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March 22, 2022

Mr. Steve Horton
SHCCSI
P.O. Box 399
Walpole, NH 03608

Re: **Cheshire County Courthouse (CCCH)**
12 Court Street
Keene, New Hampshire
Replacement Generator Sizing
WVA Project No. 22005

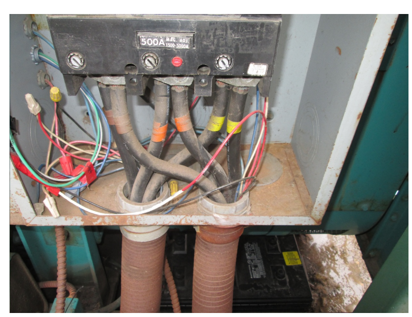
Dear Steve:

The Cheshire County government plans to replace the existing generator at its municipal complex on Court Street in Keene, and WV Engineering has been contracted to provide a size estimate for the proposed generator, and to provide guidance for providing the entire building load from the generator in the future (including the rooftop units, which are not currently powered by the generator). In furtherance of this, we offer the following summary of existing conditions, estimate of expected peak electrical demand imposed on the generator, selection of generator size and model, requirements for installation, and requirements for powering rooftop HVAC equipment from the generator.

Existing Generator

The existing generator is a diesel fired, 300 kW/375 kVA, 277/480 volt, 3-phase Onan Model 300.0DFS-17R/20382C in an enclosure located to the west of the building. It appears to be quite old and is probably nearing the end of its useful life. The unit is situated on a concrete pad and is supplied by a separately located fuel tank. There is a 500 amp circuit breaker located in the enclosure which protects two parallel sets of four 250 MCM copper conductors, each set in a dedicated conduit, which run underground to the main service electric room located in the basement of the building.

We believe these conductors and conduit can be re-used for the replacement generator, although a junction box must be installed where they emerge from grade so they can be spliced and extended to the new unit's circuit breaker. The feeders apparently emerge in the electric room beneath the existing distribution section of the switchgear, where they are spliced and feed the generator Panel SDP.



Generator Feeders from
500A CB in Generator
Enclosure to Below Grade

A 200 amp breaker in this panel feeds a transfer switch for Panel EDP (located in the older building), while a 400 amp breaker feeds a transfer switch for Panel NDP (located in the electric room). The normal source of power for these transfer switches is the distribution section of the switchgear. This distribution section also supplies the two rooftop units from dedicated breakers - thus, these rooftop units are not currently supplied by generator power. See Sheet E-1 for a power riser diagram of the existing distribution system.


200A Transfer Switch


400A Transfer Switch

The two transfer switches should be replaced along with the generator, since they are both Onan brand and appear to be the same age as the generator.

Based on utility bills provided to WVA, which cover from July 2020 to September 2021, the peak demand recorded by the utility meter is 117.9 kVA, which occurred during June 2021. Utility meters generally record peak demand by totaling energy consumption over 15 minute intervals and dividing by the time interval. Thus, this value is an average power consumption, not the actual peak. A general rule of thumb used by engineers is to multiply this value by a factor ranging from 1.2 to 1.6 to obtain the actual peak demand, depending on the nature of loads in the facility. In this case, we use the higher factor of 1.6 in order to obtain a conservative estimate that will ensure the generator can cover the building demand. Thus, the estimated peak facility demand based on the utility data is 118 kVA * 1.6 = 189 kVA. Another estimation method is to add the required starting power of the largest motor to the peak utility reading. The largest starting load for the Courthouse building is due to either of the 25 hp elevator motors which, with the soft starters installed, is three times the running kVA = 3 x 25 kVA = 75 kVA. Using this method, the peak building demand is expected to be 118 kVA + 75 kVA = 193 kVA. Another method is to add the full load of each of the two rooftop units, one of the elevator's running load, and 1W per square foot for building lighting, receptacle, and general power loads = 90 kVA + 95 kVA + 25 kVA + 135 kVA = 345 kVA. Clearly, this over-estimates the building load based on the utility bills. The reason for this may be that the rooftop units never run at full load simultaneously, or the elevator is used infrequently, or that 1W per square foot for other power loads is an over estimate, or some combination of these reasons. Regardless, we do believe that the 250 kW/312.5 kVA generator proposed by Southworth Milton is sufficient for the entire building demand.

The 250 kW/312.5 kVA generator proposed by Southworth Milton is the Cat D250 GC Model, which operates at 480 volts, and draws 376 amps at full load. The D250 unit measures 182" long x 56.3" wide. The existing pad measures 132" long x 54" wide. Thus, the generator will require the existing pad to either be expanded or replaced. As stated above, the existing conduits and feeders from the generator to the electric room can be reused. The existing controls conduit can likewise be reused. However, since these conduits penetrate through the pad, and since the existing feeders must be spliced and extended for the replacement generator, the pad for the proposed generator will have to be offset from the existing foot print, requiring further widening of the existing pad, if it is reused.

The attached Sheet E-2 provides a scenario for providing the rooftop units on generator power. The existing service entrance switchgear will be replaced due to its age, and the adjacent distribution section will be replaced with a 1000 amp transfer switch. The existing generator Panel SDP will be replaced with a 1000 amp panel with four breakers for feeding each of the two rooftop units, Panel EDP in the old building, and Panel NDP in the newer building (through the existing transformer located in the electric room). Each of the 200 amp and 400 amp transfer switches will be replaced with junction boxes to allow splicing of existing feeders from Panels EDP and NDP to new feeders from the new 1000 amp panel. Note that we have not verified the dimensions of proposed equipment to ensure that they can fit into the existing space. The NEC required clearance of 3 feet in front of existing equipment is met by the current equipment layout. Note also that for the base installation that retains the existing layout but replaces the 200 amp and 400 amp transfer switches, the contractor should ensure that the new transfer switches fit in the existing spaces.

Please contact us with any questions or comments you may have regarding this information.

Sincerely,

WV Engineering Associates, PA

Charles Herr

Charles F. Herr, PE