

Sizing Service Entrances for Industrial Buildings



Sizing the electrical service for an industrial building usually follows a process somewhat different from sizing the service for a commercial or institutional building. The National Electrical Code (NEC) has specific rules for sizing services. The first step is to determine what the electrical load connected to this service will be. The NEC specifies some loads such as how much to include for lighting (a table listing watts/square foot for different occupancies) and watts per convenience receptacle. All known loads such as HVAC equipment are to be included in the calculation at their nameplate wattage. A table in the NEC lists the amperes to be used for each motor load and these are all to be included.

Under certain conditions, some diversity factors apply to certain portions of the load. For a typical commercial or institutional building (and in some cases, industrial buildings), these individual electrical loads are summed up to provide the total connected load and the service is sized according to this total load.

The main difference with an industrial building is that the major portion of the load is usually motor load. Simply adding up the motor amperes listed in the NEC table for each motor and then combining this load with the lighting receptacle, HVAC, and other miscellaneous loads, will most often result in service size much larger than necessary. The reason for this lies in the way motors are chosen and used in the process. For example, an engineer sizing the motor to drive a conveyor may calculate 9 HP is required. Because a 9 HP motor is not commercially available, he must go to the next standard size of 10 HP as a minimum. If he feels that 1 HP does not provide enough margin for error, he may specify the next larger size of 15 HP. Once the plant has been running for some time and the conveyor is "shined up", the actual HP needed to drive the conveyor might be only 8 HP. If the calculations were exact and it did indeed draw 9 HP, the load would only be 60% of what was included in the service calculation.

Operators may purposely choose to load motors to less than 100% to avoid having to clean out plugged machines. If the plant has many motors, there is almost always some motors either not running or cycling on and off, or running lightly loaded. The plant may not receive and load out simultaneously all the time. Pumps may operate based on levels, machines may idle while new materials are loaded, or tables indexed, etc. The list goes on and on.

Because of these, the NEC allows the service entrance to be sized smaller than the total connected load with the local authority's concurrence. Based on engineering judgment, past experience with similar plants, advice from vendors, computer simulations, client input, load growth possibilities, load studies and other computational tools, the design engineer selects the final service size for industrial plant. Through the drawing submittal and review process, the approval of the local authority is received. This may require a personal meeting with the local inspection authority to explain in detail how the service size was arrived at. Sometimes a compromise must be negotiated. The process is one that can be oversimplified, leading to service sizes with marginal capacities and little or no room for growth. Increasing a service size after it is installed can result in disruption of service, downtime, and significantly more cost than building in more spare capacity at the start of the project.

For more information...

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