هيئة الإمارات للمواصفات والمقاييس

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بطاقة البيان – بطاقة كفاءة إستهلاك الطاقة للمصاعد

Labeling –Energy Efficiency Label for lifts

دولة الإمارات العربية المتحدة

UNITED ARAB EMIRATES

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تاريخ إعتماد مجلس الوزراء 2020 / /

صفة الإصدار : لائحة فنية

المواصفات القياسية الإماراتية لدولة الإمارات العربية المتحدة

Standards of United Arab Emirates

تاريخ إعتماد مجلس الوزراء	**2020 / /**
صفة الإصدار	**Technical Regulation**

Labeling –Energy Efficiency Label for lifts

1- Scope

This standard specified Energy classification system and measuring actual energy consumption of lifts, on single unit basis. This only considers the energy performance during the operational portion of the life cycle of the lifts.

This standard does not cover energy aspects, which affect the measurement, calculations and simulation such as the following:

- Hostway lighting
- Heating and cooling equipment in the lift car.
- Machine room heating, ventilation, and air conditioning.
- Machine room lighting.
- Non-lift display system , CCTV secure cameras ,
- Non –lift monitoring system (e.g. building management systems, etc.
- Effect of lift group dispatching on energy consumption.
- Consumption through the power sockets
- Lifts whose travel includes an express zone.

2- Applicable Standards

- UAE.S ISO 25745-1 :2012: Energy performance of lifts, escalators and moving walks

  Part 1: Energy measurement and verification

- UAE.S ISO 25745-2: 2015: Energy performance of lifts, escalators and moving walks

  Part 2: Energy calculation and classification for lifts (elevators).

3- Technical Terms and definitions

For the purposes of this standard, the terms and definitions in annex (1) are applied.

4- Calculation of energy performance of the lift

4.1 Classification of energy performance of the lift

The energy performance of the lift shall be classified as following:

Table 1 "Classification of energy efficiency"

Energy efficiency class	Energy consumption per day (Wh)
5 star	$E_d \leq 0.72 \times Q \times n_d \times S_{av}/1000 + 50 \times t_{nr}$
4 star	$E_d \leq 1.08 \times Q \times n_d \times S_{av}/1000 + 100 \times t_{nr}$
3 star	$E_d \leq 2.43 \times Q \times n_d \times S_{av}/1000 + 400 \times t_{nr}$
2 star	$E_d \leq 3.65 \times Q \times n_d \times S_{av}/1000 + 800 \times t_{nr}$
1 star	$E_d > 5.47 \times Q \times n_d \times S_{av}/1000 + 1600 \times t_{nr}$

Where :

E_d: Energy consumption per day (Wh)

n_d: is the number of trips per day .

Q: is the rated load (kg)

S_{av}: is the average travel distance for target installation (m).

t_{nr}: is the non – running (idle and standby) time per day (h).

Note: The value of (n_d) shown in Table 1 is taken the exact number of trips (n_d) where it is known. If it is not known, the median value for (n_d) taken from annex 2 of this standard.

4.2 Calculating the total energy consumption per day

The estimated daily energy consumption (Wh) is given by following:

$$E_d = E_{rd} + E_{nr}$$

Where

- Ed : is the total daily energy consumption (wh).
- Erd : is the daily running energy consumption (Wh).
- Enr : is the daily non-running (idle and standby) energy consumption (Wh).

4.2.1 Calculating the Daily running energy

The daily running energy consumption is given by the following:

$$E_{rd} = K_L \times n_d \times E_{rav/2}$$

Where

- Erav : is the running energy consumption of an average cycle (Wh). (see annex 2)
- KL : is the load factor . (see annex 2)
- nd : is the number of trips per day according to the selected usage category.(see annex 2)

4.2.2 Calculating the Daily non-running (idle and standby) energy consumption

The Daily non-running (idle and standby) energy consumption is given by following**:**

$$E_{nr:} t_{nr/100}(P_{id} R_{id} + P_{st5} R_{st5} + P_{st30} R_{st30})$$

Where

- Pid: is the power used in idle mode (W).
- Rid : is the ratio of idle time consuming Pid(%).(see annex 3)
- Pst5: is the standby power used after 5 minutes (W).
- Pst30 : is the standby power used after 30 minutes (W).
- Rst5 : is the ratio of 5 minutes time consuming Pst5(%).(see annex 3)
- Rst30: is the ratio of 30 minutes time consuming Pst30 (%).(see annex 3).

4.3 Total energy consumption per year

The estimated annual energy consumption (Wh) is given by following:

$$Ey = Ed \times d_{op}$$

Where

E_y : is the annual energy consumption

d_{op}: is the number of operating days per year .

If the lift is switched off on certain days (e.g. Weekends or holidays) the number of days per year can be reduced by the number of days is switched off per year.

4.4 Specific running energy for the reference cycle

The specific running energy (Espr) for the reference cycle can be calculated using the energy (Ersc), measured according to UAE.S ISO 25745-1 and is given by :

$$E_{spr} = 1000 \times E_{rc} / 2 \times Q \times s_{rc}$$

Where

- E_{spr} is the specific running energy for reference cycle mWh/(kg.m)

5- Reporting

The results of the energy assessment shall be documented and shall include the following:
— name of manufacturer;
— type of lift;
— drive system type;
— rated load (kg);
— rated speed (m/s);
— average acceleration (m/s^2);
— average jerk (m/s^3);
— travel height (m);
— number of stopping floors;
— number of trips per day;
— usage category;(annex 2)
— idle power (W);
— standby power (Pst5) (W);
— standby power (Pst30) (W);
— time(s) to reach standby mode(s);
— time(s) to recover from standby mode(s);
— operating days per year;(annex 2)
— estimated annual energy consumption (kWh);
— specific running energy for the average cycle mWh/(kg·m);
— classification of lift (number of stars);
— specific running energy for the reference cycle mWh/(kg·m);

6- General rules and requirements

- Energy classification system applied on new, existing and modernized traction lifts on a single unit basis.

- in case of identical lifts, the energy consumption value for one of the lifts can be measured and calculation made, it may then be applied to the other lifts provided that verification of equivalence can be justified.

- in case of groups of lift installation, each unit shall be considered as an individual unit.

- If the representative sample of a family of lifts has a range of rated speeds, a classification for each speed shall be determined.

- All parameters and components that may affect energy usage shall be the same as on the sample lift, changes to any of these components or parameters shall require a reclassification.

Annex 1 -

Technical Definitions

Elevator: A permanent elevating equipment serving defined floors, comprising a car whose dimensions and means of construction clearly permit the access of passengers or other loads, running at least partially between rigid vertical guides whose inclination to the vertical is not more than 15°.

Average cycle: cycle of one up and one down trip each covering the average travel distance of the target installation including two complete door cycles.

Energy: power consumed over time.

Idle condition: condition when the lift is stationary at floor following a run before the standby mode is entered.

Load factor: ratio between the running used by a car carrying an average load and the running energy measured with an empty car.

Reference cycle : cycle during which the empty car is run from the bottom terminal landing ,to the top terminal landing , and then back to the bottom terminal landing including two complete door cycles .

Running current: current drawn by the lift, when it has achieved rated speed in either the up or down direction.

Express zone: section of the lift well there are no loading entrance whose length is more than three average floor heights.

Short cycle: cycle during which the empty car is run for a travel distance of a least one – quarter of the total travel height with the travel distance centered around the mid-point of the travel height and back to the starting point over a sufficient distance for the lift car to reach stable rated speed in both direction including two complete door cycles.

Standby condition: condition when a lift is stationary at a floor and may have reduced the power consumption to a lower level set for that particular lift.

Standby current: current used by the lift, when in standby condition.

Trip (s): movement (s) from a starting (departure) landing to the next stopping (arrival) landing not including re-leveling.

Verification: procedure to identify any significant changes in energy characteristics during the life of the lift, escalator or moving walk.

Terminal landing cycling test: test for lifts when the car is continuously cycled between the bottom terminal landing and the top terminal landing , with the door operations enabled and no load in the car .

Main power coupling point: point where the main power measurements are taken , and which is located at the output side of the main switch/disconnect for the lifts , escalator or moving walk.

Ancillary current: current drawn by the ancillary circuit through the ancillary switch (es).

Ancillary power: energy used by the ancillary equipment.

Ancillary equipment: equipment such as lighting, fans, heating, alarm devices and emergency battery supplies.

Ancillary power coupling point: point where ancillary measurements are taken, and which is located at the output side of the lift**.**

Annex 2

1. Specific usage category

Table 2 - Number of trips per day (and operating days per years)

Usage category	1	2	3	4	5	6
Usage intensity frequency	Very low	Low	Medium	High	Very high	Extremely high
Number of trips per day (nd) typical range	50 <75	125 75 to < 200	300 200 to <500	750 500 to <1000	1500 1000 to < 2000	2500 2000 to ≤ 2500
Typical buildings and usage (operating days per year	Residential building up to 6 dwellings (360d) Residential care home (360d) Small office or administrative building with few operations (260d) Suburban railway stations (360d)	Residential building up to 20 dwellings (360d) Small office or administrative building with 2 to 5 floors (260d) Small hotels (360d) Office care parks(260d) General car parks (360d) Main line railway stations(360d) Library (312d) Entertainment centres (360d) Stadia (intermittent)	Residential building with up to 50 dwellings (360d) Medium – sized office or administrative building with up to 10 floors (260d) Medium – sized hotel (360d) Airports (360d) University (260d) Small hospital (360d) Shopping centre (360d)	Residential building with more than 50 dwellings (360d) Large office or administrative building with more than 10 floors (260d) Large hotel (360d)	Very large office or administrative building over 100m height (260d)	Very large office or administrative building over 100m height (260d)
Typical rated speed	0.63 m/s	1.00 m/s	1.60m/s	2.50m/s	5.00m/s	5.00 m/s

2. The load factor (KL) value :

The value for the load factor K_L shall be calculated using the following:

- For traction lifts counterbalanced to 50%,

  $K_L = 1 - (\%Q \times 0.0164)$.
- For traction lifts counterbalanced to 40%,

  $K_L = 1 - (\%Q \times 0.0192)$.
- For traction lifts counterbalanced to 30%,

  $K_L = 1 - (\%Q \times 0.0197)$.
- For hydraulic lifts with no balancing,

  $K_L = 1 - (\%Q \times 0.0071)$.
- For hydraulic lifts with 35% counterbalancing of the car weight,

  $K_L = 1 - (\%Q \times 0,0100)$.
- For hydraulic lifts with 35% counterbalancing of the car weight,

  $K_L = 1 - (\%Q \times 0,0187)$.

Traction lifts with no counterweight and positive drive lifts can be considered as a hydraulic lift with no balancing and calculations carried out accordingly.

3. The average car load (%Q)

The percentage average car load (%Q) is taken from the table (3) :

Table 3 – Average car load

Usage category	**1-3**	**4**	**5**	**6**
Rated load (kg)	**Percentage of rated load (`Q)**			
≤800	7.5%	9.0%	13%	19%
801 to ≤ 1275	4.5%	6.0%	8.2%	13.5%
1276 to ≤ 2000	3.0%	3.5%	5.0%	9.0%
>2000	2.0%	2.2%	3.0%	6.0%

4. Running energy of an average cycle with empty car

The running energy consumption of an average cycle for the target installation is given by the following:

$$Erav = 2(\mathrm{Erm} \times \mathrm{Sav} + \mathrm{Essc})$$

Where

E_{rm}: is the average running energy consumption per meter of travel (Wh/m).

S_{av}: is the average travel distance for target installation (m).

E_{ssc}: is the start /stop energy consumption for each trip (Wh).

The running energy of the average cycle can be determined directly by measurement, calculation, or simulation. In this case the above evaluation is not required.

If the travel distance for a short cycle does not allow the rated speed to be reached , then running energy consumption of an average cycle for the target installation is given by the following**:**

$$Erav = \frac{Erc\ x\ Sav}{Src}$$

5. Average travel distance

The average travel distance (**S_{av}**) for the target installation shall be selected from tables (2) :

Table 2 - Percentage of average travel distance

Usage Category	1-3	4	**5**	**6**
Number of stopping floors	Percentage average travel distance			
2	100%			
3	67%			
>3	49%	44%	39%	32%

6. Start /stop energy consumption

The Start /stop energy consumption for each trip is given by**:**

$$E_{ssc} = ½(E_{rc} - 2xE_{rm}xS_{rc})$$

7. Average running energy per meter

The average running energy consumption per meter of travel shall be determined when the lift is running at rated speed by using the following:

$$\mathrm{Erm} = 1\backslash 2\ (\ (\mathrm{Erc} - \mathrm{Esc})\backslash(\mathrm{Src} - \mathrm{Ssc}))$$

Erc: is the running energy consumption of reference cycle to ISO 25745-1 (Wh).

Esc: is the running energy consumption of the short cycle (Wh).

Src: is the one- way travel distance of reference cycle to ISO 25745-1 (m).

Ssc: is the one way travel distance of the short cycle (m).

- S_{rc} and S_{sc} are the one –way travel distances in each direction and need to be counted twice for the running distance of the complete cycle.

Annex 3

1. Time ratios of idle/standby modes

The daily non-running (idle/standby) energy consumption can comprise three components:

a) The time when idle between stopping and entering the 5 min standby mode;

b) The time between the 5 min standby mode and the 30 min standby mode, if occurring;

c) The time after 30 min have elapsed.

This ratio shall be taken from table(4) :

Table (4) – Time ratios in idle and standby modes

Usage category		**1**	**2**	**3**	**4**	**5-6**
Time ratio (%)	Rid	13	23	36	45	42
	Rst5	55	45	31	19	17
	Rst30	32	32	33	36	41

2. Non- running time per day

To calculate he energy used per day when the lift is in idle /stand modes, the non – running time per day has to be determined, this non running time is usually 24 h less the running time and is given by the following**:**

$$t_{nr} = 24 - t_{rd}$$

t_{nr}: is the non-running (idle and standby) time per day (h).

In cases where the lift is switched off at scheduled times, the non – running time has to be determined for this specific situation

3. Running time per day

The total running time per day. t_{rd}, is given , in hours (h) as following**:**

$$t_{rd} = n_d \times t_{av}/3600$$

Where:

tav : is the time to travel the average travel distance for the target installation , including door time(s).The time t_{av}, is given as following:

$$t_{av} = (s_{av}/v) + (v/a)+ (a/j)+(t_d)$$

where

t_d **:** is the time for the opening, remaining open , and closing times of the lift doors at the landings.

The value for **a** and **j** can be obtained by measurement or from a manufacturer's standard tables where **a, j, t_d** values are not available, they shall be measured.