READ ME

Temperature distribution in a weighing station of the road network: Data from an experimental measurement campaign

A. DESCRIPTION

This dataset contains temperature values measured in the pit of a heated weighing station of the road network in Quebec City (Quebec, Canada).

B. CONTENTS OF THE REPOSITORY

The experimental data were collected from December 21, 2023, until March 5, 2024. This dataset includes temperature values at 87 different locations inside the pit, measured every two minutes, allowing the reconstruction of the 3D temperature profile.

Sensors were installed on 29 vertical stands and at three height levels: LOW (0.40 m above the floor), MID (0.80 m), and TOP (1.2 m). The location of the 29 stands is shown in Figure 1.

In the Excel file, the first line contains the headers and the following columns report:

- A: Time in a format YYYY-MM-DD HH:MM
- B: Outdoor temperature [°C] from a nearby weather station
- C: Outdoor relative humidity [%] from a nearby weather station
- D to AF: Temperature measured [°C] in each of the 29 positions of Fig. 1 at the low level
- AG to BI: Temperature measured [°C] in each of the 29 positions of Fig. 1 at the med level
- BJ to CL: Temperature measured [°C] in each of the 29 positions of Fig. 1 at the top level

A CSV file with the same data is also provided with the exact same structure.

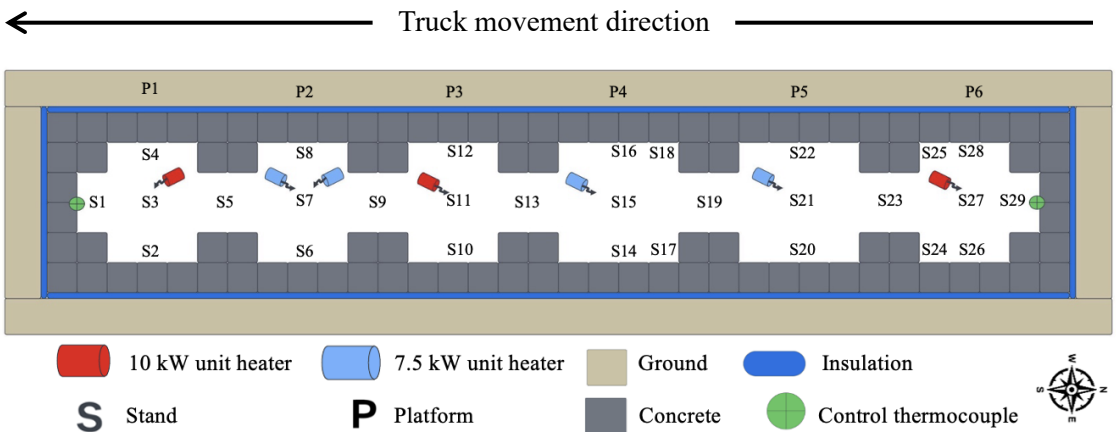

Figure 1. Floor plan of the pit and location of the temperature sensors during the measurement campaign.

Additionally, three pictures (credit: Mohammadreza Tohidi) have been added to help understand the geometry of the weighing station:

- Picture 1: Exterior view of the weighing station on which trucks are to be weighed
- Picture 2: Interior view of the pit where weighing equipment and heaters are located. White vertical poles were added to install sensors.
- Picture 3: Interior view of the pit, with a heater on the left.

The temperature sensors are NTC thermistors from the CWF series, with a resistance tolerance of ±3%, operating within a temperature range from -55°C to 125°C. This tolerance corresponds to a temperature measurement uncertainty of approximately ±1 to ±2°C, depending on the operating temperature. The thermistors have a thermal time constant ranging from ≤15 seconds to 70 seconds [1]. In this experiment, data registration occurred every 60 seconds; however, the temperature data attached to this document includes temperature readings at 120-second intervals to shorten the dataset length. The raw dataset consists of voltage values that need to be converted to temperature values using the Steinhart-Hart equation:

$$\frac{1}{T} = A + B\ln R + C(\ln R)^3 \tag{1}$$

where:

- T is the temperature in K
- R is the thermistor resistance [Ω]
- A , B and C are the coefficients of Steinhart-Hart [-]

To find R-value mentioned in Eq. (1), one can use:

$$R = \frac{V_t \times 10000}{V_{CC} - V_t} \tag{2}$$

where:

- V_t is the voltage measured by sensors [V]
- V_{cc} is the source voltage which is 4.911 [V]

Before converting voltages to temperature, specific filters were applied to the raw data:

- Negative values were removed
- Values close to 0V (less than 0.1V) were removed
- Values close to 5V (greater than 4.9V) were removed

C. ADDITIONAL INFORMATION

- When no data point was collected from a sensor or when a data point was removed from the filtering mentioned above, it is listed as NAN in the Excel file.
- Prior to January 26, 2024, the 10 kW unit heater located under platform 6 (P6 in Fig. 1) was not operating, resulting in low temperatures in that zone.

- On December 25-27, 2024, the weighing station was closed, and no operations were conducted.
- Except for the above-mentioned periods, the unit heaters were operating normally under their control algorithm.

D. REFERENCES

If you use this dataset, in addition to citing this database, consider citing the following papers:

- M. Tohidi, J. Rouleau, L. Gosselin, Analyzing and improving the thermal performance of road network weighing stations through measurements and CFD modeling, Case Studies in Thermal Engineering 2025 https://doi.org/10.1016/j.csite.2025.106543
- M. Tohidi, J. Rouleau, L. Gosselin, Experimental Study of Heat Transfer Mechanisms and Energy Consumption in a Heated Truck Weigh Station during Winter, Proceedings of the 11th International Conference on Fluid Flow, Heat and Mass Transfer (FFHMT 2024), Chestnut Conference Centre, Toronto, Canada, June 16-18, 2024, 8 p. https://doi.org/10.11159/ffhmt24.107