



# ABSTRACT

**Ebert & Baumann Consulting Engineers, Inc.**  
An Enterprise of the Ebert-Consulting Group

734 15th Street, NW, Suite 1000  
Washington, D.C. 20005, USA  
[www.eb-engineers.com](http://www.eb-engineers.com)

## ICEBO 2011 New York City

March 28, 2011

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### Functional Verification through Operation Diagnostics

One of the core objectives of the commissioning process is to ensure that the dynamic systems function correctly. Just as important, if not more so, is enabling the correct function of those systems throughout occupancy. While verification strategies vary, it is clear that examination of actual operation produces the most accurate results. This is accomplished through trend logging. With analysis of regularly recorded control point data through visualization (including graphs, charts, etc.), a quick and accurate diagnosis of incorrect or less than optimal operation can be assessed. However, several questions arise regarding this process: What data should be visualized? What form should this visualization take? How can data from several different yet interrelated control points be best compared? Finally, what patterns within a visualization should be sought?

This paper describes a method of building system trend data analysis, known as Operation Diagnostics, that involves the creation of ideal patterns for comparison to actual building data visualizations. The process of creating a complete set of "Operation Patterns" for a particular building system, placing them in a logical flow schematic, and overlaying the corresponding trend data visualizations affords several advantages to conventional testing: data review is quick and comprehensive, minimizing overlooked issues; in addition to finding faults in operation, potential energy-optimization measures can be identified and even quantified; and this process can be carried out throughout occupancy. In this paper, Operation Diagnostics is applied in a case study.

**Ben Burgoyne, LEED® AP**  
Mechanical Engineer

**Ebert & Baumann Consulting Engineers, Inc.**  
An Enterprise of the Ebert-Consulting Group

734 15<sup>th</sup> Street, NW  
Suite 1000  
Washington, D.C. 20005, USA

Tel +1.202.608.1334

Fax +1.202.544.1434

[b.burgoyne@eb-engineers.com](mailto:b.burgoyne@eb-engineers.com)

[www.eb-engineers.com](http://www.eb-engineers.com)