | | |
| - Ignition Source | | m | 20 | 20 |
| - Cloud Front/Centre | | m | 12,6334 | 10,9973 |
| - Explosion Centre | | m | 20 | 20 |

| | | | Supplementary Data at 0,1 bar | |
|-------------------------|--|----|-------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,216397 | 4,15176 |
| Used Flammable Mass | | kg | 0,216397 | 4,15176 |
| Overpressure Radius | | m | 6,25026 | 16,7324 |
| Distance to: | | | | |
| - Ignition Source | | m | 30 | 20 |
| - Cloud Front/Centre | | m | 22,3504 | 10,9973 |
| - Explosion Centre | | m | 30 | 20 |

| | | | Supplementary Data at 0,3 bar | |
|-------------------------|--|----|-------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,216397 | 4,15176 |
| Used Flammable Mass | | kg | 0,216397 | 4,15176 |
| Overpressure Radius | | m | 3,12097 | 8,35508 |
| Distance to: | | | | |
| - Ignition Source | | m | 30 | 20 |
| - Cloud Front/Centre | | m | 22,3504 | 10,9973 |
| - Explosion Centre | | m | 30 | 20 |

| | | | Supplementary Data at 0,4 bar | |
|-------------------------|--|----|-------------------------------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | | kg | 0,216397 | 4,15176 |
| Used Flammable Mass | | kg | 0,216397 | 4,15176 |
| Overpressure Radius | | m | 2,62889 | 7,03774 |
| Distance to: | | | | |
| - Ignition Source | | m | 30 | 20 |
| - Cloud Front/Centre | | m | 22,3504 | 10,9973 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | | | |
|--------------------|---|----|----|
| - Explosion Centre | m | 30 | 20 |
|--------------------|---|----|----|

Weather Conditions

Path: \Porto do Forno rev - IBAMA\Consequencias\H07,10

| | | DIA | NOITE |
|-----------------------------|----------|---------|---------|
| Wind Speed | m/s | 3,84 | 3,69 |
| Pasquill Stability | | C | E |
| Surface Roughness Length | in | 37,4366 | 37,4366 |
| Surface Roughness Parameter | | 0,17 | 0,17 |
| Atmospheric Temperature | degC | 24,03 | 22,83 |
| Surface Temperature | degC | 29,03 | 22,83 |
| Relative Humidity | fraction | 0,8117 | 0,8615 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

H08

Base Case

CASE Name: Data

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

User-Defined Data

Material

| | |
|---|---|
| Material Identifier | N-OCTANE |
| Type of Vessel | Unpressurized (at atmospheric pressure) |
| Pressure Specification | Pressure not used |
| Discharge Temperature | 25 degC |
| Volume Inventory of material to discharge | 300 m3 |

Scenario

| | |
|----------------------|----------------------|
| Type of Event | Catastrophic rupture |
| Phase | Liquid |
| Building Wake Option | None |
| Tank Head | 0 m |

Location

| | |
|--------------------------------------|-------------------|
| [Release elevation | 1 m] |
| Use ERPG averaging time | ERPG not selected |
| Use IDLH averaging time | IDLH not selected |
| Use STEL averaging time | STEL not selected |
| Supply a user defined averaging time | Not supplied |

Bund

| | |
|----------------------------|-------------------|
| Status of Bund | No bund present |
| [Surface type | Concrete] |
| [Height | 0 m] |
| [Modelling of bund failure | Bund cannot fail] |

Indoor/Outdoor

| | |
|---------------------|------------------|
| Location of release | Open air release |
|---------------------|------------------|

Flammable

| | |
|------------------------------|------------|
| Method to use for explosions | TNT |
| Jet Fire Method | Cone Model |

Dispersion

| | |
|--|--|
| Late Ignition Location | No ignition location |
| Mass Inventory of material to Disperse | 2,098E5 kg |
| Use Burst Pressure | No - Use release pressure for fireball |

Fireball Parameters

| | |
|----------------------------------|------------------|
| [Mass modification factor | 3] |
| [Calculation method for fireball | DNV Recommended] |
| [TNO model flame temperature | 1727 degC] |

Toxic Parameters

| | |
|----------------------------|-----------------|
| [Indoor calculations | Unselected] |
| [Ventilation specification | Case Specified] |
| [Building exchange rate | 4 /hr] |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | |
|---------------------------------|-----------------------------|
| [Tail time | 1800 s] |
| [Method of setting time | Use a fixed averaging time] |
| [Cut-off fraction of toxic load | 0,05 fraction] |
| [Cut-off concentration | 0 fraction] |

Geometry

| | |
|----------------|----------|
| Geometry shape | Point |
| Coordinates | Absolute |
| East(1) | 0 m |
| North(1) | 0 m |

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

Discharge Data

User-Defined Quantities

| | |
|----------------|----------------------|
| Material | N-OCTANE |
| Temperature | 25,00 degC |
| Pressure | 1,01 bar |
| Inventory | 209.759,38 kg |
| Scenario | Catastrophic rupture |
| Fixed Duration | n/a s |

Calculated Quantities

Weather: Global Weathers\Dia

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

Average Values for Segment Number 1

| | |
|--------------------------|---------------|
| Liquid Fraction | 1,00 fraction |
| FinalTemperature | 25,00 degC |
| Final Velocity | 0,00 m/s |
| Droplet Diameter | 10.000,00 um |
| Continuous Release Data: | |
| Mass Flowrate | n/a kg/s |
| Release Duration | n/a s |
| Orifice Velocity | n/a m/s |
| Exit Pressure | n/a bar |
| Exit Temperature | n/a degC |
| Discharge Coefficient | n/a |
| Expanded Radius | n/a m |

Weather: Global Weathers\NOITE

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

Average Values for Segment Number 1

| | |
|--------------------------|---------------|
| Liquid Fraction | 1,00 fraction |
| FinalTemperature | 25,00 degC |
| Final Velocity | 0,00 m/s |
| Droplet Diameter | 10.000,00 um |
| Continuous Release Data: | |
| Mass Flowrate | n/a kg/s |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | |
|-----------------------|----------|
| Release Duration | n/a s |
| Orifice Velocity | n/a m/s |
| Exit Pressure | n/a bar |
| Exit Temperature | n/a degC |
| Discharge Coefficient | n/a |
| Expanded Radius | n/a m |



Consequence Results

Pool Vaporization Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

N.B. Pool vaporization segments begin when the cloud has left the pool

| | | DIA | NOITE |
|------------------------|----------|----------|----------|
| Liquid Rainout | fraction | 0,999999 | 0,999999 |
| Initial Vapor Cloud | kg | 0,113938 | 0,11658 |
| Time Pool Left Behind | s | 42,798 | 62,76 |
| Cloud Segment 1 | | | |
| Cloud Segment Duration | s | 147,016 | 217,563 |
| Pool Vaporization Rate | kg/s | 10,6026 | 11,2241 |
| Cloud Segment 2 | | | |
| Cloud Segment Duration | s | 63,96 | 102,847 |
| Pool Vaporization Rate | kg/s | 24,6225 | 23,6954 |
| Cloud Segment 3 | | | |
| Cloud Segment Duration | s | 50,655 | 3279,59 |
| Pool Vaporization Rate | kg/s | 30,8934 | 26,5492 |
| Cloud Segment 4 | | | |
| Cloud Segment Duration | s | 246,872 | |
| Pool Vaporization Rate | kg/s | 37,7073 | |
| Cloud Segment 5 | | | |
| Cloud Segment Duration | s | 3091,5 | |
| Pool Vaporization Rate | kg/s | 31,0124 | |
| Maximum Pool Radius | m | 136,338 | 136,59 |

Distance to Concentration Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the cloud centreline height

| Concentration(ppm) | Averaging Time | | DIA | NOITE | Distance (m) |
|--------------------|----------------|---|---------|---------|---------------------------------|
| UFL (65000) | 18,75 | s | 7,35532 | 7,39468 | |
| LFL (8000) | 18,75 | s | 46,116 | 41,6603 | |
| LFL Frac (4000) | 18,75 | s | 82,294 | 68,9032 | |
| Concentration(ppm) | Averaging Time | | DIA | NOITE | Heights (m) for above distances |
| UFL (65000) | 18,75 | s | 0 | 0 | |
| LFL (8000) | 18,75 | s | 0 | 0 | |
| LFL Frac (4000) | 18,75 | s | 0 | 0 | |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Late Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

| | DIA | NOITE |
|-----------------------|--------|--------|
| Late Pool Fire Status | Hazard | Hazard |

Radiation Effects: Late Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

| | | | DIA | NOITE |
|-----------------|------|-------|-------------|--------------|
| | | | | Distance (m) |
| Radiation Level | 3 | kW/m2 | 332,394 | 330,843 |
| Radiation Level | 18,3 | kW/m2 | 137,578 | 137,895 |
| Radiation Level | 36 | kW/m2 | Not Reached | Not Reached |
| Radiation Level | 71,2 | kW/m2 | Not Reached | Not Reached |

Radiation Effects: Late Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

| | DIA | Radiation Level (kW/m2) |
|--|-----|-------------------------|
| | | NOITE |

Fireball Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

| | DIA | NOITE |
|-----------------------|-----------|-----------|
| Fireball Flame Status | No Hazard | No Hazard |

Flash Fire Envelope

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

All flammable results are reported at the cloud centreline height

| | | | DIA | NOITE |
|-----------------|------|-----|--------|---------------------------------|
| | | | | Distance (m) |
| Furthest Extent | 4000 | ppm | 82,294 | 68,9032 |
| Furthest Extent | 8000 | ppm | 46,116 | 41,6603 |
| | | | | Heights (m) for above distances |
| | | | DIA | NOITE |
| Furthest Extent | 4000 | ppm | 0 | 0 |
| Furthest Extent | 8000 | ppm | 0 | 0 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Explosion Effects: Early Explosion

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

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

| Supplied Flammable Mass | | | DIA | NOITE |
|---------------------------------------|------|-----|-----------|-----------|
| | | kg | 209759 | 209759 |
| Distance (m) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | No Hazard | No Hazard |
| Overpressure | 0,1 | bar | No Hazard | No Hazard |
| Overpressure | 0,3 | bar | No Hazard | No Hazard |
| Overpressure | 0,4 | bar | No Hazard | No Hazard |
| Used Mass (kg) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 0 | 0 |
| Overpressure | 0,1 | bar | 0 | 0 |
| Overpressure | 0,3 | bar | 0 | 0 |
| Overpressure | 0,4 | bar | 0 | 0 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Explosion Effects: Late Ignition

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

| | | | Maximum Distance (m) at Overpressure Level | |
|--------------|------|-----|--|---------|
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 100,711 | 99,5354 |
| Overpressure | 0,1 | bar | 81,4807 | 80,7509 |
| Overpressure | 0,3 | bar | 68,0954 | 65,355 |
| Overpressure | 0,4 | bar | 66,819 | 62,934 |

Supplementary Data at 0,05 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|---------|
| Supplied Flammable Mass | kg | | 27,6497 | 25,7709 |
| Used Flammable Mass | kg | | 27,6497 | 25,7709 |
| Overpressure Radius | m | | 50,711 | 49,5354 |
| Distance to: | | | | |
| - Ignition Source | m | | 50 | 50 |
| - Cloud Front/Centre | m | | 29,7361 | 26,5477 |
| - Explosion Centre | m | | 50 | 50 |

Supplementary Data at 0,1 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|---------|
| Supplied Flammable Mass | kg | | 27,6497 | 25,7709 |
| Used Flammable Mass | kg | | 27,6497 | 25,7709 |
| Overpressure Radius | m | | 31,4807 | 30,7509 |
| Distance to: | | | | |
| - Ignition Source | m | | 50 | 50 |
| - Cloud Front/Centre | m | | 29,7361 | 26,5477 |
| - Explosion Centre | m | | 50 | 50 |

Supplementary Data at 0,3 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|---------|
| Supplied Flammable Mass | kg | | 3,77661 | 25,7709 |
| Used Flammable Mass | kg | | 3,77661 | 25,7709 |
| Overpressure Radius | m | | 8,09544 | 15,355 |
| Distance to: | | | | |
| - Ignition Source | m | | 60 | 50 |
| - Cloud Front/Centre | m | | 40,2146 | 26,5477 |
| - Explosion Centre | m | | 60 | 50 |

Supplementary Data at 0,4 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|---------|
| Supplied Flammable Mass | kg | | 3,77661 | 25,7709 |
| Used Flammable Mass | kg | | 3,77661 | 25,7709 |
| Overpressure Radius | m | | 6,81903 | 12,934 |
| Distance to: | | | | |
| - Ignition Source | m | | 60 | 50 |
| - Cloud Front/Centre | m | | 40,2146 | 26,5477 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | | | |
|--------------------|---|----|----|
| - Explosion Centre | m | 60 | 50 |
|--------------------|---|----|----|

Weather Conditions

Path: \Porto do Forno rev - IBAMA\Consequencias\H08

| | | DIA | NOITE |
|-----------------------------|----------|---------|---------|
| Wind Speed | m/s | 3,84 | 3,69 |
| Pasquill Stability | | C | E |
| Surface Roughness Length | in | 37,4366 | 37,4366 |
| Surface Roughness Parameter | | 0,17 | 0,17 |
| Atmospheric Temperature | degC | 24,03 | 22,83 |
| Surface Temperature | degC | 29,03 | 22,83 |
| Relative Humidity | fraction | 0,8117 | 0,8615 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

H09

Base Case

CASE Name: Data

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

User-Defined Data

Material

| | |
|---|---|
| Material Identifier | N-OCTANE |
| Type of Vessel | Unpressurized (at atmospheric pressure) |
| Pressure Specification | Pressure not used |
| Discharge Temperature | 25 degC |
| Volume Inventory of material to discharge | 43 m3 |

Scenario

| | |
|----------------------|----------------------|
| Type of Event | Catastrophic rupture |
| Phase | Liquid |
| Building Wake Option | None |
| Tank Head | 0 m |

Location

| | |
|--------------------------------------|-------------------|
| [Release elevation | 1 m] |
| Use ERPG averaging time | ERPG not selected |
| Use IDLH averaging time | IDLH not selected |
| Use STEL averaging time | STEL not selected |
| Supply a user defined averaging time | Not supplied |

Bund

| | |
|----------------------------|-------------------|
| Status of Bund | No bund present |
| [Surface type | Concrete] |
| [Height | 0 m] |
| [Modelling of bund failure | Bund cannot fail] |

Indoor/Outdoor

| | |
|---------------------|------------------|
| Location of release | Open air release |
|---------------------|------------------|

Flammable

| | |
|------------------------------|------------|
| Method to use for explosions | TNT |
| Jet Fire Method | Cone Model |

Dispersion

| | |
|--|--|
| Late Ignition Location | No ignition location |
| Mass Inventory of material to Disperse | 3,007E4 kg |
| Use Burst Pressure | No - Use release pressure for fireball |

Fireball Parameters

| | |
|----------------------------------|------------------|
| [Mass modification factor | 3] |
| [Calculation method for fireball | DNV Recommended] |
| [TNO model flame temperature | 1727 degC] |

Toxic Parameters

| | |
|----------------------------|-----------------|
| [Indoor calculations | Unselected] |
| [Ventilation specification | Case Specified] |
| [Building exchange rate | 4 /hr] |

SUMMARY REPORT

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Study Folder: Porto do Forno rev - IBAMA

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[Tail time 1800 s]
[Method of setting time Use a fixed averaging time]
[Cut-off fraction of toxic load 0,05 fraction]
[Cut-off concentration 0 fraction]

Geometry

Geometry shape Point
Coordinates Absolute
East(1) 0 m
North(1) 0 m

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

Discharge Data

User-Defined Quantities

Material N-OCTANE
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 30.065,51 kg
Scenario Catastrophic rupture
Fixed Duration n/a s

Calculated Quantities

Weather: Global Weathers\Dia

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

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 0,00 m/s
Droplet Diameter 10.000,00 um
Continuous Release Data:
Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice Velocity n/a m/s
Exit Pressure n/a bar
Exit Temperature n/a degC
Discharge Coefficient n/a
Expanded Radius n/a m

Weather: Global Weathers\NOITE

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

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 0,00 m/s
Droplet Diameter 10.000,00 um
Continuous Release Data:
Mass Flowrate n/a kg/s

SUMMARY REPORT

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Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | |
|-----------------------|----------|
| Release Duration | n/a s |
| Orifice Velocity | n/a m/s |
| Exit Pressure | n/a bar |
| Exit Temperature | n/a degC |
| Discharge Coefficient | n/a |
| Expanded Radius | n/a m |

SUMMARY REPORT

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Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Consequence Results

Pool Vaporization Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

N.B. Pool vaporization segments begin when the cloud has left the pool

| | | DIA | NOITE |
|------------------------|----------|-----------|-----------|
| Liquid Rainout | fraction | 0,999999 | 0,999999 |
| Initial Vapor Cloud | kg | 0,0286778 | 0,0242196 |
| Time Pool Left Behind | s | 18,225 | 34,85 |
| Cloud Segment 1 | | | |
| Cloud Segment Duration | s | 75,2556 | 126,563 |
| Pool Vaporization Rate | kg/s | 2,21006 | 2,42385 |
| Cloud Segment 2 | | | |
| Cloud Segment Duration | s | 34,47 | 555,953 |
| Pool Vaporization Rate | kg/s | 4,80412 | 4,39355 |
| Cloud Segment 3 | | | |
| Cloud Segment Duration | s | 193,905 | 2917,48 |
| Pool Vaporization Rate | kg/s | 5,93673 | 3,90546 |
| Cloud Segment 4 | | | |
| Cloud Segment Duration | s | 3296,37 | |
| Pool Vaporization Rate | kg/s | 4,62611 | |
| Maximum Pool Radius | m | 52,0899 | 52,0459 |

Distance to Concentration Results

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the cloud centreline height

| Concentration(ppm) | Averaging Time | | DIA | NOITE |
|--------------------|----------------|---|---------|--|
| UFL (65000) | 18,75 | s | 3,49501 | 3,71514 |
| LFL (8000) | 18,75 | s | 25,2984 | 22,5786 |
| LFL Frac (4000) | 18,75 | s | 44,8828 | 37,0599 |
| Concentration(ppm) | Averaging Time | | DIA | Heights (m) for above distances NOITE |
| UFL (65000) | 18,75 | s | 0 | 0 |
| LFL (8000) | 18,75 | s | 0 | 0 |
| LFL Frac (4000) | 18,75 | s | 0 | 0 |

Late Pool Fire Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

| | DIA | NOITE |
|-----------------------|--------|--------|
| Late Pool Fire Status | Hazard | Hazard |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Radiation Effects: Late Pool Fire Ellipse

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

| | | | DIA | Distance (m) |
|-----------------|------|-------|-------------|--------------|
| Radiation Level | 3 | kW/m2 | 154,726 | 153,541 |
| Radiation Level | 18,3 | kW/m2 | 53,2352 | 53,2057 |
| Radiation Level | 36 | kW/m2 | Not Reached | Not Reached |
| Radiation Level | 71,2 | kW/m2 | Not Reached | Not Reached |

Radiation Effects: Late Pool Fire Distance

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

| DIA | Radiation Level (kW/m2) |
|-----|-------------------------|
| | NOITE |

Fireball Hazard

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

| | DIA | NOITE |
|-----------------------|-----------|-----------|
| Fireball Flame Status | No Hazard | No Hazard |

Flash Fire Envelope

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

All flammable results are reported at the cloud centreline height

| | | | DIA | Distance (m) |
|-----------------|------|-----|---------|--------------|
| Furthest Extent | 4000 | ppm | 44,8828 | 37,0599 |
| Furthest Extent | 8000 | ppm | 25,2984 | 22,5786 |

| | | | DIA | Heights (m) for above distances |
|-----------------|------|-----|-----|---------------------------------|
| Furthest Extent | 4000 | ppm | 0 | NOITE |
| Furthest Extent | 8000 | ppm | 0 | 0 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Explosion Effects: Early Explosion

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

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

| Supplied Flammable Mass | | | DIA | NOITE |
|---------------------------------------|------|-----|-----------|-----------|
| | | kg | 30065,5 | 30065,5 |
| Distance (m) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | No Hazard | No Hazard |
| Overpressure | 0,1 | bar | No Hazard | No Hazard |
| Overpressure | 0,3 | bar | No Hazard | No Hazard |
| Overpressure | 0,4 | bar | No Hazard | No Hazard |
| Used Mass (kg) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 0 | 0 |
| Overpressure | 0,1 | bar | 0 | 0 |
| Overpressure | 0,3 | bar | 0 | 0 |
| Overpressure | 0,4 | bar | 0 | 0 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

Explosion Effects: Late Ignition

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

| | | | Maximum Distance (m) at Overpressure Level | |
|--------------|------|-----|--|---------|
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 47,2456 | 51,5583 |
| Overpressure | 0,1 | bar | 40,5182 | 39,5909 |
| Overpressure | 0,3 | bar | 35,2521 | 34,1417 |
| Overpressure | 0,4 | bar | 34,424 | 33,4887 |

Supplementary Data at 0,05 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|---------|
| Supplied Flammable Mass | kg | | 4,28816 | 6,66382 |
| Used Flammable Mass | kg | | 4,28816 | 6,66382 |
| Overpressure Radius | m | | 27,2456 | 31,5583 |
| Distance to: | | | | |
| - Ignition Source | m | | 20 | 20 |
| - Cloud Front/Centre | m | | 11,8963 | 10,1649 |
| - Explosion Centre | m | | 20 | 20 |

Supplementary Data at 0,1 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|---------|
| Supplied Flammable Mass | kg | | 1,0313 | 6,66382 |
| Used Flammable Mass | kg | | 1,0313 | 6,66382 |
| Overpressure Radius | m | | 10,5182 | 19,5909 |
| Distance to: | | | | |
| - Ignition Source | m | | 30 | 20 |
| - Cloud Front/Centre | m | | 21,0336 | 10,1649 |
| - Explosion Centre | m | | 30 | 20 |

Supplementary Data at 0,3 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|----------|
| Supplied Flammable Mass | kg | | 1,0313 | 0,505721 |
| Used Flammable Mass | kg | | 1,0313 | 0,505721 |
| Overpressure Radius | m | | 5,25211 | 4,14168 |
| Distance to: | | | | |
| - Ignition Source | m | | 30 | 30 |
| - Cloud Front/Centre | m | | 21,0336 | 19,282 |
| - Explosion Centre | m | | 30 | 30 |

Supplementary Data at 0,4 bar

| | | | DIA | NOITE |
|-------------------------|----|--|---------|----------|
| Supplied Flammable Mass | kg | | 1,0313 | 0,505721 |
| Used Flammable Mass | kg | | 1,0313 | 0,505721 |
| Overpressure Radius | m | | 4,42401 | 3,48867 |
| Distance to: | | | | |
| - Ignition Source | m | | 30 | 30 |
| - Cloud Front/Centre | m | | 21,0336 | 19,282 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

| | | | |
|--------------------|---|----|----|
| - Explosion Centre | m | 30 | 30 |
|--------------------|---|----|----|

Weather Conditions

Path: \Porto do Forno rev - IBAMA\Consequencias\H09

| | | DIA | NOITE |
|-----------------------------|----------|---------|---------|
| Wind Speed | m/s | 3,84 | 3,69 |
| Pasquill Stability | | C | E |
| Surface Roughness Length | in | 37,4366 | 37,4366 |
| Surface Roughness Parameter | | 0,17 | 0,17 |
| Atmospheric Temperature | degC | 24,03 | 22,83 |
| Surface Temperature | degC | 29,03 | 22,83 |
| Relative Humidity | fraction | 0,8117 | 0,8615 |

SUMMARY REPORT

Unique Audit Number: 75.227



Study Folder: Porto do Forno rev - IBAMA

Phast 6.54

H11 Explosion

Base Case

CASE Name: Data

Path: \Porto do Forno rev - IBAMA\Consequencias\H11 Explosion

User-Defined Data

Material

Material Identifier GLP

TNT Explosion

| | |
|--------------------------|------------|
| Distance Step Size | 0,01 m |
| Minimum Distance | 1 m |
| Maximum Distance | 300 m |
| Flammable Mass | 342 kg |
| Liquid Fraction | 0 fraction |
| Mass Modification Factor | 1 |

Geometry

| | |
|----------------|----------|
| Geometry shape | Point |
| Coordinates | Absolute |
| East(1) | 0 m |
| North(1) | 0 m |



Consequence Results

Explosion Effects: Early Explosion

Path: \Porto do Forno rev - IBAMA\Consequencias\H11 Explosion

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

| | | | | |
|---------------------------------------|------|-----|---------|---------|
| | | | DIA | NOITE |
| Supplied Flammable Mass | kg | | 342 | 342 |
| Distance (m) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 118,638 | 118,638 |
| Overpressure | 0,1 | bar | 73,6485 | 73,6485 |
| Overpressure | 0,3 | bar | 36,7753 | 36,7753 |
| Overpressure | 0,4 | bar | 30,9769 | 30,9769 |
| Used Mass (kg) at Overpressure Levels | | | | |
| | | | DIA | NOITE |
| Overpressure | 0,05 | bar | 342 | 342 |
| Overpressure | 0,1 | bar | 342 | 342 |
| Overpressure | 0,3 | bar | 342 | 342 |
| Overpressure | 0,4 | bar | 342 | 342 |

Weather Conditions

Path: \Porto do Forno rev - IBAMA\Consequencias\H11 Explosion

| | | | | |
|-----------------------------|----------|--|---------|---------|
| | | | DIA | NOITE |
| Wind Speed | m/s | | 3,84 | 3,69 |
| Pasquill Stability | | | C | E |
| Surface Roughness Length | in | | 37,4366 | 37,4366 |
| Surface Roughness Parameter | | | 0,17 | 0,17 |
| Atmospheric Temperature | degC | | 24,03 | 22,83 |
| Surface Temperature | degC | | 29,03 | 22,83 |
| Relative Humidity | fraction | | 0,8117 | 0,8615 |