BSR/ASHRAE/IES Addendum bu
to ANSI/ASHRAE/IES Standard 90.1-2022

Public Review Draft

Proposed Addendum bu to Standard 90.1-2022, Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings

First Public Review (February 2025)
(Draft Shows Proposed Changes to Current Standard)

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FOREWORD

This is an update to the language in Table G3.1 #16 based on the requirement in 90.1 2022 that the energy efficiency class of proposed elevators shall be E or better per ISO 25745-2, Table 7 in 90.1 Section 10.4.3.4. Since 90.1 2016 the energy efficiency class has been required to be reported on design documents but until 90.1 2022 there was no requirement to specify a particular class or better.

ISO 25745-2, Table 7 includes equations for calculating kWh consumption. There is both an in operation and standby/idle component to the calculation. To help modelers develop model inputs, promote methodological consistency across projects, prevent elevator consumption from being modeled higher than justified, and ensure that the standby/idle component of elevator operation is adequately accounted for in the models we are proposing the language change to Appendix G shown below. This essentially aligns App G requirements with the kWh calculations in ISO 25745-2 based on the energy efficiency class. Because there was no efficiency class requirement prior to 90.1 2022 we set the baseline requirements at class F/G. The proposed model would then be modeled with the as specified energy efficiency class and the kWh calculated accordingly. Schedules would be modeled identically across the baseline and proposed.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by <u>underlining</u> (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum bu to 90.1-2022

Table G3.1 Modeling Requirements for Calculating Proposed Building Performance and Baseline Building Performance *(Continued)*

Proposed Building Performance	**Baseline Building Performance**
14. Exterior Conditions (continued)	
…	
16. Elevators	
Where the *proposed design* includes elevators, the elevator motor~~,~~ and *ventilation* fan, ~~and light load~~ shall be included in the model. The cab *ventilation* fan ~~and lights~~ shall be modeled with the same schedule as the elevator motor. The modeled elevator cab annual energy consumption shall be calculated based on elevator consumption coefficients as follows: Annual operating kWh = OpDays * Coeff1*Q*nd*sav/1,000,000 Annual standby/idle kWh = Coeff2*tnr * (1/1,000) Where OpDays = number of days annually where the building is occupied Q = Rated load of elevator, lbs. (kg) nd = Number of trips per day from Table G3.2.3.17. sav = is the one-way average travel distance for the installation, ft (m) = (Average floor to floor height, ft (m) * (number of floors -1)) * percentage of average travel distance from Table G3.2.3.17 Coeff1, Coeff2 = coefficients from Table G3.2.3.16 based on the energy efficiency class of the *proposed design*. tnr = is the annual non-running idle/standby time = [24 - nd/3600 * (sav/v + v/a + a/j + td)] * OpDays Where v = rated speed (ft/s) (m/s) td = is the time for the opening, opened, and closing times of the elevator doors at the landings, s. Default from Table G3.2.3.18 can be used where unknown. a = average acceleration, ft/s^2 (m/s^2). Default from Table G3.2.3.18 can be used where unknown. j = average jerk, ft/s^3 (m/s^3) . Default from Table G3.2.3.18 can be used where unknown. **Exception**: Where the daily non running (idle/standby) (Enr, kWh) and daily running (Erd, kWh) energy consumption, determined according to the ISO 25745-2 testing procedure, are available from the manufacturer the annual modeled elevator cab energy consumption shall be modeled based on the following calculations: Annual operating kWh = Erd * OpDays Annual standby/idle kWh = Enr * OpDays *The tables and methodology referenced in this section © ISO is material reproduced from ISO 125745-2:2015, with permission of the American National Standards Institute (ANSI) on behalf of the International Organization for Standardization. All rights reserved.*	Where the *proposed design* includes elevators, the *baseline building design* shall be modeled to include the elevator cab and *ventilation* fans~~, and lighting power~~. The elevator cab modeled annual energy consumption shall be calculated the same as the *proposed design* with Coeff1 = 0.756 (5.47) and Coeff2 = 1600. If exception is used to calculate *proposed design* annual energy consumption from Enr and Erd, the baseline shall be calculated using *proposed design* parameters and the elevator coefficient equations in the proposed design column. ~~The elevator peak motor power shall be calculated as follows: bhp = (Weight of Car + Rated Load – Counterweight) × Speed of Car/(33,000 × hmechanical)~~ ~~Pm = bhp × 746/hmotor~~ ~~where~~ ~~Weight of Car = the proposed design elevator car weight, lb Rated Load = the proposed design elevator load at which to operate, lb~~ ~~Counterweight of Car = the elevator car counterweight, from Table G3.9.2, lb~~ ~~Speed of Car = the speed of the proposed elevator, ft/min~~ ~~hmechanical = the mechanical efficiency of the elevator from Table G3.9.2~~ ~~hmotor = the motor efficiency from Table G3.9.2~~ ~~Pm = peak elevator motor power, W~~ The elevator motor use shall be modeled with the same schedule as the *proposed design*. When included in the *proposed design*, the baseline elevator cab *ventilation* fan shall be 0.33 W/cfm (0.699 W/L/s) ~~and the *lighting power density* shall be 3.14 W/ft²~~; ~~both~~ operate continuously.

~~Table G3.9.2 Performance Rating Method Baseline Elevator Motor~~

~~Number of Stories (Including Basement)~~	~~Motor Type~~	~~Counterweight~~	~~Mechanical Efficiency~~	~~Motor Efficiency[a]~~
~~≤4~~	~~Hydraulic~~	~~None~~	~~58%~~	~~Table G3.9.3~~
~~>4~~	~~Traction~~	~~*Proposed design* counterweight, if not specified use weight of the car plus 40% of the rated load~~	~~64%~~	~~Table G3.9.3~~

~~a. Use the *efficiency* for the next motor size greater than the calculated bhp.~~

~~Table G3.9.3 Performance Rating Method Hydraulic Elevator Motor Efficiency~~

~~Shaft Input Power~~	~~Full-Load Motor Efficiency for Modeling, %~~
~~10~~	~~72%~~
~~20~~	~~75%~~
~~30~~	~~78%~~
~~40~~	~~78%~~
~~100~~	~~80%~~

Table G3.2.3.16 Coefficients for Elevator Consumption Calculations

Energy Efficiency Class	**Coeff1**	**Coeff2**
A	0.100 (0.72)	50
B	0.149 (1.08)	100
C	0.224 (1.62)	200
D	0.336 (2.43)	400
E	0.505 (3.65)	800
F/G	0.756 (5.47)	1600

Table G3.2.3.17 Inputs for Elevator Consumption Calculations

Usage category	**Very low**	**Low**	**Medium**	**High**	**Very high**	**Extremely high**
Trips per day (nd)	50	125	300	750	1500	2500
Number of stopping floors	**Percentage of Average Travel Distance**					
2	1	1	1	1	1	1
3	0.67	0.67	0.67	0.67	0.67	0.67
4	0.49	0.49	0.49	0.44	0.39	0.32

Informative Note: Below are the buildings typically associated with each usage category in Table G3.2.3.17

Usage category	**Very low**	**Low**	**Medium**	**High**	**Very high**	**Extremely high**
Typical buildings	• Residential building up to 6 dwellings • Residential care home • Small office or administrative building with few operations • Suburban railway stations	• Residential building up to 20 dwellings • Small office or administrative building with 2 to 5 floors • Small hotels • Office parking lots • General parking lots • Library • Entertainment centers • Main line railway stations • Stadia	• Residential building with up to 50 dwellings • Medium- sized office or administrative building with up to 10 floors • Medium-sized hotel • Airports • University • Small hospital • Shopping center	• Residential building with more than 50 dwellings • Large office or administrative building with more than 10 floors • Large hotel	• very large office or administrative building over 328 ft (100 m) height	• very large office or administrative building over 328 ft (100 m) height

Table G3.2.3.18 Defaults for Elevator Consumption Calculations

Variable	**Description**	**Default Value**	**Units**
a	Acceleration	3.28 (1.0)	ft/s^2 (m/s^2)
j	Jerk	4.1 (1.25)	ft/s^3 (m/s^3)
td	Door operation time	8	s