

Manual for the Excel-Tool: “Energy Demand Assessment of Lifts”

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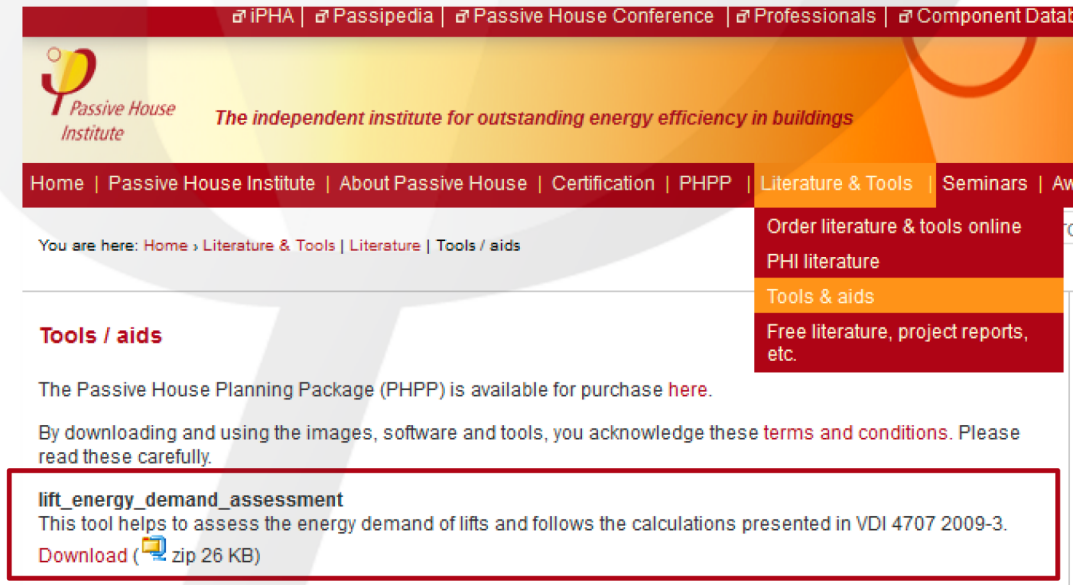
Excel-Tool: Lift Energy Demand Assessment

Important Results

- total energy demand of lifts $E_{\text{year,total}}$ kWh/a
- specific total energy demand per lift $E_{\text{lift,spec}}$ mWh/(kg m)

assessment follows the calculations presented in VDI 4707 2009-3

Download the Tool from www.passivehouse.com



The screenshot shows the website interface for the Passive House Institute. At the top, there is a navigation bar with links to iPHA, Passipedia, Passive House Conference, Professionals, and Component Database. Below this is the institute's logo and tagline: "The independent institute for outstanding energy efficiency in buildings". A secondary navigation bar includes links to Home, Passive House Institute, About Passive House, Certification, PHPP, Literature & Tools, Seminars, and Awards. A breadcrumb trail indicates the current location: Home > Literature & Tools | Literature | Tools / aids. A dropdown menu is open under "Literature & Tools", listing options: "Order literature & tools online", "PHI literature", "Tools & aids" (highlighted), and "Free literature, project reports, etc.". The main content area is titled "Tools / aids" and contains a paragraph about the PHPP. Below this, a red-bordered box highlights the tool: "lift_energy_demand_assessment", with a description and a download link for a 26 KB zip file.

Excel-Tool: Overview Worksheet 1/2

1. Lift Type: A B C ... expandable

Energy demand assessment of lifts

description of lift		Lift A		
number of lifts		1		
nominal load	Q [kg]	630		
nominal speed	v _{nom} [m/s]	1,0		
lifting height	F _H [m]	12,0		
average distance/trip		6,0		
standby demand				
energy efficiency class according to VDI 4707 2009-3				
user-determined / manufacturer specification	P _{standby} [W]	40,0		
value for project planning		40		
specific travel demand				
energy efficiency class according to VDI 4707 2009-3				
user-determined / manufacturer specification	E _{travel,spec} [mWh/(kg m)]	0,50		
value for project planning		0,5		
working load				
usage intensity according to VDI 4707 2009-3		2-aidlom		
time of usage	t _{travel} [h/d]	0,5		
time of standby	t _{standby} [h/d]	23,5		
user-determined: working load per day				
time of usage per lift				
distance per lift	S _{nom} [m/d]	1800,00		
daily standby demand per lift		0,940		
daily travel demand per lift		0,567		
daily total energy demand per lift	E _{day_lift} [kWh/d]	1,507		
total standby demand lifts in total	kWh/a	343		
total travel demand lifts in total	kWh/a	207		
total energy demand lifts in total	E _{year,total} kWh/a	550		
specific total energy demand per lift	E _{lift,spec} [mWh/(kg m)]	1,33		
specific total energy demand lifts in total	E _{total,spec} [mWh/(kg m)]	1,33		

auxiliary calculation user-determined E_{travel,spec}

detailed calculation energy demand reference trip E_R with load spectrum

E _{R,measured} [Wh]	Load spectrum according to VDI 4707 2009-3	E _{R,load spectrum} [Wh]
	load in % of the nominal load	trip ratio in %
	0%	50%
	25%	30%
	50%	10%
	75%	10%
	100%	0%

E_{R,load spectrum} [Wh]

simplified calculation of energy demand reference trip E_R with load factor

measured energy demand reference trip (empty trip)

E_{R,empty trip} [Wh]

lift with counterbalance weight (car weight plus 40 % to 50 % of the nominal weight)

load factor k

lift without the compensation weight or a compensation weight of up to 30 % of the car weight

load factor k

E_{R,loadfactor} [Wh]

nominal load
lifting height

Q [kg]
F_H [m]

user-determined specific travel demand

E_{travel,spec} [mWh/(kg m)]

2. auxiliary calculation user-determined travel demand (E_{travel,spec})

3. Daily Working load: user-determined calculation for daily usage time per lift [h/d] (hidden cells)

Excel-Tool: Overview Worksheet 2/2

1. If more lifts are necessary the column can be easily expanded (copy total column and paste).
2. There are three separate auxiliary calculations available (hidden cells). The results of the auxiliary calculation are not connected to the main calculation, and have to be transferred separately.
3. The user-determined calculation for the daily usage time per lift is hidden, and need only be completed when the usage intensity according to VDI 47072009-3 is not selected.

If entries for the specific travel demand/user-determined working load per day have been made in efficiency class/usage intensity as well as in user-determined, the user-determined value will be used for the calculation.

Excel-Tool: Input Data

description of lift			Lift A
number of lifts			1
nominal load	Q	[kg]	630
nominal speed	v_{nom}	[m/s]	1,0
lifting height	F_H	[m]	12,0
average distance/trip		[m/trip]	6,0
standby demand			
energy efficiency class according to VDI 4707 2009-3		[W]	
user-determined / manufacturer specification		[W]	40,0
value for project planning	$P_{standby}$	[W]	40
specific travel demand			
energy efficiency class according to VDI 4707 2009-3		[mWh/(kg m)]	
user-determined / manufacturer specification		[mWh/(kg m)]	0,50
value for project planning	$E_{travel,spec}$	[mWh/(kg m)]	0,5
working load			
usage intensity according to VDI 4707 2009-3			2-seldom
time of usage	t_{travel}	[h/d]	0,5
time of standby	$t_{standby}$	[h/d]	23,5
user-determined: working load per day			
time of usage per lift		[h/d]	

Excel-Tool: Standby Demand

description of lift			Lift A
number of lifts			1
nominal load	Q	[kg]	630
nominal speed	v_{nom}	[m/s]	1,0
lifting height	F_H	[m]	12,0
average distance/trip			6,0
standby demand			
energy efficiency class according to VDI 4707 2009-3		[W]	
user-determined / manufacturer specification		[W]	40,0
value for project planning	$P_{standby}$	[W]	40

The total energy demand of the lift in standby mode

- **energy efficiency class** according to VDI 4707 2009-3
- or**
- **user-determined/** manufacturer specification
 - Measurement of the standby demand: five minutes after the last trip has ended

→ priority for calculation: user-determined value

energy efficiency class	output (standby time) [W]
A	50
B	100
C	200
D	400
E	800
F	1600
G	3200

Excel-Tool: Specific Travel Demand

- **energy efficiency class** according to VDI 4707 2009-3
or
- **user-determined/** manufacturer specification
 - Measurement of the specific travel demand:
auxiliary calculation

→ priority for calculation: user-determined value

energy efficiency class	Specific energy consumption (travel time) [mWh/(kg m)]
A	0,56
B	0,84
C	1,26
D	1,89
E	2,8
F	4,2
G	8,4

specific travel demand			
energy efficiency class according to VDI 4707 2009-3		[mWh/(kg m)]	
user-determined / manufacturer specification		[mWh/(kg m)]	0,50
value for project planning	$E_{\text{travel,spec}}$	[mWh/(kg m)]	0,5
working load			
usage intensity according to VDI 4707 2009-3			2-seldom
time of usage	t_{travel}	[h/d]	0,5
time of standby	t_{standby}	[h/d]	23,5
user-determined: working load per day			
time of usage per lift		[h/d]	

Total energy demand of the lift during travel at specified cycles and with a specific load.

Excel-Tool: Auxiliary Calculation

auxiliary calculation user-determined $E_{\text{travel,spec}}$

detailed calculation energy demand reference trip E_R with load spectrum

$E_{R,\text{measured}}$	Load spectrum according to VDI 4707 2009-3		$E_{R,\text{load spectrum}}$
[Wh]	load in % of the nominal load	trip ratio in %	[Wh]
	0%	50%	
	25%	30%	
	50%	10%	
	75%	10%	
	100%	0%	

$E_{R,\text{load spectrum}}$ [Wh]

- Measurement of reference trip consists (VDI 4707 2009-3) :
 - 1) begin of reference trip with open lift door
 - 2) closing lift door
 - 3) trip up or down using the full lifting height
 - 4) opening and immediate closing of the lift door
 - 5) trip up or down using the full lifting height
 - 6) door opening
 - 7) end of reference trip
- $E_{R,\text{load spectrum}}$: Sum of all reference trips with different nominal load and trip ratio

Excel-Tool: Auxiliary Calculation

- Measurement of reference trip empty $E_{R, \text{empty trip}}$
- $E_{R, \text{load factor}} = E_{R, \text{empty trip}} \cdot \text{load factor } k$
 - with counterbalance weight
 - without / with up to 30% of car weight

simplified calculation of energy demand reference trip E_R with load factor

measured energy demand reference trip (empty trip)	$E_{R, \text{empty trip}}$	<input style="width: 80%;" type="text"/> [Wh]
<input style="width: 20px; height: 15px;" type="checkbox"/> lift with counterbalance weight (car weight plus 40 % to 50 % of the nominal weight)	load factor k	
<input style="width: 20px; height: 15px;" type="checkbox"/> lift without the compensation weight or a compensation weight of up to 30 % of the car weight	load factor k	
	$E_{R, \text{load factor}}$	<input style="width: 80%;" type="text"/> [Wh]

nominal load	Q	<input style="width: 80%;" type="text"/> [kg]
lifting height	F_H	<input style="width: 80%;" type="text"/> [m]
user-determined specific travel demand	$E_{\text{travel, spec}}$	<input style="width: 80%; background-color: #c8e6c9;" type="text"/> [mWh/(kg m)]

Excel-Tool: Auxiliary Calculation

auxiliary calculation user-determined $E_{\text{travel,spec}}$

detailed calculation energy demand reference trip E_R with load spectrum

$E_{R,\text{measured}}$ [Wh]	Load spectrum according to VDI 4707 2009-3		$E_{R,\text{load spectrum}}$ [Wh]
	load in % of the nominal load	trip ratio in %	
	0%	50%	
	25%	30%	
	50%	10%	
	75%	10%	
	100%	0%	

$E_{R,\text{load spectrum}}$ [Wh]

simplified calculation of energy demand reference trip E_R with load factor

measured energy demand reference trip (empty trip)

$E_{R,\text{empty trip}}$

lift with counterbalance weight (car weight plus 40 % to 50 % of the nominal weight)

load factor k

lift without the compensation weight or a compensation weight of up to 30 % of the car weight

load factor k

$E_{R,\text{loadfactor}}$ [Wh]

nominal load
lifting height

Q [kg]

F_H [m]

user-determined specific travel demand

$E_{\text{travel,spec}}$ [mWh/(kg m)]

Transfer the result $E_{\text{travel,spec}}$ to cell "F/G/H20" (main calculation)

Excel-Tool: Working Load

- usage intensity according to VDI 4707 2009-3

usage category	1	2	3	4	5
usage intensity/frequency	1-very seldom	2-seldom	3-occasionally	4-frequently	5-very frequently
average travel time [h/d]	0,2	0,5	1,5	3	6
average standby time [h/d]	23,8	23,5	22,5	21	18

or

- user-determined measurement of the usage time per lift:
 - 3 usage profiles available
 - unhide cells to enter user-determined values

→ priority for calculation: user-determined value

working load			
usage intensity according to VDI 4707 2009-3			2-seldom
time of usage	t_{travel}	[h/d]	0,5
time of standby	t_{standby}	[h/d]	23,5
user-determined: working load per day			
time of usage per lift		[h/d]	

Excel-Tool: User-determined Working Load

user-determined: working load per day

user-determined profiles below need only be completed when the *usage intensit*

usage profile I

total number of user	[p]	20
number of trips per person	[trip/p d]	2
number of person per trip	[p/trip]	2
number of trips usage profile I	[trip/d]	20

usage profile II

total number of user	[p]	8
number of trips per person	[trip/p d]	2
number of person per trip	[p/trip]	2
number of trips usage profile II	[trip/d]	8

usage profile III

total number of user	[p]	12
number of trips per person	[trip/p d]	4
number of person per trip	[p/trip]	3
number of trips usage profile III	[trip/d]	16

total number of trips	[trip/d]	44
total time of usage	[h/d]	0,1
total distance	[km/d]	0,3
trips per lift	[trip/d]	44,0
time of usage per lift	[h/d]	0,07

usage profile

- daily usage
- different type of usage

Example: Multi-storey house with doctor's office

- Profile I: patient to doctor's office
- Profile II: elderly residents
- Profile III: family

Excel-Tool: Implementation of Results in PHPP

distance per lift	S_{nom}	[m/d]	1800,00
daily standby demand per lift		[kWh/d]	0,940
daily travel demand per lift		[kWh/d]	0,567
daily total energy demand per lift	$E_{day, lift}$	[kWh/d]	1,507

Only for 1 lift

total standby demand lifts in total		kWh/a	343
total travel demand lifts in total		kWh/a	207
total energy demand lifts in total	$E_{year, total}$	kWh/a	550

PHPP Worksheet "Electricity"

Application	Used ? (1/0)	Within the thermal envelope? (1/0)	Norm demand
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Other:

Lift A	1	1	550 kWh/a
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$E_{lift, spec}$	[mWh/(kg m)]	1,33
$E_{total, spec}$	[mWh/(kg m)]	1,33

550 [kWh/a]/365 [d/a]

non-residential buildings PHPP "Electricity non-res"

Kitchen / Aux. electricity	Room category (predominant utilisation pattern of building)	Within the thermal envelope [1/0]	Existing [1/0]	Days of utilisation per year [d/a]	Number of meals per day of use	Norm consumption
Lift A		1	1	200		1,51

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