

Project: Hampton Loade pH Correction

Date: 24/11/2011

Document: 15018-CAL-111

Pages: 6

HEAT LOSS CALCULATION

Amendment Record

Revision	Date	Description of changes	Prepared by (sign)	Checked by (sign)	Authorised by (sign)
0	07/09/2011	Original issue	PKF		
A	27/09/2011	Building height increase; bund air gap decrease	PKF		
B	24/11/2011	Change to existing chlorine bulk store	PKF		

HEAT LOSS CALCULATION - BUILDING (UNINSULATED)

Scheme Number	15018	Prepared	P K Francis	Date	24-Nov-11
Scheme Name	Hampton Loade pH Correction	Checked	.	Date	.
Doc Ref	15018-CAL-111 Rev. B	Reviewed	.	Date	.

Building Temperature

Required building temperature	15 °C
Minimum external temperature	-5 °C
Temperature lift =	20 °C

Chlorine Building dimensions

Length	8.8 m
Width	9.38 m
Eave height	4.45 m
Ridge height	4.45 m
Ventilation rate	0.5 AC/h
Door 1	2m x 2.2m
Door 2	1m x 2.2m
Door 3	2.2m x 2.5m
Area of roof=	82.54 m ²
Area of walls=	149.70 m ²
Area of floor=	82.54 m ²
Area of doors=	12.10 m ²

Roof material	100mm concrete slab with 35mm screed and 20mm asphalt
External walls	2x100mm brick with 75mm cavity uninsulated
Floor slab	150mm concrete with 75mm screed and quarry tiles

Roof U value	2.793 W/m ² °C
Walls U value	1.954 W/m ² °C
Floor U value	2.101 W/m ² °C
Doors U value*	2.2 W/m ² °C

* Data from Building regulations 2006 L2A table 4

Heat loss through roof=	230.56 W/°C
Heat loss through walls=	292.52 W/°C
Heat loss through floor=	173.40 W/°C
Heat loss through doors=	26.62 W/°C
Total surface heat loss=	696.48 W/°C

Heat loss through ventilation	62.44 W/°C
Total heat loss=	835.77 W/°C
Heat input required = total heat loss x temperature uplift	16715.42 W

Cavity Wall U-value calculation

Conductivity air gap	2.25 W/m ² °C
Cond. inner brick	0.56 W/m ² °C
Cond. outer brick	0.77 W/m ² °C
Inner wall thickness	100 mm
Outer wall thickness	100 mm
Air gap	75 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Inner wall	0.179 m ² °C/W
Air gap	0.033 m ² °C/W
Outer wall	0.130 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.512 m ² °C/W
U value = 1/ thermal resistance	
Walls u-value	1.954 W/m ² °C

Concrete Roof U-value calculation

Cond. concrete	1.35 W/m ² °C
Cond. Screed	0.41 W/m ² °C
Cond. Asphalt	0.7 W/m ² °C
Concrete thickness	100 mm
Screed thickness	35 mm
Asphalt thickness	20 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Concrete	0.074 m ² °C/W
Screed	0.085 m ² °C/W
Asphalt	0.029 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.358 m ² °C/W
U value = 1/ thermal resistance	
Roof u-value	2.793 W/m ² °C

Concrete Floor U-value calculation

Cond. concrete	1.35 W/m ² °C
Cond. Screed	0.41 W/m ² °C
Cond. Tile	1 W/m ² °C
Concrete thickness	150 mm
Screed thickness	75 mm
Tile thickness	12 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Concrete	0.111 m ² °C/W
Screed	0.183 m ² °C/W
Tile	0.012 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.476 m ² °C/W
U value = 1/ thermal resistance	
Floor u-value	2.101 W/m ² °C

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Lean-to/bund dimensions	
Length	8.86 m
Width	9.2 m
Eave height	3.2 m
Ridge height	3.2 m
Ventilation rate	0.5 AC/h
Area of roof=	81.51 m ²
Area of walls=	115.58 m ²
Area of floor=	81.51 m ²

Roof material	To current building regs
External walls	250mm cast concrete
Floor slab	250mm cast concrete with graded screed to drain

Roof U value*	0.25 W/m ² °C
Walls U value	2.815 W/m ² °C
Floor U value	2.209 W/m ² °C
Doors U value*	W/m ² °C

* Data from Building regulations 2006 L2A table 4

Heat loss through roof=	20.38 W/°C
Heat loss through walls=	325.42 W/°C
Heat loss through floor=	180.04 W/°C
Heat loss through doors=	0.00 W/°C
Total surface heat loss=	525.84 W/°C

Heat loss through ventilation	44.34 W/°C
Total heat loss=	631.00 W/°C
Heat input required = total heat loss x temperature uplift	12620.07 W

Concrete Wall U-value calculation	
Cond.concrete	1.35 W/m ² °C
Cond. Screed	0.41 W/m ² °C
Cond. Tile	0.52 W/m ² °C
Concrete thickness	250 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Concrete	0.185 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.355 m ² °C/W
U value = 1/ thermal resistance	
Wall u-value	2.815 W/m ² °C

Concrete Floor U-value calculation	
Cond.concrete	1.35 W/m ² °C
Cond. Screed	0.41 W/m ² °C
Concrete thickness	250 mm
Screed thickness	40 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Concrete	0.185 m ² °C/W
Screed	0.098 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.453 m ² °C/W
U value = 1/ thermal resistance	
Floor u-value	2.209 W/m ² °C

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Building Temperature

Required building temperature	12 °C
Minimum external temperature	-15 °C
Temperature lift =	27 °C

Chlorine Building dimensions

Length	8.8 m
Width	9.38 m
Eave height	4.45 m
Ridge height	4.45 m
Ventilation rate	0.5 AC/h
Door 1	2.1m x 2.2m
Door 2	0.8m x 2.2m
Door 3	0.8m x 2.2m
Area of roof=	82.54 m ²
Area of walls=	153.66 m ²
Area of floor=	82.54 m ²
Area of doors=	8.14 m ²

Roof material	100mm concrete slab with 35mm screed and 20mm asphalt with 50mm phenolic board insulation
External walls	2x100mm brick with 75mm cavity insulated**
Floor slab	150mm concrete with 75mm screed and quarry tiles

Roof U value	0.405 W/m ² °C
Walls U value	0.442 W/m ² °C
Floor U value	2.101 W/m ² °C
Doors U value*	2.2 W/m ² °C

* Data from Building regulations 2006 L2A table 4

**Cavity insulation conductivity = 0.042 W/m²°C

Heat loss through roof=	33.43 W/°C
Heat loss through walls=	67.87 W/°C
Heat loss through floor=	173.40 W/°C
Heat loss through doors=	17.91 W/°C
Total surface heat loss=	274.70 W/°C

Heat loss through ventilation	62.44 W/°C
Total heat loss=	337.14 W/°C
Heat input required = total heat loss x temperature uplift	9102.79 W

Cavity Wall U-value calculation

Conductivity insul	0.042 W/m ² °C
Cond. inner brick	0.56 W/m ² °C
Cond. outer brick	0.77 W/m ² °C
Inner wall thickness	100 mm
Outer wall thickness	100 mm
Air gap	75 mm
Thermal resistance = thickness / conductivity	
Inner surface	0.13 m ² °C/W
Inner wall	0.179 m ² °C/W
Cavity	1.786 m ² °C/W
Outer wall	0.130 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	2.264 m ² °C/W
U value = 1/ thermal resistance	
Walls u-value	0.442 W/m ² °C

Concrete Roof U-value calculation

Cond insulation	0.025 W/m ² °C
Cond air gap	2.25 W/m ² °C
Cond.concrete	1.35 W/m ² °C
Cond. Screed	0.41 W/m ² °C
Cond. Asphalt	0.7 W/m ² °C
Insulation thickness	50 mm
Air gap	250 mm
Concrete thickness	100 mm
Screed thickness	35 mm
Asphalt thickness	20 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Insulation	2.000 m ² °C/W
Air gap	0.111 m ² °C/W
Concrete	0.074 m ² °C/W
Screed	0.085 m ² °C/W
Asphalt	0.029 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	2.469 m ² °C/W
U value = 1/ thermal resistance	
Roof u-value	0.405 W/m ² °C

Concrete Floor U-value calculation

Cond.concrete	1.35 W/m ² °C
Cond. Screed	0.41 W/m ² °C
Cond. Tile	1 W/m ² °C
Concrete thickness	150 mm
Screed thickness	75 mm
Tile thickness	12 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Concrete	0.111 m ² °C/W
Screed	0.183 m ² °C/W
Tile	0.012 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.476 m ² °C/W

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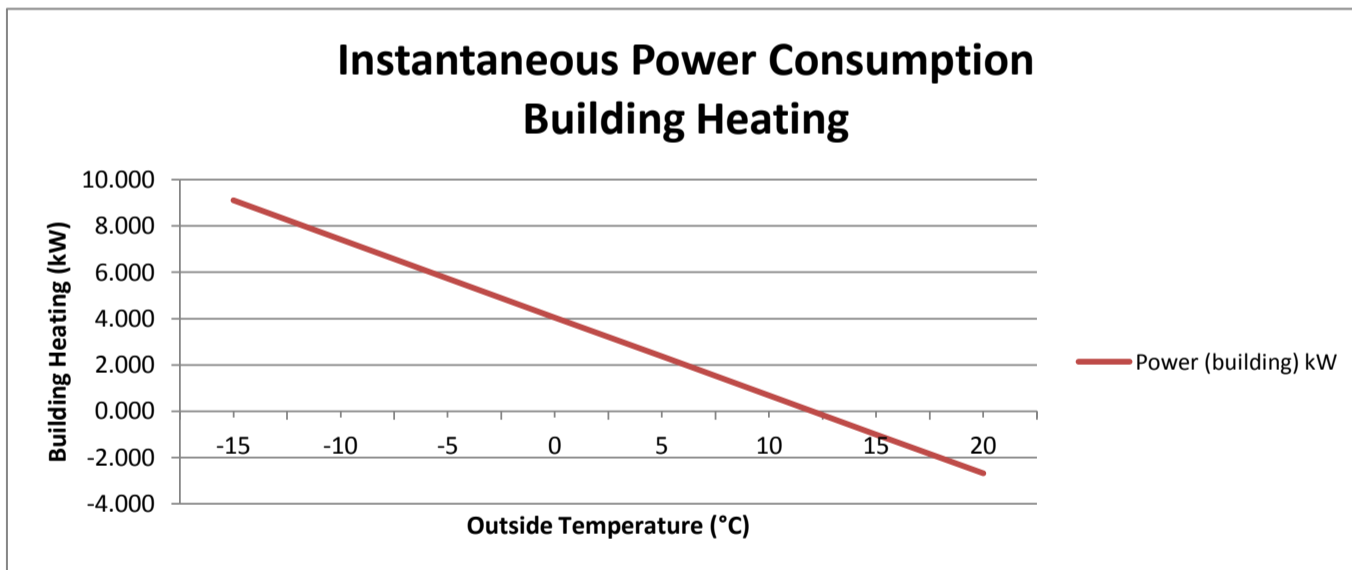
Lean-to/bund dimensions	
Length	8.86 m
Width	9.2 m
Eave height	3.2 m
Ridge height	3.2 m
Ventilation rate	0.5 AC/h
Area of roof=	81.51 m ²
Area of walls=	115.58 m ²
Area of floor=	81.51 m ²
Roof material	To current building regs
External walls	250mm cast concrete
Floor slab	250mm cast concrete with graded screed to drain

U value = 1/ thermal resistance
Floor u-value 2.101 W/m ² C

Concrete Wall U-value calculation	
Cond. concrete	1.35 W/m ² C
Cond. Screed	0.41 W/m ² C
Concrete thickness	250 mm
Screed thickness	0 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² C/W
Concrete	0.185 m ² C/W
Screed	0.000 m ² C/W
External surface	0.040 m ² C/W
Total resistance	0.355 m ² C/W
U value = 1/ thermal resistance	
Wall u-value	2.815 W/m ² C

Roof U value*	0.25 W/m ² C
Walls U value*	2.815 W/m ² C
Floor U value*	2.209 W/m ² C
Doors U value*	W/m ² C
* Data from Building regulations 2006 L2A table 4	
Heat loss through roof=	20.38 W/°C
Heat loss through walls=	325.42 W/°C
Heat loss through floor=	180.04 W/°C
Heat loss through doors=	0.00 W/°C
Total surface heat loss=	525.84 W/°C
Heat loss through ventilation	44.34 W/°C
Total heat loss=	631.00 W/°C
Heat input required = total heat loss x temperature uplift	
	17037.09 W

Concrete Floor U-value calculation	
Cond. concrete	1.35 W/m ² C
Cond. Screed	0.41 W/m ² C
Concrete thickness	250 mm
Screed thickness	40 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² C/W
Concrete	0.185 m ² C/W
Screed	0.098 m ² C/W
External surface	0.040 m ² C/W
Total resistance	0.453 m ² C/W
U value = 1/ thermal resistance	
Floor u-value	2.209 W/m ² C



HEAT LOSS CALCULATION - TANKS

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Tank 1/2 Uninsulated

Required contents temperature	20 °C
Minimum external temperature	-15 °C
Temperature lift =	35 °C
Tank dimensions	
Diameter	2 m
Length	7.15 m
Area of body=	44.92 m ²
Area of ends=	6.28 m ²
Body U value*	5.872 W/m ² °C
Ends U value	5.872 W/m ² °C
<i>*No insulation fitted to tank</i>	
Heat loss through roof=	263.80 W/°C
Heat loss through walls=	36.89 W/°C
Total surface heat loss=	300.69 W/°C
Heat input required = total heat loss x temperature uplift	10524.24 W
Total heat input required (both tanks)	21048.49 W

Steel Tank U-value calculation non-insulated	
Conductivity steel	50 W/m°C
Wall thickness	15 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Steel body	0.000 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	0.170 m ² °C/W
U value = 1/ thermal resistance	
Tank wall u-value	5.872 W/m ² °C

Tank 1/2 Insulated

Required contents temperature	20 °C
Minimum external temperature	-15 °C
Temperature lift =	35 °C
Tank dimensions	
Diameter	2 m
Length	7.15 m
Area of body=	44.92 m ²
Area of ends=	6.28 m ²
Body U value*	0.267 W/m ² °C
Ends U value	0.267 W/m ² °C
Heat loss through roof=	12.01 W/°C
Heat loss through walls=	1.68 W/°C
Total surface heat loss=	13.69 W/°C
Heat input required = total heat loss x temperature uplift	478.99 W
Total heat input required (both tanks)	957.98 W

Steel Tank U-value calculation non-insulated	
Conductivity steel	50 W/m°C
Cond insulation	0.042 W/m°C
Cond insul case	50 W/m°C
Wall thickness	15 mm
Insulation thickness	150 mm
Ins casing thickness	2 mm
Thermal resistance = thickness / conductivity	
Internal surface	0.13 m ² °C/W
Steel body	0.000 m ² °C/W
Insulation	3.571 m ² °C/W
Insulation casing	0.000 m ² °C/W
External surface	0.040 m ² °C/W
Total resistance	3.742 m ² °C/W
U value = 1/ thermal resistance	
Tank wall u-value	0.267 W/m ² °C

