DRAFT 3/15/2022 PRE-DECISIONAL

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ESB Proposal to City Council Requesting Support for the Installation of Electric Vehicle Supply Equipment (EVSE) in New Commercial and Residential Building:

DRAFT LANGUAGE FOR ESB PROPOSAL:

The Hendersonville Environmental Sustainability Board (ESB) requests that the Hendersonville City Council adopt a resolution affirming the City's intent to support policies that encourage electric vehicle adoption and build out the charging infrastructure necessary to power the growing number of electric vehicles in the Hendersonville area. To accomplish this goal, we propose that the Council call for the installation of Electric Vehicle Supply Equipment (EVSE) in all new commercial and residential construction including construction on City property.

The Council resolution should outline that not more than 30 days from adoption, the City Community Development Department - (Planning Division) informally notify all new applicants for new commercial construction and new residential single or two family and multi-family residential dwellings within City jurisdiction, that the City is proposing that all new construction and major renovations include installation of EVSE. The ESB requests that under the same resolution, the City Council also require that within 45 days from adoption, the Community Development Department - (Planning Division) begin the formal process of amending City codes and regulations to include requirements for installation of EVSE at: 1) new commercial development exceeding 50k square feet (including any business that increases parking spaces or total square footage by 50 percent, or that institutes property upgrades totaling 50 percent of the taxable value in a given year); 2) residential single or two family and multi-family developments of eight or more units, and; 3) new development or construction at City managed facilities or properties. The proposed revisions should reflect the 2021 model International Energy Conservation Code language provided in the attached appendix. The code revisions should include requirements that the EVSE shall be maintained in good working order and include appropriate signage, and that facility managers may recover reasonable costs of EVSE operation.

BACKGROUND:

In early 2022, a draft sustainability plan was developed by a subcommittee of the Hendersonville Environmental Sustainability Board. That draft includes a recommendation the City "Amend the City zoning code to require that EV charging stations be installed in all new single-family and multi-family housing developments of X units, new commercial enterprises including Y parking spaces, and any such pre-existing entity that incurs expansion or repair costs of at least 50 percent of its taxable value." This proposal reflects that recommendation.

DRAFT 3/15/2022 PRE-DECISIONAL

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Electric Vehicles:

Electric Vehicles (EVs) provide substantial benefits to the consumer and society. EVs are less expensive to operate than conventional internal combustion engine vehicles, are less affected by fluctuations in petroleum market prices, have lower maintenance costs, and have the convenience of fueling (charging) at home or work. Depending on how they are driven, today's light-duty EVs (or PHEVs in electric mode) can exceed 130 MPGe (miles per gallon equivalent). Further, EVs have significant emissions benefits over conventional petroleum based vehicles and are part of a larger strategy to address impacts of climate change.

All major auto manufacturers have formally announced that they plan to transition to a majority of electric vehicles in the next 3-5 years. With greater model availability and increased vehicle range, consumer and commercial interest in EVs has grown significantly in recent years. More than 50 EV models are available today and nearly 140 models are expected by 2024.

The success of EV adoption is directly related to the availability of the EV charging infrastructure in private and public settings. It is vitally important to increase the number of available EV charging stations to support the public's desire to transition to EVs.

As of December 31, 2020, North Carolina (see) had 16,190 registered EVs and as of January 2021, Henderson County had 134 registered EVs an increase of 30% from the previous year. More recent data is not yet available.

EV Charging and New Construction:

New homes and commercial buildings are built to last for decades, thus they represent a unique opportunity during initial construction to be equipped to support future technologies, including the ability to efficiently charge EVs. Homes built today are expected to last at least 30 years (2052) and for example, General Motors has stated that they plan to stop selling internal combustion engines vehicles by 2035.

The costs associated with installing EV charging infrastructure during new construction are substantially lower than during a retrofit and can be recovered through minimal surcharges added to the construction or charging fees. Level 2 chargers cost between $2,000 and $5,000 to install, with subsidies available for residents and businesses to cover upfront costs.

According to the 2021 JD Power's U.S. Electric Vehicle Experience Home Charging Study, 88 percent of EV owners prefer to charge their vehicle at home where charging can take place overnight. Overnight charging has the added benefit of promoting off-peak charging that allows beneficial energy demand management.

DRAFT 3/15/2022 PRE-DECISIONAL

DRAFT FOR DISCUSION PURPOSES ONLY

For businesses and property managers, EV charging can improve tenant or worker retention, increase property value, contribute to sustainability goals and count towards Leadership in Energy and Environmental Design (LEED) certification.

EV Charging and Building Codes:

In 2020, the International Energy Conservation Code (IECC) — the country's model code for establishing minimum design and construction requirements for energy efficiency — issued the new provisional EV infrastructure requirements for all new homes and commercial and multi-family residential buildings.

Many states and local governments have added EVSE provisions to their building codes, local ordinances and zoning requirements. Locations in the southeast include; Atlanta, Miami-Dade county, Surfside, FL, Boca Raton, Boynton Beach, Coral Gables, Hollywood, Miami Beach, St Petersburg, and Winter Park. In 2021, a bill was introduced in the North Carolina General Assembly which required the NC Energy Code to provide that all new one- and two-family dwellings include at least one electric vehicle–ready parking space, except where no parking spaces are provided for the dwelling unit.

DEFINITIONS

Level 2 Charging:

Level 2 charging is the most widely used level for daily residential/public EV charging and is the recommended level for this proposal. Level 2 equipment is cost effective and can be installed at home and at the workplace, as well as in public locations like shopping plazas, parking garages, and other destinations. Level 2 charging can replenish between 12 and 80 miles of range per hour, depending on the power output of the Level 2 charger, and the vehicle's maximum charge rate.

Level 2 charging equipment uses the same standard J1772 connector that Level 1 equipment uses. All commercially available Plug-in Electric Vehicles have the ability to charge using Level 1 and Level 2 charging equipment.

DRAFT 3/15/2022 PRE-DECISIONAL

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	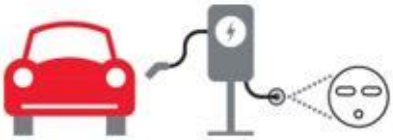	
Level 1 Charger	**Level 2 Charger**	**Level 3 Charger**
This charger has a 120-volt cord that plugs into the wall.	This charger requires a 208/240-volt service.	This is charger is typically used for public charging.
It can provide around 40 miles of range after charging overnight.[1]	It can provide 30-80 miles of range for every hour of charging.[1]	It can provide up to 40 miles of range for every 10 minutes of charging.[1]
This charger may not require an electrician.	An electrician is required to set up electrical wiring for a new outlet or breaker and a service panel upgrade if necessary.	It typically requires 480-volt service.

[1] Range depends on vehicle, speed, cargo weight, and other factors.

From Hastings Minnesota planning document.

Electric Vehicle Supply Equipment (EVSE):

There are three different EVSE-ready building code terms currently in use. They include:

1) *EVSE-Capable*. This means there is electric panel capacity, a dedicated branch circuit, and continuous raceway from the panel to the intended location of the EVSE. This is definitely the most popular building code in regard to EVSE, and is the easiest and least expensive to complete. It just means EVSE can be installed in the future without re-wiring.

2) *EVSE-Ready Outlet*. This code means the raceway with conduit ends in a 240 volt outlet, ready to plug a Level 2 charger into with appropriate adapter technology.

3) *EVSE-Installed*. The final building code means the raceway with conduit ends in a 240 volt level-2 charger installed at the site. This is the most common installation.

DRAFT 3/15/2022 PRE-DECISIONAL

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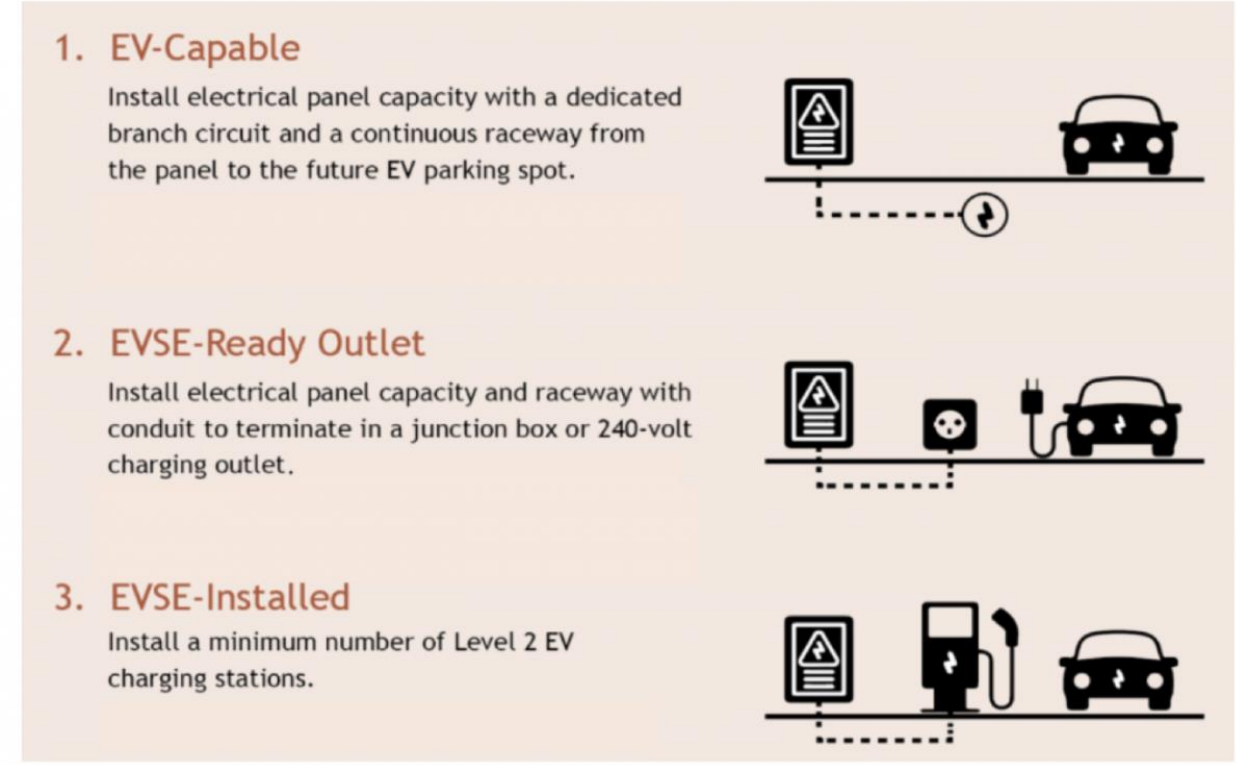

Diagram of three different EVSE installation options. From Ann Arbor Michigan planning document.

FREQUENTLY ASKED QUESTIONS:

How many charging stations would be required under this proposal? The number and type of installation varies and reflects the number of parking spaces planned. For example, in a multi-family development of 15 units, the developer would need to install a minimum of one EVSE-Installed space, two EVSE-Ready spaces and one EVSE-Capable space. The two EVSE-Ready spaces would provide an available circuit for future EVSE installation by an EV owner and the single EVSE-Installed would allow immediate use of the installed level-2 charger. The EV-Capable space would be available for future EVSE installation with appropriate installation of circuitry. For one and two family dwellings, the developer would need to provide each dwelling unit at least one EV-Ready Space. It is important to note that because most EV parking spaces would be adjacent, the circuits for all spaces could be placed in the same raceway/conduit and managed by the same electrical panel.

What are the benefits to a builder/developer who installs EV charging stations? Providing EV charging is a win-win for developers. As noted by Duke Energy, "EV chargers provide an attractive amenity to residents of multifamily dwellings such as apartments, condos and

townhomes and will become a necessity as more people start driving EVs and need to charge at home." Further, the costs of installation can be recovered through surcharges applied later in the ownership process including around charging costs. The existence of EV chargers improves tenant or worker retention, increases property value and counts towards Leadership in Energy and Environmental Design (LEED) certification which is the most widely used green building rating system. Finally, the costs associated with installing EV charging infrastructure during new construction are substantially lower than during a retrofit.

What are the costs for installing an EV charging station? While it is difficult to predict the exact cost of EV charger installation, one thing is clear; the costs associated with installing EV charging infrastructure during new construction are substantially lower than during a retrofit. Most commercial enterprises such as developers of multi-family dwellings look to install level two charging stations, which run on 240-volt power and provide a compromise between power and cost. One trade representative document estimates that an *EVSE Installed* level two electric vehicle charging station costs around $7,200 for a dual-port station—it can charge two cars simultaneously in eight to 10 hours. According to Swenergy.org, building codes present a low-cost, energy-efficient way to prepare for electric cars. A study conducted by Swenergy in San Francisco compared the cost of creating a parking lot with ten spots, 2 of them for EVs vs. retrofitting an old parking lot to the same specs. The price of the new lot starting from scratch was $920, while the retrofit was substantially higher at $3,550.

Are there other factors driving EV adoption? On January 7, 2022, NC Governor Cooper signed Executive Order 246. This executive order establishes a goal to reduce greenhouse gas emissions by 50 percent and increase zero-emission vehicle (ZEV) adoption to 1.25 million vehicles by 2030.

What tax or other incentives are available to promote EV charging station installation? For tax year 2021, commercial EV charging stations were as eligible for a tax credit of 30% of the cost, not to exceed $30,000. The current proposed Federal budget increases the tax credit limit on individual devices to $200,000 for devices installed for commercial use and extends the tax credit for five years through December 31, 2026. Duke Energy has implemented a "Park & Plug" program where they provide EV station installation including the equipment, installation, warranty and network connection services free of charge in multifamily dwelling sites. Finally, in mid-February of 2022, the North Carolina Utility Commission approved Duke Energy's electric vehicle Make Ready Credit Program. This new program provides residential (including multi-family) and non-residential customers with an installation credit to cover their costs paid to electrical contractors to install EV charging stations.

What no-cost incentives could Hendersonville offer? Some municipalities offer rebates or tax incentives for EVSE installation while other municipalities have provided developers who pledged to install EVSE with no-cost incentives such as streamlined permit review. One

approach that would also benefit permeable surface goals would be to adjust the code to allow developers to provide fewer parking spaces if EVSE equipment was installed.

Are EVs important to the economy of North Carolina? In 2020, Arrival, a manufacturer which develops electric lightweight commercial vehicles such as buses and vans, placed its U.S. headquarters in Charlotte, with its manufacturing facility just across state lines in York County, South Carolina. In December of 2021, Toyota announced it would invest $1.29 billion in an electric battery manufacturing plant in Randolph County. The plant, which is expected to begin production in 2025, will be Toyota's first U.S. battery plant and marks the largest private investment in North Carolina history.

How do costs compare when fueling EVs vs gasoline fueled vehicles? A recent analysis from The Zero Emission Transportation Association (ZETA), found that, in North Carolina, consumers might expect to pay about $70 (@$3.06/gal) to fill the gas tank of a regular cab gasoline fueled Ford F-150. Comparatively, ZETA found that an electric Ford F-150 Lightning would cost $7.59 (@$0.08/kWh) to reach full capacity. Put differently. The gas powered F-150 would cost 14 cents per mile to drive while the electric version would cost 3 cents per mile. (see)

Aren't there already enough charging stations in the Hendersonville area? There are approximately 10 Level 2 chargers available in the Hendersonville area although several are destination chargers at lodging establishments where charging is available only to customers. Public Level 2 chargers are generally deigned to "top off" the EV battery, not provide full charging – which is typically done at home. In general, EV-owners prefer to charge their vehicle at home where charging can take place overnight. (For a map of available charging in a given area see). At present, the closest Level 3 (High Capacity) Charger is a TESLA supercharger at the Biltmore Park Town Square (~14miles) while the closest non-Tesla level 3 charger is in Asheville. The United States currently has a total of nearly 43,000 public EV charging stations and around 120,000 charging ports, according to U.S. Department of Energy data.

If there is a communal charging area, what will be done about non-electric vehicles parked at charging stations and/or vehicles parked after their charging cycle is complete? In most cases where properties have EV charging stations they also have signage and other markings designating those spaces for parking/EV charging. Further, cell phone applications are fairly common which notify drivers when their vehicle charging is complete so if the vehicle needs to be moved, the driver is alerted. It should be noted that, in the case of multi-family dwellings, parking spaces may be allocated to particular units in the complex and therefore those with EV charging capabilities would be designated for specific tenants/occupants. This also allows the unit owner to leave their EV on the charging station without worrying about others wanting to use the charger. In 2021, the NC General Assembly introduced legislation to regulate parking in an EV charging space that states: "No person may park a vehicle in a space designated with a sign pursuant to subsection (b) of this section as an electric vehicle charging station located on public or private property unless the vehicle is an electric vehicle connected to the charging equipment for the purpose of charging the vehicle."

DRAFT 3/15/2022 PRE-DECISIONAL

DRAFT FOR DISCUSION PURPOSES ONLY

What about the safety of charging stations? The National Electric Code (NEC) comes from the National Fire Protection Agency. These are the standards to which buildings and equipment must meet minimum regulatory safety requirements in order to be safe enough for the general public to install and use. The NEC absolutely requires any charging station to be Nationally Recognized Testing Laboratory (NRTL) certified in order to be installed anywhere in the US. Hendersonville, installing an EVSE requires a building permit. This provides the opportunity for a building inspector to verify that the charging station is NRTL listed and that the electrical installation meets all other applicable aspects of the NEC and therefore the equipment is safe to use. (see)

APPENDIX: this section is adapted from the US Department of Energy Document:

Electric Vehicle Charging for Residential and Commercial Energy Codes - Technical Brief - July 2021

3.0 Sample Code Language

Appendix A contains model code language for any state or local government to overlay the 2021 IECC or existing codes with EV charging infrastructure requirements for both residential and commercial buildings.

3.1 Definitions
The following definitions shall be added to Section R202 of the 2021 IECC residential energy code and Section C202 of the 2021 IECC commercial energy code.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, EVSE, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded and equipment grounding conductors, and the EV connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatuses installed specifically for the purpose of transferring energy between the premises wiring and the EV.

EV-CAPABLE SPACE. A dedicated parking space which is provided with electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the EVSE.

EV-READY SPACE. A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for future dedicated Level 2 EVSE servicing EVs. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an

EVSE, and be located in close proximity to the proposed location of the EV parking spaces. The circuit shall have no other outlets. The service panel shall include an over-current protective device and provide sufficient capacity and space to accommodate the circuit and over-current protective device and be located in close proximity to the proposed location of the EV parking spaces.

3.2 Residential Buildings
The following EV charging infrastructure requirements shall be placed in Section R401.4 of the 2021 IECC residential energy code or existing code.

R401.4 (IRC N1101.15) Plug-in electric vehicle charging.
Where parking is provided, new construction shall provide EVSE-installed spaces and facilitate future installation and use of EVSE through the provision of EV-Ready Spaces and EV-Capable Spaces provided in compliance with Sections R401.4.1 through R401.4.4 (IRC N1101.15.1 through IRC N1101.15.3). Where more than one parking facility is provided on a site, electric vehicle ready parking spaces shall be calculated separately for each parking facility. The service panel or subpanel circuit directory shall identify the spaces reserved to support EV charging as "EV-Capable" or "EV-Ready". The raceway location for EV-Capable Spaces shall be permanently and visibly marked as "EV-Capable".

Exception: This section does not apply to parking spaces used exclusively for trucks or delivery vehicles.

R401.4.1 (IRC N1101.15.1) Electric vehicle service equipment (EVSE) ready circuit.
Each EV-Ready Space shall be provided with a minimum 40-ampere branch circuit to accommodate a future dedicated Level-2 EVSE. The service panel shall provide sufficient capacity and space to accommodate the circuit and over-current protective device. A permanent and visible label stating "EV-READY" shall be posted in a conspicuous place at both the service panel and the circuit termination point.

R401.4.2 (IRC N1101.15.2) One- to two-family dwellings and townhouses. For each dwelling unit, provide at least one EV-Ready Space. The branch circuit shall be identified as "EV-Ready" in the service panel or subpanel directory, and the termination location shall be marked as "EV-Ready."

Exception: EV-Ready Spaces are not required where no parking spaces are provided.

R401.4.3 Multifamily dwellings (three or more units). EVSE-Installed, EV-Ready Spaces and EV-Capable Spaces shall be provided in accordance with Table R401.4.3. EV-Ready Spaces that terminate with an installed Level 2 EVSE shall count as spaces under the EV-Ready Space requirements. Where the calculation of percent served results in a fractional parking space, it shall round up to the next whole number.

Exception: Where the number of EV-Ready Spaces exceeds the required minimum in Table R401.4.3, the additional EV Ready Spaces shall be used for compliance with the minimum EV-Capable Spaces requirement.

Table R401.4.3 EVSE Installed, EV-Ready and EV-Capable Space Requirements for New Multifamily Buildings

Total Number of Parking Spaces	Minimum Number of Spaces with EVSE Installed (a)	Minimum Number of EV Ready Spaces.	Minimum Number of EV Capable Spaces
1	1	1	-
2-10	1	2	-
11-15	1	2	1
16-19	1	2	2
21-25	2	3	2
25+	5% of total parking spaces	10% of total parking spaces	10% of total parking spaces

(a). Spaces that terminate with a Level 2 EVSE are considered EV-Ready Spaces and count towards the minimum number of EV-Ready Spaces.

R401.4.4 (IRC N1101.15.3) Identification. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information about the amperage of future EVSE, raceway methods, wiring schematics, and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE.

Notes for jurisdictions adopting residential language: Recommended minimum EV parking space requirements in Table R401.4.3 may be adjusted based on the needs of each jurisdiction. There are other important code references to examine in parallel to IECC/IRC Chapter 11 requirements. If not consistent with the latest editions, update:

- Section 625 of the National Electrical Code (NFPA 70)
- Section E3702.13 of the International Residential Code

See Section R328.10 of the International Residential Code and Section 1207.11.10 of the International Fire Code for provisions on the use of electric vehicles as energy storage systems.

3.3 Commercial Buildings

The following EV charging infrastructure requirements shall be placed in Section C401.4 of the 2021 IECC commercial energy code or existing code.

DRAFT 3/15/2022 PRE-DECISIONAL

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C401.4 Electric Vehicle ready parking. Where parking is provided, new construction shall provide EVSE installed spaces and facilitate future installation and use of EVSE through the provision of EV-Ready Spaces and EV-Capable Spaces provided in compliance with Sections C401.4.1 through C401.4.3, Where more than one parking facility is provided on a site, EV-Ready Spaces and EV-Capable Spaces shall be calculated separately for each parking facility.

C401.4.1. New commercial and multifamily buildings. EVSE Installed spaces, EV-Ready Spaces and EV-Capable Spaces shall be provided in accordance with Table C401.4.1 for commercial buildings and Table C401.4.2 for multifamily buildings. Where the calculation of percent served results in a fractional parking space, it shall be shall rounded up to the next whole number. The service panel or subpanel circuit directory shall identify the spaces reserved to support EV charging as "EV-Capable" or "EV-Ready." The raceway location shall be permanently and visibly marked as "EV-Capable."

Exception: Where the number of EV-Ready Spaces exceeds the required minimum, the additional EV Ready Spaces shall be used for compliance with the minimum EV-Capable Spaces requirement.

C401.4.2 Identification. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information about the amperage of future EVSE, raceway methods, wiring schematics, and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE.

Table C401.4.1 EVSE Installed, EV-Ready Space and EV-Capable Space Requirements for New Commercial Buildings

Total Number of Parking Spaces	Minimum number of Spaces with EVSE Installed (a)	Minimum Number of EV Ready Spaces	Minimum Number of EV Capable Spaces
1	1	1	-
2-10	1	2	-
11-15	1	2	1
16-19	1	2	2
21-25	2	3	2
26+	5% of total parking spaces	10% of total parking spaces	10% of total parking spaces

(a). Spaces that terminate with a Level 2 EVSE are considered EV-Ready Spaces and count towards the minimum number of EV-Ready Spaces.

DRAFT 3/15/2022 PRE-DECISIONAL

DRAFT FOR DISCUSION PURPOSES ONLY

Table C401.4.2 EVSE Installed, EV-Ready Space and EV-Capable Space Requirements for New Multifamily Buildings

Total Number of Parking Spaces	Minimum number of Spaces with EVSE Installed(a)	Minimum Number of EV Ready Spaces	Minimum Number of EV Capable Spaces
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26+	5% of total parking spaces	10% of total parking spaces	10% of total parking spaces

(a). Spaces that terminate with a Level 2 EVSE are considered EV-Ready Spaces and count towards the minimum number of EV-Ready Spaces.

Notes for jurisdictions adopting commercial language:
Recommended minimum EV parking space requirements in Table C401.4.1 and Table C401.4.2 may be adjusted based on the needs of each jurisdiction.

There are other important code references to examine in parallel to IECC/IBC Chapter 11 requirements. If not consistent with the latest editions, update:

- Section 625 of the National Electrical Code (NFPA 70)
- Section 406.2.7 of the IBC

Jurisdictions adopting EV provisions that have not adopted the 2021 IBC must also amend earlier versions of the International Building Code to renumber Section 1109.14 Fuel-dispensing Systems and add the following language into Chapter 11:

SECTION 1107
MOTOR-VEHICLE-RELATED FACILITIES

1107.1 General. Electrical vehicle charging stations shall comply with Section 1107.2. Fuel dispensing systems shall comply with Section 1107.3.

1107.2 Electrical vehicle charging stations. Electrical vehicle charging stations shall comply with Sections 1107.2.1 and 1107.2.2.

Exception: Electrical vehicle charging stations provided to serve Group R-2, R-3 and R4 occupancies are not required to comply with this section.

1107.2.1 Number of accessible vehicle spaces. Not less than 5 percent of vehicle spaces on the site served by electrical vehicle charging systems, but not fewer than one for each type of electric vehicle charging system, shall be accessible.

1107.2.2 Vehicle space size. Accessible vehicle spaces shall comply with the requirements for a van accessible parking space that is 132 inches (3350 mm) minimum in width with an adjoining access aisle that is 60 inches (1525 mm) minimum in width.

There are other important code references to examine in parallel to IECC/IRC Chapter 11 requirements. If not consistent with the latest editions update:

- Section 625 of the National Electrical Code (NFPA 70)
- Section 406.2.7 of the IBC

1107.3 Fuel-dispensing systems. Fuel-dispensing systems shall be accessible.

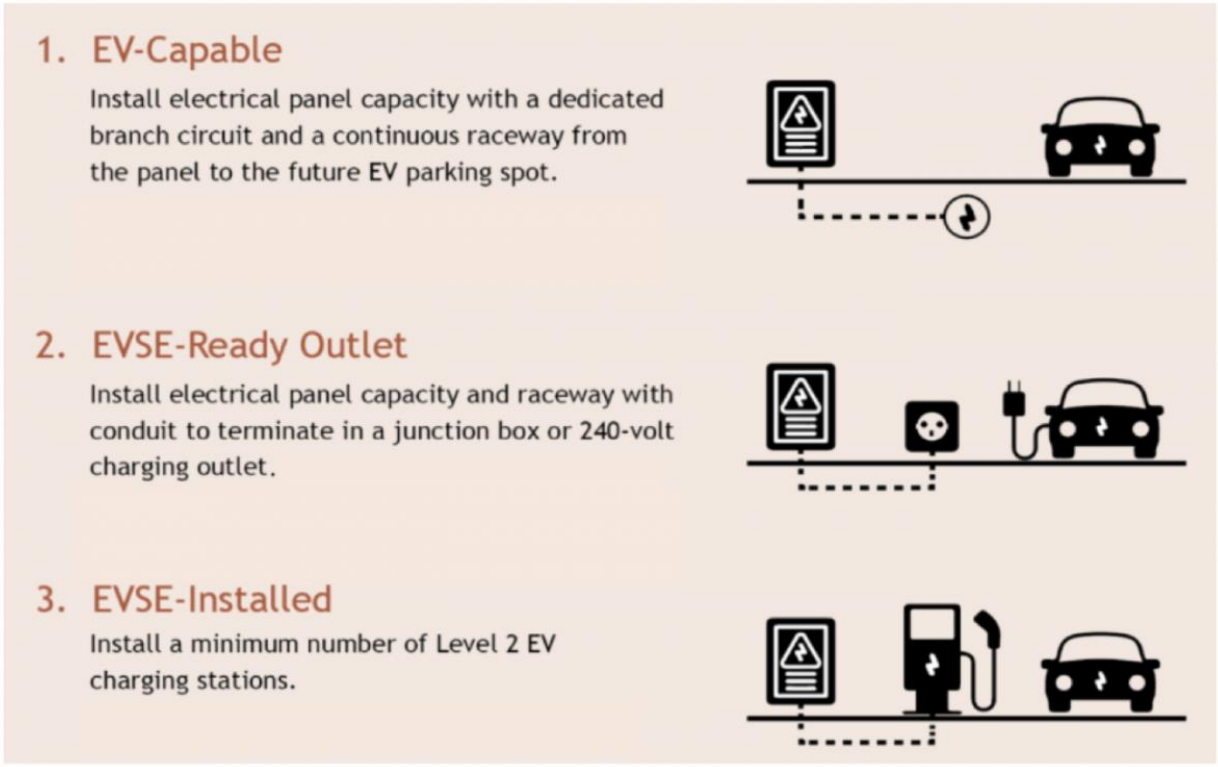

Diagram of three different EVSE installation options. From Ann Arbor Michigan planning document.

DRAFT 3/15/2022 PRE-DECISIONAL

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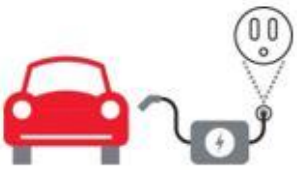	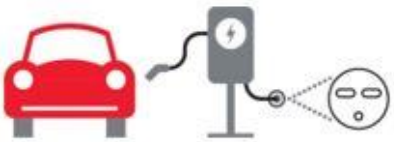	
Level 1 Charger	**Level 2 Charger**	**Level 3 Charger**
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It can provide around 40 miles of range after charging overnight.[1]	It can provide 30-80 miles of range for every hour of charging.[1]	It can provide up to 40 miles of range for every 10 minutes of charging.[1]
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[1] Range depends on vehicle, speed, cargo weight, and other factors.

From Hastings Minnesota planning document.

DRAFT 3/15/2022 PRE-DECISIONAL

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RESOURCES

Southern Alliance for Clean Energy Toolkit for local governments.

2019 Raleigh EV Transportation Study.