

Accepted Manuscript

Title: Full-factorial design space exploration approach for multi-criteria decision making of the design of industrial halls

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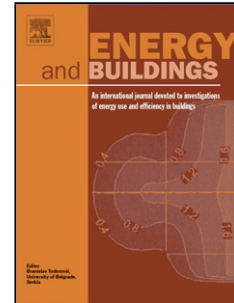
PII: S0378-7788(15)30269-3
DOI: <http://dx.doi.org/doi:10.1016/j.enbuild.2015.09.028>
Reference: ENB 6148

To appear in: *ENB*

Received date: 2-7-2015
Revised date: 5-9-2015
Accepted date: 14-9-2015

Please cite this article as: B. Lee, N. Pourmousavian, J.L.M. Hensen, Full-factorial design space exploration approach for multi-criteria decision making of the design of industrial halls, *Energy and Buildings* (2015), <http://dx.doi.org/10.1016/j.enbuild.2015.09.028>

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Full-factorial design space exploration approach for multi-criteria decision making of the design of industrial halls

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Abstract

Industrial halls pose high energy saving potential that is not yet explored under current design practice. Common design approaches such as parametric study or optimization are largely constrained by the assumptions and do not promote flexibility in the decision making process. Based on the unique characteristics of industrial halls, this paper develops a full factorial design space exploration approach to support multi-criteria design decision making. Energy performance, environmental impact, and cost effectiveness are studied over the whole life cycle. The approach is demonstrated with a case study of a warehouse in Amsterdam. Design parameters of interest are the insulation values, construction types, skylight coverage and transpired solar collector coverage. The results indicate that this approach offers design solutions that might not be otherwise identified. The non-case-specific one-time investigation allows objective space of derived performance to be generated dynamically based on even changing information or inputs specified by the users at the time of making the decision. This new design support approach facilitates designers to assess feasibility of any design solution based on their own desired set of performance requirement under different probable scenarios in the future.

Keywords: Industrial halls; Multi-criteria decision making; Full-factorial design space exploration; Energy performance; Environmental impact; Cost effectiveness

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