FROM 'SIMULATION AND REALITY' IN BS2013

'Building classification based on simulated annual results: Towards realistic building performance expectations.'

Heidarinejad M., Dahlhausen M., McMahon S., Pyke C., and Srebic J.
Pennsylvania State University and the US Green Building Council

Comments on: Heidarinejad M. et al. (2013)
Pennsylvania State University and USGBC
'Building classification based on simulated results:
Towards realistic building performance expectations.'

Design Simulation EUI v.s. Building Operation EUI
a basic topic in building simulation performance.

EUI
EXPECTATION

D — AS DESIGNED

B — AS BUILT

O — AS OPERATED

EUI
MEASURED

Comments on: Heidarinejad M. et al. (2013)
Pennsylvania State University and USGBC
*'Building classification based on simulated results:
Towards realistic building performance expectations.'*
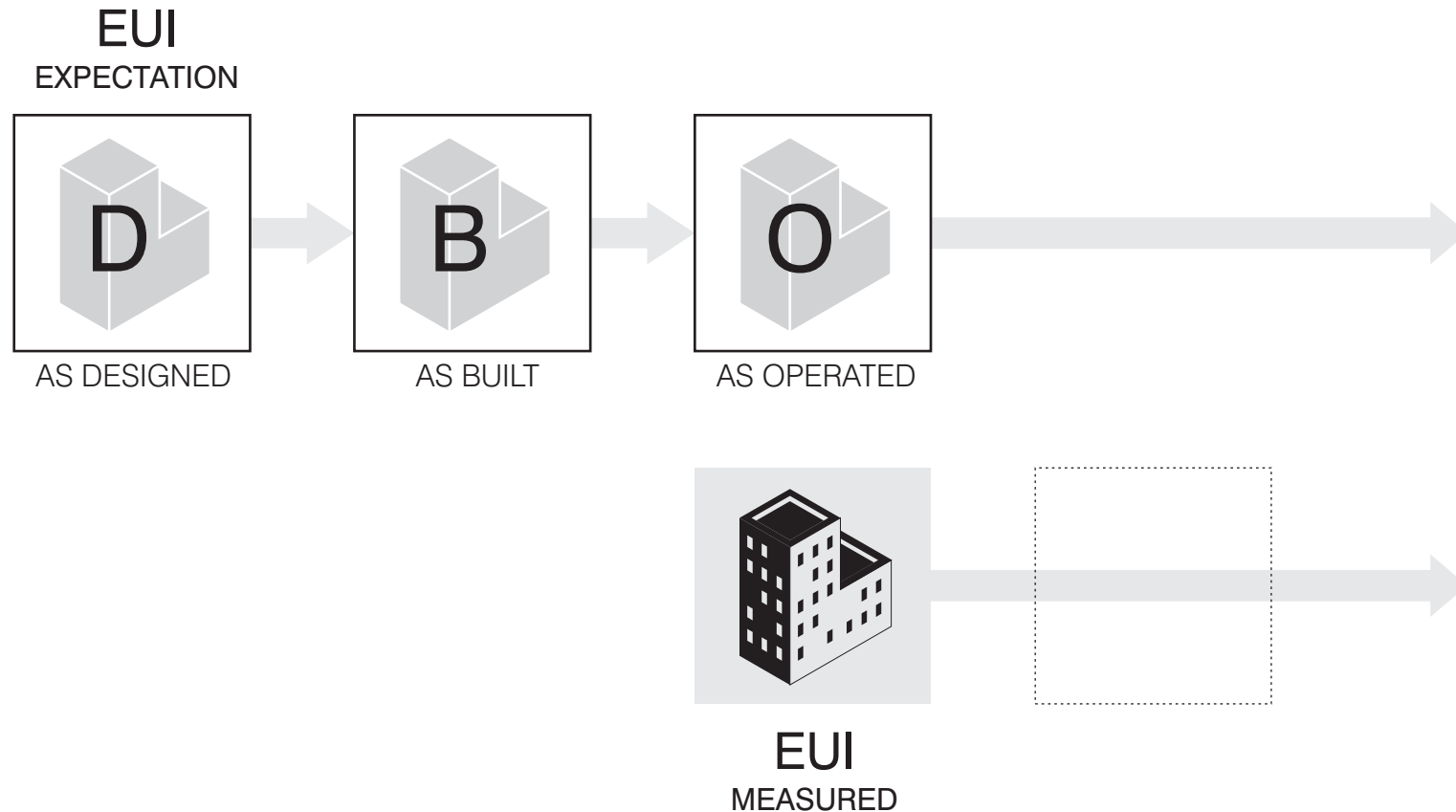
How did researchers address the question of energy simulation expectations in BS 2013?

10/11	POST-OCCUPANCY CALIBRATION

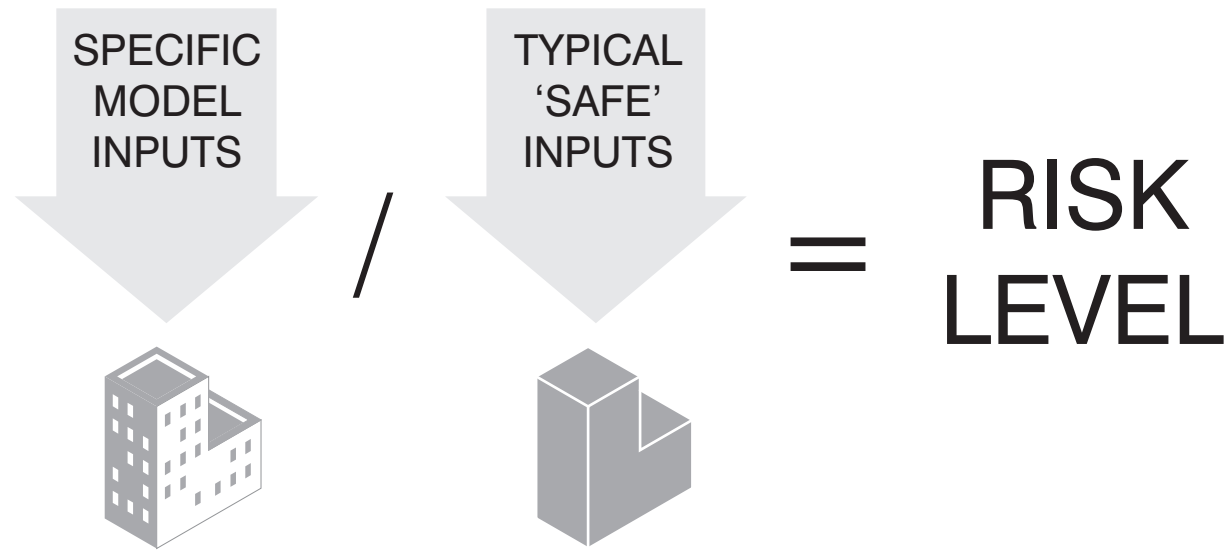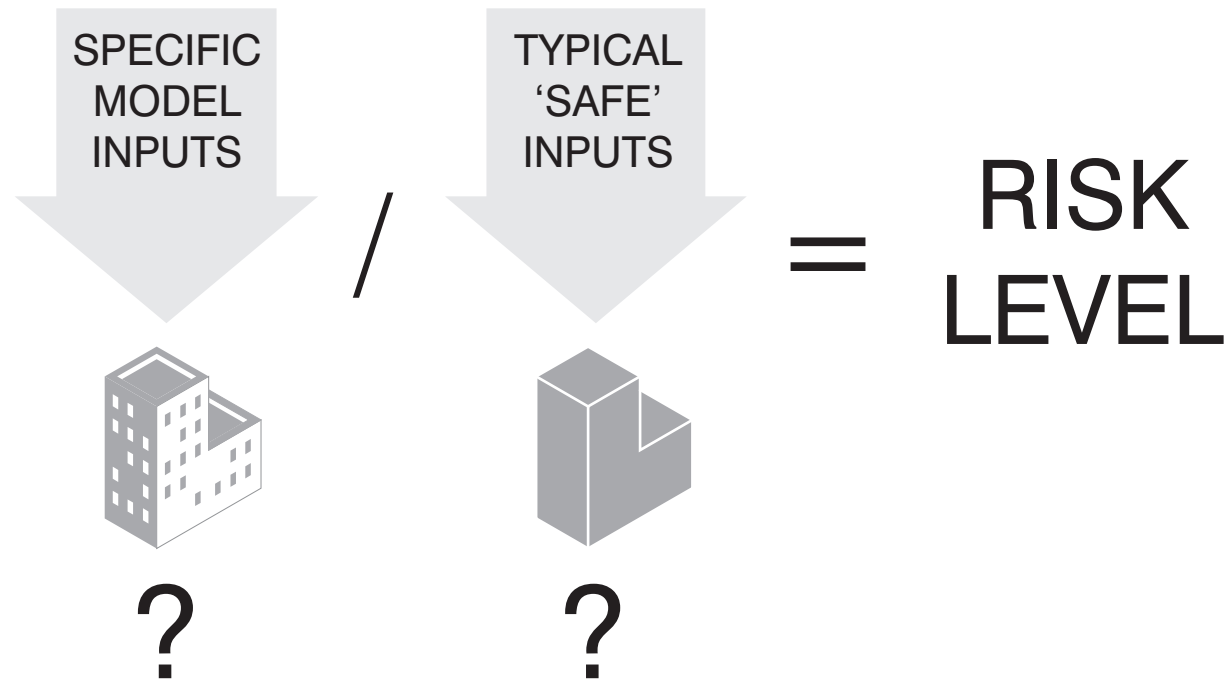|	
1	Energy label standard effectivity
4	Whole building model improvement
3	HVAC systems performance optimization
1	Calibration uncertainty evaluation

V.S.

1/11	PRE-DESIGN CLASSIFICATION

Heidarinejad M., Dahlhausen M., McMahon S., Pyke C., and Srebic J.

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Building models can be classified based on inputs deviation from typical input values.

SPECIFIC MODEL INPUTS / TYPICAL 'SAFE' INPUTS = RISK LEVEL

Building models can be classified based on inputs deviation from typical input values.

SPECIFIC MODEL INPUTS

TYPICAL 'SAFE' INPUTS

/

=

RISK LEVEL

?

?

Methodology

134 LEED CERTIFIED OFFICE BUILDINGS ANALYSIS

VARIABLES and TYPICAL VALUES are statistically defined based on ASHRAE 90.1 requirements and engineering design teams feed back. A 95% Confidence Interval was the reference.

VARIABLES	1. Yearly Days of Operation 2. Use and Unregulated Loads 3. Occupancy Rates

RISK LEVELS	1. LOW RISK: Within 95% CI of typical office. 2. MEDIUM RISK: Between median and 95% CI. 3. HIGH RISK: Lower or Higher then 95% CI.

Chambery (France), 25-28 August 2013
13th International Conference of the
International Building Performance
Simulation Association

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The resulting values of the study offer a classification tool to evaluate the simulation expectations of an office building:

Summary of risk indicators for office buildings.
*(Adapted from Heidarinejad et al. 2013)*

	operation (days)	use/loads (kBtu/ft2)	occupancy (p/1000 ft2)
LOW	263 - 277	18.8 - 29.1	4.6 - 5.7
MEDIUM	255 - 263	16.2 - 18.8	4.3 - 4.6
HIGH	<255 or >277	<16.2 or >18.8	<4.3 or >5.7

RISK CLASS = [R1 , R2 , R3]

The application of the method to the sample showed a minority of LOW RISK cases.

Risk classification by variable for 134 LEED office buildings.
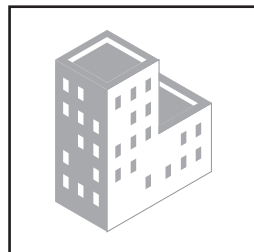*(Adapted from Heidarinejad et al. 2013)*

only
10-25%
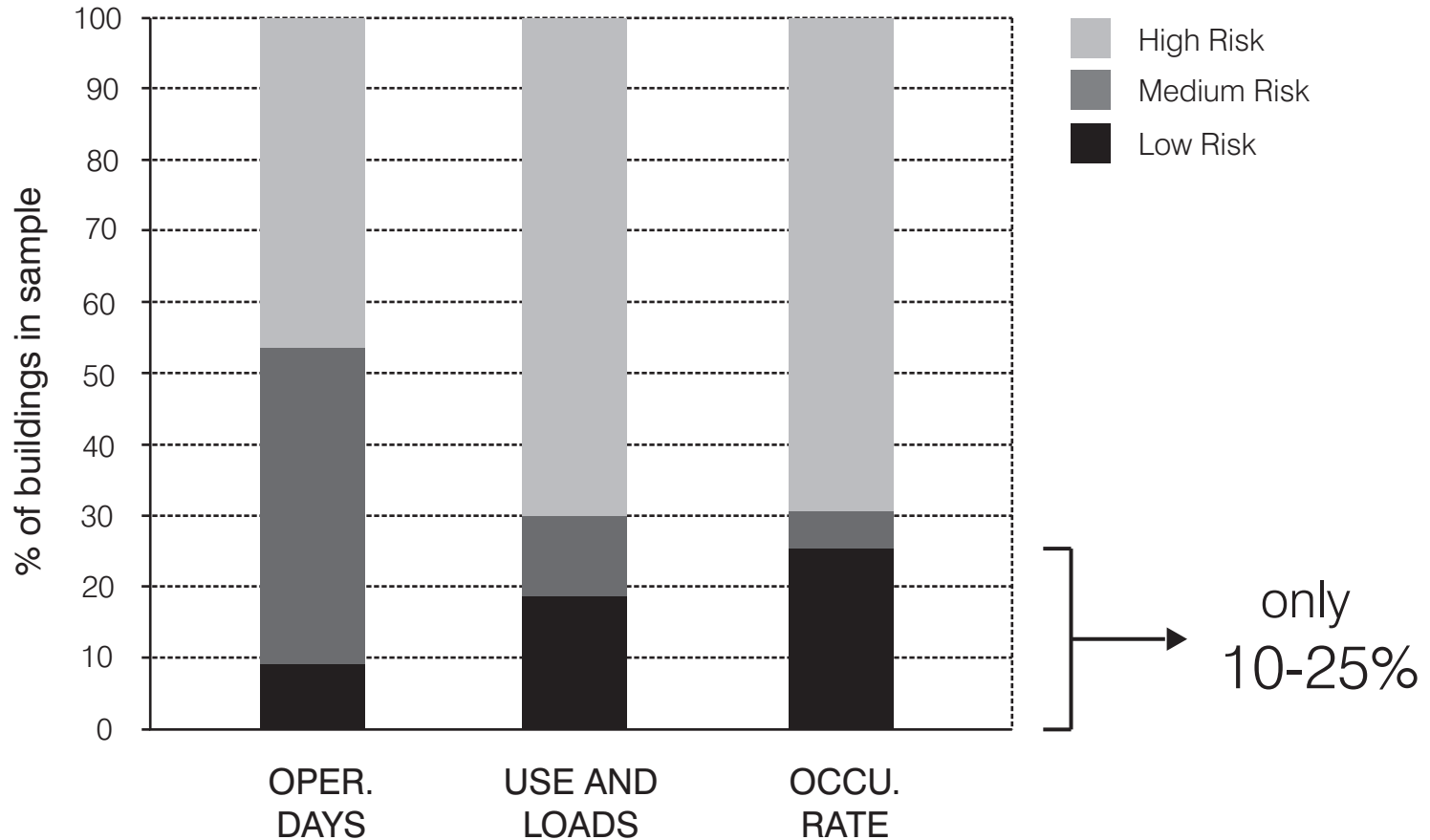
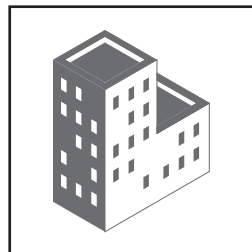# Relevant conclusions for the future of practice:

1. Inform building managers about expectations.

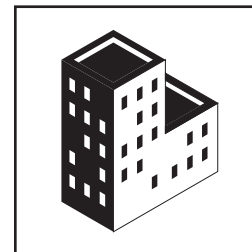**2**. EUI prediction model based on typical inputs.

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3. LEVEL OF BUILDING SIMULATION DIFFICULTY

AMATEUR   PROFESSIONAL   EXPERT

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Thank You.

Carlos Cerezo Davila, <u>ccerezod@mit.edu</u>
MIT Sustainable Design Lab, Cambridge, MA

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