SENSOR DATA ANALYSIS

(FOR FACILITIES MANAGEMENT)
FOSTER + PARTNERS

DATA EXTRACTION

The available data included:

1. Indoor air quality data (iaq.json)
2. Outdoor air quality data (oaq.json)
3. Sensor location data (floors.json)

The available data included TimeStamp for the collected readings by the sensors along with the Temperature, Humidity, and CO2 data with their sensor IDs.

MAKING DATA ANALYSIS READY

Preparing data for forecasting requires a series of checks and transformations. This includes identifying missing values, ensuring date continuity, detecting outliers, and determining the correlation between data variables. The initial step before all these is to subset the data of working hours (9 am - 5 pm). These steps are crucial in data analysis. For instance, when performing Pearson correlation, it was discovered that none of the variables have any correlation with each other.

MAKING DATA ANALYSIS READY

MISSING VALUE CHECK

There are no missing values found in the data.

CHECKING DATA FORMATS

Changing format for time stamp so that it can be analysed date wise. The available format was ‘text’ for date.

ADJUSTING VALUES

The temperature at desk height is 1.5 degree lower than sensor reading which has been adjusted.

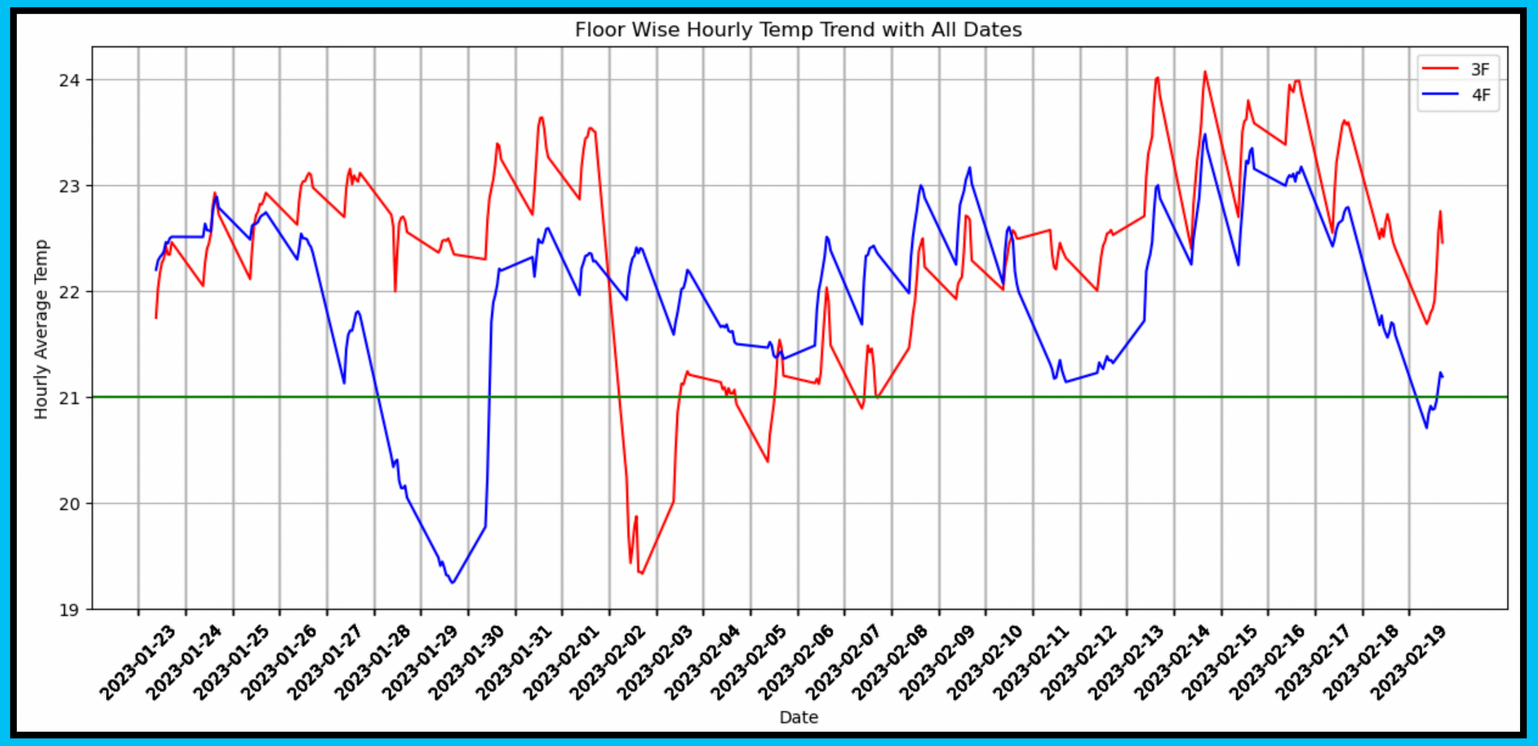
DATA SPLITTING

Data available for 3rd floor and 4th floor has different floor plans, therefore split data floor wise and sensor wise to dig deeper.

PRELIMINARY ANALYSIS

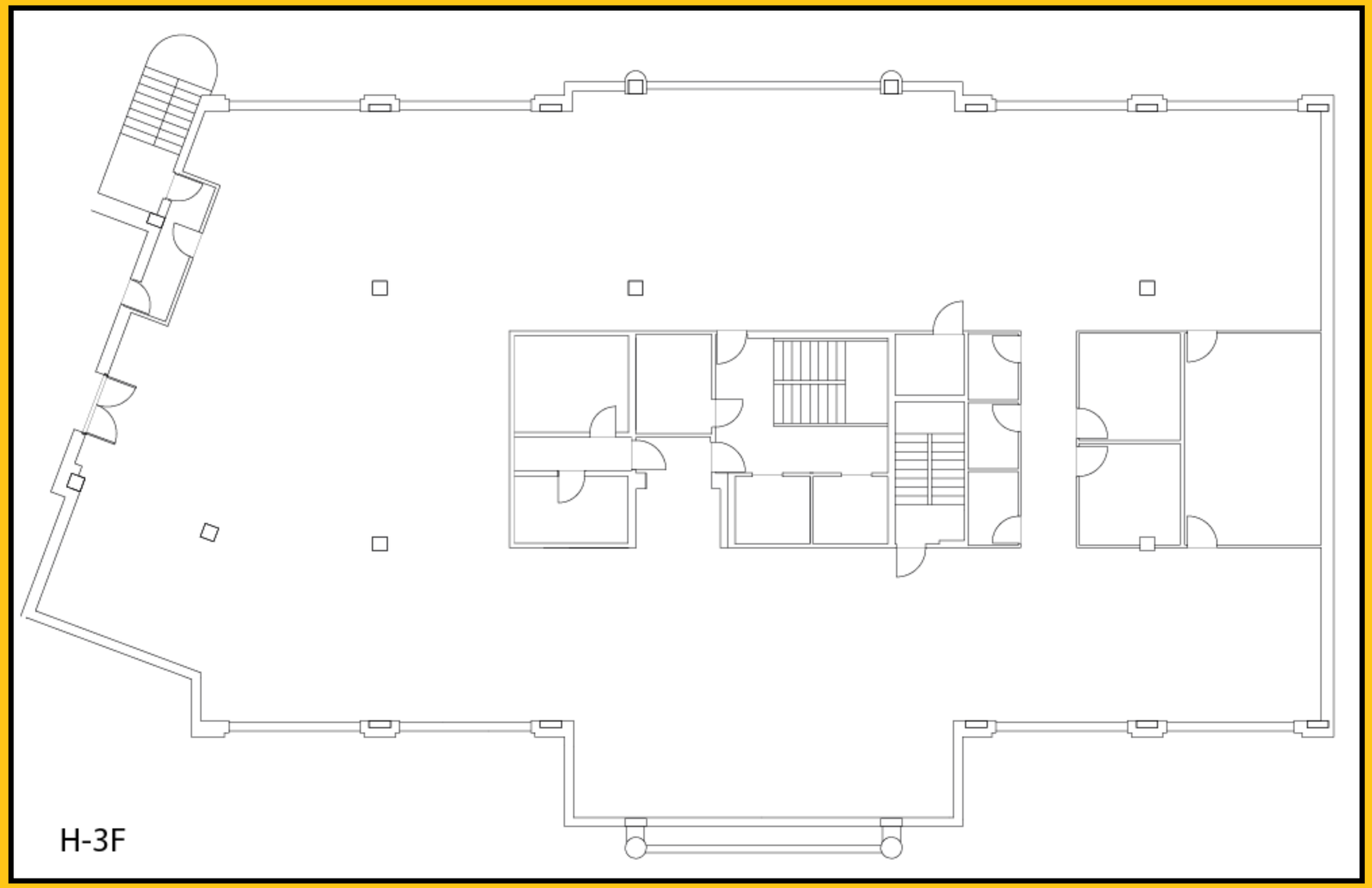
1. The available data points are analysed keeping in mind that the facilities manager needs to control the building temperature and CO2 levels during the working hours.
2. When analyzing data, we kept the goal in mind to save time and energy, while identifying target areas and dates to take further action.

FLOOR WISE TEMPERATURE TREND



1. The temperature data is divided floor wise, revealing a clear variation in trends with a threshold of 21 degrees Celsius.
2. The temperature trend displays hourly averages, with 12 values per hour.
3. On weekends, there is a noticeable drop in temperature with a few drops occurring on weekdays.
4. Mainly 3 days have the temperature dropped below the threshold, out of which only 1 is the weekend.

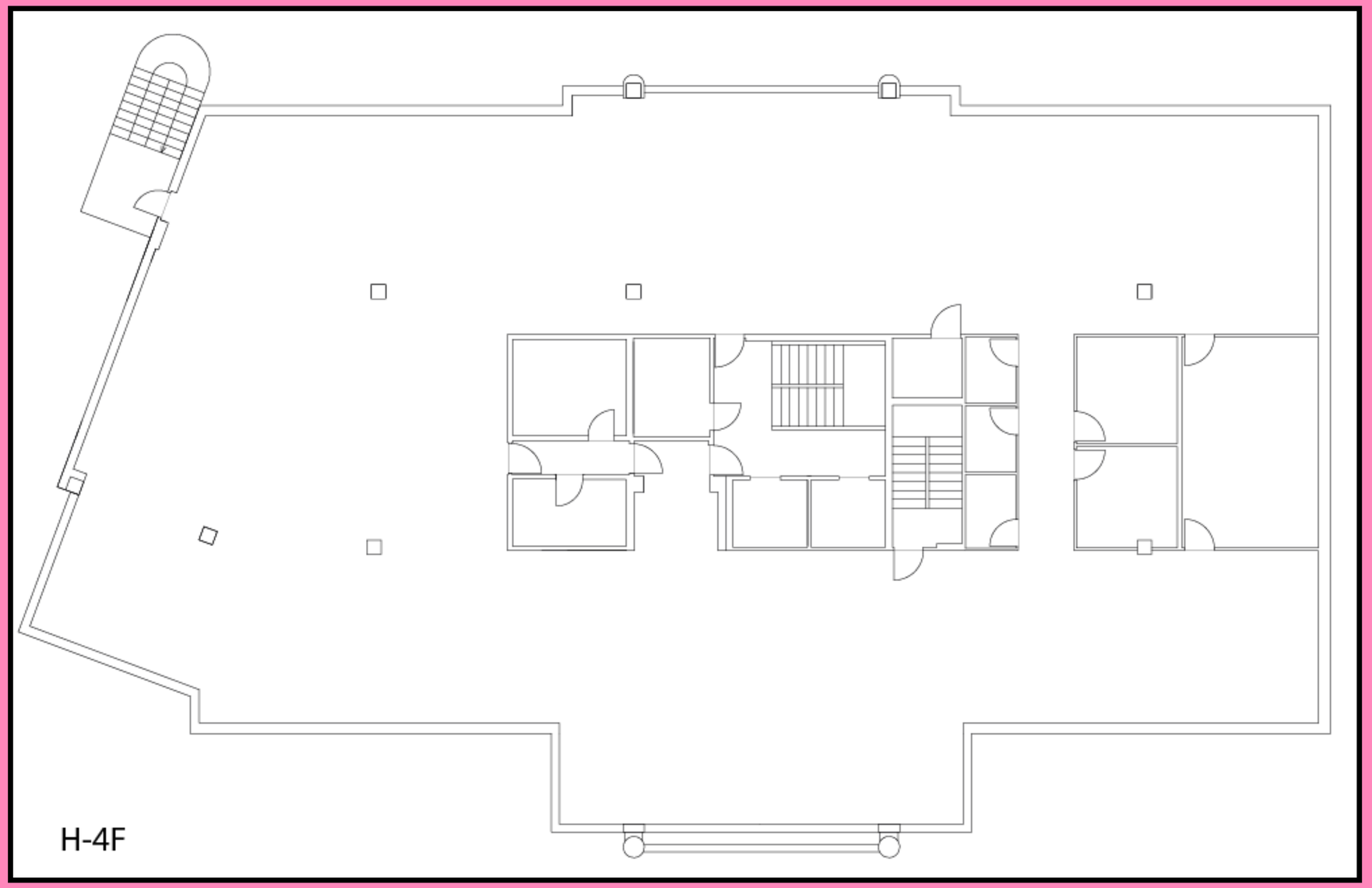
3RD FLOOR PLAN



The floor plan shows that this floor is probably insulated.

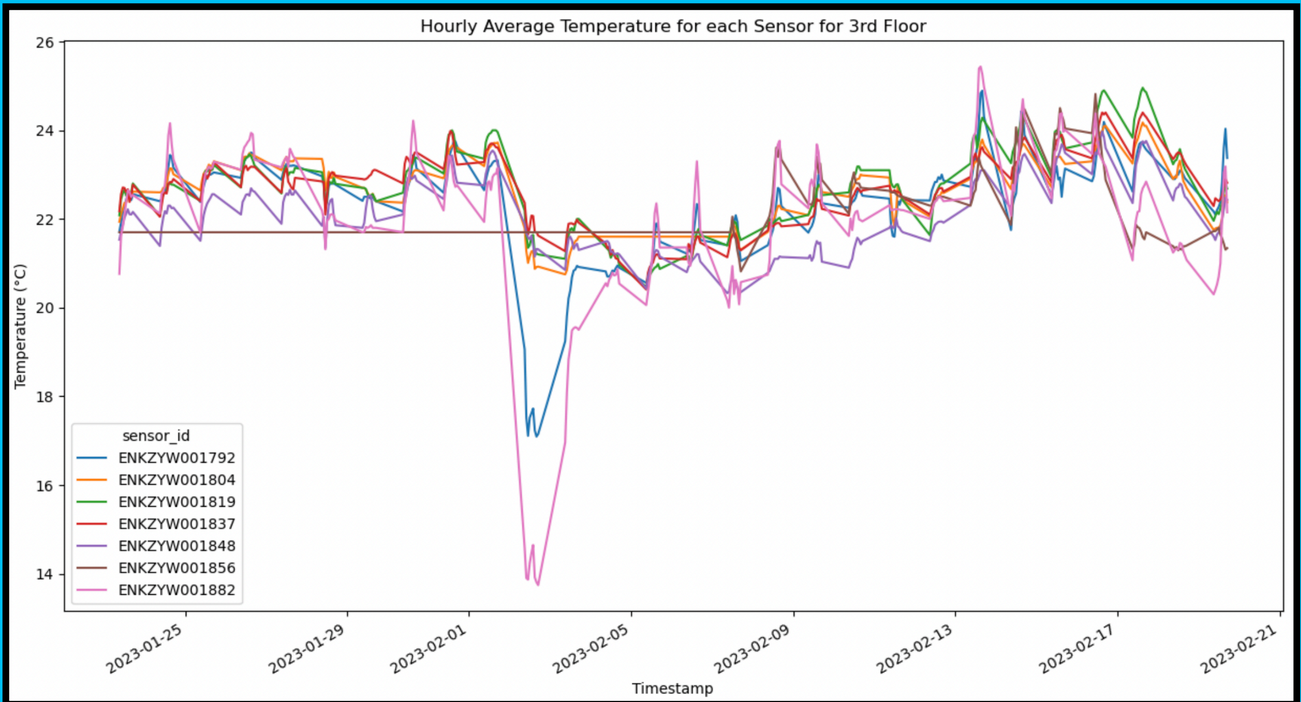
1. **The floor seems to have insulated glass units (IGUs), providing insulation from outside weather.**
2. **Insulation seems to be maintaining the indoor temperature.**

4TH FLOOR PLAN



The floor plan shows that this floor is probably not insulated.

1. The outdoor weather conditions could have an impact on the indoor temperature.
2. There could be a notable impact when HVAC systems are turned off.

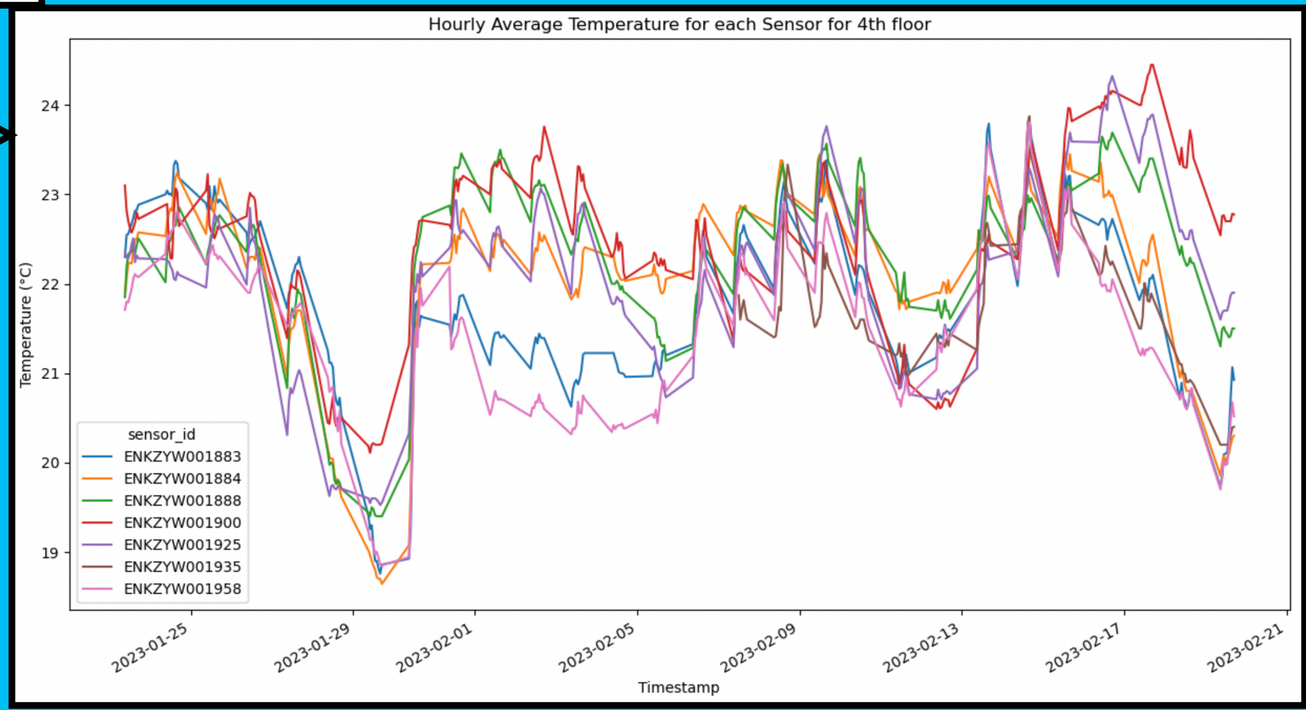


3RD FLOOR TEMPERATURE BY EACH SENSOR

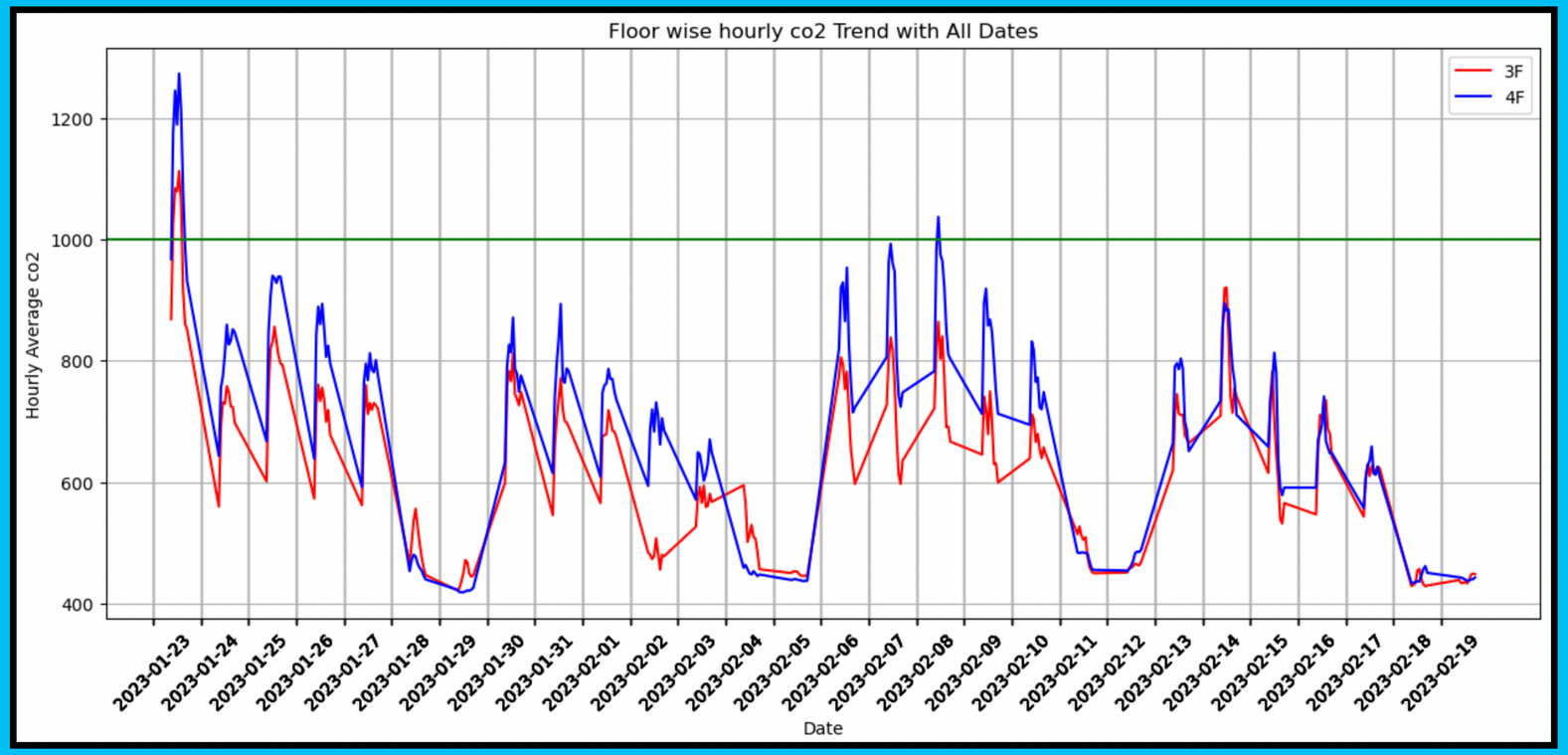
1. Most sensors show similar values, indicating well-maintained temperatures due to insulation.
2. On a weekday, there has been a significant drop shown by ENKZYW001792 and 1882. This could be due to a fault in the sensor, HVAC system, or insulation.
3. Due to the large number of such values, they cannot be removed to prevent data loss.

4RD FLOOR TEMPERATURE BY EACH SENSOR

1. Sensors indicate temperature variations across the floor, suggesting the absence of insulation.
2. Based on the sensor readings, it appears that the temperature drops as expected during weekends.



CO2 TREND



1. The graph shows the hourly average of CO2 level with a 1000 ppm threshold (green line).
2. The CO2 level is maintained under the threshold, probably using HVAC systems.
3. An unusual spike appears at the beginning, possibly due to system failure or a surge in headcount from an event.
4. The CO2 level on the 4th floor is a bit higher than that on the 3rd floor.
5. The levels indicate the potential for either high occupancy or an HVAC problem.

SUGGESTIONS & KEY INFERENCES

TEMPERATURE CONTROL

- The average hourly temperature readings can aid in managing the building's temperature throughout the day.
- During working hours, the temperature tends to be cooler in the morning and gradually increases in the afternoon by 2 to 3 degrees. It is recommended to adjust the temperature control setting during this time to maintain a temperature of 21 degrees, and not more, to conserve energy.

PREDICTION

- The data has been cleaned and turned stationary so that the predictive modelling can be done.
- Reset/Default have been identified to remove any discrepancies from the data.

CO2 MANAGEMENT

- The data depicts usual spikes during working hours with no fluctuations except for one event. The average value ranges from 600 to a maximum of 900 during normal working hours.
- It is suggested to maintain a daily overall level of 600 to ensure breathing air quality during sudden head count rises.

MICRO MANAGEMENT

- After dividing the data floor wise and sensor wise, different areas of the building can be monitored and micromanaged on a regular basis to avoid sudden surges in temperature and CO2 levels.
- Since the 4th floor is not insulated, it The temperature can be controlled by utilising the sensor wise trend.

AS A FACILITY MANAGER, THE AFOREMENTIONED CONCLUSIONS AND SUGGESTIONS CAN BE USED TO BETTER MANAGE THE FACILITIES.

THANK-YOU