



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: _____

City/State: _____

3. Project Description: _____

Project Study/Design Period: _____ to _____
Begin date (mm/yyyy) End date (mm/yyyy)

Percent Occupancy at time of submission: _____

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

a. Name: _____
Last First Middle

Membership Number: _____

Chapter: _____

Region: _____

b. Address (including country): _____

_____ City State Zip Country

c. Telephone: (O) _____ d. Email: _____

e. Member's Role in Project: _____

f. Member's Signature: _____

5. Engineer of Record: _____

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.

Monitoring-Based Commissioning Performance

ASHRAE Chapter Technology Award Narrative

Citigroup Center, 500 West Madison Street, Chicago, IL

Description of Facility: Citigroup Center, located at 500 West Madison Street, Chicago is a multi-tenant office building incorporating retail space in the atrium area of its first two floors, and is situated at the terminus of Ogilvie Transportation Center. Citigroup Center opened in 1986 and has a total gross floor area of 1,860,000 square feet. The building is a 43-story structure with one level under-grade. It is an all-electric building.

Project Scope: Citigroup Center participated in the Monitoring-based Commissioning Incentive Program, part of the ComEd Smart Ideas program beginning February 2013. The goal of monitoring-based commissioning is to reduce electricity consumption and monitor reduction persistence through the continuous acquisition and analysis of HVAC performance data. The project ended in December 2015.

Energy Reduction Implementation Cost: \$55,000

Annual energy Cost Savings: \$112,000

Simple Payback: 0.50 Years



Facility System Description

Space Heating

System Description – Office Tower, AHU-1 & AHU-2

- Electric resistance heaters in AHUs used only during morning warm-up.
- Parallel fan-powered boxes (FPBs) installed in perimeter spaces with electric resistance heaters, which act as primary heating source for the facility.
- AHUs are DDC and connected to the building automation system (BAS); FPBs are locally pneumatically controlled.

Monitoring-Based Commissioning Performance

Space Cooling

System Description – Office Tower

- Hydronic chilled water system.
- Chillers:
 - two Carrier 1,600-ton chillers (R-11) – calculated efficiency of 0.66 kW/ton
 - one Carrier 600-ton chiller (R-12) – calculated efficiency of 0.51 kW/ton
- Chilled water pumps, condenser water pumps, and cooling towers all updated to DDC controls.



Ventilation

System Description – Office Tower

- Variable air volume system (AHU-1 & AHU-2):
 - Six 150 HP vane axial supply fans per AHU.
 - Six 60 HP vane axial return fans per AHU.
 - All supply and return fans are equipped with VFDs.
 - Full air-side economizing capability.



The Monitoring-Based Commissioning Project

The Citigroup Center engineering team was seeking an innovative path to increased energy efficiency. Although engineering personnel had maintained excellent occupant comfort and achieved ENERGY STAR and LEED certification, they had never pursued a detailed analysis of HVAC system performance as an optimization strategy. The engineering team lacked the empirical data to justify bold changes to HVAC operations.

In Q1 2013 building management engaged Sieben Energy Associates (SEA) to assist the building with an application to receive monitoring-based commissioning services under the aegis of an incentive program that was part of ComEd *Smart Ideas for Your Business*. Citigroup Center's engineering team would share its HVAC system performance data with an authorized service provider, in this case Sieben Energy Associates (SEA), who would analyze the shared data for opportunities to identify and help implement low-cost, rapid-payback energy reduction measures. At time of application Citigroup Center's annual energy use was greater than 22 million kWh.

In the Integration Phase of the project SEA worked with the building engineering team to establish a connection whereby trended data of points controlled by the BAS could be shared with SEA, run through SEA's HVAC analytics SkySpark software, and analyzed by SEA engineers.

Monitoring-Based Commissioning Performance

After establishing protocols for sharing HVAC data, Sieben Energy Associates began acquiring, consistent with the monitoring-based commissioning process, continuous streams of HVAC system performance data for all monitored BAS points, employing its customized software to analyze the data, highlight anomalies, and present evidence of opportunities to modify HVAC operations.

Citigroup Center engineering personnel were alerted to correct operating anomalies before they led to excessive wasted energy. The building's steadily increasing ENERGY STAR rating and decreasing EUI demonstrated the power of SEA's MBCx service in helping the building owner achieve its energy goals.

The building's engineering team was given visibility into the data collected and analyzed by SEA via a web-accessible 'dashboard' enabling the team to view the same daily, weekly, and monthly results as SEA.

The participation agreement between the building and ComEd was extended twice during the project, once following a change of building ownership at the start of 2014, extending the program to July 31 2015, and a second time in summer 2015, extending the participation agreement to December 31 2015.

Over the course of the engagement, seven energy reduction measures were implemented, totaling 1,992,168 kWh equaling a projected annual value of \$112,000 energy savings. The building's cost of implementing the measures was \$55,000.

Sieben Energy Associates performed the initial analysis of each implemented energy reduction measure, presented its analysis to the building engineering team to achieve consensus, worked with the building engineering team and its controls contractor to implement each measure, and then measured and verified the results of each project. All of SEA's engineering calculations were peer-reviewed by ComEd's project administrator, Nexant, before being recognized as valid and final.

Applicability to ASHRAE Technology Award Criteria

- 1. Energy Efficiency:** The twin goals of the project were to detect operational faults that would result in wasted energy use and, through the continuous monitoring of HVAC system performance, to identify, implement, and verify energy efficiency measures. All identified, implemented, and verified measures represent opportunities to improve the building's mechanical system efficiency and reduce systems' energy consumption.
- 2. Indoor Air Quality:** The measures implemented were all in compliance with ASHRAE 62.1.
- 3. Innovations:** The monitoring-based commissioning project was launched at Citigroup Center in Q1 2013, at a time when the continuous improvement of HVAC performance by monitoring large data sets was still a relatively new concept and not widely used in the multi-tenant office building marketplace. Building management and ownership demonstrated leadership and innovation in undertaking such an initiative. The monitoring-based commissioning project brought visibility to potential energy-saving changes in operation that otherwise would have gone unseen employing conventional BAS-oriented control and reporting. The results of the project influenced an expansion of the scope of the MBCx program incentives offered by ComEd.
- 4. Operation and Maintenance:** The project provided daily fault detection reporting to the site engineering team to readily correct system performance faults as they occurred and resulted in several modifications to existing O&M practices that will help ensure that energy savings persist.

Monitoring-Based Commissioning Performance

5. **Cost Effectiveness:** The nature of monitoring-based commissioning projects guarantees cost-effective results. The process identifies and promotes the evaluation of operational adjustments that generally are limited to low-cost implementation. The measures identified and implemented employing the MBCx process offered significant return-on-investment opportunities, often with simple paybacks of less than one year.
6. **Environmental Impact:** The measures included in the MBCx project resulted in in approximately 10% reduction in the building's carbon footprint.

Table 1 provides the summary all measures verified in the MBCx Project:

ECM No.	Measure Description	Electrical Energy Savings (kWh/yr)	Electrical Cost Savings (\$/yr)	Implementation Cost (\$)	Simple Payback (years)	Incentive Payment (\$)
1	Automatic discharge air reset based on outside and return air temperatures	376,716	\$21,390	\$1,400	0.03	\$26,370
2	Automatic static pressure reset based on outside air temperature	153,058	\$8,691	\$840	0.04	\$10,714
3	Optimize Chilled Water Pump Freeze Protection Control	63,865	\$3,626	\$700	0.09	\$4,471
4	Unoccupied temperature setback control for FPB & BB Heaters	493,573	\$27,591	\$3,500	0.12	\$34,550
5	Implement staged winter optimum start sequence	486,599	\$27,629	\$47,500	1.74	\$34,062
6	Close minimum OA dampers during unoccupied hours	242,264	\$13,756	\$960	0.03	\$16,958
7	Reduce the use of supply fan heaters	176,093	\$9,999	\$0	Immediate	\$12,327
Total		1,992,168	\$112,682	\$54,850	0.22	\$139,452