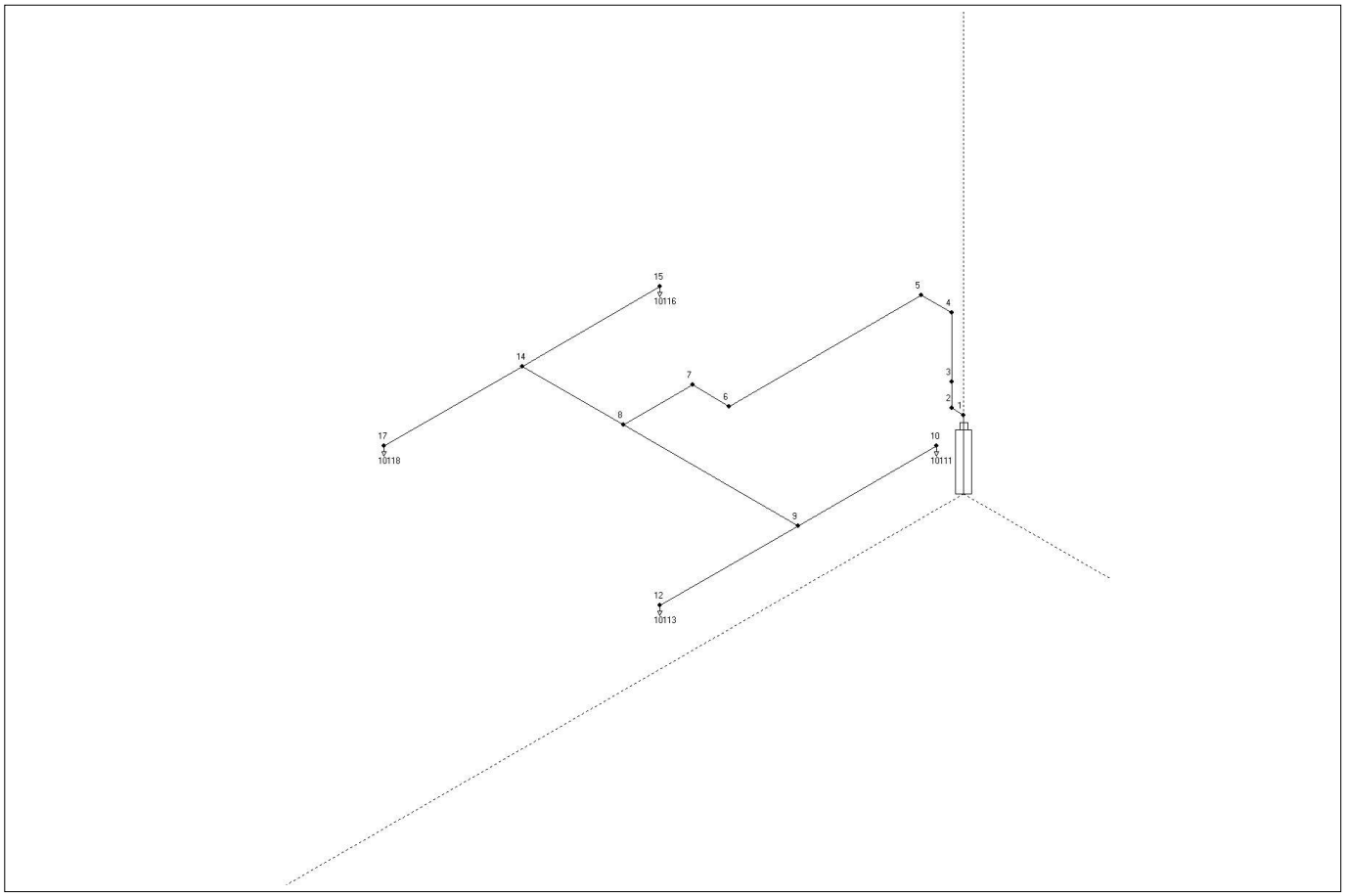
| | |
|---|---|
| Project: | Saudi |
| Project-No: | 18-12-285 |
| Building: | |
| Object: | LV Room |
| Contractor: | |
| Owner: | |
| Project engineer: | |
| Date: | 16-Dec-18 |
| Altitude above sealevel: | 0 m |
| Regulation rule for calculation of FK-5-1-12 quantities: | NFPA 2001 (edition 2000) |
| | |
| Pipe catalogue: | SHG Pipe - Schedule 40 - 1.0.0.rkl |
| Component catalogue: | SHG Components 1.0.0.arm |
| Nozzle catalogue: | SHG Nozzles - 1.0.2.noz |



## Pipesystem data:

| Section-No: | Starting-node | Endnode | Length [m] | Height [m] | Pipetype | Diameter [mm] ** | Fitting * | Component code | Component coefficient | Nb of containers FK-5-1-12 quantity |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1.485 | 1.485 | 10 | 62.7 | C | 160 | 3.500 | 0.0 |
| 2 | 1 | 2 | 0.250 | 0.000 | 10 | 62.7 | E | - | - | 0.0 |
| 3 | 2 | 3 | 0.500 | 0.500 | 12 | 62.7 | E | - | - | 0.0 |
| 4 | 3 | 4 | 1.300 | 1.300 | 13 | 102.3 | | - | - | 0.0 |
| 5 | 4 | 5 | 0.660 | 0.000 | 13 | 102.3 | E | - | - | 0.0 |
| 6 | 5 | 6 | 4.180 | 0.000 | 13 | 102.3 | E | - | - | 0.0 |
| 7 | 6 | 7 | 0.800 | 0.000 | 13 | 77.9 | E | - | - | 0.0 |
| 8 | 7 | 8 | 1.500 | 0.000 | 13 | 77.9 | E | - | - | 0.0 |
| 9 | 8 | 9 | 3.800 | 0.000 | 13 | 62.7 | T-90° | - | - | 0.0 |
| 10 | 9 | 10 | 3.000 | 0.000 | 13 | 52.5 | T-90° | - | - | 0.0 |
| 11 | 10 | 10111 | 0.100 | -0.100 | 13 | 52.5 | E | - | - | 0.0 |
| 12 | 9 | 12 | 3.000 | 0.000 | 13 | 52.5 | T-90° | - | - | 0.0 |
| 13 | 12 | 10113 | 0.100 | -0.100 | 13 | 52.5 | E | - | - | 0.0 |
| 14 | 8 | 14 | 2.200 | 0.000 | 13 | 62.7 | T-90° | - | - | 0.0 |
| 15 | 14 | 15 | 3.000 | 0.000 | 13 | 52.5 | T-90° | - | - | 0.0 |
| 16 | 15 | 10116 | 0.100 | -0.100 | 13 | 52.5 | E | - | - | 0.0 |
| 17 | 14 | 17 | 3.000 | 0.000 | 13 | 52.5 | T-90° | - | - | 0.0 |
| 18 | 17 | 10118 | 0.100 | -0.100 | 13 | 52.5 | E | - | - | 0.0 |

* C=Component, B=Bend, T=T-Piece, E=Elbow
** If a pipe diameter is equal zero see the extra table of the calculated diameters

### Legend of pipetypes

| Type | Pipeclass | Pipe roughness |
|---|---|---|
| 10 | Schedule 40 - 1/4" to 6" Diameter | smooth |
| 12 | Schedule 40 - 1/4" to 6" Diameter | hose |
| 13 | Schedule 40 - 1/4" to 6" Diameter | black pipe |

### Legend of components

| Code | Type | Resistance coefficient |
|---|---|---|
| 160 | 950LB | 3.500 |

**Nozzle data:**

| No. | Calculation zone | Diameter [mm] |
|---|---|---|
| 10111 | LV Room | 21.5 |
| 10113 | LV Room | 21.5 |
| 10116 | LV Room | 21.5 |
| 10118 | LV Room | 21.5 |

**Legend of nozzles:**

| Type | Number of orifices | C1 | C2 | C3 | C4 | C5 | C6 |
|---|---|---|---|---|---|---|---|
| 1 360° Central | 1 | 0.10652 | 0.26900 | 0.00000 | -0.18900 | 0.00000 | 0.00000 |

**Calculation zone data:**

**Calculation of design quantity:**

| Zone | Total volume [m3] | Volume of building parts [m3] | Calculated volume [m3] | Total surface [m2] | Max. Over-pressure [mbar] | Design temp. [°C] | Extinguish-conc. [% Vol] | Design factor | Design conc. [% Vol] | Design quantity [kg] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 LV Room | 457.0 | 0.0 | 457.0 | 0.0 | 1.000 | 25.0 | 3.3 | 1.35 | 4.5 | 294.09 |

Regulation rule for calculation of FK-5-1-12 quantities: NFPA 2001 (edition 2000)
Altitude above sealevel: 0.0 m

**FK-5-1-12 storage input data:**

| | |
|---|---|
| Container volume: | 368.0 l |
| Filling ratio: | 1.200 kg/l |
| Filling pressure: | 34.5 bar abs |
| Storage temperature: | 21.1 °C |
| Supplement factor: | 1.02 |
| Minimum storage quantity: | 299.98 kg |
| Number of containers: | 0 |

**Discharge time (input value):** 10.0 s

**Further information:**
Design with included gas discharge time
Design with predeterminated orifice diameters

# Calculation results:

**FK-5-1-12 storage data:**

| | |
|---|---|
| Design quantity: | 294.1 kg |
| Supplement factor: | 1.02 |
| Minimum storage quantitiy: | 300.0 kg |
| | |
| Container volume: | 368.0 l |
| Filling ratio: | 0.82 kg/l |
| Filling pressure: | 34.5 bar abs |
| FK-5-1-12 -mass per container: | 300.0 kg |
| Number of containers: | 1 |
| Actual storage quantity: | 300.0 kg |
| | |
| Storage temperature: | 21.1 °C |
| Starting container pressure: | 34.5 bar abs |

**Discharge time:**

| | |
|---|---|
| Discharge time air: | 0.5 s |
| Total gas discharge time: | 0.9 s |
| Two-phase discharge time: | 9.5 s |
| Total discharge time: | 10.4 s |

**System information:**

| | |
|---|---|
| Container working pressure: | 16.6 bar abs |
| Container working temperature: | 21.1 °C |
| Total network volume: | 114.4 l |
| Medium pipe content: | 149.6 kg FK-5-1-12 |
| Filling portion in pipe system: | 0.51 kg FK-5-1-12 /kg FK-5-1-12 -storage |

**Pipe system:**

| Section-No: | Starting-node | Endnode | Pressure [bar abs] | Flowrate [kg/s] | Pipedimension Di [mm] | DN |
|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 15.19 | 29.34 | 62.7 * | 2 1/2" |
| 2 | 1 | 2 | 14.61 | 29.48 | 62.7 * | 2 1/2" |
| 3 | 2 | 3 | 13.92 | 29.48 | 62.7 * | 2 1/2" |
| 4 | 3 | 4 | 13.74 | 29.48 | 102.3 * | 4" |
| 5 | 4 | 5 | 13.64 | 29.48 | 102.3 * | 4" |
| 6 | 5 | 6 | 13.53 | 29.48 | 102.3 * | 4" |
| 7 | 6 | 7 | 13.20 | 29.48 | 77.9 * | 3" |
| 8 | 7 | 8 | 12.89 | 29.48 | 77.9 * | 3" |
| 9 | 8 | 9 | 12.59 | 14.72 | 62.7 * | 2 1/2" |
| 10 | 9 | 10 | 12.41 | 7.36 | 52.5 | 2" |
| 11 | 10 | 10111 | 12.33 | 7.36 | 52.5 | 2" |
| 12 | 9 | 12 | 12.41 | 7.36 | 52.5 | 2" |
| 13 | 12 | 10113 | 12.33 | 7.36 | 52.5 | 2" |
| 14 | 8 | 14 | 12.63 | 14.75 | 62.7 * | 2 1/2" |
| 15 | 14 | 15 | 12.44 | 7.38 | 52.5 | 2" |
| 16 | 15 | 10116 | 12.37 | 7.38 | 52.5 | 2" |
| 17 | 14 | 17 | 12.44 | 7.38 | 52.5 | 2" |
| 18 | 17 | 10118 | 12.37 | 7.38 | 52.5 | 2" |

* Attention! This pipe dimension is not in the pipe catalogue!

**Nozzle data:**

| Calculation-zone no: | Nozzle no. | Nozzle type | Number of orifices | Pipeconnection Di [mm] | DN | Orifice [mm] | FK-5-1-12 output [kg] |
|---|---|---|---|---|---|---|---|
| 1 | 10111 | 1 | 1 | 52.5 | 2" | 21.5 | 73.8 |
| 1 | 10113 | 1 | 1 | 52.5 | 2" | 21.5 | 73.8 |
| 1 | 10116 | 1 | 1 | 52.5 | 2" | 21.5 | 73.9 |
| 1 | 10118 | 1 | 1 | 52.5 | 2" | 21.5 | 73.9 |

Two-phase discharge time: 9.5 s

MAXIMUM TRANSPORT TIME DIFF. BETWEEN NOZZLES: 10118./ 10113. IS 0.42 S

| Calculation-zone no: | Nozzle no. | Outlet velocity [m/s] | Transport time [s] | Jetdistance [m] | Evaporation distance [m] |
|---|---|---|---|---|---|
| 1 | 10111 | 16.9 | 5.23 | 8.42 | 4.90 |
| 1 | 10113 | 16.9 | 5.23 | 8.42 | 4.90 |
| 1 | 10116 | 16.8 | 4.81 | 8.42 | 4.90 |
| 1 | 10118 | 16.8 | 4.81 | 8.42 | 4.90 |

**Concentrations:**

| Calculation-zone no: | Gascomposition after discharge [%] O2 | FK-5-1-12 | N2 |
|---|---|---|---|
| 1 | 20.0 | 4.5 | 74.6 |

**Pressure relief opening:**

| Calculation-zone no: | Recommended area against overpressure Area [m²] | Overpressure [mbar] | Max. flow [kg/s] |
|---|---|---|---|
| 1 | 0.283 | 1.0 | 29.5 |

## Component list:

| Component | Number | Code | Coefficient |
|---|---|---|---|
| 950LB | 1 | 160 | 3.500 |

| Nozzle-type | Number | C1 | C2 | C3 | C4 | C5 | C6 |
|---|---|---|---|---|---|---|---|
| 1 | 4 | 0.10650 | 0.26900 | 0.00000 | -0.18900 | 0.00000 | 0.00000 |

| Pipe-type | Di [mm] | DN | Length [m] |
|---|---|---|---|
| 10 | 62.70 | 2 1/2" | 1.800 |
| 12 | 62.70 | 2 1/2" | 0.500 |
| 13 | 102.30 | 4" | 6.200 |
| 13 | 77.90 | 3" | 2.300 |
| 13 | 62.70 | 2 1/2" | 6.000 |
| 13 | 52.50 | 2" | 12.400 |

**Number of bends (+) and elbows (-)**

| Bend-type | Di [mm] | DN | Number |
|---|---|---|---|
| -90 | 62.70 | 2 1/2" | 1 |
| -90 | 62.70 | 2 1/2" | 1 |
| -90 | 102.30 | 4" | 2 |
| -90 | 77.90 | 3" | 2 |
| -90 | 52.50 | 2" | 4 |

**Number of T-distributors (in- and outdiameter)**

| Number | Input | 90-out | 90-out | 0-out |
|---|---|---|---|---|
| 1 | 77.9 | 62.7 | 62.7 | 0.0 |
| 2 | 62.7 | 52.5 | 52.5 | 0.0 |