SKYLINE ENGINEERING LLC

Project Memorandum

Date: 5-11-15
To: Aaron Baker, Good Samaritan
From: James Stampe, PE

Project: Good Samaritan Elderly Housing - Rapid City, SD
Project No.: Skyline Engineering, #13005

Re: Master Metering of Electrical Service(s)

A. This objective of this memo is to demonstrate why Master Metering of Electricity within this housing facility is in the best interest of all parties.

B. The project objective is to provide affordable housing to the elderly. Affordable housing is directly related to the initial cost of the project. Construction with individual metering circumvents that objective. Master Metering provide a significant efficiency and resultant cost advantages to all parties.

C. The project design/parameters –
   a. Common utilities cost are allocated per the standard practices of the Good Samaritan Society.
   b. The project provides 50 units of elderly housing and contains significant areas of common use. Hence some level of "common" metering and utilities allocation is required.
   c. For efficiency and maintenance reasons, central gas-fired water heating has been utilized. Hence some level of "common" metering and utilities allocation is required. This affects both gas and electricity utilities.
   d. For efficiency reasons, a central HVAC system is utilized for each corridor. This is a criterion that precludes the requirement for individual meters per SD Administrative rule 20:10:26:04 (6).
   e. For efficiency and maintenance reasons, central laundry facilities have been utilized. Hence some level of "common" metering and utilities allocation is required. Both gas and electricity driven.
   f. For efficiency reasons, a common water service entrance has been utilized. Hence some level of "common" metering and utilities allocation is required.

D. **With specific regard to the Electrical Utilities** – For efficiency, physical and aesthetic reasons, a master metering design was implemented.

   a. **As designed;** the power risers and panels are able to be significantly reduces in size due to the allowance demand factors which may be applied to feeders and services as outlined in the *National Electric Code*, NEC table 220.84. This can only be applied if the power equipment and feeders provide power to multiple units – which is not possible with individually metered units. As an example, a demand factor of 75% means the breakers are 25% smaller and the feeders are 25% smaller.
   b. Application to this project -
      i. The panels 1M, 2M, and 3M and their associated feeders provide power to multiple living units. As such, the demand factor applies.
      ii. The feeders to 1M supplies power to 14 dwelling units. As such, the demand factor is 40%. Panel 1M, the feeder to 1M, and the main in panel 1M is 40% of the capacity which would be required without the demand factor.

iii. The feeders to 2M supplies power to 18 dwelling units. As such, the demand factor is 38%. Panel 2M, the disconnect protecting panel 2M, and the feeder to 2M is 38% of the capacity which would be required without the demand factor.

iv. The feeders to 3M supplies power to 18 dwelling units. As such, the demand factor is 38%. Panel 3M, the disconnect protecting panel 3M, and the feeder to 3M is 38% of the capacity which would be required without the demand factor.

v. The laterals from 1M, 2M, and 3M to the associated living units provide power to multiple units. As such, the demand factor applies. The demand factors range from 44% to 45%. Each panel and the feeders to the units are reduced to about 50% of the capacity which would be required without the demand factor.

vi. In addition, as a result of combining the unit laterals, the number of breakers and size of feeders are significantly less. In addition, the available fault current specifications on each unit panel are much less – resulting in the use of a less expensive "loadcenter".

vii. The use of common panels and feeders results in significantly less building materials and less expensive materials as well. The quantity of steel and copper for the electrical system is 30-40% less. In fact, the designed risers combined are 2400 amps as opposed to a little over 6000 amps being required by individual living unit feeders of 125 amps.

c. **Under and individual metering design**:

i. Each of the 50 living units would be metered at the grade level and a dedicated feeder required to each living unit panel. Each panel is 125 amps per the connected loads. This would require a combined electrical capacity of a little over 6000 amps if the design used individual living unit feeders of 125 amps.

ii. The risers associated cannot use any diversity since the feeder is required to go directly from the living unit meter to the living unit panelboard.

iii. The loadcenters in each living unit may need to be revised to panelboards to brace the increased fault current – more copper lets through more fault current.

iv. Since meters come in 100 and 200 amp frames without anything between, each unit would require a 200 amp meter. In total, 51 Meters would be required. Fifty meters for the units and one for the common/house power.

v. Physical limitations will nearly prevent the installation of an individual meters and feeders within this building.

1. First, the meter array(s)

a. A meter array is typically 4 meters high (maximum height), 12" each meter for a total meter array height of 48" high. Typically a meter is 18"-24" wide. The total array size would be approximately 4 ft high x 21 ft long plus the mains in the array (each about 24" wide, not less than 3). **Total about 4ft x 27 ft long.**

2. Second, the feeder's space through the corridor. Due to the living units construction, all feeders would need to rough through the corridor ceilings. This would result in the entire building needing to be raised by at least 3ft.

E. A comparative analysis by the electrical construction contractor between the two design solutions described above indicates the cost difference for these two solutions would be approximately $160,000. For perspective, individual metering would result in this facility's electrical construction costing at least 1/3 more. As such, individual metering does not seem feasible.

F. In conclusion, common metering is already required for several of the utility services. The use of a common meter complies with the physical limitations of the design. The use of a common electricity meter for this facility allows for significantly less construction materials and is significantly less expensive, thus resulting in Affordable Elderly Housing.

G. Questions regarding this memo may be directed to Jamie Stampe, PE.