

Slash Installation Time and Labor with Digital Electricity™

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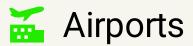


Digital Electricity Powers and Supports Vast, Critical Infrastructures











Hotels

















































Industry Response

"VoltServer's offering fits squarely in our digital power focus, <u>combining data and DC power</u> to create a new format of low loss electrical distribution."

- Norman Adkins, COO, Southwire Cable

"The development of Fault Managed Power represents another <u>giant leap in power distribution</u> across multiple environments."

- Denise Lee, Vice President of Engineering,

Cisco

"[Fault-Managed Power] is a **game changer** that disrupts the 120-year-old method of electrification."

- Jeff Beavers, Executive Director, Network Integration and Services, NECA



Digital Electricity Changed Code

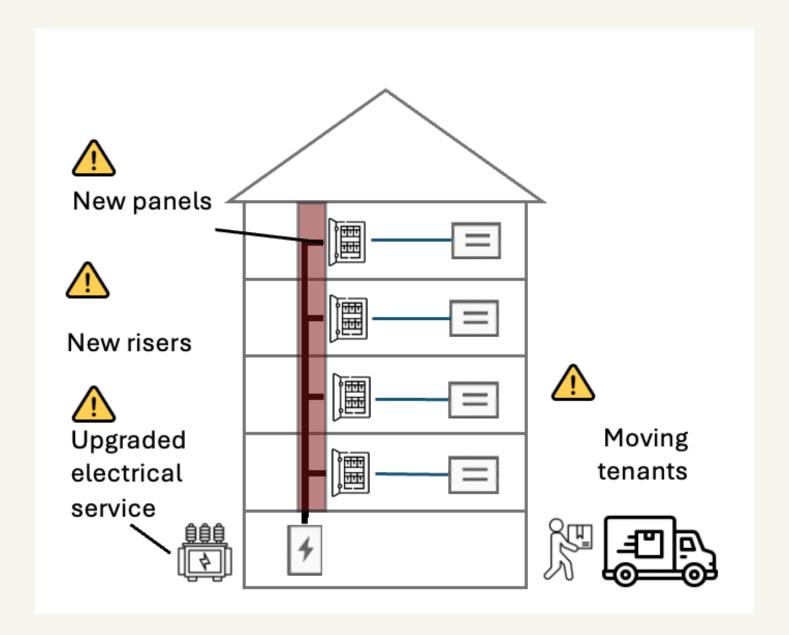
"[The 2023] edition of the <u>National Electrical Code (NEC) introduces a</u> <u>wiring method</u> that has the potential to <u>fundamentally change electrical</u> <u>installations</u>, upend electrical safety, revive DC distribution, and reduce emissions. Quite a wiring method. Quite a new Article."

- IAEI Magazine, Kevin Smith, CSA Group.

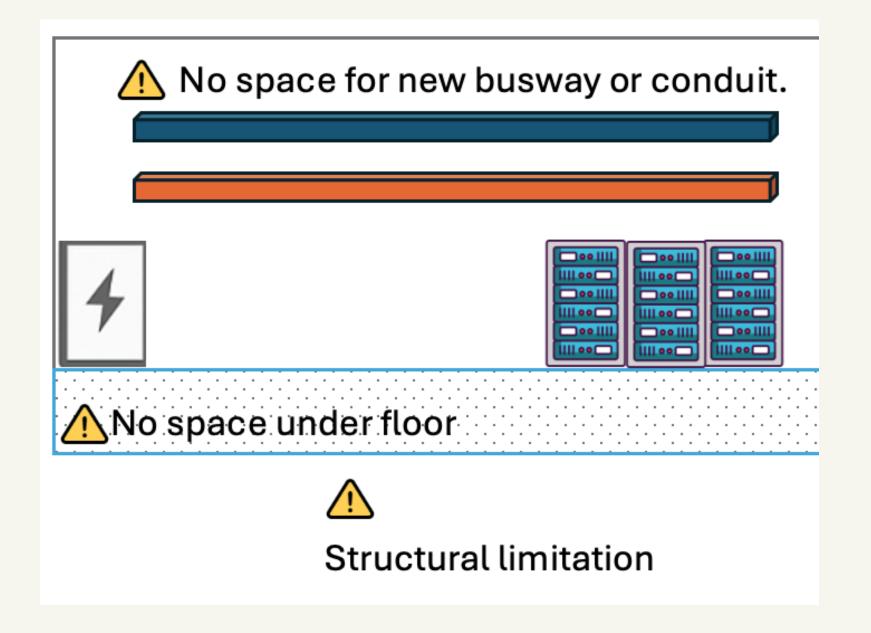


Tough Retrofits

Heat Pumps and Electric Stoves

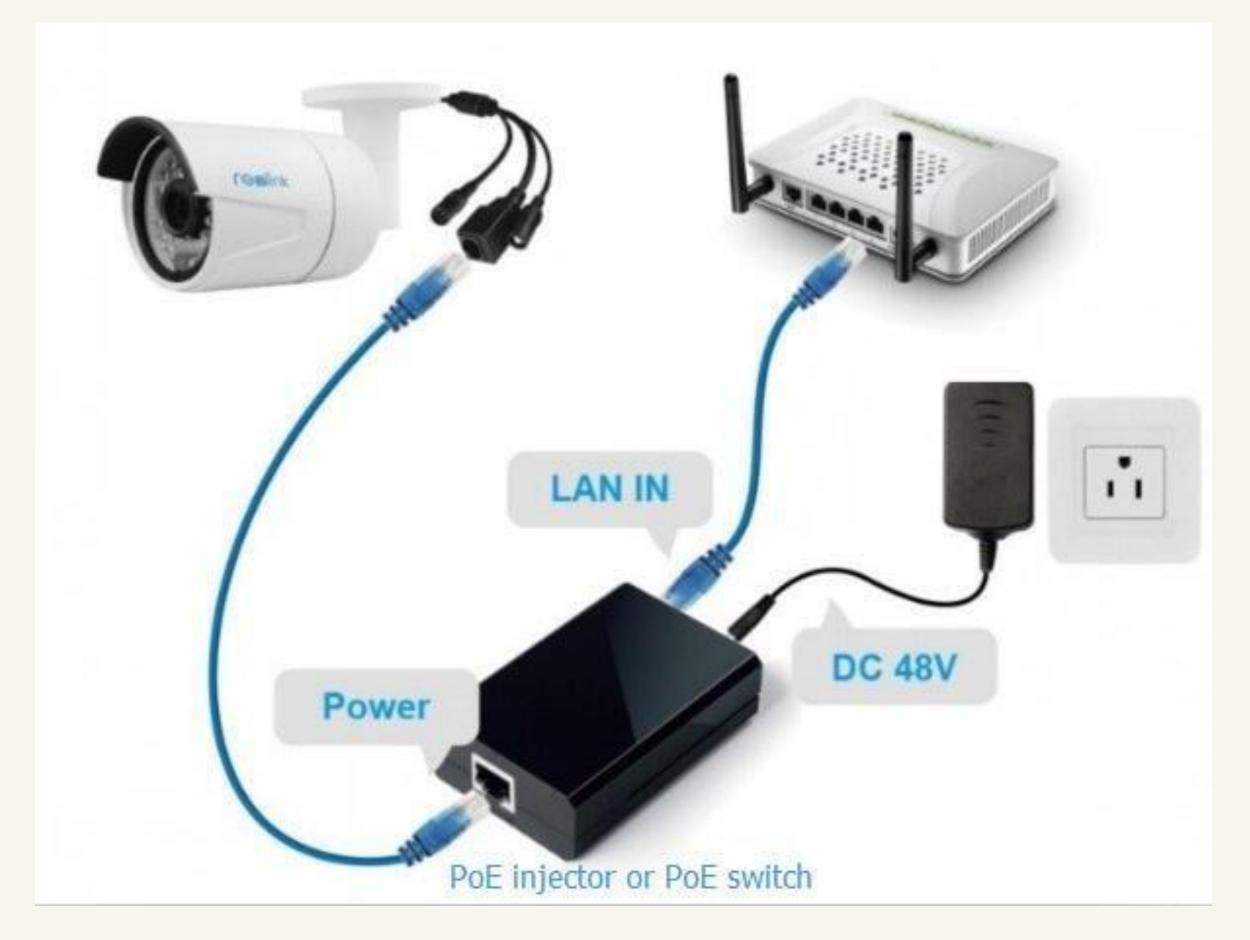


New Server Racks





Power over Ethernet is Easy But Very Limited





Imagine...

if you could do it with PoE.

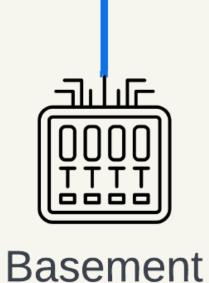




No Conduit

Tiny raceways and risers

Data and Power in one raceway





DIGITAL ELECTRICITY[™]

Delivers up to 350V DC but is allowed to be installed using methods similar to data cabling.



Digital Electricity is Listed Under

- ▶ UL 62368-1 as a Limited Power Source (LPS), qualifying it as a Class 2 circuit under NEC Article 725.
- ▶ **UL 1400-1** as a Fault Managed Power (FMP) System, qualifying it as a Class 4 power system under NEC Article 726 (2023, effective 2026).



Major Installation Criteria

Criteria	Class 2	Class 4
Separated from power and light circuits	Y (725.136)	Y (726.136)
Coexistence with coms wiring (in raceway or cable)	Y (725.139)	Y (726.139)
Permitted in Dwelling units	Υ	Not until 2026 NEC
Neat, workman like install practices	Y(725.24)	Y (726.24)
Cables and Power Source Tested as a System	N	Y, Mfg. Specified
Conduit Required (non-hazardous locations)	N	N
Raceway fill Max 40%, Chap. 9, Table 1, Notes 5,9	Υ	Y
Conductor Derate per Art 310.15(B)(3)(a)	Υ	Υ
Clearly Marked for Circuit Class	Y (725.60(C))	Y (726.60(C))

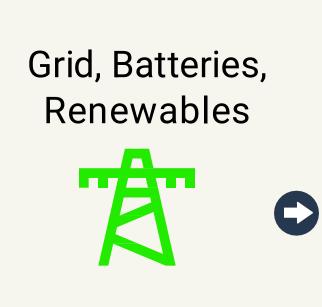
How Digital Electricity* works

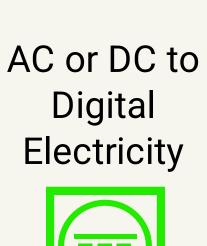


Our innovative approach allows for safe power delivery at levels into the 1000s of watts using low-voltage wiring techniques typically associated with low-voltage technologies like Power over Ethernet (PoE).

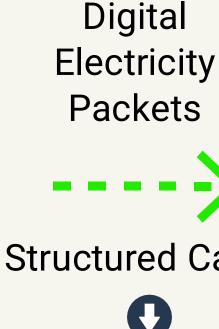
Energy

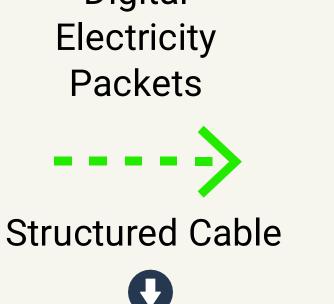
1.5ms

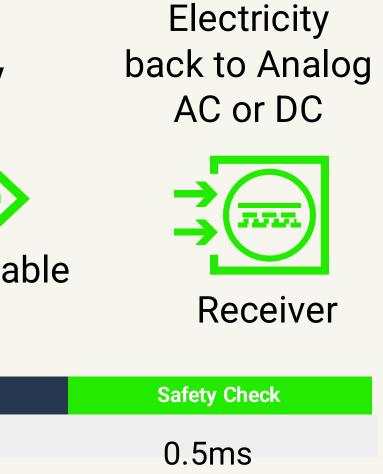




Transmitter

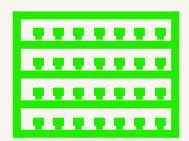






Digital

Remote loads



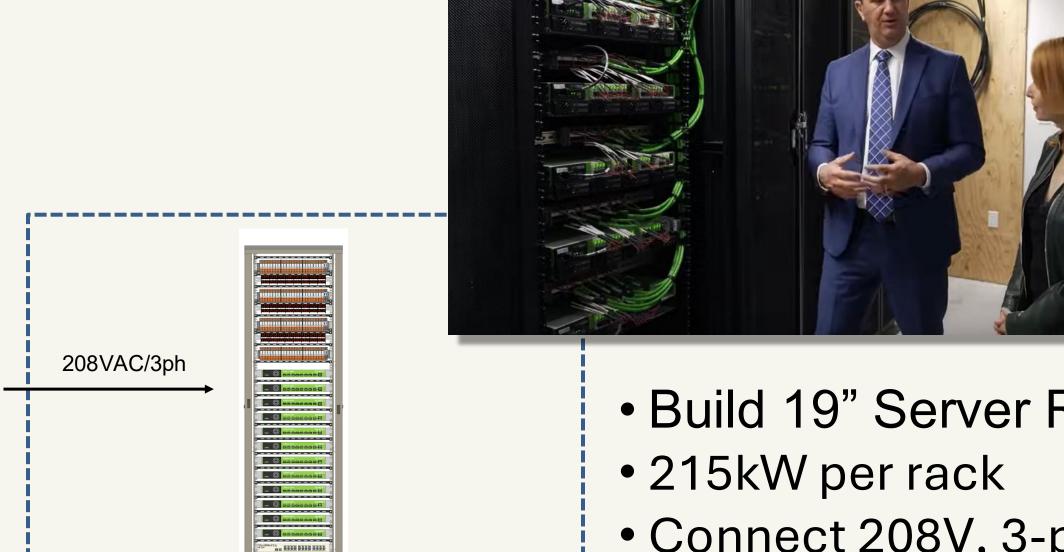


^{*}Digital Electricity is VoltServer's Brand Name for FMP (VoltServer is the inventor of the technology) Other manufacturers such as Panduit and EnerSys also produce FMP systems



High-Level Installation

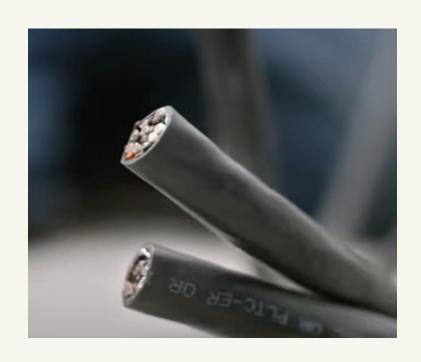




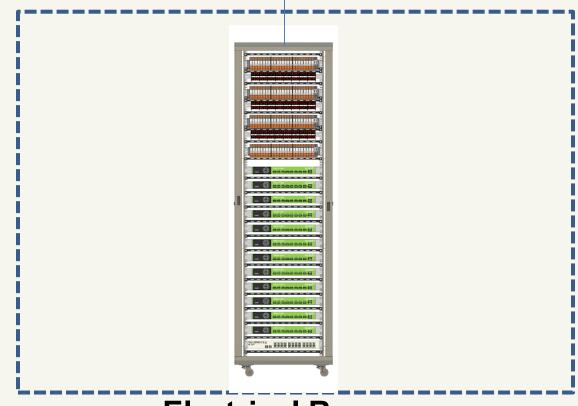
- Build 19" Server Rack(s)
- Connect 208V, 3-phase feeders

Electrical Room





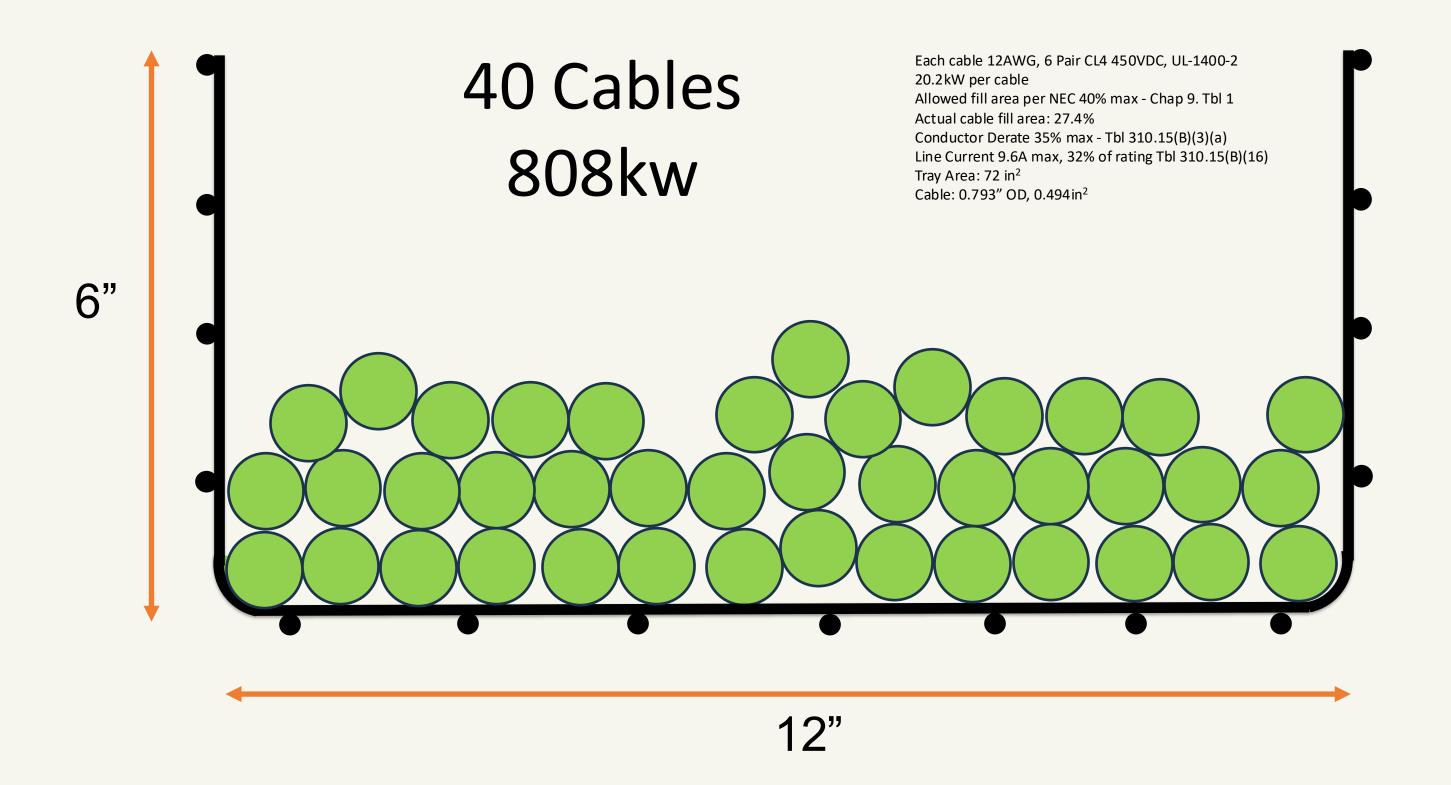
- Pull, flexible, multiconductor cable
- 12-18AWG
- Class 2 or Class 4
- Usually no-conduit required
- 0.47" OD for 8pr, 18AWG



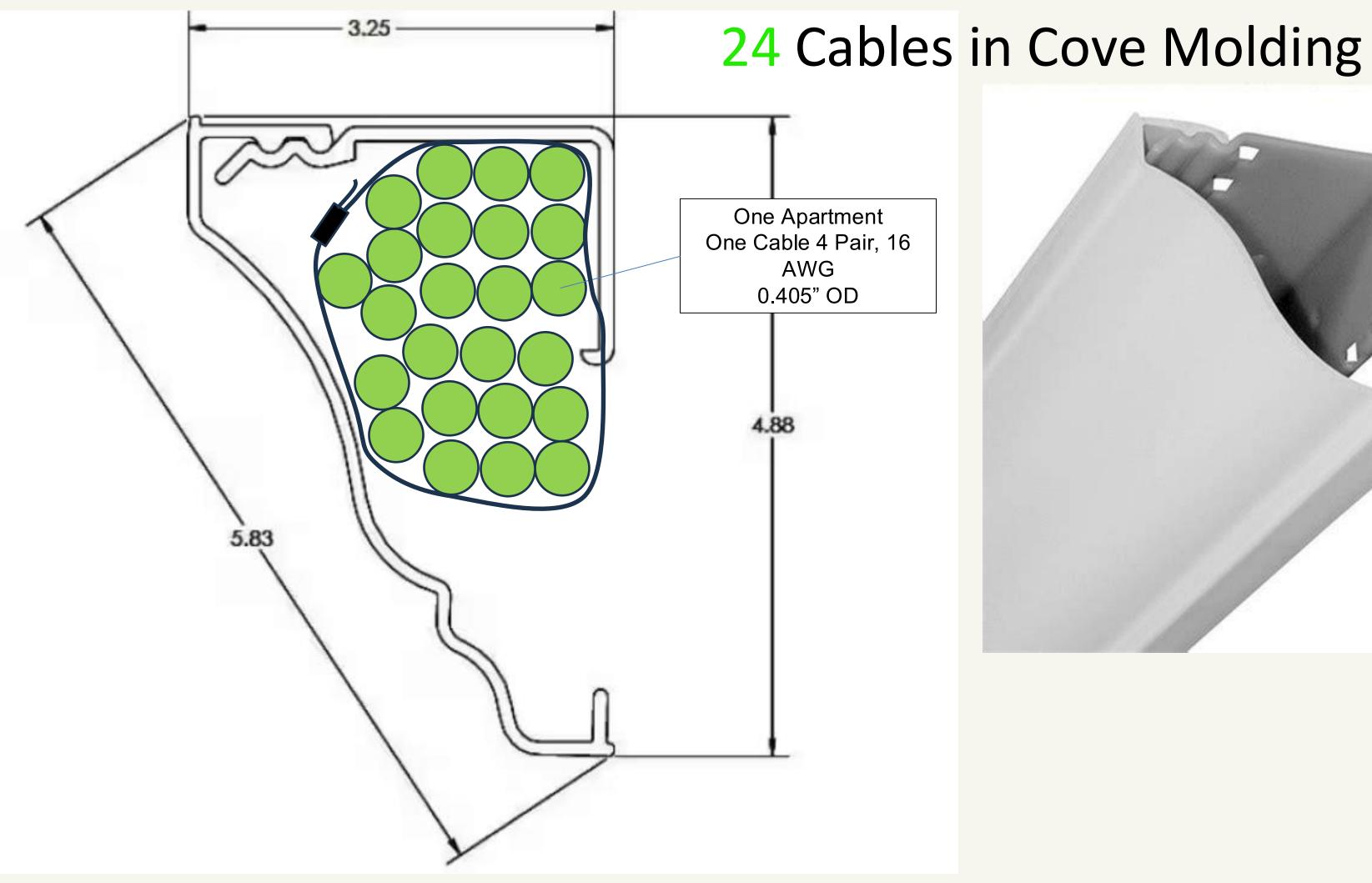
Electrical Room



High Cable Power Density in a Tray





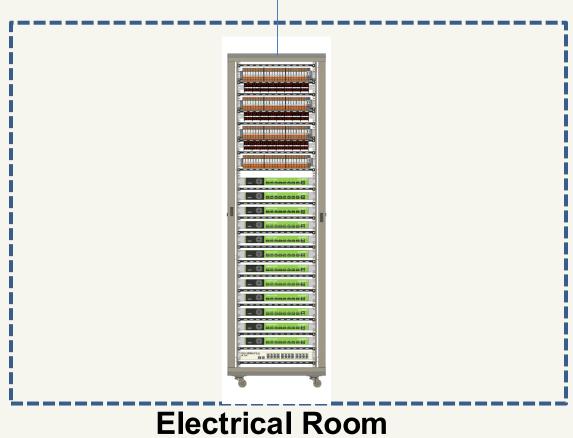








- Terminate wire in "Receiver"
- Outputs: AC or DC
- Configured to load requirements





Digital Electricity™ is a power delivery and an Energy Management System (EMS)

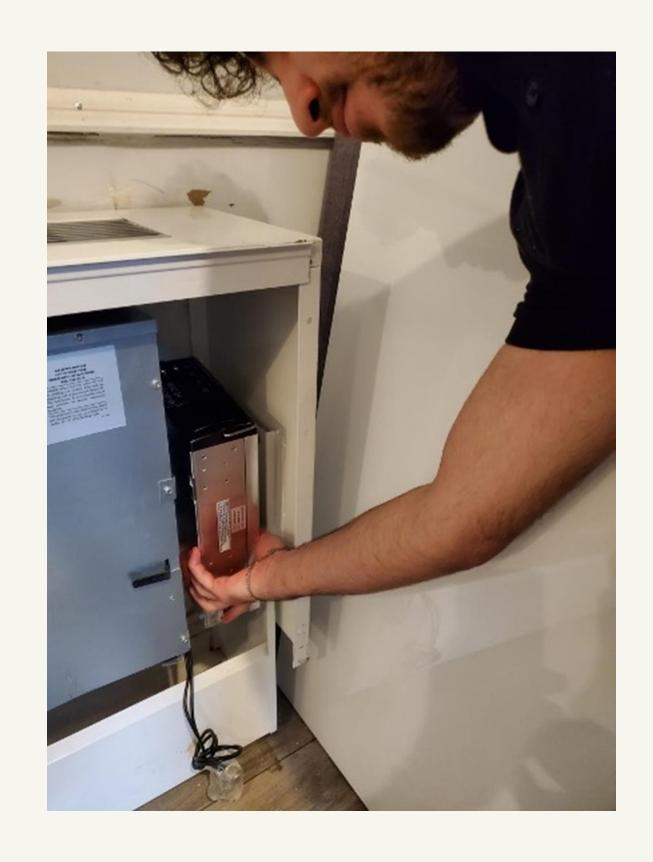


...installing currently developed and properly tuned controls could cut commercial building energy consumption by approximately...

29%*

Receiver example



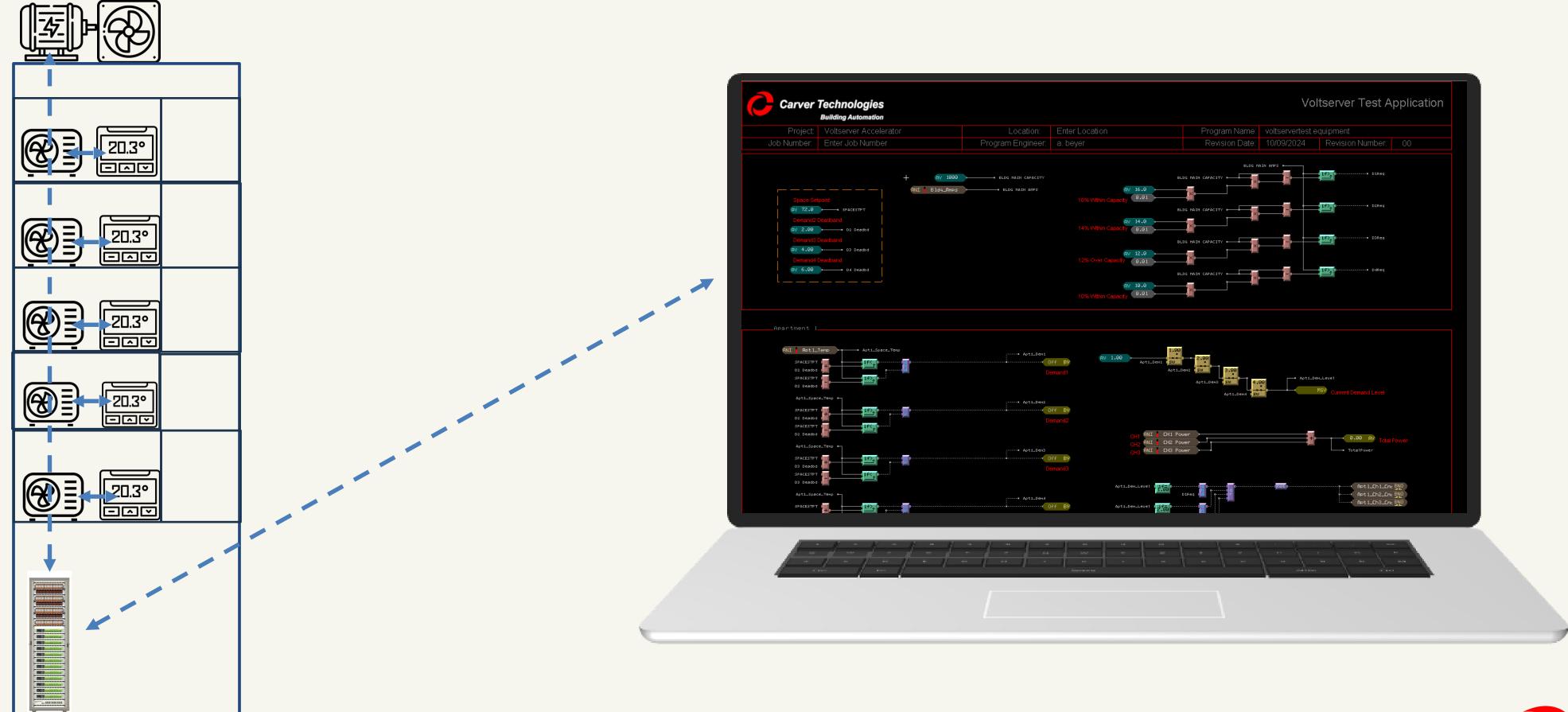




Receptacle For PTAC

RXAC 240VAC 15A Receptacle

Avoid Service Upgrades and Improve Efficiency LITSERVER







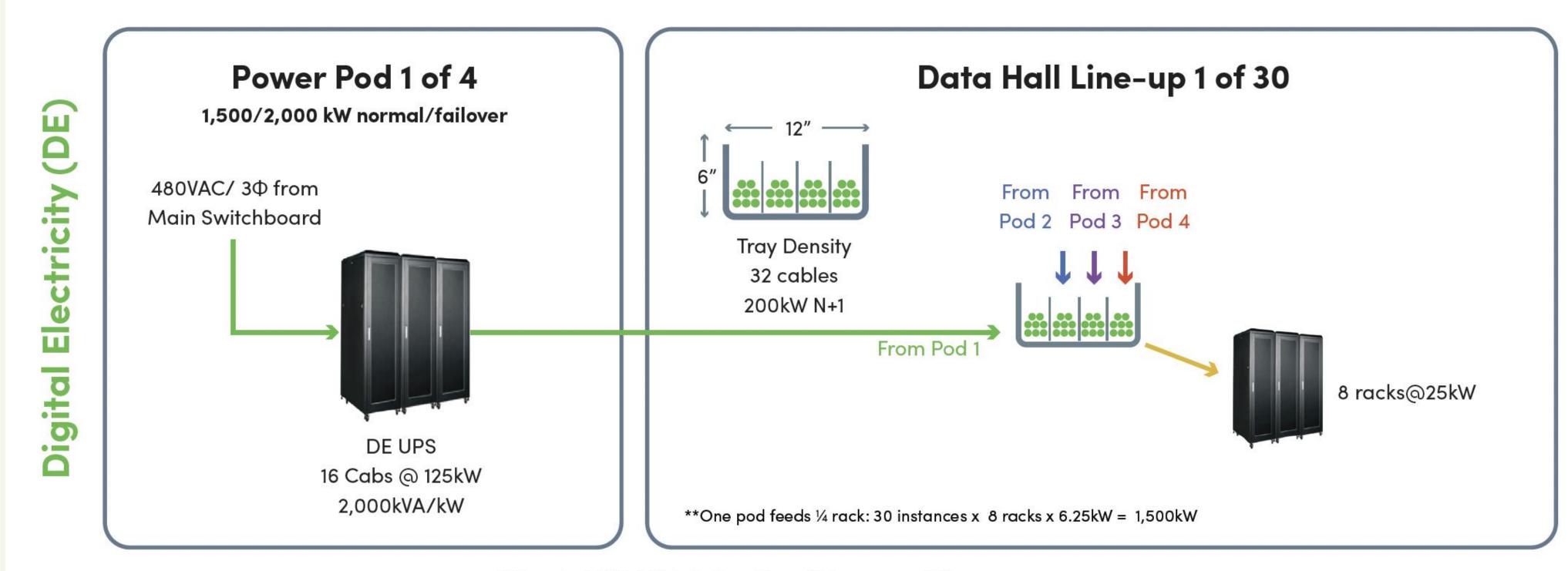


Fig. 4: FMP Distribution Line-up Diagram



Equipment Eliminated by DE

Traditional AC Equipment	Why It's Eliminated in FMP
Output Switchboards	No need to route power to multiple branches — each server gets its own dedicated cable.
Distribution Panels (Panelboards)	No branch circuits — power is delivered point-to-point.
Floor PDUs	FMP delivers power directly to the server rack PDU; no need for centralized PDUs.
Overhead Busways	FMP uses structured cable trays, not high-amperage copper busbars.
Conduit and Large-Gauge AC Wire	Structured cabling (e.g. 12AWG, 4-pair) replaces heavy copper in conduit.
Arc Flash Mitigation Equipment	Packetized energy with built-in fault protection reduces arc flash risk to near zero.
Breakers and Disconnects (Downstream)	Fault isolation happens in software/hardware at the transmitter. No mechanical protection needed at branch points.
External Power Monitoring Systems (DCIM for Power)	Monitoring is inherent in FMP — every transmitter and receiver communicates status and energy use.
Separate Battery Management Systems	Batteries are integrated directly in the FMP UPS cabinets and monitored natively.

Transmitters and Receivers in Practice













Transmitters

Receivers

Use Case - Circa Hotel, Las Vegas





- 1.25 million square feet
- 777 rooms and suites



- Battery/Gen backed power plant
- Lighting, BMS, small appliances
- LVDC distribution within rooms
- Digital Electricity™ also powers the DAS and WiFi

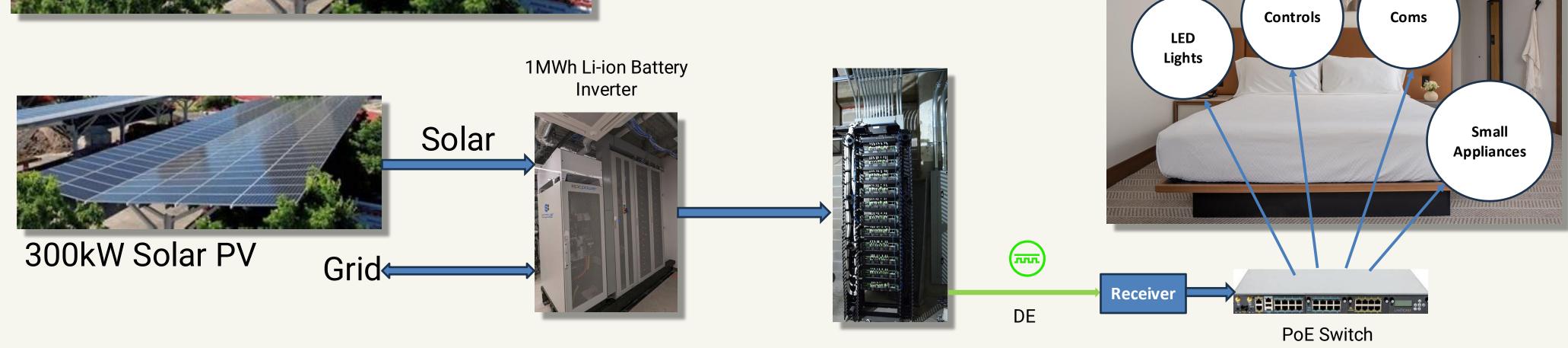
Use Case - Hotel Marcel, New Haven, CT







- Integrator Sinclair Digital LLC
- Net Zero, Leed Platinum, 165 Rooms
- Designer Becker+Becker
- Case Study, Video



Use Case - Hard Rock Stadium, Miami

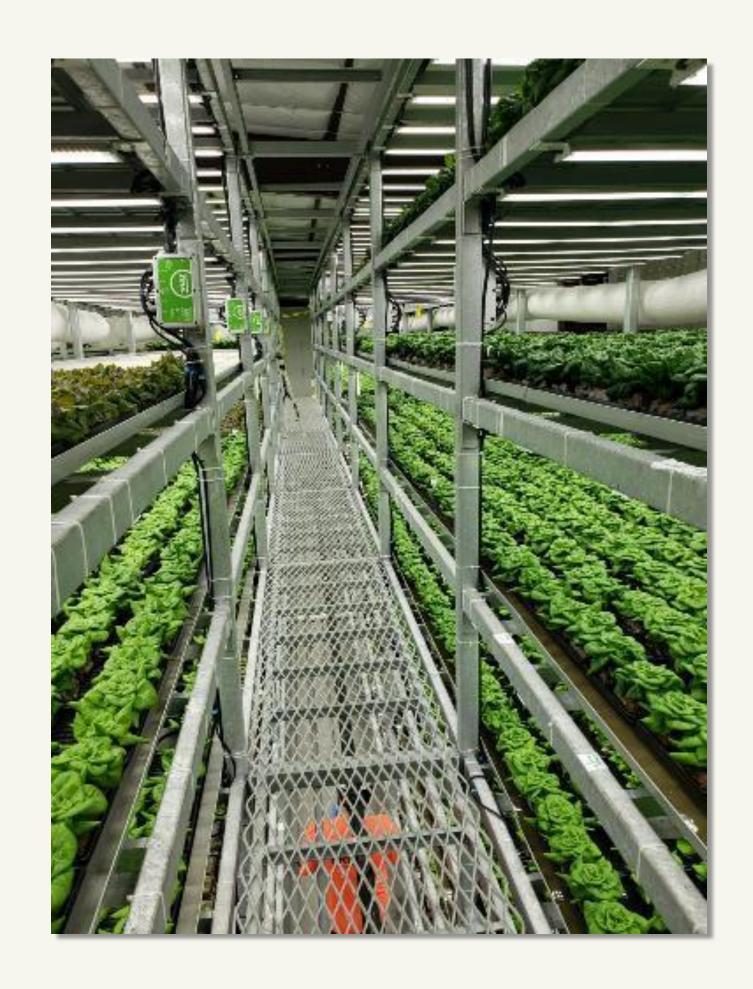


- 4G and 5G radios and Wi-Fi
- 700,000ft of total cable
- Cable lengths from 500-2500 feet
- Battery/Gen backed power plant



Use Case - Hardee Fresh Vertical Farm

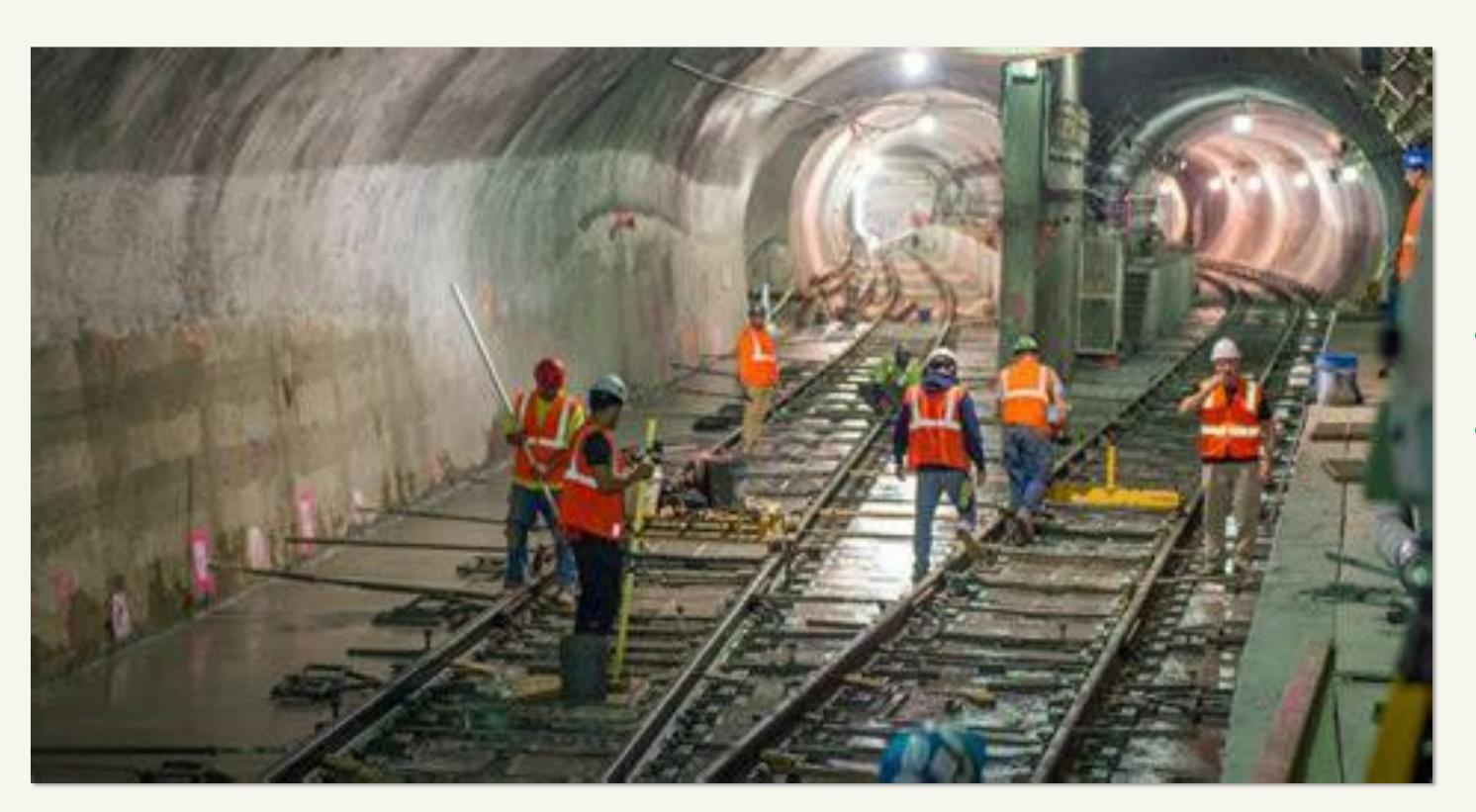




- 5 varieties of lettuce
- 50,000 over 9 levels
- 10,000 light fixtures
- Production equal to 9 acres of field
- 1.1MW solar facility
- 22 miles of Digital Electricity (DE) cable
- Grow Lights, controls

Use Case - East Side Access Project





- 4G/5G Infrastructure
- Miles of tunnels





NEC Chap. 1: Definition of Class 2 Circuit

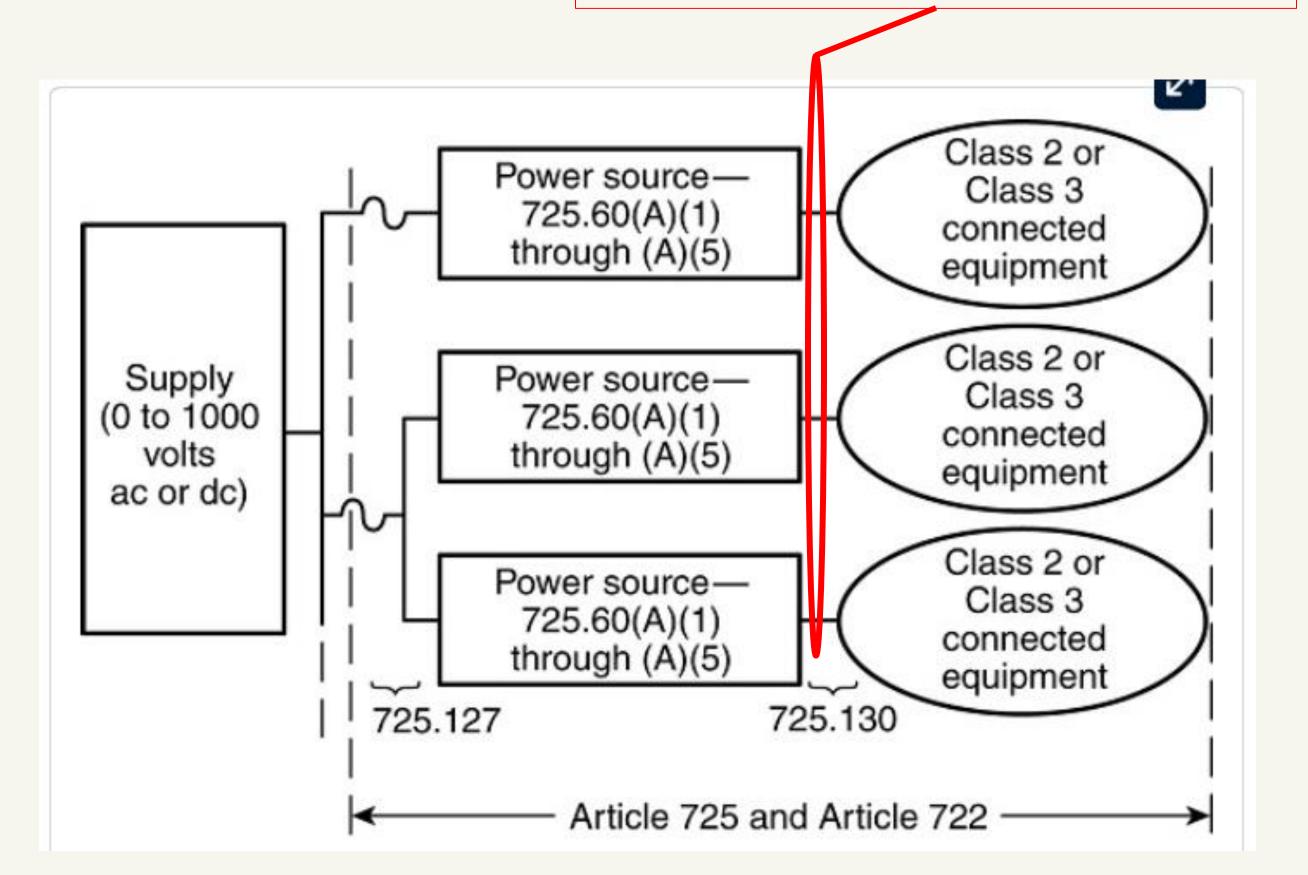
Class 2 Circuit.

The portion of the wiring system between the load side of a Class 2 power source and the connected equipment. Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock.

Class 2 Circuit

Power Limited in circuit between power source and Class 2 connected equipment







NEC Chap. 1: Definitions of Class 4 Circuit

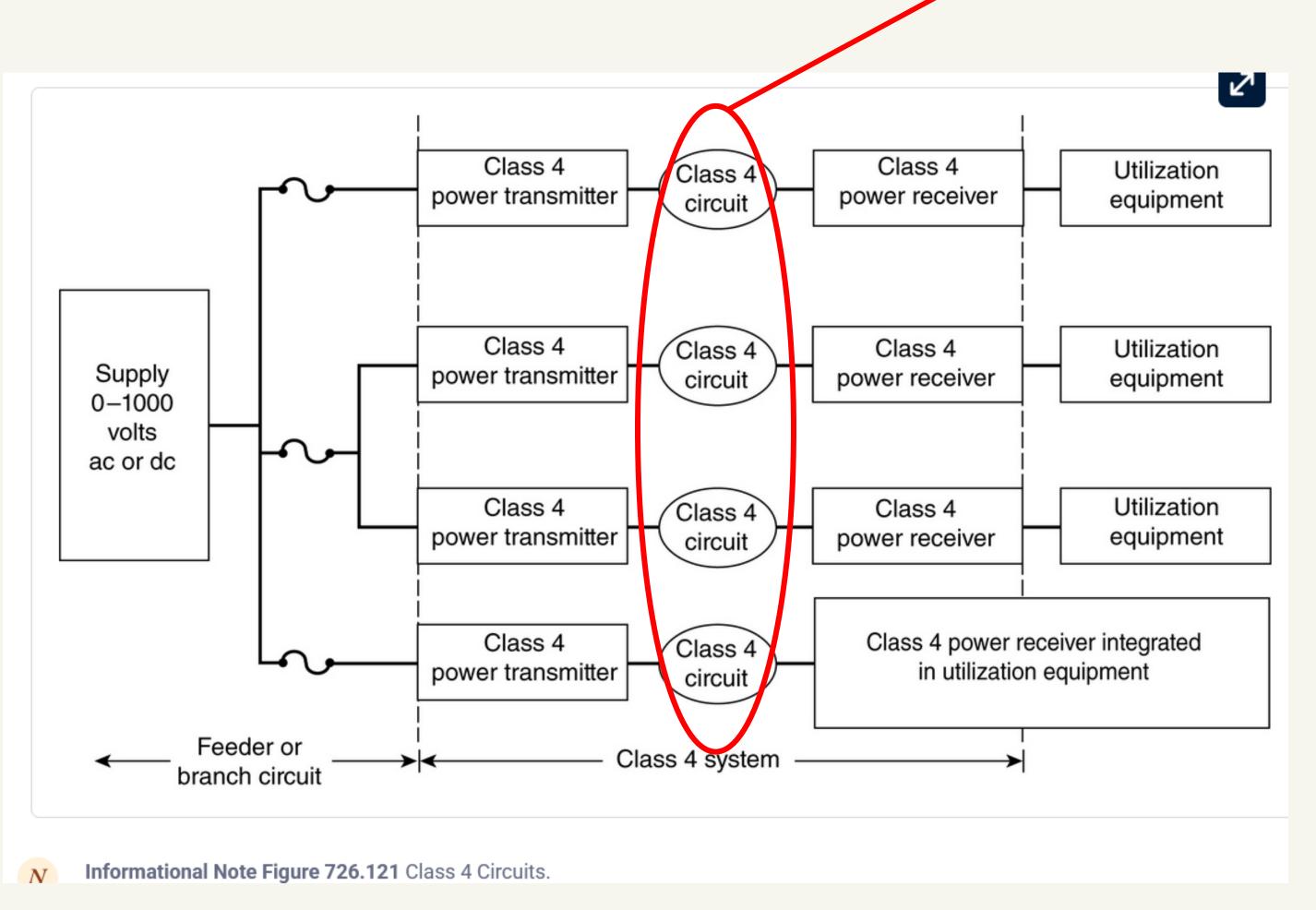
Class 4 Circuit.

The portion of the wiring system between the load side of a Class 4 transmitter and the Class 4 receiver or Class 4 utilization equipment, as appropriate. Due to the active monitoring and control of the voltage and current provided, a Class 4 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock.

Class 4 Circuit









Fault Management Art. 726.121(A) Listing Requirements

(A) Fault Management.

For listing purposes, a transmitter shall interrupt an energized circuit when any of the following conditions occur on the circuit between the transmitter and receiver:

- (1) A short circuit
- (2) A line-to-line fault condition that presents an unacceptable risk of fire or electric shock
- (3) A ground-fault condition that presents an unacceptable risk of fire or electric shock
- (4) An overcurrent condition
- (5) A malfunction of the monitoring or control system that presents an unacceptable risk of fire or electric shock
- (6) Any other condition that presents an unacceptable risk of fire or electric shock

Informational Note: See UL 1400-1, *Outline for Fault-Managed Power Systems — Part 1: General Requirements*, for information on determining applicable requirements for the listing of Class 4 power systems, including safe operation and limiting the risk of fire and electric shock.

Cable Class Listings











	Class 1	Class 2	Class 3	Class 4
safety from a fire initiation	No	Yes	Yes	Yes
provides acceptable protection from electric shock	No	Yes	No	Yes
Listing	TC TC-ER	CL2 CL2R CL2P CL2X	CL3 CL3R CL3P CL3X	CL4 CL4R CL4P
Minimum Voltage cable rating	600 v	150 v	300 v	450 v

Manufacturers are multi-rating Class 4 cable to Class 2,3

Devices and Cabling must be marked with its Class Listing

Listed Cable Print String Example:

BELDEN DIGITAL ELECTRICITY(TM) DEDN168U 8PR16 (UL) CL4 105C SUN RES WET LOCATION OR CL3 OR C(UL) CMG (xxx) FEET

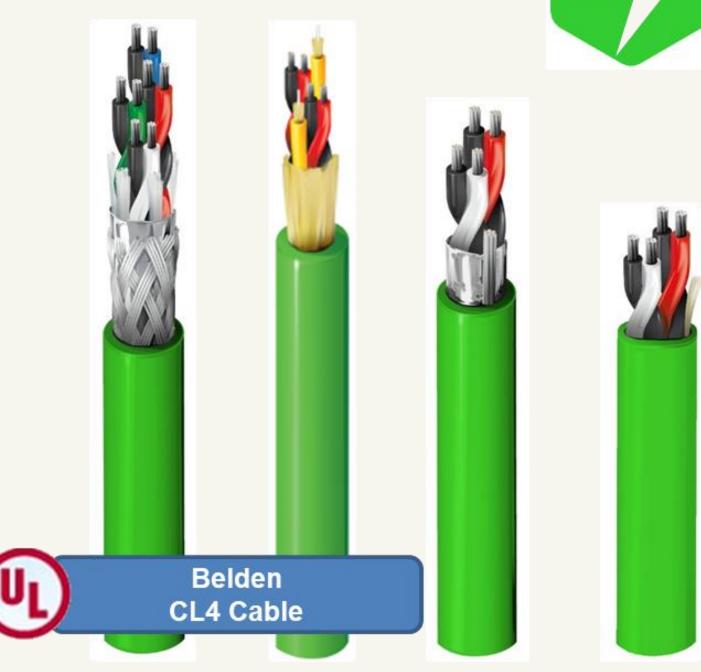
Belden Cable Examples





Versatile Solution

- Copper Only or Copper/Fiber Hybrid
- Indoor and Indoor/Outdoor Variants
 - Plenum and Riser Ratings
- Copper Options
 - 14-18 AWG
 - 2-8 or More Pairs
 - Foil Shielding Optional
- Fiber Options
 - Distribution or Breakout Type
 - 2-12 Fibers
 - OM3, OM4, or OS2





Source:

https://iq.ulprospector.com/ Product Category: DLPY

Ref: FMPS-Structured Cabling-CIM Webinar PPT

Raceway fill, Chap 9, Table 1 Notes 5,9



Percent of Cross Section of Conduit and Tubing for Conductors and Cables

Table 1 Percent of Cross Section of Conduit and Tubing for Conductors and Cables				
Number of Conductors and/or Cables	Cross-Sectional Area (%)			
1	53			
2	31			
Over 2	40			

Informational Note No. 1: Table 1 is based on common conditions of proper cabling and alignment of conductors where the length of the pull and the number of bends are within reasonable limits. It should be recognized that, for certain conditions, a larger size conduit or a lesser conduit fill should be considered.

Informational Note No. 2: When pulling three conductors or cables into a raceway, if the ratio of the raceway (inside diameter) to the conductor or cable (outside diameter) is between 2.8 and 3.2, jamming can occur. While jamming can occur when pulling four or more conductors or cables into a raceway, the probability is very low.

Notes to Tables

- (1) See Informative Annex C for the maximum number of conductors and fixture wires, all of the same size (total cross-sectional area including insulation) permitted in trade sizes of the applicable conduit or tubing.
- (2) Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage.
- (3) Equipment grounding or bonding conductors, where installed, shall be included when calculating conduit or tubing fill. The actual dimensions of the equipment grounding or bonding conductor (insulated or bare) shall be used in the calculation.
- (4) Where conduit or tubing nipples, not including connectors, having a maximum length not to exceed 600 mm (24 in.) are installed between boxes, cabinets, and similar enclosures, the nipples shall be permitted to be filled to 60 percent of their total cross-sectional area, and 310.15(C)(1) adjustment factors need not apply to this condition.
- (5) For conductors not included in Chapter 9, such as multiconductor cables and optical fiber cables, the actual dimensions shall be used.
- (6) For combinations of conductors of different sizes, use actual dimensions or <u>Table 5</u> and <u>Table 5A</u> for dimensions of conductors and <u>Table 4</u> for the applicable conduit or tubing dimensions.
- (7) When calculating the maximum number of conductors or cables permitted in a conduit or tubing, all of the same size (total cross-sectional area including insulation), the next higher whole number shall be used to determine the maximum number of conductors permitted when the calculation results in a decimal greater than or equal to 0.8. When calculating the size for conduit or tubing permitted for a single conductor, one conductor shall be permitted when the calculation results in a decimal greater than or equal to 0.8.
- (8) Where bare conductors are permitted by other sections of this *Code*, the dimensions for bare conductors in <u>Table 8</u> shall be permitted.
- (9) A multiconductor cable, optical fiber cable, or flexible cord of two or more conductors shall be treated as a single conductor for calculating percentage conduit or tubing fill area. For cables that have elliptical cross sections, the cross-sectional area calculation shall be based on using the major diameter of the ellipse as a circle diameter. Assemblies of single insulated conductors without an overall covering shall not be considered a cable when determining conduit or tubing fill area. The conduit or tubing fill for the assemblies shall be calculated based upon the individual conductors.
- (10) The values for approximate conductor diameter and area shown in Table 5 are based on worst-case scenario and indicate round concentric-lay-stranded conductors. Solid and round concentric-lay-stranded conductor values are grouped together for the purpose of <u>Table 5</u>. Round compact-stranded conductor values are shown in <u>Table 5A</u>. If the actual values of the conductor diameter and area are known, they shall be permitted to be used.

V LTSERVER DIGITAL ELECTRICITY

Art 725 Class 2 Circuit Power Sources

Part III. Class 2 and Class 3 Circuits

725.121 Power Sources for Class 2 and Class 3 Circuits.

(A) Power Source. The power source for a Class 2 or a Class 3 circuit shall be as specified in 725.121(A)(1), (A)(2), (A)(3), (A)(4), or (A)(5):

Informational Note No. 1: Informational Note Figure 725.121, No. 1 illustrates the relationships between Class 2 or Class 3 power sources, their supply, and the Class 2 or Class 3 circuits.

Informational Note No. 2: Table 11(A) and Table 11(B) in Chapter 9 provide the requirements for listed Class 2 and Class 3 power sources.

- (1) A listed Class 2 or Class 3 transformer
- (2) A listed Class 2 or Class 3 power supply
- (3) Other listed equipment marked to identify the Class 2 or Class 3 power source

Exception No. 1 to (3): Thermocouples shall not require listing as a Class 2 power source.

Exception No. 2 to (3): Limited power circuits of listed equipment where these circuits have energy levels rated at or below the limits established in Chapter 9, Table 11(A) and Table 11(B).

Informational Note: Examples of other listed equipment are as follows:

- A circuit card listed for use as a Class 2 or Class 3 power source where used as part of a listed assembly
- (2) A current-limiting impedance, listed for the purpose, or part of a listed product, used in conjunction with a nonpower-limited transformer or a stored energy source, for example, storage battery, to limit the output current
- (3) A thermocouple
- (4) Limited voltage/current or limited impedance secondary communications circuits of listed industrial control equipment

(4) Listed audio/video information technology (computer), communications, and industrial equipment limited-power circuits.

> Informational Note: One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL 60950-1-2011, Standard for Safety of Information Technology Equipment. Another way to determine applicable requirements for listing of audio/video, information and communication technology equipment is to refer to UL 62368-1-2014, Safety of audio/video, information and communication technology equipment. Typically such circuits are used to interconnect data circuits for the purpose of exchanging information data. One way to determine applicable requirements for listing of industrial equipment is to refer to UL 61010-2-201, Safety requirements for electrical equipment for measurement, control, and laboratory use -Part 2-201: Particular requirements for control equipment, and/or UL 61800-5-1, Adjustable speed electrical power drive systems — Part 5-1: Safety requirements —Electrical, thermal and energy.

Conductor Derating

Table 310.15(B)(3)(a) Adjustment Factors for More Than Three Current-Carrying Conductors

Number of Conductors ¹	Percent of Values in Table 310.15(B)(16) through Table 310.15(B)(19) as Adjusted for Ambient Temperature if Necessary
4–6	80
7–9	70
10–20	50
21–30	45
31–40	40
41 and above	35

¹Number of conductors is the total number of conductors in the raceway or cable, including spare conductors. The count shall be adjusted in accordance with 310.15(B)(5) and (6). The count shall not include conductors that are connected to electrical components but that cannot be simultaneously energized.



Table 310.15(B)(16) (formerly Table 310.16) Allowable Ampacities of Insulated Conductors Rated Up to and Including 2000 Volts, 60°C Through 90°C (140°F Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)*

		Temperature I	Rating of Conduc	tor [See Tab	le 310.104(A).]		
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
Size AWG or kcmil	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW,	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	
		COPPER		ALUN	MINUM OR COP ALUMINUM		Size AWG or kcmil
18** 16** 14** 12** 10**	15 20 30 40	20 25 35 50	14 18 25 30 40 55	 15 25 35	20 30 40		12** 10** 8
6	55	65	75	40	50	55	6
4	70	85	95	55	65	75	4
3	85	100	115	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	145	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	195	230	260	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	350	420	475	285	340	385	600
700	385	460	520	315	375	425	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	445	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	525	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	555	665	750	470	560	630	2000

^{*}Refer to 310.15(B)(2) for the ampacity correction factors where the ambient temperature is other than 30°C (86°F).

^{**}Refer to 240.4(D) for conductor overcurrent protection limitations.



Installation Practices

725.24 Mechanical Execution of Work. Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be supported by straps, staples, hangers, cable ties, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D).

300.4(D)

(D) Cables and Raceways Parallel to Framing Members and Furring Strips. In both exposed and concealed locations, where a cable- or raceway-type wiring method is installed parallel to framing members, such as joists, rafters, or studs, or is installed parallel to furring strips, the cable or raceway shall be installed and supported so that the nearest outside surface of the cable or raceway is not less than 32 mm (1½ in.) from the nearest edge of the framing member or furring strips where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable or raceway shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1.6 mm (½ in.) thick.





Table 220.55 Demand Factors and Loads for Household Electric Ranges, Wall-Mounted Ovens, Counter-Mounted Cooking Units, and Other Household Cooking Appliances over 1¾ kW Rating (Column C to be used in all cases except as otherwise permitted in Note 3.)

ARTICLE 220 - BRANCH-CIRCUIT, FEEDER, AND SERVICE CALCULATIONS

	Demand Factor				
Number of Appliances	Column A (Less than 3½ kW Rating)	Column B (3½ kW through 8¾ kW Rating)	Column C Maximum Demand (kW) (See Notes) (Not over 12 kW Rating		
1	80	80	8		
2	75	65	11		
3	70	55	14		
4 5	66 62	50 45	17 20		
3	62	43	20		
6	59	43	21		
7	56	40	22		
8	53	36	23		
9	51	35	24		
10	49	34	25		
11	47	32	26		
12	45	32	27		
13	43	32	28		
14	41	32	29		
15	40	32	30		
16	39	28	31		
17	38	28	32		
18	37	28	33		
19	36	28	34		
20	35	28	35		
21	34	26	36		
22	33	26	37		
23	32	26	38		
24	31	26	39		
25	30	26	40		
26-30	30	24	15 kW + 1 kW for each range		
31–40	30	22			
41–50	30	20	25 kW + 3/4 kW for each range		
51-60	30	18	25 km + 74 km for each fange		
61 and over	30	16			

Notes

220.61

Table 220.42 Lighting Load Demand Factors

Type of Occupancy	Portion of Lighting Load to Which Demand Factor Applies (Volt-Amperes)	Demand Factor (%)
Dwelling units	First 3000 at	100
	From 3001 to 120,000 at	35
	Remainder over 120,000 at	25
Hospitals*	First 50,000 or less at	40
	Remainder over 50,000 at	20
Hotels and motels,	First 20,000 or less at	50
including	From 20,001 to 100,000 at	40
apartment houses without provision for cooking by	Remainder over 100,000 at	
tenants*		30
Warehouses	First 12,500 or less at	100
(storage)	Remainder over 12,500 at	50
All others	Total volt-amperes	100

Demand Factors for Lighting/Receptacles

^{1.} Over 12 kW through 27 kW ranges all of same rating. For ranges individually rated more than 12 kW but not more than 27 kW, the maximum demand in Column C shall be increased 5 percent for each additional kilowatt of rating or major fraction thereof by which the rating of individual ranges exceeds 12 kW.

^{2.} Over 8¾ kW through 27 kW ranges of unequal ratings. For ranges individually rated more than 8¾ kW and of different ratings, but none exceeding 27 kW, an average value of rating shall be calculated by adding together the ratings of all ranges to obtain the total connected load (using 12 kW for any range rated less than 12 kW) and dividing by the total number of ranges. Then the maximum demand in Column C shall be increased 5 percent for each kilowatt or major fraction thereof by which this average value exceeds 12 kW.

^{3.} Over 1¾ kW through 8¾ kW. In lieu of the method provided in Column C, it shall be permissible to add the nameplate ratings of all household cooking appliances rated more than 1¾ kW but not more than 8¾ kW and multiply the sum by the demand factors specified in Column A or Column B for the given number of appliances. Where the rating of cooking appliances falls under both Column A and Column B, the demand factors for each column shall be applied to the appliances for that column, and the results added together.

^{4.} Branch-Circuit Load. It shall be permissible to calculate the branch-circuit load for one range in accordance with Table 220.55. The branch-circuit load for one wall-mounted oven or one counter-mounted cooking unit shall be the nameplate rating of the appliance. The branch-circuit load for a counter-mounted cooking unit and not more than two wall-mounted ovens, all supplied from a single branch circuit and located in the same room, shall be calculated by adding the nameplate rating of the individual appliances and treating this total as equivalent to one range.

^{5.} This table shall also apply to household cooking appliances rated over 1¾ kW and used in instructional programs.

^{*}The demand factors of this table shall not apply to the calculated load of feeders or services supplying areas in hospitals, hotels, and motels where the entire lighting is likely to be used at one time, as in operating rooms, ballrooms, or dining rooms.



What is a dwelling unit (NEC Chap 1)

Dwelling Unit. A single unit, providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, cooking, and sanitation.



Occupancy considerations

Table 220.12 General Lighting Loads by Occupancy

	Unit	Load
Type of Occupancy	Volt-Amperes/ Square Meter	-
Armories and auditoriums	11	1
Banks	39 ^b	3½ ^b
Barber shops and beauty	33	3
parlors		
Churches	11	1
Clubs	22	2
Court rooms	22	2
Dwelling units ^a	33	3
Garages — commercial (storage)	6	1/2
Hospitals	22	2
Hotels and motels, including apartment houses without provision for cooking by tenants ^a	22	2
Industrial commercial (loft) buildings	22	2
Lodge rooms	17	$1\frac{1}{2}$
Office buildings	39 ^b	$3\frac{1}{2}^{b}$
Restaurants	22	2
Schools	33	3
Stores	33	3
Warehouses (storage)	3	1/4

220.52 Small-Appliance and Laundry Loads — Dwelling Unit.

(A) Small-Appliance Circuit Load. In each dwelling unit, the load shall be calculated at 1500 volt-amperes for each 2-wire small-appliance branch circuit as covered by 210.11(C)(1). Where the load is subdivided through two or more feeders, the calculated load for each shall include not less than 1500 volt-amperes for each 2-wire small-appliance branch circuit. These loads shall be permitted to be included with the general lighting load and subjected to the demand factors provided in Table 220.42.

Exception: The individual branch circuit permitted by 210.52(B)(1), Exception No. 2, shall be permitted to be excluded from the calculation required by 220.52.

220.14 Other Loads — **All Occupancies.** In all occupancies, the minimum load for each outlet for general-use receptacles and outlets not used for general illumination shall not be less than that calculated in 220.14(A) through (L), the loads shown being based on nominal branch-circuit voltages.



NEC Chap.9, Table 11(B)

Table 11(B)	Class 2 and	Class 3	Direct-Current	Power Source	Limitations
THUSE TTIES	CHESS # WILL	C 10000000	DILLECT CHILLETT	TOHER DOMESE	ACTUAL VALUE OF THE

		Inherently Limited Power Source (Overcurrent Protection Not Required)					Not Inherently Limited Power Source (Overcurrent Protection Required)			
Power	Source		Cl	ass 2		Class 3	Cla	iss 2	Cla	ss 3
Source voltage (see Note 1)	11 11 11 11 11 11 11 11 11 11 11 11 11	0 through 20*	Over 20 and through 30*	Over 30 and through 60*	Over 60 and through 150	Over 60 and through 100	0 through 20*	Over 20 and through 60*	Over 60 and through 100	Over 100 and through 150
Power limitation (volt-ampere	ons VA _{max} es) (see Note 1)	_	_	_	_	_	250 (see Note 3)	250	250	N.A.
Current limitat (amperes) (s	***************************************	8.0	8.0	$150/V_{\rm max}$	0.005	$150/V_{\rm max}$	$1000/V_{\rm max}$	$1000/V_{\rm max}$	1000/ V _{max}	1.0
Maximum ove protection (a		_	_	_	_	_	5.0	$100/V_{\rm max}$	$100/V_{\rm max}$	1.0
Power source maximum	VA (volt-amperes)	$5.0 \times V_{\rm max}$	100	100	$0.005 \times V_{\rm max}$	100	$5.0 \times V_{\rm max}$	100	100	100
nameplate rating	Current (amperes)	5.0	$100/V_{\rm max}$	$100/V_{\rm max}$	0.005	$100/V_{\rm max}$	5.0	$100/V_{\rm max}$	$100/V_{\rm max}$	100/V _{max}

^{*}Voltage ranges shown are for continuous dc in indoor locations or where wet contact is not likely to occur. For interrupted dc or wet contact conditions, see Note 4.

Notes for Tables 11(A) and 11(B)

 $1.V_{\text{max}}$, I_{max} , and VA_{max} are determined with the current-limiting impedance in the circuit (not bypassed) as follows:

 V_{max} : Maximum output voltage regardless of load with rated input applied.

 I_{max} : Maximum output current under any noncapacitive load, including short circuit, and with overcurrent protection bypassed if used. Where a transformer limits the output current, I_{max} limits apply after 1 minute of operation. Where a current-limiting impedance, listed for the purpose, or as part of a listed product, is used in combination with a nonpower-limited transformer or a stored energy source, e.g., storage battery, to limit the output current, I_{max} limits apply after 5 seconds.

VA_{max}: Maximum volt-ampere output after 1 minute of operation regardless of load and overcurrent protection bypassed if used.

- For nonsinusoidal ac, V_{max} shall not be greater than 42.4 volts peak. Where wet contact (immersion not included) is likely to occur, Class 3 wiring methods shall be used or V_{max} shall not be greater than 15 volts for sinusoidal ac and 21.2 volts peak for nonsinusoidal ac.
- 3. If the power source is a transformer, VA_{max} is 350 or less when V_{max} is 15 or less.
- 4. For dc interrupted at a rate of 10 to 200 Hz, V_{max} shall not be greater than 24.8 volts peak. Where wet contact (immersion not included) is likely to occur, Class 3 wiring methods shall be used, or V_{max} shall not be greater than 30 volts for continuous dc; 12.4 volts peak for dc that is interrupted at a rate of 10 to 200 Hz.