**Topic 1**: HVAC&R Components and Systems (12 pt. Leave one line after, Times New Roman for full length paper text)

Heat Transfer in Ground Heat Exchangers with Groundwater Advection (Template for Full Length Paper of ISHVAC2017, 14 pt. Bold. Capitalize the First Letter of Keywords)

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***Keywords****: Heat transfer; Advection; Porous medium; Ground source heat pump; Ground heat exchanger (Italic, Maximum five keywords, Capitalize the first word, 12 pt. Leave one blank line after)*

# ABSTRACT (Times New Roman Bold 12 pt, UPPERCASE, leave a blank line before and after the main level headings)

Prepare an informative abstract of up to 150 words for your paper. The abstract should provide information on the purpose of the study, methods or procedures, results, discussion and concluding remarks. The abstract should be a self-contained statement giving the reader a clear indication of the purpose and content of the paper. **This file can be used as a template by simply replacing the corresponding text with your own.**

# INTRODUCTION

The introduction should present the practical and scientific background for the study or presentation, the hypothesis and a clear statement of the objective (s) of the study/presentation. ***(Leave one blank line between paragraphs throughout)***

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Please use A4 paper format when preparing your paper. All margins should be set to 25 mm. Use single column format. All text should be justified using ***Times New Roman*** font with 12 pt size. Leave a blank line between paragraphs and before and after a main level heading. Please use 12 pt UPPERCASE bold font for main headings and 12 pt normal lowercase (The first letter capitalized) bold font for second level headings. Avoid use third level headings. Please do not number the pages. The **maximum length of a paper is 8 pages** including references, figures and tables.

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# METHODS

This section should describe the study design, materials, measurement methods, and procedures and statistical methods. Measurement and statistical methods should be mentioned, but for routine methods a reference rather than a description of the method is recommended.

The full papers must provide new information on scientific validation, comparative testing, research or development. Commercialism is not allowed.

# RESULTS

Please provide some overall comments on the findings and their applicability in other settings or applications. You should do the analyses of the results for readers.

## Tables and illustrations (Times New Roman Bold 12 pt, Lowercase for 2nd level heading)

In general, figures and other illustrations should be used when they are shorter, clearer, or more effective than explanations in words. Avoid tables and figures that duplicate each other or present superfluous data. If you use a figure, do not include a table for the same information. Substitute a few typical results for lengthy tables when practical. A table must have a suitable caption above it, and a figure must have a caption below it. Use single line border as shown in Table 1. Tables and figures should be inserted in the text near to the place they are mentioned the first time. Please insert figures as ‘picture’ (e.g. wmf or jpg), not as ‘objects’ or spreadsheets. Maintain the resolution of photos and figures to 300 pixels/inch. Do not extend figures or tables beyond the margins. Please do not shrink the figures too small. Your eye resolution is the same for the text in a paragraph or in a figure.

***(Leave one blank line before and after tables, figures and equations)***



*Figure. 1. The temperature rise on a circle around the heat source (****Italic figure caption****)*

[***leave one blank line between a figure and a table***]

*Table 1. Typical values of hydraulic and thermal properties of soils and rocks (****Italic table caption****)*

|  |  |  |  |
| --- | --- | --- | --- |
| Medium | *K*  [m·s−1] | *ε* | *k\*\**  [W·m−1·K−1] |
| Gravel | 3.0E−3 | 0.31 | 0.98 |
| Sand (coarse) | 7.3E−5 | 0.385 | 1.02 |
| Sand (fine)n | 6.3E−6 | 0.40 | 1.03 |

[***leave one blank line between a table and the following text***]

## Equations

Equations should be numbered at the right margin, as in the example below (***Leave one blank line before and after an equation or between equations***):

 (1)

where K is the hydraulic conductivity, and h the hydraulic head. The volumetric flow rate per unit of cross-sectional area, q is equal to the average linear velocity of the liquid over the cross-section.

## Names and units

Only use the metric system (SI units). Frequently used technical terms may be abbreviated after the first time they are mentioned: “Ground heat exchanger (GHE) can…”

# DISCUSSION

The most important findings of the paper should be put into perspective with prior knowledge. Possible sources of error that may affect the interpretation of the results should also be discussed.

Discussion should also present authors’ interpretation of the meaning of the results. The authors are encouraged to make recommendations on the basis of the earlier knowledge and the present results with special reference practical achievement.

The discussion of implications should tell readers what the importance of the work is for others including researchers, building designers, owners and operators, or occupants.

# CONCLUSIONS

The conclusions must be supported by the findings you detailed in the RESULTS section. They should be solid, new, and concise.

# ACKNOWLEDGEMENT

You may acknowledge the assistance provided by others to your paper or address the sources of financial aid. We would like to thank our committee members, sponsors, supporting institutions, and participants for their active efforts to take part in the ISHVAC 2017.

# REFERENCES

Cite the literature by using author and date format, such as a paper published by Fang and Diao (2002). You could also use the format (Fang and Diao 2002). Please do not use a comma between name and date. Single author’s name and two authors’ names should be included in the text. For three or more authors, use the last name of the first author with “et al”. For example

...Following the Eskilson’s model (Eskilson 1987), a further approximation is .... the GHE can be considered by superimposition of a series of heating pulses (Fang et al. 2002). Consequently,...

Do not use blank lines between references. Instead, use a hanging indent of 0.6 cm, as in the examples below. **The references should be in alphabetical order**.

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