

ERRATA SHEET FOR ANSI/ASHRAE STANDARD 90.4-2022
Energy Standard for Data Centers

September 14, 2023

The corrections listed in this errata sheet apply to all copies of ANSI/ASHRAE Standard 90.4-2022. The first printing is identified on the outside back cover as “Product code: 86237 2/23”.

Page Erratum

47 Chart C-1 Calculation of UPS Segment of ELC
 (Example Based on Modular UPS with N+1 Redundancy Designed at 80% Normal Loading)

Revise the equations in the columns shown below. Changes are highlighted in yellow.
 (Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

UPS Total Capacity, kW ²		
550 g		
<i>f</i>		
<i>f = d + e</i>	-	-

47 Chart 2 Calculation of UPS-to-PDU Feeder Segment of ELC-Step #1

Revise the equations in the columns shown below. Changes highlighted in yellow.
 (Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

% Design Load	UPS Output, kVA ^{9, 12}	PDU Quant. ¹⁰	PDU Size, kVA ¹²	PDU Actual, kVA ^{10, 12}	PDU Input, V
100%	444.44	4	150	111.11	480
75% -	333.33	4	150	83.33	480
50%	222.22	4	150	55.56	480
25%	111.11	4	150	27.78	480
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>
<i>a = 1</i> +	<i>b = 1</i> u			<i>e = b/c</i>	<i>f = 1</i> jk

48 Chart 4 Calculation of Branch Circuit Portion of Distribution Segment of ELC – Step # 3

Revise the equations in the columns shown below. Changes highlighted in **yellow**.

(Note: Additions are shown in underline and deletions are shown in ~~strike through~~.)

Loss and Efficiency of Worst Case Branch Circuit from PDU Branch Breakers to Cabinets																	
Design Load, %	Distrib. Volts, 1Ph	Breaker Rating, A	Max. Current, A ¹⁸	Current @ Load %, A	Per Cond. Power, VA ¹²	No. Cond. VA ¹²	Total Power, VA ¹²	Wire Size, AWG ¹⁹	Wire Length, ft	Ohms/ 1000', 75°C	Wire Resist., ohms	I ² R, Amps ²	I ² r Loss Per Cond., VA ^{12, 13}	Total Loss, VA ^{12, 13}	Power Loss, %	Segment Effic., % ²⁰	
100%	208	30	24	24	2882 2496	2	5764 4994	#10	50	1.21	0.0605	576.00	34.85	69.70	1.21 1.40%	98.79 98.60%	
75%	208	30	24	18	2162 1872	2	4323 3744	#10	50	1.21	0.0605	324.00	19.60	39.20	0.91 1.05%	99.09 98.95%	
50%	208	30	24	12	1441 1248	2	2882 2496	#10	50	1.21	0.0605	144.00	8.71	17.42	0.60 0.70%	99.40 99.30%	
25%	208	30	24	6	721 624	2	1441 1248	#10	50	1.21	0.0605	36.00	2.18	4.36	0.30 0.35%	99.70 99.65%	
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>	<i>q</i>	<i>r</i>	
	$b = \textcircled{3}d$		$d = c \times 80\%$	$e = a \times d$	$f = b \times e / 3$ $f = b \times e / 2$		$h = f \times g$				$l = k / 1000 \times j$	$m = e$	$n = m \times l$	$o = g \times n$	$q = o / h \times 100\%$	$r = 100\% - q$	

49 Chart 5 ELC Calculation of Distribution Segment of ELC- Step 4

Revise the equations in the columns shown below. Changes highlighted in yellow.

(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

Combined UPS, PDU, and Branch Ckt. Efficiencies for Distribution Segment of ELC

% Design Load, %	PDU		Branch Circuit, % 20	Combined Efficiencies, % 21		Loss, % 22	Distrib. Segment of ELC 23
	Feeder, % 14	PDU, % 17					
100%	99.41%	97.50%	98.79 <u>98.60%</u>	95.75 <u>95.57%</u>	4.25 <u>4.43%</u>	0.042 <u>0.044</u>	
75%	99.56%	97.80%	99.09 <u>98.95%</u>	96.49 <u>96.35%</u>	3.51 <u>3.65%</u>	0.035 <u>0.037</u>	
50%	99.71%	98.00%	99.40 <u>99.30%</u>	97.12 <u>97.03%</u>	2.88 <u>2.97%</u>	0.029 <u>0.030</u>	
25%	99.85%	98.40%	99.70 <u>99.65%</u>	97.96 <u>97.91%</u>	2.04 <u>2.09%</u>	0.020 <u>0.021</u>	
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	
	$b = \textcircled{2}r$	$c = \textcircled{3}r$	$d = \textcircled{4}r$	$e = b \times c \times d$	$f = 100\% - e$	$g = f $	

49 Chart 6 ELC Calculation Based on Losses

Revise the equations in the columns shown below. Changes highlighted in yellow.

(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

% Design Load, %	UPS Segment 7	ITE Distrib. Segment 23	ELC 24	ELC Standard Values 25	Diff. from Standard	Pass or Fail
100%	0.042	0.042 <u>0.044</u>	0.085 <u>0.086</u>	0.110	0.025 <u>0.024</u>	Pass
75%	0.044	0.035 <u>0.037</u>	0.079 <u>0.080</u>	0.098	0.019 <u>0.018</u>	Pass
50%	0.042	0.029 <u>0.030</u>	0.070 <u>0.071</u>	0.094	0.024 <u>0.023</u>	Pass
25%	0.065	0.020 <u>0.021</u>	0.085 <u>0.086</u>	0.093	0.008 <u>0.007</u>	Pass
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>
	$b = \textcircled{1}tq$	$c = \textcircled{5}gi$	$d = b + c$ $d = a + b + e$		$f = e - d$	$f \geq 0$ $g \geq f$