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**INFORMATION
About your Overhead
Electrical Service Entrance Upgrade
and
Xcel Energies**

Thanks for considering Don's Electric for your electrical needs. I've put together this information which may help you understand what's involved in an overhead electrical service entrance upgrade.

A service entrance consists of the following components:

1. The meter socket which contains the Xcel meter. This is a customer-owned device.
2. The riser which is the conduit that goes up from the meter socket to where the wires attach to the incoming overhead line from the power pole. The riser could be a conduit that goes up the wall to an insulator knob on the side of the house, or it could be a conduit that goes up through the roof and actually holds the incoming overhead line.
3. The main panel which usually sets next to the meter, but sometimes is located inside the garage or house. The panel contains the main breaker and all the individual branch circuit breakers.
4. An "all-in-one" is a combination unit that sets outside and contains the meter and the panel all in one device.
5. On some homes there is a meter socket outside and a main circuit breaker switch beside it, and the main line is run from there to a panel which is inside the house or garage.
6. On some homes there is a main panel or an "all-in-one" combination device, and there may also be another "sub-panel" elsewhere in the garage or house. A sub-panel is a second panel in addition to the main panel, and usually feeds a certain section of the house.

The service entrance that was installed on your house when it was built was legal and approved at the time the house was built. If it's in its original condition and unmodified then it's covered under the "Grandfather's Clause," because it was built at the time when it was legal and approved. Also, if it was updated since the house was built, and the work was done under a building electrical permit and was approved, then it too would be covered under the Grandfather's Clause. However if the service was modified in an illegal way then it could be a hazard. Here are several reasons you might need a service entrance upgrade:

1. Your service is outdated or in poor condition. Perhaps you have an old fuse box inside which is becoming worn out, or may have improperly sized fuses now. Your panel could be overloaded, having more than one wire on a breaker (double-tapped), or having no main breaker.
2. You have a Federal Pacific breaker panel. Federal Pacific, or FPE panels were widely used in the 1950's, 60's and 70's. While they were legal at the time, Underwriters Laboratories™ has removed FPE breakers and panels from their UL Approved List, as they are no longer considered safe. FPE breakers have a tendency not to trip when they should, and they don't always make a good connection when plugged into the FPE panels. They do make a replacement breaker now which is approved, but they run about \$49.00 each compared to a regular breaker which runs about \$5.00, and even if you replace them you still have the old panel which could still be a hazard. While FPE breakers and panels were legal at the time they were installed, and therefore would be covered under the Grandfather's Clause from a legal standpoint, they can represent a significant safety hazard and the homeowner should consider having the service upgraded for that reason, especially if you're adding new circuits or need more power. Here is a link to an article about FPE: www.inspect-ny.com/fpe/fpepanel.htm

3. Your current system is giving you problems, or you need more power, or you need more circuits and there isn't space in it to add more breakers. You may be adding a major appliance such as a range or dryer, or you may be doing an addition on your house. If so you should consider a service entrance upgrade.
4. If you're building a room addition where the service is now, or for some other reason it needs to be relocated. Often, with a room addition, it works best to install the new service on the addition. If you're living in the house during the construction, it may be necessary to install a temp service so the old one can be removed for the addition. You can discuss this with your electrician. Another good option is to relocate the service on the existing house so it's out of the way of the addition. This way you probably won't need to have a temp service installed. The old house circuits from the old location would normally be relocated or extended to the new service location. The way this will be done varies with the layout and should be discussed prior to that option being taken.

You should discuss with your electrician whether you need a service entrance upgrade based on what you currently have, and on what you are planning to do with your home. You have to be careful because a lot of electrical contractors will try to sell you a service upgrade whether you need it or not. I consider myself to be an honest contractor and will let you know truthfully what you need, based on what you have and what your plans are.

If you're going to have the service entrance upgraded, here are some things to consider before making the final decision:

1. Consolidation and location. The meter socket should be located outside in a place that's accessible to the meter reader. Today's meters put out an electronic frequency that the meter reader can access from his truck, without having to go in your yard. However it's still required that the meter be accessible. The panel is normally located outside next to the meter, or as part of an all-in-one meter and panel. About 99% of the homes in Colorado are wired this way. The reasons for this are economical, as it's cheaper to build homes this way; and it provides a certain level of safety as the main power shut-off can be accessed quickly in an emergency, such as a fire. There are some disadvantages as burglars or vandals can also access the panel, and it's not always pleasant to have to go out in the weather or mud to reset a breaker. The law doesn't require the panel to be outside, only the meter. Sometimes the meter can be outside and the panel inside in a back-to-back configuration. If the electrician has to run a line from the meter through the house to a different panel location, such as in a hallway, then a main breaker shut-off has to be installed outside next to the meter. This is to avoid having an un-fused or un-protected line running through the house, which could be a hazard if it ever developed a short or was damaged. Depending on what city you live in there are local Codes and ordinances which govern the location of the meter and panel, as well as how they're to be wired. Your electrician should be familiar with the rules for the city in which you live, or find out for sure from the building department. You can also contact your own building department electrical section if you have questions.
2. Size and rating. The minimum sized service entrance you're allowed on a single-family home is 100 amps. You can also have a 125-amp system, a 150-amp system, or a 200-amp system. If you need more than 200 amps then a licensed engineer is required to submit a load calculation and drawings of what will be done to the building department. I've found over the years that a 150-amp or 200-amp system is very good for most homes. All systems are 120/240-volt. You should discuss with your electrician what size would be best for your situation. Again it's important to remember two things, first of all that some unscrupulous contractors will try to sell you more than you need, but secondly that a service upgrade is not something you want to do twice. Trying to save a few hundred dollars by putting on a smaller system now, and then a few years later learning you need a bigger system, is not a good way to go for obvious reasons.
3. Number of panels. Most homes only have and need one panel. All the house circuits originate from this main panel. However if your home is exceptionally large, it usually pays to have one or more additional panels located in areas that are far away from the main panel. Also it's not a bad

idea to have a sub-panel located in the basement, if you're planning to ever do a major basement finish. It's easier and more efficient to run the new basement circuits from a sub-panel than it is to bring them all outside into the main panel, which may not have sufficient space for all the new circuits. Also, if you're doing a second story addition on your home, it sometimes helps to install a sub-panel upstairs, to avoid running all those new circuits down and into the main panel.

What to think about when hiring someone to do an overhead service entrance upgrade:

First of all it's extremely important that you hire a licensed and insured electrical contractor to do the work. He should pull his own permit from the building department, in his company's name, have it inspected, and acquire all the necessary authorizations from Xcel. If you take all those steps, and then later have some serious problems that you can't resolve, you can go to the building department and they will gladly assist you in resolving the issues. They can force the contractor to make the necessary repairs or have his license suspended. In addition, his liability insurance would cover the work he did and any damages done to your house as a result.

However, if the work is done without a permit, and you develop problems that you can't resolve, then the building department will be of no help to you. Also, if your house becomes damaged by a faulty installation, or a fire, you could have problems with insurance. It's always best to do it the right way even if it costs a little more initially, to avoid the serious headaches that could come down the road if you don't.

It's also a serious problem, especially in today's world, where an unlicensed or uninsured person will offer to do the work, but will want you to pull your own permit, called a homeowner's permit. In most cities, if you want to do your own work, you can obtain a homeowner's permit from the building department, though there are restrictions. In some cities you have to take a written test to show you have sufficient electrical knowledge to do the work. However, if you get a homeowner's permit and then have someone else do the work, you alone are fully responsible for the work he does. This could be a very serious problem because if the work is done improperly, or if it fails the inspection, or if you have problems with it later, you would have no legal recourse to go after the person who did the work. The building department wouldn't help you either, since you own the permit. And, if the work fails the inspection and the person who did the work is unable or unwilling to correct it, you could have your power shut off by Xcel. Basically, unless you have sufficient knowledge to do the work yourself, it's extremely risky to use a homeowner's permit and hire someone else to do the work. The few hundred dollars you might save would quickly be forgotten in the problems you could run into down the road. The only advantage in such a situation goes to the person who did the work, who has your money, and can't be forced to fix his mistakes. It's not a risk worth taking.

What to expect with an overhead service entrance upgrade:

1. The electrical contractor should first consult with you and inspect your system to determine if a service upgrade is needed, and how it should be done, location, etc. He should provide a written estimate or proposal stating exactly what he's going to do and what it's going to cost, as well as what fees may be charged by Xcel. He should be licensed and insured, meaning that he has a state license, a city registration, and proper liability insurance.
2. On the day when the main work is done, the power to your house will be off for most of the day. However it should not be left off overnight, although it may be necessary because of time constraints that some circuits be reconnected the following day, provided they aren't critical. For most homes the main work can be done in one day, reconnecting back all the circuits; and the remaining details be done the following day. Every house and job is a little different though so you should consult with your electrician prior to the work what you should expect.
3. Before disconnecting the meter, the electrician will call to obtain a "closed loop authorization" number from Xcel. To do this he must also give to Xcel the address where the work is being done, that it's an overhead service, if the incoming line has to be relocated or replaced, and the building permit number for the job. Your account with Xcel must be up to date also. Sometimes, especially if you just bought the house, you may need to contact Xcel to update your account

information with them. This all has to be done before authorization is given. The “closed loop” is basically permission from Xcel to you so the meter can be disconnected and removed, and you can use electricity without a meter for a time. I’ll explain more about that later.

4. With the meter out and the electricity disconnected, the electrician will do all the work required in your situation to do the upgrade. Normally this would involve removing the old equipment, installing a new meter socket and panel that meets today’s Codes, a new riser and wires, all wiring connections, the new grounding system, and installing all the breakers and reconnecting all the new and existing house circuits. If the old panel was inside the house, in a hall or stairway for example, the electrician will normally do a “by-pass.” This means gutting the old panel and extending those circuits out to the new panel, so all circuits will originate from the new panel. The old panel then becomes a junction box, and has no breakers in it. In some cases the old panel can be removed completely, and the circuits relocated. This is usually done if the wall is going to be removed for remodeling where the old panel was. The new system will have one main breaker and space for 24 house circuits in a 100-amp or 125-amp system, 32 circuits in a 150-amp system, and 40 circuits in a 200-amp system. If you still need more circuits an additional panel or sub-panel will be installed, though usually this isn’t needed. If a new riser has to be run through the roof, the hole in the roof will be flashed in a Code approved way and inspected by the electrical inspector. The minimum height requirement for the overhead line coming to the house is 12 feet above grade. Sometimes the new service equipment (meter and panel) won’t completely cover the area where the old equipment was. If siding was installed around the old equipment, for example, then the new equipment might not cover and the siding will have to be modified. The electrician normally wouldn’t do that type of work, but should discuss with you the possibility if it might occur. Once the work is done, he will install jumpers in the meter socket, which take the place of the meter for now. This way you won’t be without electricity, even though you don’t have a meter.
5. The contactor has to ground the service in accordance with today’s Codes. He has to run a ground wire from the main panel to the water service on the house. This wire is connected and sized according to Code, and has to be connected to the water pipe somewhere along the line within five feet of where the water pipe enters the building. This is usually on the street side of the house in the basement or crawlspace. If the basement is finished, the wire still has to be run to this location. Most building departments used to have an exception if the basement was finished, allowing you to run the wire to the water pipe in an unfinished area; however they no longer allow this exception. Therefore sometimes it’s necessary to cut into the drywall to fish the wire across the ceiling, or sometimes the wire can be run on the outside of the house and then into where the water service is. All these things you should discuss with the electrician before the work is ever done. He also has to install 2 ground rods outside near the main panel. The ground rod is a steel rod that has a conductive coating applied to it, is UL approved for the purpose, and is eight feet long and 5/8” inch in diameter. A #6 AWG copper wire is run from the main panel and goes to both of these ground rods. The ground rods have to be at least six feet apart from each other. If you have a large cement patio where the service entrance is, it may be necessary to drill through the concrete by the house to install the ground rods, however this should be discussed beforehand if it’s going to be necessary. The electrician also installs a “ground bridge”, or “inter-system bond.” This is a little device that goes usually below the panel, must be on the outside of the house, and is a place where all the ground wires for the phone, cable TV, and satellite connect together with the ground wire from the panel.
6. All of the existing house circuits, plus any new circuits that were run as part of the job, are to be connected. It’s important to remember that doing a service upgrade doesn’t include rewiring the whole house. If you have a circuit that was going to too many things, that won’t change just because of the upgrade. However you don’t always know until the upgrade work is done. After the upgrade the electrician will make a panel schedule, which is a list of each circuit breaker and what it feeds. If, after all this work is done it becomes apparent that one or more circuits are supplying too many things and are overloaded, you’ll need to discuss with your electrician, if you haven’t already, how that might be remedied. It would usually mean running more circuits into the house and splitting things up in a better way. Sometimes, in the old panel, two wires may have been connected to one breaker. In a new panel upgrade each of these wires should be on its

own breaker, and sometimes that will help alleviate overloading. What the service entrance upgrade does basically is to reconnect all the existing and new circuits that are in the house. Other problems you may have had in the house won't necessarily be resolved just with the service upgrade. All these things you can discuss with your electrician.

7. After all the work is done the electrician will call the building department to order a final inspection. While it's not required, the electrician should be there to meet the inspector, in case there are items that need to be corrected, or questions the inspector might have. He should coordinate with you what day will work. On the day of the inspection you or the electrician can call the building department to get an approximate time. In Denver and Englewood they'll give you a 2 ½-hour window in which they'll come, and in Aurora the inspector will call ahead about 30 minutes before he comes. You can also meet the inspector yourself if you want. The inspector will look at the service entrance work and will also normally have to see the grounding connection at the main water service. The inspection should take place as soon as possible after the work is done, or at least within a few days. This is because you're still without a meter and Xcel only allows a certain amount of time for this condition to go on, though they will extend the time period in most cases if needed. This period is seven days from the time the meter is removed.
8. If the job fails to pass inspection the inspector will leave a card indicating what corrections need to be made. Here's where having a licensed contractor with a permit is to your benefit as I described earlier. If the job is okay then the inspector will pass it, and on the following business day he'll automatically contact Xcel to let them know, this is a "meter release."
9. After receiving the release notice from the inspector Xcel will plan to come. When they come they won't need to get in the house. If you have a dog or a locked gate, and they can't get in, they'll normally leave a note so you can call them to arrange a time. They'll usually have the power off for a short time while they do their work, usually not more than 15 minutes. They'll install permanent crimped connectors onto the wires where their overhead wires attach to the main wires that go down to the meter. They'll collect the old meter and install a new meter and seal on the new meter socket. Because of the closed loop authorization, Xcel will know when the meter was disconnected and when the new meter was installed. The time you were connected without a meter they'll estimate your bill based on past usage. They do charge a fee for this service which is normally \$144.00, unless there's a lot of work to be done. Sometimes trees have to be trimmed or the line relocated for some reason. Your electrician should go over that with you if it looks like that might be the case prior to doing the work. If necessary, you can get an estimate from Xcel to find out what their charges will be, but this is only if you have a very unusual layout or situation. It's also important to remember that Xcel is not always timely, and it may take them some time, especially if they're busy, to schedule the installation of the new meter. If a month or more passes from the time the work is done and they still haven't installed a new meter, you should contact the electrician. He can contact them to resolve it. Usually they come out within a few days.

If you have any other questions please feel free to contact me, and I look forward to serving you if you decide to have me do the work.

Thanks,

Don Natelborg
Owner, Don's Electric
State License 1938