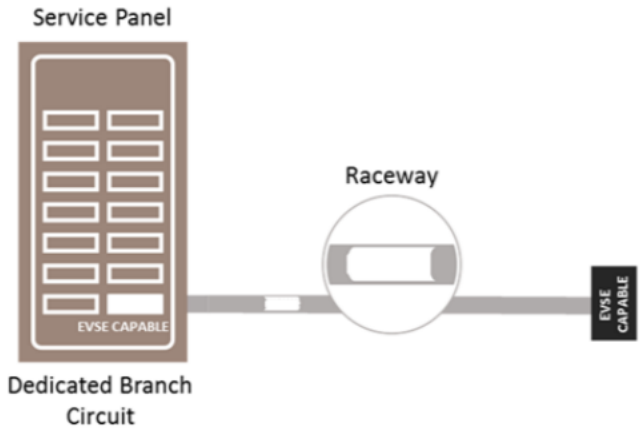
The purpose of this memo is to provide a comprehensive comparison of the cost of installing EV-Capable, EV-Ready, and EV-Installed charging infrastructure both during construction (new construction) and during retrofit. The Solar Foundation utilized previous research on this topic and real-world cost data of the technologies necessary to install various levels of EV charging infrastructure. In all cases there is over a 55% cost savings to install EV charging infrastructure during construction compared to retrofit.

EV-Capable

EV-Capable requires that new construction is equipped with conduit (raceway) and adequate panel capacity to accommodate future installation of a dedicated branch circuit and charging station. The figure below presents the schematic of an EV-Capable charging space.[1]



The California Electric Transportation Coalition recently released a new report that outlines the cost of each technology used for EV-capable spaces, including any necessary installation costs such as trenching, labor costs, and permitting.[2] These costs were based on requirements for the future installation of Level 2 charging stations and were determined under three building scenarios: (1) small retail/commercial building; (2) medium office/school; (3) large office/retail/hospital. Under each scenario, the costs were estimated for 10% of parking spots, the resulting number of EV-Capable parking spots are specified in Table 1. The cost is broken down into each category for each scenario in Table 1. For small retail/commercial it is almost 7 times more expensive to install EV-capable infrastructure as a retrofit, for medium office/school it is 5 times more expensive, and for large office it is 4 times more expensive.

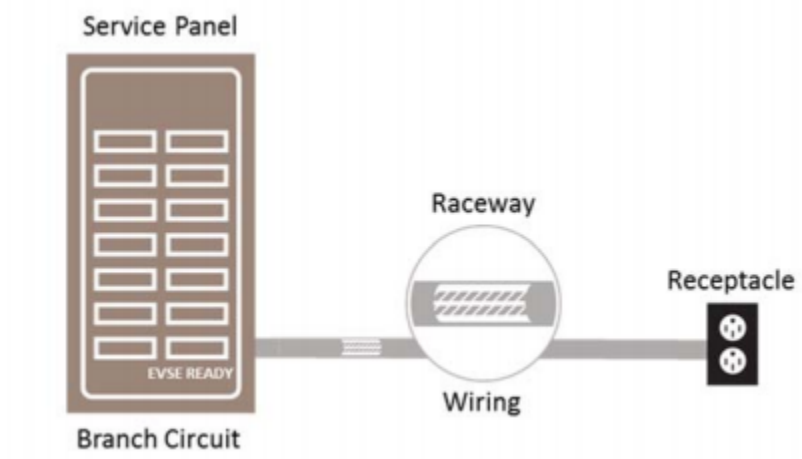
Table 1: Cost of EV-Capable Installation for three building scenarios for retrofit and new construction.

[1] https://www.carlsbadca.gov/civicax/filebank/blobdload.aspx?BlobID=37502
[2] https://caletc.com/wp-content/uploads/2019/10/CALGreen-2019-Supplement-Cost-Analysis-Final-1.pdf

	4 EV-Capable spaces in Small Retail/Commercial		15 EV-Capable spaces in Medium Office/School		40 EV-Capable spaces in Large Office/Retail/Hospital	
Cost Category	Retrofit	New Construction	Retrofit	New Construction	Retrofit	New Construction
Electrical Panel	$1,319	$1,100	$8,477	$6,486	$25,879	$18,467
Raceway	$1,733	$886	$7,269	$4,107	$32,429	$5,155
Trenching	$816	$53	$1,657	$413	$0	$0
Demolition of Equipment	$7,136	$0	$22,966	$0	$21,711	$0
Asphalt & Concrete	$4,452	$0	$9,223	$0	$6,392	$0
Balance of Circuit	$0	$0	$0	$0	$0	$0
Permitting, Inspection, Fees	$3,726	$1,179	$8,792	$1,560	$18,602	$3,193
Construction Management	$2,520	$18	$2,781	$90	$3,071	$196
Total Cost for EV Capable	$21,702	$3,236	$61,165	$12,656	$108,084	$27,011

EV-Ready

EV-Ready requires the installation of conduit (raceway), electrical panel capacity, dedicated branch circuit, and a receptacle (outlet) to support future installation of charging stations. Therefore, the difference between EV-Capable and EV-Ready is the addition of the wiring and receptacle. Below is a schematic of EV-Ready charging stations.[3]



To determine the cost of EV-Ready installation, The Solar Foundation applied the costs from the EV-Capable estimates and included the additional costs for the branch circuits and electrical

[3] https://www.carlsbadca.gov/civicax/filebank/blobdload.aspx?BlobID=37502

outlet (receptacle). The receptacle costs are based on the California Electric Transportation Coalition report.[4] The cost of the branch circuit is an estimated $3.60/ft and each scenario used the following assumptions for the length of the branch circuit (these assumptions and wiring cost data are based on a report prepared for the City of Carlsbad[5]):

- For small retail/commercial assume 80 ft. + 20 ft. for branching off to each space
- For medium office assume 100 ft. + 20 ft. for branching off to each space
- For large office assume 200 ft. + 20 ft. for branching off to each space

The cost is broken down for each category in Table 2. The total cost for EV-Ready infrastructure includes the cost for EV-Capable infrastructure + the additional costs for the outlet and branch circuit.

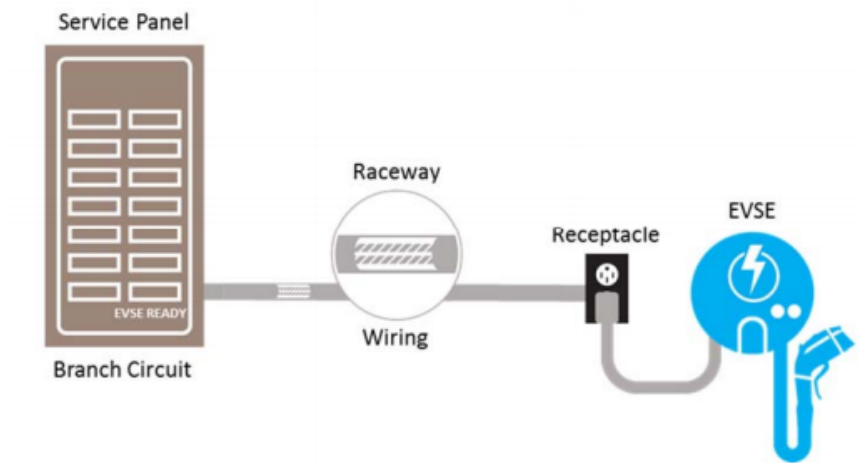
Table 2: Cost of EV-Ready Installation for three building scenarios for retrofit and new construction.

	4 EV-Capable spaces in Small Retail/Commercial		15 EV-Capable spaces in Medium Office/School		40 EV-Capable spaces in Large Office/Retail/Hospital	
Cost Category	Retrofit	New Construction	Retrofit	New Construction	Retrofit	New Construction
Total Cost for EV Capable	$21,702	$3,236	$61,165	$12,656	$108,084	$27,011
Branch Circuit	$576	$576	$1,440	$1,440	$3,312	$3,312
Receptacle	$460	$384	$1,151	$959	$3,069	$2,558
Total Cost for EV Ready	$22,738	$4,196	$63,756	$15,055	$114,465	$32,881

EV-Installed

EV-installed charging stations include the infrastructure required for EV-Ready spaces plus the physical charging station. Therefore, the cost includes the additional cost for each charging station infrastructure. Below is a schematic of EV-installed charging stations.

[4] https://caletc.com/wp-content/uploads/2019/10/CALGreen-2019-Supplement-Cost-Analysis-Final-1.pdf
[5] https://www.carlsbadca.gov/civicax/filebank/blobdload.aspx?BlobID=37502



The cost for a charging station is not different for retrofit compared to new construction. The cost is determined to be an average $600 per charging station, assuming Level 2 chargers are installed.[6] The cost for each scenario are presented in Table 3 below.

Table 3: Cost of EV-Installed Installation for three building scenarios for retrofit and new construction.

	4 EV-Capable spaces in Small Retail/Commercial		15 EV-Capable spaces in Medium Office/School		40 EV-Capable spaces in Large Office/Retail/Hospital	
Cost Category	Retrofit	New Construction	Retrofit	New Construction	Retrofit	New Construction
Total Cost for EV Ready	$22,738	$4,196	$63,756	$15,055	$114,465	$32,881
EV Charging Station	$2,400	$2,400	$9,000	$9,000	$24,000	$24,000
Total Cost for EV-Installed	$25,138	$6,596	$72,756	$24,055	$138,465	$56,881

Summary

To draw more immediate and concise conclusions, the cost data determined above is further analyzed to determine the cost per charging station. Table 4 presents the cost per charging station for each EV charging infrastructure under each scenario for retrofit and new construction.

[6] https://www.homeadvisor.com/cost/garages/install-an-electric-vehicle-charging-station/

Table 4: Cost per charging station for EV-Capable, EV-Ready, and EV-Installed for each scenario under retrofit and new construction.

	Small Retail/Commercial		Medium Office/School		Large Office/Retail/Hospital	
	Retrofit	New Construction	Retrofit	New Construction	Retrofit	New Construction
EV-Capable	$5,426	$809	$4,078	$844	$2,702	$675
EV-Ready	$5,685	$1,049	$4,250	$1,004	$2,862	$822
EV-Installed	$6,285	$1,649	$4,850	$1,604	$3,462	$1,422

Under each scenario, there is more than 58% cost savings to install EV charging infrastructure during new construction compared to retrofit. For EV-Capable infrastructure, the cost savings ranges between 73% and 85%, based on each scenario. EV-Ready infrastructure cost savings ranges between 67% and 79% and for EV-installed infrastructure, the cost savings ranges between 59% and 75%.