EXECUTIVE SUMMARY

The first section of the report mainly explains the existing mechanical system design of the Northfield Mental Healthcare center. Based on the existing mechanical system, the TRACE model was created to evaluate a cooling load, heating load, and ventilation load to estimate the annual electrical and gas consumption. The procedures and assumptions used for the TRACE model are described in the first section of this report, as well.

The outputs of the energy model, including cooling load, heating load, ventilation load, Economical data, estimated energy consumption, and emission of pollutants, are compared with the ones provided by the engineer of the project. Comparison processes of some of these outputs, with design values, were omitted due to the lack of given information provided by the engineer.

The overall performance of the existing mechanical system was analyzed based on the outputs of the model. Better alternative mechanical systems were proposed after the analyses. Due to high demands on heating and cooling, even with the efficient ventilation equipment, annual electricity and gas consumptions are still high. Employing on-site energy generation systems is the main goal of this report.

The second section of the report evaluates the proposed systems: the cogeneration system and the tri-generation system. The overall performance of each designed system is evaluated, equipment for each system is selected, and the total savings and payback periods are calculated for each system.

The third section of the report evaluates the noise generation of the CHP module, which is selected in the previous section. The sound attenuation device, such as an exhaust air silencer, is studied, selected, and applied for the selected CHP module. The fourth section of the report evaluates whether the CHP generator can replace one of the existing emergency generators. The NEC code requirements for the emergency generator and the CHP generator are studied, and the load distribution systems of the existing generators are examined. The calculation on the size of the conductors, used to connect the CHP generator with the existing parallel switchgear, is also performed.