



## OPPONENT'S EVALUATION OF THE DIPLOMA THESIS

**Student:** Artambo Benjamin  
Pangaribuan

**Opponent:** Assoc. Prof. Ing. Jiří Hirš, CSc.

Study program: **Engineering Informatics**  
Study discipline: **Integrated Systems in Buildings**  
Academic year: **2014/2015**

Thesis topic: **Complete Solution of HVAC for family House Building in Indonesia**

### Evaluation of the thesis:

▪ *The thoroughness of the elaboration, its validity and the difficulties resolved in the thesis*

This master thesis deals with design of building services of single family house located in Indonesia approaching green building standard. The mainly purpose of the thesis was to design cooling system using reversible heat pump, design of ventilation, electrical installation such as lighting design combine with other electrical fixtures in security and communication systems by using the collaboration of utility grid and photovoltaic panel as the renewable power source, plumbing system for domestic hot water associated of heat waste from the heat pump and solar water heating system. All systems are integrated in one communication distributed control BACnet protocol network platform of SCADA for building management system of the house.

Elaboration is complete, solved the current task and the difficulty is slightly above average.

▪ *The method and level of the concepts resolved in the thesis*

Master student used for processing the theoretical part of the appropriate literature valid for Asia, research are an adequate extent, concrete knowledge applied to the family house by BIM software.

▪ *The level of the student's thesis topic and elaboration and its contribution(s)*

The level of the topic is moderately difficult. I see the benefit of diploma student in good overview of the theory, design of cooling using energy from renewable sources and application of appropriate solutions to Indonesian family house.

▪ *The formal aspects of the thesis, errors and mistakes in the technical aspects*

- Page 39, chapter 1.3: **Is it possible to use the value for passive house presented in this chapter also for solved house in Indonesia?**
- Page 46, Fig. 13: Chart is bad oriented. Good orientation is on Fig. 14.
- Page 47, Fig. 15: Bad description of Wet Bulb Temperature (not **Wer** Bulb Temp.)
- Page 101, Table 35: **What is the total number of occupants in house?** Do you calculate heat gains from all occupants?
- Page 103,104, table 36, 37: **Do you sizing pipes according equivalent diameter or real designed diameter?**

▪ *Questions relating to the defence of the thesis*

- **What is the difference between Near Zero Energy Building and Net Zero Energy Building?**
- **What is the correlation between the leakage of window and VAC system during operation?**

- **What is the price of chandelier lamp (type LED, 100W apparent load, intensity 2400 lm) mention on the end of page 111?**

- Conclusion, evaluation of the overall qualities of the submitted thesis and classification according to the rating scale

The work is good. The application made on concrete building demonstrates the ability of diploma students mastering the subject. At work are some inaccuracies and incorrect technical terms. Work fulfils the requirements for a university qualifying work and I recommend it for defence.

**Overall evaluation of the thesis:**

The Opponent shall grant a mark according to the ECTS classification scale:

A – Excellent, B – Very Good, C – Good, D – Satisfactory, E – Sufficient , F – Insufficient

An “F” grade also means "I do not recommend the thesis for defence."

**I recommend this thesis to be defended and suggest the following evaluation:**

**B - Very Good**

**In the case of an evaluation grade of “F – Insufficient”, please supply the main shortages and reasons for this assessment.**

Date: 4.9.2015

Thesis Opponent's Signature:

