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Commonwealth of Virginia
Department of General Services
Division of Engineering & Buildings

Equals and Substitutes

Last November, masks were worn almost exclusively by workers whose jobs required them. But during the COVID-19 pandemic, many kinds of protective face coverings became an increasingly common sight in public places. Their visibility raises an obvious question: what's the difference between N95 masks vs. surgical masks vs. dust masks vs. cloth masks? What kind of protection do they offer? Are they all equal? Can I substitute one for another to save money or for quicker shipping?



The questions surrounding Equal and Substitute products are important ones. What is the difference between “Equals” and “Substitutes” as they relate to design and construction?

First, let us look at the contract references found in the [Terms and Conditions of the A/E Contract](#) DGS Form CO-3a and the [General Conditions of the Construction Contract](#) DGS Form CO-7.

Definitions

Both “Equal” and “Substitute” are defined in the Terms and Conditions of the A/E Contract, as follows:

Equal: Any other brand, make or manufacturer of a product, assembly or equipment that, in the opinion of the **A/E**, is equivalent to that specified, considering quality, capabilities, workmanship, configuration, economy of operation, useful life, compatibility with design of the Work and suitability for the intended purpose, and which is accepted as such by the Owner.

Substitute: A material, product, equipment, or assembly that deviates from the requirements of the Contract Documents but which the **Contractor** deems will perform the same function and have equal capabilities, service life, economy of operation, and suitability for the intended purpose. The proposal must include any cost differentials proposed. Any such proposed substitute must be submitted to the A/E for review and, if acceptable to the A/E and the Owner, incorporated into the Construction Contract by Change Order.

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Owner Approval Required

It is important to note that both **EQUALS** and **SUBSTITUTES** must be approved by the **Agency (Owner)** before they are incorporated into the Work. It is the responsibility of the A/E to inform and educate the Agency regarding the technical and long-term effects of selecting one product over another.

No two products are actually equal in every respect. Often, subtle differences between two products are the reason one product was selected by the Owner or A/E over the other in the first place. Experience has shown that many Contractor proposed “or equal” products are actually not only lower in cost but also in real value and quality.

Some confusion is often apparent in specifications as to the difference between equivalents (“or equal”) and Substitutes. An “or equal” is a product that is equal to the standard of quality set in the contract documents. Its use should be an option of the bidder so as to allow for maximization of competition. Inherently, the Contractor takes a risk that his judgment of the product’s equivalence is something that the A/E agrees with, post bid. Bid documents shall not require samples or shop drawings to be submitted prior to the bid receipt date.



Evaluation of Proposed Equals and Substitutes

Evaluating proposed Equals and determining the acceptability of any equal materials or equipment proposed by the Contractor is a Basic Service of the A/E, as described in the Terms and Conditions of the A/E Contract under “Construction Phase Services Required to be Performed by the A/E.” Section 26 of the General Conditions of the Construction Contract is referenced for the process of evaluating Equals and Substitutes. Note, the General Conditions definition of “Recycled” also requires evaluation of Recycled products as equals.

Equals

As stated in General Conditions Section 26, identification of a brand name in specifications *“denotes the characteristics, quality, workmanship, economy of operation and suitability for the intended purpose of the article to be supplied, but does not restrict the Contractor to the specific brand, make, or manufacturer indicated.”* Brand names do not restrict bidders. A brand, make of material, device or equipment shall be regarded as a standard, and any other brands or manufacturers that the A/E considers equal will be accepted unless rejected by the Owner. If brand names are included in the specifications, a minimum of three (3) brands with model numbers must be provided in accord with the [Virginia Public Procurement Act \(VPPA\)](#).

Substitutes

A Substitute, on the other hand, is an alternate product of lesser or greater quality which deviates from the performance requirements of the specifications, but which is deemed acceptable by the Contractor and is most often proposed by the Contractor. The proposal must include any cost differentials. An example of a Substitute is proposing “precast concrete panels” in lieu of “masonry walls.”

A/Es may dislike dealing with Substitutes because of potential pitfalls and problems involved with a change to their design. Because selecting products is of vital importance to the success or failure of a project, the A/E spends considerable time evaluating them during the design phase; repeating the process with another product is not ideal. At the Owner’s request, the A/E will evaluate the proposed Substitute and provide a recommendation on acceptability. Consideration of life-cycle cost, incompatibilities, energy, and risk of delays are important factors to evaluate that are often overlooked or poorly evaluated. Substitutes often have associated cost savings, somewhat offset by the A/E design fee for incorporating the Substitute into the Contract Documents.



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Changes in the Work

Equals may be accepted without a construction Change Order. Substitutes that have been approved by the Owner require a construction Change Order. See CPSM Section 6.0.6. for further details.

Specifications must be carefully written and coordinated with the drawings. When EQUALS and SUBSTITUTES present themselves, both the A/E and the Owner/Agency must take the time and effort to thoroughly and thoughtfully evaluate the proposed changes.

It's important.

Electric Vehicle Charging Stations

Introduction

Electric vehicles have become a common and a normal part of life on and off the road. There are electric buses, cars, scooters, and golf carts. However, charging stations are not as available or universal as gas stations. Electric vehicle charging stations are coming of age at state facilities. They are to be permitted, inspected, and approved by DEB to make them safe and accessible. This article focuses on permitting requirements for electric vehicle charging stations.



Project initiation

To assist state agencies, the procedures required to have an electric charging station installed are available on the DEB home page under “State Building Official” at: <https://dgs.virginia.gov/engineering-and-buildings/project-permits--certificates/electric-vehicle-charging-stations>.

DEB Charging Station Design Requirements

1. An Architect or Engineer licensed by the Commonwealth of Virginia must prepare construction documents (CPSM 3.1.1.1).
2. DEB must review the construction documents, issue a permit, and inspect the installations (CPSM 5.1, CPSM 7.6.17).
3. A National Recognized Testing Laboratory (NRTL) must list charging station equipment (NEC 90.7, NEC 110.2, and NEC 110.3).
4. Charging equipment must be an established technology (CPSM 5.3.12.4).

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Charging Station Selection

The time it takes to charge is dependent on the level (AC 1-3 - defined below) of the system and kilowatt output capacity. Marketing comes into play here as some manufacturers will market their systems by the SAE Level, some will claim the number of miles you can drive per hour of charging, and some will claim the amount of time required to charge a vehicle. The efficiency of the vehicles and the limits to their charging systems will influence these claims. Only use the SAE Level and Kilowatt rating of the equipment when considering a system. Level 2 plug in is commonly used, but the kilowatt rating will determine the amount of time the system will take to charge the vehicle.

The charging station will come with a communication system or communication system option(s). The agency should not need to be concerned about the specific communication system, but rather the vehicles excluded by the system selected. Vehicle owners should be able to obtain power converters and adapters that will permit different systems, so do not be concerned with being able to power 100% of the vehicles on the road today.



Site Considerations

Parking spaces for electric vehicles need to be coordinated to avoid conflicts or additional expenses. Select location based on:

- Availability of power
- Clearance spaces for the equipment and charging cords
- Accessibility
- Quantity and location required by project for energy and efficiency scores

Evaluate site considerations as early in the design process as possible. Once selected, the A/E should be able to provide design services to achieve the agency's goals. Where seeking green energy credits, consider providing solar power allowing reduced power requirements for vehicle charging.

The Commonwealth requires compliance with Americans with Disabilities Act. This will require the evaluation of available number of spaces, available handicap accessible spaces, and the number of charging stations to determine the specific 2010 ADA Standards for Accessible Design (ASAD) requirements for the charging spaces. This should be closely coordinated with DEB.

Signage

Electric Vehicle Charging Stations require specific signage that is indicated by the A/E on the contract drawings. Not all signage is required based on the scope of the project. Types of signage are:



- Wayfinding: Provided to assist drivers to locate the charging station while in transit.
- Lot Signage: Traffic directing within lots to charging spaces.
- Station Signage: Indicating parking requirements for the spaces used.
- ASAD Signage: Required for ASAD compliance.
- NEC Signage: Specific requirements based on the electrical system

Signage requirements are specific to project needs and agency goals. The agency should consider signage on and off site prior to initiating planning. In addition to signage, consider registering the charging stations with the Department of Energy, PlugShare, or other online services.



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ENERGY



PlugShare



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Charging Station Standards

North American vehicle-charging systems must comply with Society of Automobile Engineer (SAE) standards. SAE approves two charging electric vehicles systems: Direct connection charging transfers power using physical connections (AC or DC) and induction charging (Wireless Power Transfer) using electromagnetic coupling.

Direct Connect Standards

- SAE J2953/1: Plug-In Electric Vehicle (PEV) Interoperability with Electric Vehicle Supply Equipment
- AC Level 1: 120VAC, single phase, 1.4-1.9KW
- AC Level 2: 208-240VAC, Single phase, 2.5-19.2KW
- AC Level 3: (VAC to be determined), single or three phase, (TBD) Max KW
- DC Level 1: 200-450VDC, 80KW Max
- DC Level 2: 200-450VAC, 400KW Max
- DC Level 3: 200-600VDC, (TBD)KW Max

Wireless Power Transfer Charging

- SAE J2954: Wireless Power Transfer for Light-Duty Plug-in/Electric Vehicles and Alignment Methodology
- Level 1: 3.7KW Max
- Level 2: 7.7KW Max
- Level 3: 11KW Max

Charging Station Communications

- SAE J2847: Converter Communications
- Communication between vehicle and charger to start, stop, regulate rate of charge, or disconnect all power.
- Communication may be via the charging medium (direct connect or wireless) or wireless via an alternate means.

Electrical Code Requirements

National Electrical Code, Article 625 covers Electric Vehicle Charging Systems. Requirements include signage, labels, clearances, types of materials, ventilation, and required system interlocks. Acting as the technical advisor to the agency, the electrical engineer shall coordinate the equipment selected with these code requirements. Listed equipment specifications and site conditions affect design on a case-by-case basis. Engage the electrical engineer as early in the process as is practical to address all electrical code issues.

Vehicles

The types of potential vehicles an agency serves will influence equipment selection. As part of the pre-planning phase, the agency should consider the types of vehicles (scooters, golf carts, cars, trucks, or buses), the means of charging (plug-in or wireless), no-fee or metered charging, and allowable parking time(s). This will drive the selection of the type of charging stations, the electrical demand, and required site support.



VCCO Updates

Michael Jackson with the Virginia Department of Health and **April Helbert** with the Department of Corrections recently passed the Virginia Construction Contracting Officer (VCCO) certification examination.

Virginia Construction Contracting Officers are state and local government employees who have completed the necessary training and successfully passed a multi-part examination focused on state procurement law, policy and procedures. VCCOs perform several key functions in delivering projects including the procurement of professional services; the receipt, opening and review of bids; and in some cases the approval of CO-8 forms for recommending the award of construction contracts.

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