

Proposed Amendment to the Ann Arbor Unified Development Code Requiring Installation of EV Charging Infrastructure

To **Article VIII: Definition**, add the following terms:

Electric Vehicle (EV)

Electric Vehicle Supply Equipment (EVSE)

EV-Capable (EV-C)

EV-Ready (EV-R)

EV-Installed (EV-I)

To **Article IV: Development Standards 5.19, 5.19.1 Applicability**, add:

A, No New Building or modifications that will trigger a site plan for an existing building shall be erected unless the parking for bicycles, motor vehicles and *electric vehicles* required by this section 5.19 is provided.

To **Article IV: Development Standards 5.19, Table 5:19-1**, add a new column: *Required Electric Vehicle Charging Spaces*

To **Table 5:19-2 Stall and Aisle Standards** add to footnote 3: *Barrier Free Spaces shall have electric vehicle charging access according to Table 5:19-3*

DEFINITIONS TO BE ADDED TO *ARTICLE VIII: DEFINITIONS:*

Electric Vehicle (EV): An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current which is charged by being plugged into an electrical source. For the purpose of this ordinance, off-road, self-propelled electric vehicles, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats, and the like, are not included.

Electric Vehicle Supply Equipment (EVSE): Conductors, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises and the electric vehicle.

EV-Capable(EV_C): Refers to installed electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to future EV parking spaces.

EV-Ready(EV_R): Refers to the following components: The entirety of the elements contained in the EV-Capable definition, in addition to the installation of a minimum 40-amp circuit breaker and suitable wiring that is continuous from the installed circuit breaker to an appropriate termination point such as a junction box or charging outlet.

EV-Installed(EV_I): Refers to a parking space that is completely ready to provide charging to an EV. This parking space must contain the entirety of the elements contained in the EV-Capable and EV-Ready definitions, in addition to a charging station.

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To Section 5.19.8 Design of Vehicle Parking Facilities, add:

G. All Parking shall have at least the percent of EV charging infrastructure noted in Table 5.19.2. If the percentage results in a fraction, the number of EV charging sites shall be rounded up to the next whole number. The following provisions must be met in accordance with the apportioned EV-designated parking spaces contained in Table 5.19.2.

1. EV Capable infrastructure(EV-C) shall include....

1. EV-Ready infrastructure(EV-R) shall include...

1. EV-Installed infrastructure(EV-I) shall include...

1. The proposed placement and installation of EV infrastructure or equipment shall not allow for any violation of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101).

1. The placement of EV charging infrastructure shall not create a trip hazard or violation of the accessible path of travel when the cord is connected to an EV or PHEV.

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H. Where parking spaces are separated into distinct areas, separate garages or lots, EV charging infrastructure (EV-C, EV-R, EV-I) shall be evenly distributed among all separate areas by their required percentages....

I. The proposed placement and installation of EV infrastructure or equipment shall not allow for any violation of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101). The minimum number of electric vehicle charging stations (EVCS) as dictated by Table 5:19-3 shall meet the accessibility requirements as shown in Graphic 5:19-1 (graphic)

Table 5:19-3 Accessible EV Charging Stations Required (table)

J. Requirements for the City of Ann Arbor

Requirements for the City of Ann Arbor Construction and Building Department

Requirements for the Office of Sustainability and Innovation



EV Ordinance Site Plan Study:

An Exercise in Using the Parking Table to Calculate Required EV-C / R / I Parking Spaces

Natural Features Adjacent						
	ft	40	land edge of wetland	NA	NA	NA
ft min.						
Vehicular Parking						
Required Parking			PUD	Avalon	Thrive	
Multi-family residential	1.5/DU	133 dwelling units = 195	204	71(1 EV)	133(58 EV)(2 BF)	min
Single Family	2/DU	16 dwelling units = 32	32	-	32(16 EV)	min
Retail sales, general merchandise less than 300,000/sf	1/310sf	4745/310sf min. = 15 spaces	15	-	15(6 EV) (284)	min
School, Private (Elementary/Day Care)	3/classroom	3 classrooms x 3 = 9 spaces	0		church agreement	
		Total Spaces Required = 251	251	71	180	min
Bicycle Parking						
			PUD	Avalon	Thrive	

Parking			
Parking - Automobiles - total	705	719	1.5 per unit required
Garage Parking (see architectural plans)		578	
Garage Parking (see architectural plans)		14	EV charging stations
Townhouse garage parking		49	
Street Parking		92	Includes 2 car share spaces
Barrier Free Parking		16	Included in total (4 site, 12 garage)
Parking - Bicycles (see architectural plans)	94		1 per 5 D U.
Parking - in garages	47	128	Class A & A1 (50%)
Parking - in garages	47	40	Class B (50%)
Parking - in garages	47	38	Class C
Parking - surface		9	Class C



PARKING REQUIREMENTS					
PARKING SPACE TYPES		REQUIRED	PREVIOUS PLAN	PROPOSED	LOCATION
VEHICULAR SPACES					
1 CAR GARAGES			56	203*	INTERIOR
2 CAR GARAGES			152/304 SPACES	51/102 SPACES	INTERIOR
EXTERIOR PARKING	9' SPACES	264	60	60	EXTERIOR
	8' SPACES	115 MAX.	74	74	
	BF SPACES	4	5	5	
	BF VAN SPACES	1	1	1	
TOTAL VEHICULAR SPACES		380	600 SPACES	445 SPACES	
		1.5 SP/UNIT	1.95 SP/UNIT	1.78 SP/UNIT	
BICYCLE SPACES					
	CLASS A	26/50%	208	154	IN GARAGES
	CLASS B	25/50%	60	60	EXTERIOR
TOTAL BICYCLE SPACES		51 SPACES	268 SPACES	214 SPACES	
		1 SP/5 DU	1 SP/0.96 DU	1 SP/1.18 DU	

* 4 apartment units have 1 stall barrier free garages

Stories		n/a	n/a	NON-RESIDENTIAL, 200	RESIDENTIAL, 200
PARKING - Vehicular	Per Off Street Parking Table 5-19 (City of Ann Arbor Unified Development Code)	0		Per July 1, 2019 Council Amended Supplemental Regulations	490 (Incl. 7 standard and 2 van BF Spaces)
PARKING - Bicycle	Per Off Street Parking Table 5-19 (City of Ann Arbor Unified Development Code)	0		Per July 1, 2019 Council Amended Supplemental Regulations	82 Required, 83 Provided, as shown on CS100

Ann Arbor UDC Parking Table 5:19-1 Off-Street Parking Spaces Required

(draft) EV CHARGING EQUIPMENT REQUIREMENTS

Residential Uses				
Property Use [See Sec. 5.19.3 for Uses in D1 and D2 Downtown Districts:]	Required Parking Spaces	Required Bicycle Spaces	Required Bicycle Class	Required EV Charging Spaces (round up to next integer)
Dwelling, Assisted Living	For R4A: 2 spaces per Dwelling Unit For R4B, R4C, R4D and R4E: 1 ½ spaces per Dwelling Unit For any Nonresidential District: 1 space per Dwelling Unit	1 space per 5 Dwelling Units	A 50% C 50%	65% EV-C plus 25% EV-R 10% EV-I
Dwelling, Multi-Family	For R4A: 2 spaces per Dwelling Unit For R4B, R4C, R4D, and R4E: 1 ½ spaces per Dwelling Unit In any Nonresidential District: 1 space per Dwelling Unit	1 space for 5 Dwelling Units	A 50%, C 50%	65% EV-C plus 25% EV-R 10% EV-I
Dwelling, Single-Family	1 space per Dwelling Unit	None	None	100% EV-R
Dwelling, Townhouse	2 spaces per Dwelling Unit	1 space per 5 Dwelling Units	A 50%, C 50%	100% EV-R
Dwelling, Two Family	1 ½ spaces per Dwelling Unit	None	None	100% EV-R
House Trailer Park	1 space per Dwelling Unit	None	None	100% EV-C
Emergency Shelter	None	None		25% EV-C
Fraternities, sororities, student cooperatives	1 space for each 5 beds	1 space per 2 beds	A 50% B 50%	65% EV-C plus 25% EV-R 10% EV-I
Group Housing	1 space for each 3 beds	1 space per 5 beds	A 50% B 50%	65% EV-C plus 25% EV-R 10% EV-I

EXAMPLE: Midtown Condominium, 1400 S. Maple, just south of Pauline Blvd

EXERPT FROM UDC PARKING TABLE:

Property Uses	Off-Street Parking Spaces Required	EV Charging Spaces Required
Dwelling, Single-Family	1 space per Dwelling Unit	100% EV-R
Dwelling, Townhouse	2 spaces per Dwelling Unit	100% EV-R

Calculating Number of EV-C / R / I Parking Spaces:

PROJECT ID:		SP19-011 Midtown Condos, 1400 S. Maple St.					
ZONE:		R4B Multiple family dwelling					
79 townhomes; 174 apartments	Units	parking spaces	EV-C		EV-R		EV-I
TOTAL RESIDENTIAL UNITS:	253						
TOTAL PROPOSED SPACES:		445					
one-car garages	203	203	0%	0	100%	203	0%
two-car garages	51	102	0%	0	100%	51	0%
exterior parking spaces		140	0%	0	0%	-	0%
		445	0		254		0

Midtown Condominium parking table:

PARKING SPACE TYPES		REQUIRED	PREVIOUS PLAN	PROPOSED	LOCATION
VEHICULAR SPACES					
1 CAR GARAGES			56	203*	INTERIOR
2 CAR GARAGES			152/304 SPACES	51/102 SPACES	INTERIOR
EXTERIOR PARKING	9' SPACES	264	60	60	EXTERIOR
	8' SPACES	115	74	74	
	BF SPACES	4	5	5	
	BF VAN SPACES	1	1	1	
TOTAL VEHICULAR SPACES		380 1.5 SP/UNIT	600 SPACES 1.95 SP/UNIT	445 SPACES 1.76 SP/UNIT	

NEW TABLE:

PARKING SPACE TYPES		REQUIRED	PREVIOUS PLAN	PROPOSED	# EV-C/I/R SPACES	LOCATION
VEHICULAR SPACES						
1 CAR GARAGES			56	203*	203 EV-R	INTERIOR
2 CAR GARAGES			152/304 SPACES	51/102 SPACES	51 EV-R	INTERIOR
EXTERIOR PARKING	9' SPACES	264	60	60		EXTERIOR
	8' SPACES	115	74	74		
	BF SPACES	4	5	5		
	BF VAN SPACES	1	1	1		
TOTAL VEHICULAR SPACES		380 1.5 SP/UNIT	600 SPACES 1.95 SP/UNIT	445 SPACES 1.76 SP/UNIT		

EXAMPLE: The Glen PUD, between E. Ann & Catherine

EXERPT FROM UDC PARKING TABLE:

Property Uses	Off-Street Parking Spaces Required	EV Charging Spaces Required
Dwelling, Multi-Family	For R4A: 2 spaces per Dwelling Unit	65% EV-C plus 25% EV-R plus 10% EV-I
	For R4B, R4C, R4D, and R4E: 1 ½ spaces per Dwelling Unit	
	In any Nonresidential District: 1 space per Dwelling Unit	
Hotel	1 space per room	25% EV-C plus 50% EV-R plus 25% EV-I
Retail Sales, General Merchandise	Retail stores and Retail Centers less than 300,000 sq. ft. of Floor Area = Minimum of 1 space per 310 sq. ft. of Floor Area; maximum of 1 space per 265 sq. ft. of Floor Area [1]	10% EV-R plus 10% EV-I
Restaurant, Bar, Food Service	1 space for each 100 sq. ft. of Floor Area	15% EV-C plus 10% EV-R plus 10% EV-I

Calculating Number of EV-C / R / I Parking Spaces:

PROJECT ID:		SP19-012									
ZONE:		T2S, R6E Mixed use									
Hotel + Retail + Apartments + Restaurant 24 apts, 162 hotel rooms											
	Units	area (sf)	parking spaces	EV-C		EV-R		EV-I			
TOTAL REQUIRED SPACES:			238								
TOTAL PROPOSED SPACES:			241								
apartment units	24		24	65%	16	25%	6	10%	2		
hotel rooms	162		162	25%	40.5	50%	121.5	25%	40.5		
retail		1173 sf	4	0%	0	10%	0.4	10%	0.4		
restaurant (new)		4000 sf	40	15%	6	10%	4	10%	4		
restaurant (Angelos)			8	15%	1	10%	1	10%	1		
238					63			92		48	

The Glen PUD parking table:

	Glenn Ann Place Previously Approved PUD Zoning 11/01/7	The Glenn Mixed Use Development Previously Approved PUD Zoning - December 2017	The Glenn Mixed Use Development Required/Permitted	The Glenn Mixed Use Development Revised PUD Zoning - Current Provided
CAR PARKING				
Retail Parking Req'd	16,800 SF/310 = 54 spaces		1,173 SF/310 = 4 spaces	
Office Parking Req'd	21,031 SF/333 = 63 spaces			
Apartment Parking Req'd	112 Units/1 = 112 spaces		24 Units/1 = 24 spaces	
Hotel Parking Req'd			162 Hotel Rooms/1 = 162 spaces	
Restaurant Parking Req'd			4,000 SF/100 = 40 spaces	
			Angelo's restaurant parking = 8 spaces	
Total Parking Req'd	237 spaces required		238 total spaces required	
Total Parking Provided	136 + 8 = 144 spaces provided	252 spaces provided		241 spaces provided per parking summary on A6



Retail: 1,173 SF/310 = 4 spaces **(0.4 EV-R spaces; 0.4 EV-I spaces)**

Apartments: 24 Units/1 = 24 spaces **(16 EV-C spaces; 6 EV-R spaces; 2 EV-I spaces)**

162 Hotel Rooms/1 = 162 spaces **(40 EV-C spaces; 81 EV-R spaces; 41 EV-I spaces)**

Restaurant: 4,000 SF/100 = 40 spaces **(6 EV-C spaces; 4 EV-R spaces; 4 EV-I spaces)**

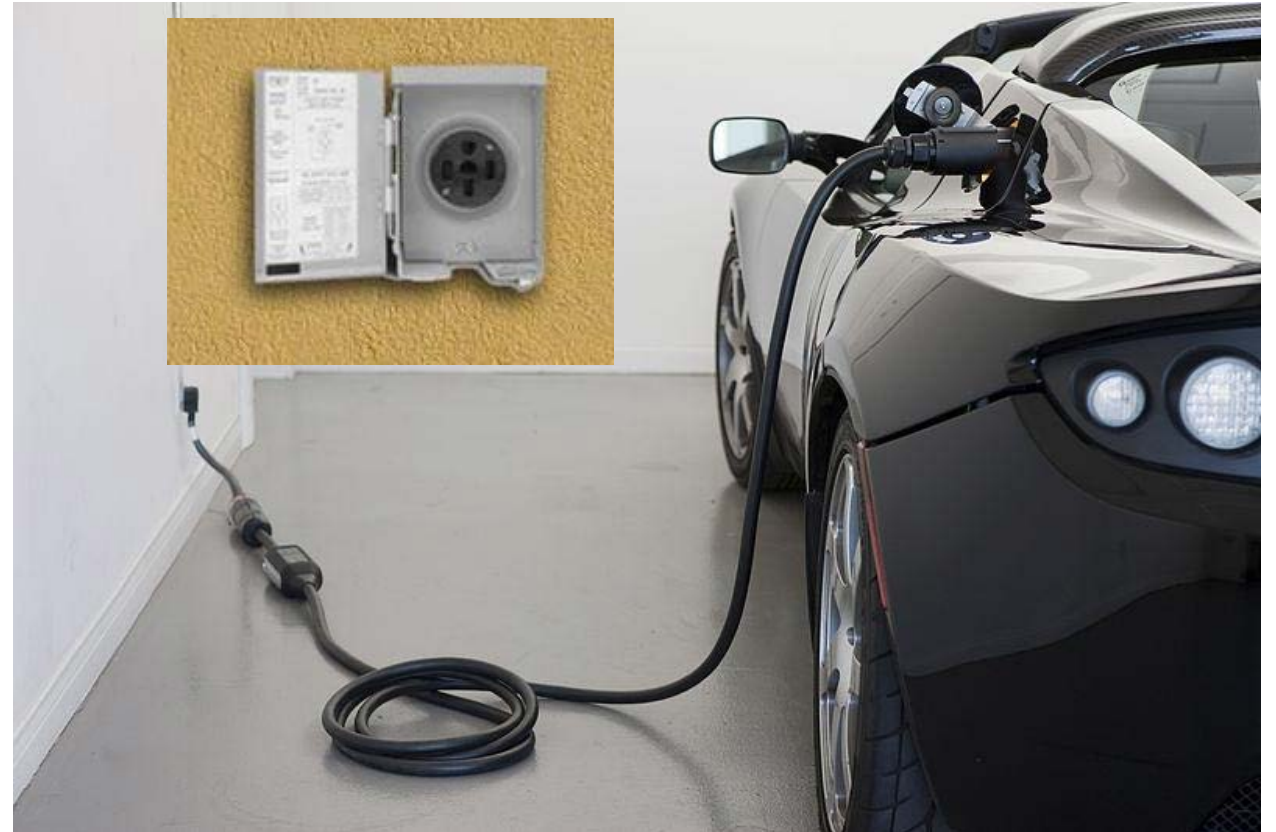
Angelo's restaurant parking = 8 spaces **(2 EV-C)**

238 total spaces required

Wall- and Pole-Mounted Charging Stations



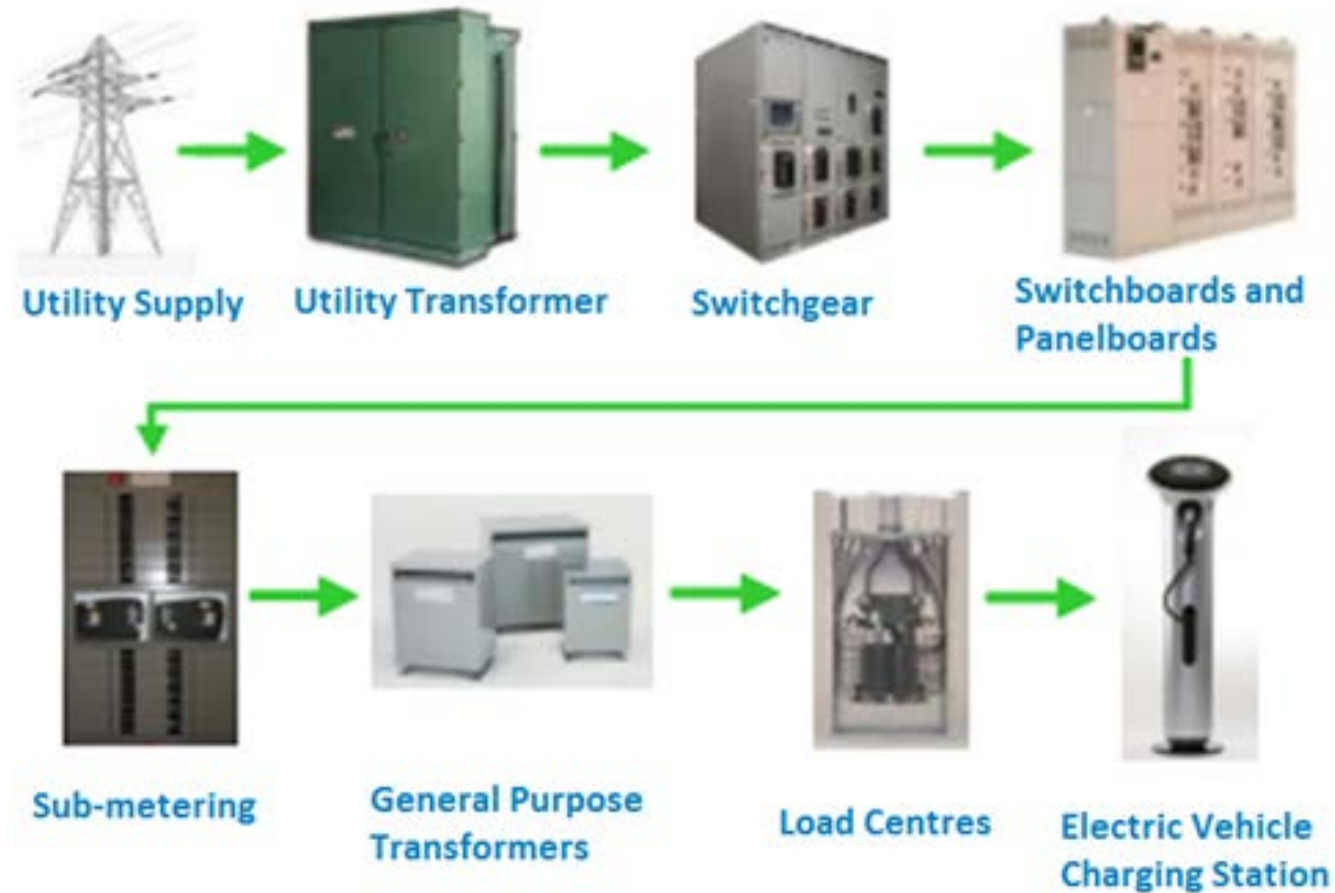
Portable L2 Chargers





- EVSE INSTALLATION COST AS A % OF PROJECT COST
 - Ann Arbor Infrastructure Cost Analysis: Cost estimates are for EV-R and EV-R, in ENCLOSED Garages
 - NEW Installation: 0.03% -> 0.4%
 - RETROFIT Installation: 0.07% -> 0.19%
- Total EV charging capacity that Ann Arbor could build from the twenty-seven 2019 site plans in this study, if the EV Ordinance were in place now, based on the proposed UDC Parking Table's EV Charging Equipment Requirements:
 - EV-C spaces: 1,373
 - EV-R spaces: 1,225
 - EV-I spaces: 379

EV CHARGING STATION FLOW CHART



- <http://www.eai.in/wp-content/uploads/2018/12/EVSE.png>