# CHAPTER/REGIONAL TECHNOLOGY AWARD APPLICATION SHORT FORM

**(Revision January 2016)**

***INTRODUCTION:***

*This Short Form has been developed to stimulate more participation in chapter and regional competition.* ***This form is not intended to replace the full Society Technology Award Application form.*** *Regional winners using the short form will be required to complete the full Technology Award Application form before their applications can be forwarded for Society Competition. (This form does not require extensive narrative, plans or photographs.)*

***INSTRUCTIONS:***

A. The individual submitting the Technology Award Application must be a current member of ASHRAE who had a significant role in the design or development of the project.

B. Complete the "Short Form" and use it as the cover page.

C. Provide a system schematic/diagram not larger than 11" x 17" in size. In addition, attach a brief narrative (maximum of 2 pages). The narrative should include the gross and net building areas applicable to the project, a description of the major building areas (i.e.,operating rooms, laboratories, computer rooms, industrial processes, offices, warehouses) and a brief discussion regarding the following five criteria ( if a criterion is not applicable, state accordingly):
   - Energy Efficiency
   - Indoor Air Quality
   - Innovation
   - Operation & Maintenance
   - Cost Effectiveness
   - Environmental Impact

D. Submit your schematic, brief narrative, and completed form to your Chapter Technology Transfer Committee Chapter (CTTC) Chair for judging at the chapter level in accordance with their instructions.

E. The ASHRAE Technology Award program is intended for built projects. First place winning projects should be eligible for submission to the Society level competition on September 1st of the following Society calendar year. Therefore, a project submitted to a Chapter or Regional competition shall be occupied prior to September 1st of the current Society year in order to satisfy the Society level competition requirement of one full year of occupancy.

   First place winners in each category from chapter competition will be submitted by the CTTC Chapter Chair to the CTTC Regional Vice Chair for judging in the Regional Technology Awards competition. At the discretion of the CTTC Regional Vice Chair, this may require completion of the full Society Technology Award Application form if the chapter submission was done on the Short Form Application.

   The CTTC Regional Vice Chair will invite first place winners in each category from regional competition to submit them for judging in the Society level Technology Awards competition. The regional winners will be given the opportunity to incorporate new information or otherwise improve their submittal before submitting it to the society level competition (e.g., by addressing comments from regional judges). At the discretion of the judging panels at the chapter and regional competitions, more than one first place winner may be awarded in each category.

   For the regional competition, submit the number of copies requested by the Regional CTTC Vice Chair. The CTTC Regional Vice Chair may require entries into the regional competition to be done on the full Society Technology Award Application form. In any case, all submissions to the Society level competition must be done on the full Society Technology Award Application form.

F. It is highly recommended that each entrant confirm by letter (and retain a copy for record) to the owner that the owner has granted permission to submit this project to competition.

NOTE: ASHRAE Technology Awards are the HVAC&R industry's most prestigious honor for efficient energy use in buildings and environmental system performance. While the awards do not certify responsible charge or professional license status, they do recognize outstanding design innovation and successful implementation.

# CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

**1. Category - Check one and indicate New, Existing, or Existing Building Commissioning (EBCx)**

| | | | | |
|---|---|---|---|---|
| ☐ Commercial Buildings | ☐ New | ■ Existing or | ☐ EBCx |
| Institutional Buildings: | | | |
| ☐ Educational Facilities | ☐ New | ☐ Existing or | ☐ EBCx |
| ☐ Other Institutional | ☐ New | ☐ Existing or | ☐ EBCx |
| ☐ Health Care Facilities | ☐ New | ☐ Existing or | ☐ EBCx |
| ☐ Industrial Facilities or Processes | ☐ New | ☐ Existing or | ☐ EBCx |
| ☐ Public Assembly | ☐ New | ☐ Existing or | ☐ EBCx |
| ☐ Residential (Single and Multi-Family) | | | |

**2. Name of building or project:** Grace Lake Corporate Center

City/State: Van Buren Township, MI

**3. Project Description:** DTE Retro-commissioning

Project Study/Design Period: 06/2015 (Begin date (mm/yyyy)) to 01/2016 (End date (mm/yyyy))

Percent Occupancy at time of submission: 90%

**4. Entrant (ASHRAE member with significant role in project)**:

a. Name: Mardikar (Last) Yogesh (First) (Middle)

Membership Number: 8207107

Chapter: Illinois

Region: VI

b. Address (including country): 333 N. Michigan Ave., Suite 2117

Chicago (City) IL (State) 60601 (Zip) USA (Country)

c. Telephone: (O) 312-899-1000 d. Email: YMardikar@SiebenEnergy.com

e. Member's Role in Project: Project Lead

f. Member's Signature: Dr. Yogesh Mardikar

Digitally signed by Dr. Yogesh Mardikar
DN: cn=Dr. Yogesh Mardikar, o=SIEBEN ENERGY ASSOCIATES, ou, email=YMardikar@SiebenEnergy.com, c=US
Date: 2016.09.28 21:51:34 -05'00'

**5. Engineer of Record:** Dr. Yogesh Mardikar

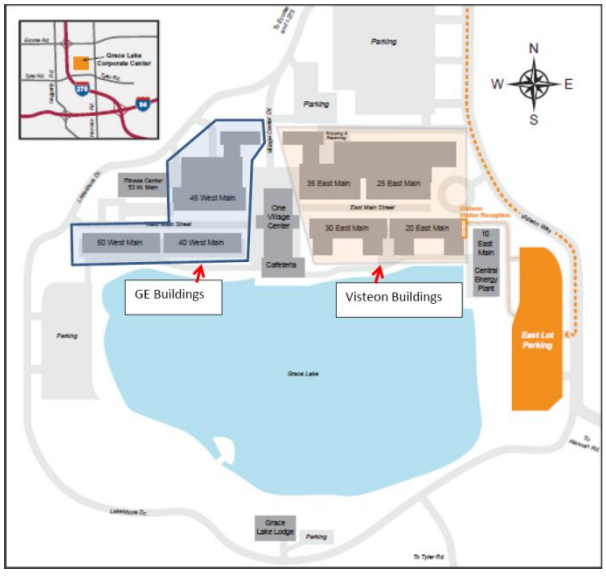
By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

# Retro-Commissioning

ASHRAE Chapter Technology Award Narrative

## Grace Lake Corporate Center
## Van Buren Township, MI

**Description of Facility:** The Grace Lake Corporate Center located in Van Buren Township, MI is a combined office, research, and testing lab facility. The complex consists of ten (10) buildings all connected to each other via an underground pedestrian way. The buildings are occupied by Visteon Corporation and General Electric and feature the following common areas: document center, fitness center, café, and a central cooling and heating plant. The total estimated gross floor area for the complex is approximately 882,000 square feet. The facility also features approximately 2,000 square feet of data center space. The complex features multiple surface parking lots adjacent to the buildings. The Grace Lake Corporate Center was built in 2004 and is owned and managed by Sovereign Partners, LLC.




**Project Scope:** The Grace Lake Corporate Center was retro-commissioned (RCx) under the guidelines of the DTE Retro-commissioning Services Program. The goal of the utility's retro-commissioning incentive program is to reduce electricity usage and demand through the implementation of low-cost, rapid payback energy efficiency measures. The retro-commissioning services were performed by Sieben Energy Associates (SEA). The retro-commissioning project began in June, 2015 and was completed in January, 2016.

**Energy Reduction Measure Investment:** $3,325
**Projected Energy Cost Savings:** $144,000/year
**Percent Annual Energy Reduction:** 8.5%
**Simple Payback:** < 1 month
**Project Duration:** Eight (8) Months

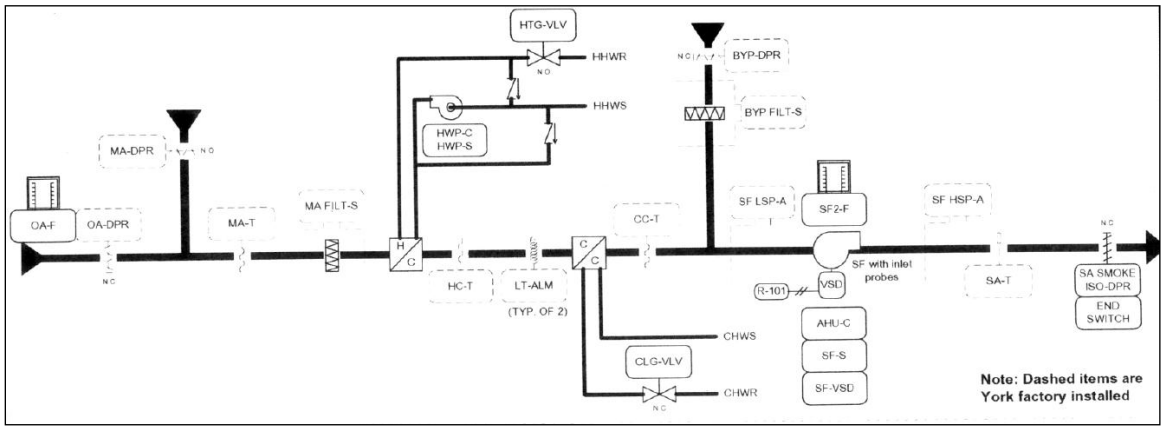
**Electric Savings Target:** 800,000 kWh (~3.5%)
**Gas Savings Target:** 15,000 Ccf (~2.7%)
**Projected Electric Savings:** 1,951,212 kWh (~8.4%)
**Projected Gas Savings:** 24,336 Ccf (~4.4%)

**Facility System Description**

- A Johnsons Controls Inc. (JCI) Metasys Building Automation System (BAS) is available in the Central Plant building and is used for controlling the Heating, Ventilation, and Air-conditioning (HVAC) systems serving all ten campus buildings. All central mechanical equipment has full DDC control. A separate GE lighting controls system is used for controlling the lighting operating schedules at Grace Lake Corporate Center. The two control systems have been in place since the complex was built in 2004.

  **Ventilation:** HVAC is provided by thirty-two air-handling units (AHUs) each with a rated capacity from 18,000 to 42,000 CFM. Total AHU supply air volume amounts to 856,000 cubic feet per minute (CFM). The supply and return fans are equipped with variable frequency drives (VFDs). All AHUs are cooling and heating units that feature chilled water cooling coils and hot water heating coils.

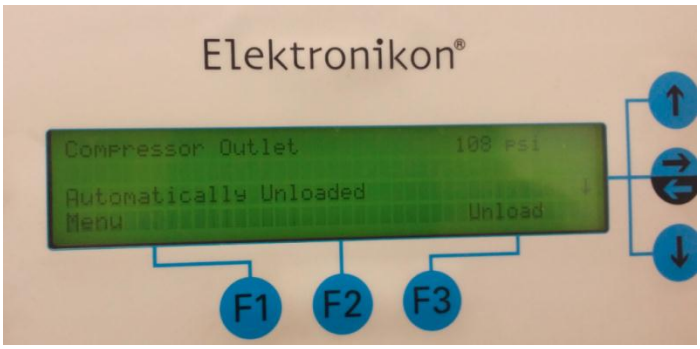
  The conditioned spaces feature variable-air-volume (VAV) cooling-only boxes and fan-powered boxes (FPBs) with hot water reheat and receive primary air from the VAV AHUs. The supply is through floor plenum. The duct static pressure set-point is 1.0-1.5 inches of water column and remains unchanged throughout the year. Each AHU is controlled via the BAS. All AHUs bring in a minimum of 20% outside air at all times and have capabilities to bring in fresh outside air for free-cooling purposes. All AHUs are 12 years old.




**Cooling:** Three (3) 1,000 ton centrifugal chillers equipped with VFDs provide chilled water to the AHUs when operating in cooling mode; the hot condenser water leaving the chillers rejects its heat to the adjacent lake. Chilled water is also used for process cooling purposes in the lab areas. There are three (3) variable-flow chilled water pumps and three (3) variable-flow condenser pumps each rated at 125-hp. Typically, one (1) set of chilled and condenser water pumps operate with one (1) chiller; the pumps can be swapped and used with other chillers. The chillers are operational from April-November and generate chilled water at a fixed set-point of 41 ºF. Two heat exchangers cool the building loop water using lake water in winter to provide cold water to the lab areas.

**Heating:** Three (3) natural gas-fired boilers each rated at 12.25 MMBtu generate hot water for comfort heating purposes. Hot water is generated between 180-185 ºF and is used for comfort heating purposes. There are three (3) variable-flow hot water pumps each rated at 50-hp. The AHUs feature hot water coils; the FPBs feature hot water reheat systems that temper the primary air from the AHUs before supplying it to the conditioned spaces.

**Air-compressors:**
The lab areas feature three air-compressors that generate compressed air between 100 and 110-psig that is used by the pneumatic actuators in the lab machines. The compressors load and unload between 100 and 110-psig. All three air-compressors are screw-type and are each rated at 125-hp. All three (3) air-compressors are water cooled units; currently, the air-compressors use room air at the intake which is typically warmer than outside air resulting in excessive energy consumption for air compression. Most compressed air end-use applications require 80-90 psig air.

**Lighting:** The lighting systems in the office areas feature 54W T5 or 32W T8 linear fluorescent lighting with electronic ballasts. Lighting is controlled by a separate master lighting control system that turns off the lights at a predetermined schedule.

**The Retro-Commissioning Project**

DTE Retro-commissioning projects are divided into several phases: planning and investigation, implementation, and verification. During the planning and investigation phase, thirteen (13) energy conservation measures (ECMs) with energy savings potential of 2.2 million kWh and 34,000 Ccf were identified and analyzed. Grace Lake Corporate Center elected to implement eleven (11) of the thirteen (13) identified measures.

Although the automation system was maintained well by the operating staff, many of the control sequences were not optimized. SEA engineers evaluated large data sets of system operation and consequently designed control strategies that optimized energy usage of air-handling units, cooling and heating plant equipment, lab support equipment such as air-compressors, terminal units, and lighting equipment throughout the building. The most significant ECMs consisted of optimizing AHU schedules and discharge air temperature reset strategies based upon outdoor weather conditions. These measures maximized the effectiveness of the ventilation control system reducing AHU fan energy use throughout the year, heating use during winter, and chilled water use in summer.

Retro-commissioning measures included:

1. Adjust Unoccupied Time AHU Schedules
2. AHU Duct Static Pressure Reset
3. Reduce Compressed Air Pressure Set-point
4. Optimize Economizer Operation
5. Turn Off Excessive CHWPs
6. Slow-down AHU fan speeds during unoccupied hours below 25 ºF and above 80 ºF
7. Lower OA% for AHUs
8. Turn Off Excessive ACs Serving the Data Center
9. Control Dynamo Area AHU Based on Space Temperature
10. Lower Cooling Set-point for AHUs
11. Release Return Fan VFD Speeds for L1 and J2 AHUs
12. Repair Leaking Return Air Damper for AHU D1
13. Optimize Lighting Schedules

The retro-commissioning project at Grace Lake Corporate Center produced outstanding results in both energy savings and overall return on investment. At the close of the project, Sieben Energy Associates (SEA) was able to verify annual electric savings of 1,951,212 kWh, an 8.4% reduction of the building's annual electric use and annual natural gas savings of 24,336 Ccf, a 4.4% reduction of the building's annual natural gas consumption. The success of the project resulted in Grace Lake Corporate Center being honored as one of three finalists for the 2016 Michigan Governor's Energy Excellence Award.

**Applicability to ASHRAE Technology Award Criteria**

1. **Energy Efficiency:** The primary goal of the project was to identify and implement energy efficiency measures. All identified, implemented, and verified measures represent opportunities to improve mechanical system efficiency at the facility and reduce systems' energy consumption.

2. **Indoor Air Quality:** The measures implemented were all in compliance with ASHRAE 62.1.
3. **Innovations:** The facilities staff at Grace Lake Corporate Center was looking for ideas to reduce their energy consumption without having to invest significant capital in the equipment that still had considerable remaining useful life. The engineering staff had already considered and implemented several energy efficiency best practices at the complex; however, the energy intensity at the complex was still significantly higher based upon the nature of site operations. The retro-commissioning approach allowed a detailed view of HVAC systems' baseline operation and control, and enabled Sieben Energy Associates to identify and evaluate energy saving ideas that didn't seem obvious before. The RCx effort helped the site engineering personnel bridge the gap between HVAC system operations (supply) and facility HVAC requirements (demand) as dictated by occupancy and desired comfort conditions.
4. **Operation and Maintenance:** The project resulted in several modifications to existing O&M practices that will help ensure that energy savings persist.
5. **Cost Effectiveness:** The nature of RCx projects guarantee cost-effective results. The simple payback of investment in less than one month ranks among the most cost-effective projects ever completed in the DTE Retro-commissioning Program.
6. **Environmental Impact:** The measures included in the RCx project result in a significant reduction in the building's carbon footprint.

The following table provides a summary of all measures identified, implemented, and verified in the Grace Lake Corporate Center RCx project:

| RCM No. | Measure Description | Peak Electric Demand Savings (kW/mo) | Electrical Energy Savings (kWh/yr) | Electrical Cost Savings ($/yr) | Natural Gas Energy Savings (Ccf/yr) | Natural Gas Cost Savings ($/yr) | Implementation Cost ($) | Simple Payback (years) |
|---|---|---|---|---|---|---|---|---|
| 1 | Adjust Unoccupied Time AHU Schedules | - | 1,252,063 | $49,882 | 10,351 | $6,162 | $302 | Immediate |
| 2 | AHU Duct Static Pressure Reset | 22.5 | 84,814 | $7,840 | - | - | $302 | Immediate |
| 3 | Reduce Compressed Air Pressure Set-point | - | - | - | - | - | - | - |
| 4 | Optimize Economizer Operation | - | - | - | - | - | - | - |
| 5 | Turn Off Excessive CHWPs | - | 42,631 | $1,698 | - | - | $302 | 0.2 |
| 6 | Slow-down AHU fan speeds during unoccupied hours below 25 ºF and above 80 ºF | - | 41,942 | $1,671 | 2,762 | $1,644 | $302 | Immediate |
| 7 | Lower OA% for AHUs | 43.6 | 16,290 | $9,280 | 6,362 | $3,788 | $302 | Immediate |
| 8 | Turn Off Excessive ACs Serving the Data Center | 11.7 | 102,105 | $6,377 | - | - | $302 | Immediate |
| 9 | Control Dynamo Area AHU Based on Space Temperature | 10.2 | 73,060 | $4,297 | 4,675 | $2,783 | $302 | Immediate |
| 10 | Lower Cooling Set-point for AHUs | 371.1 | 271,676 | $41,421 | - | - | $302 | Immediate |
| 11 | Release Return Fan VFD Speeds for L1 and J2 AHUs | 21.4 | 66,577 | $6,878 | - | - | $302 | Immediate |
| 12 | Repair Leaking Return Air Damper for AHU D1 | 0.11 | 53 | $13 | 186 | $107 | $302 | 2.5 |
| 13 | Optimize Lighting Schedules | - | 0 | $0 | - | - | $302 | - |
| **Electric & Gas Total** | | **480.6** | **1,951,212** | **$129,357** | **24,336** | **$14,485** | **$3,325** | **0.02** |