# ILLUMINATING LILLIS

## INTRODUCTION

The classrooms in the Lillis Business Complex are illuminated by a daylight integrated lighting system, which was designed to provide approximately 30 footcandles (fc) at desktop height under the "Lecture 1" preset.

When a user pushes the "on" button for the classroom lights, the automatic shades open to let in daylight, and the electric lights turn on at 50% illumination and adjust according to the amount of light received by photo sensors located above the ceiling panels.The lighting systems are broken up into three light gradients moving away from the windows.

Four preset lighting conditions are provided for the user: "Lecture 1," "Lecture 2," "Projector 1," and "Projector 2." While under the preset conditions, the system continues to automatically respond to daylight levels. However, if the shade position or individual lighting zones ("wall wash," "audience," "board," and "screen") are manually adjusted, the system is overridden and will no longer automatically adjust according to available daylight.

## INQUIRY QUESTIONS

Are lighting levels substantial for tasks when the electric lights are on or off?
Are the system controls being overridden?

## HYPOTHESIS

*The daylight integrated lighting systems in the classrooms of the Lillis Business Complex do not provide 30 foot candles at desk level per the design intentions*

## METHODOLOGY

We chose four classrooms in which to conduct our study. Two are north facing (rooms 162 and 262) and two are south facing (185 and 285). We conducted two separate studies: a study of the illumination levels in the classrooms to determine if the lighting levels at desk height were adequate for the required tasks, and a patterns of use study to determine the user/lighting system interaction throughout a typical week of classes.

## ILLUMINATION


Fig. 1


Fig. 2

Fig. 1: North-facing classroom.

Fig. 2: Light meter.

Fig. 3: Section graph of daylight factor distribution in Room 162.

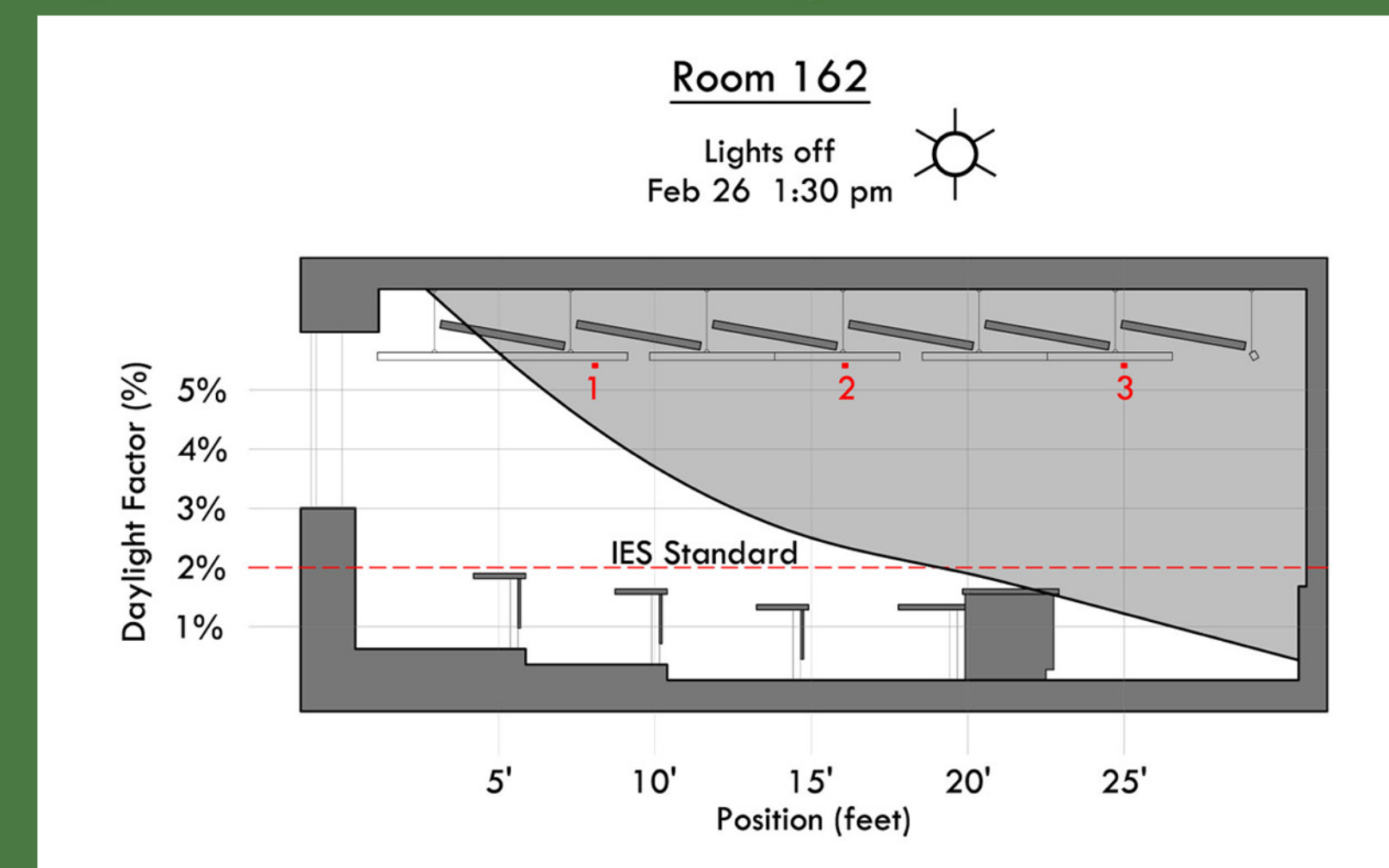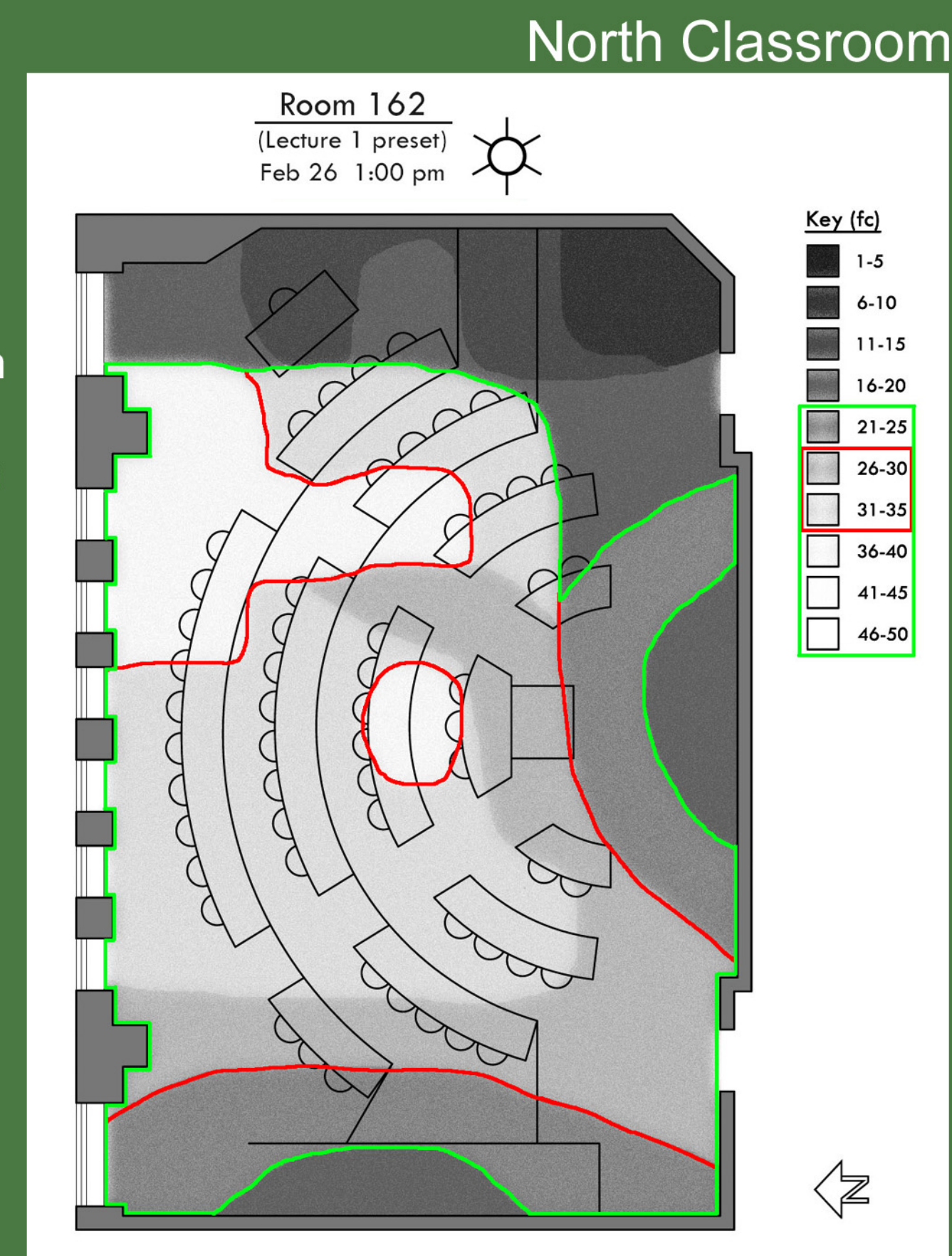Fig. 4: Light distribution of preset "Lecture 1" in Room 162.
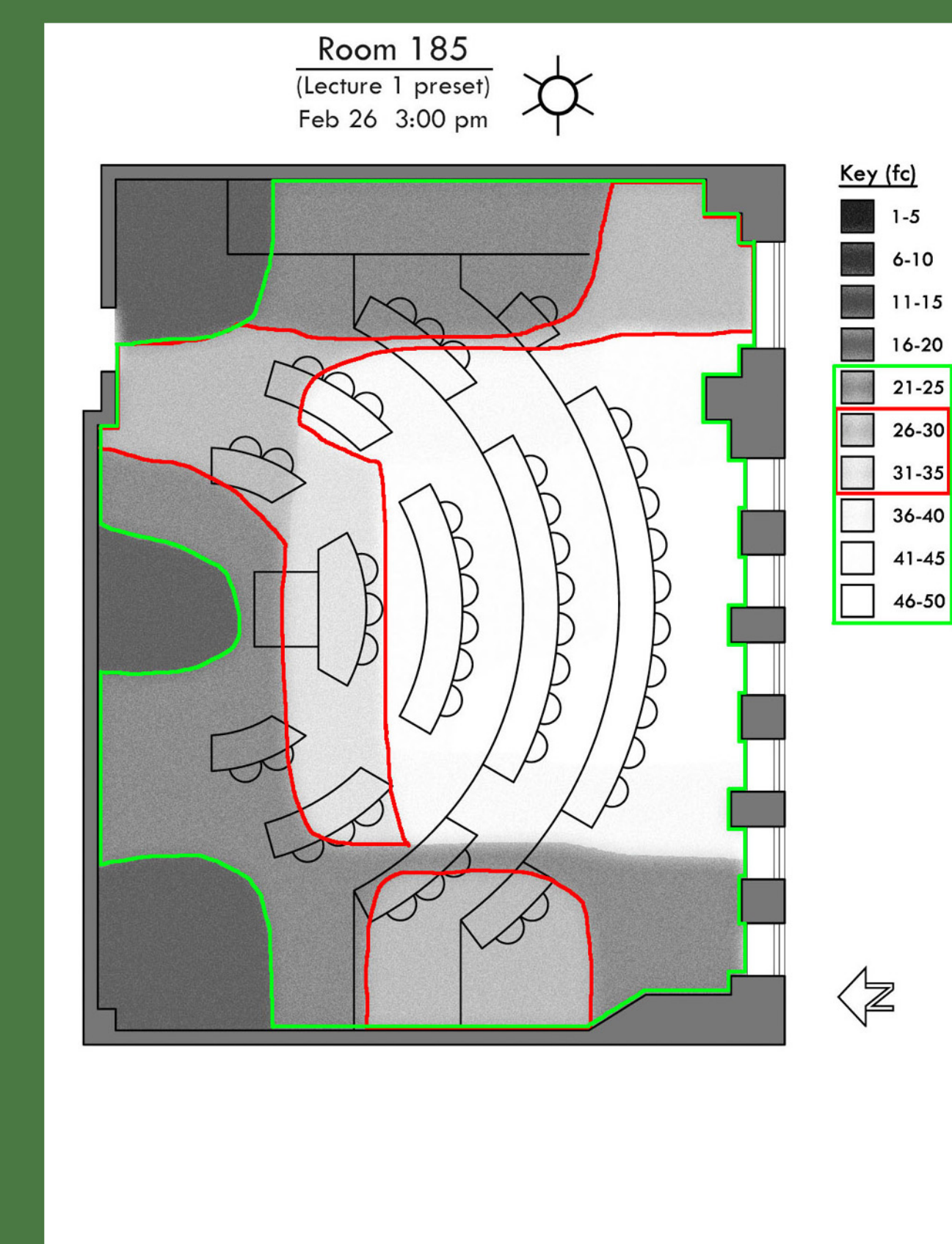

Fig. 3

North Classroom


Fig. 4

Fig. 5: Light distribution of preset "Lecture 1" in Room 185.

Fig. 6: South-facing classroom.

Fig. 7: Light shelves in South-facing classrooms.

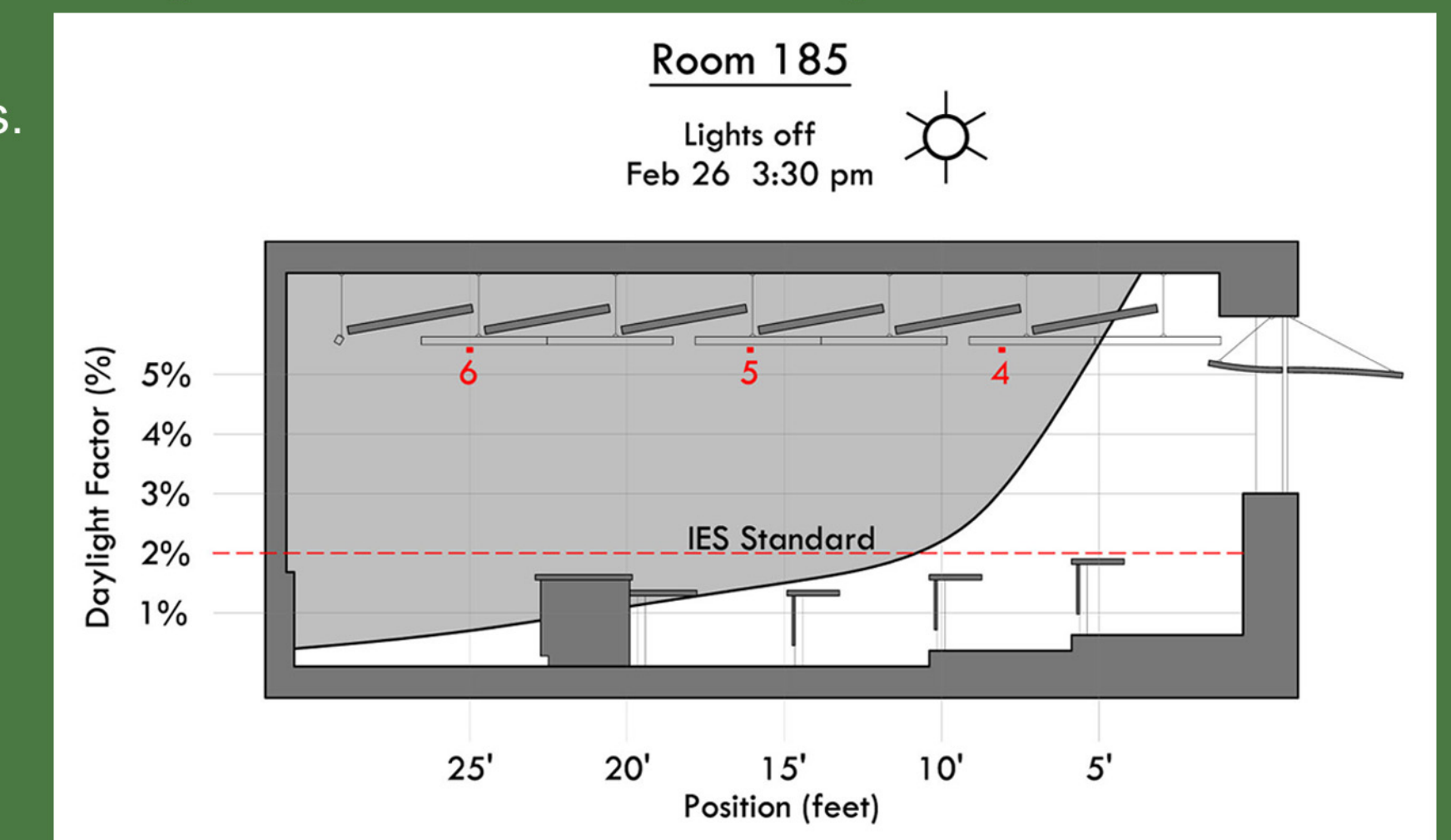Fig. 8: Section graph of daylight factor distribution in Room 162.


Fig. 5

South Classroom


Fig. 6


Fig. 7


Fig. 8

## PATTERNS OF USE


Fig. 9


Fig. 10

Fig. 9: Hobo data logger in place during study.

Fig. 10: Light fixture and photo sensor.

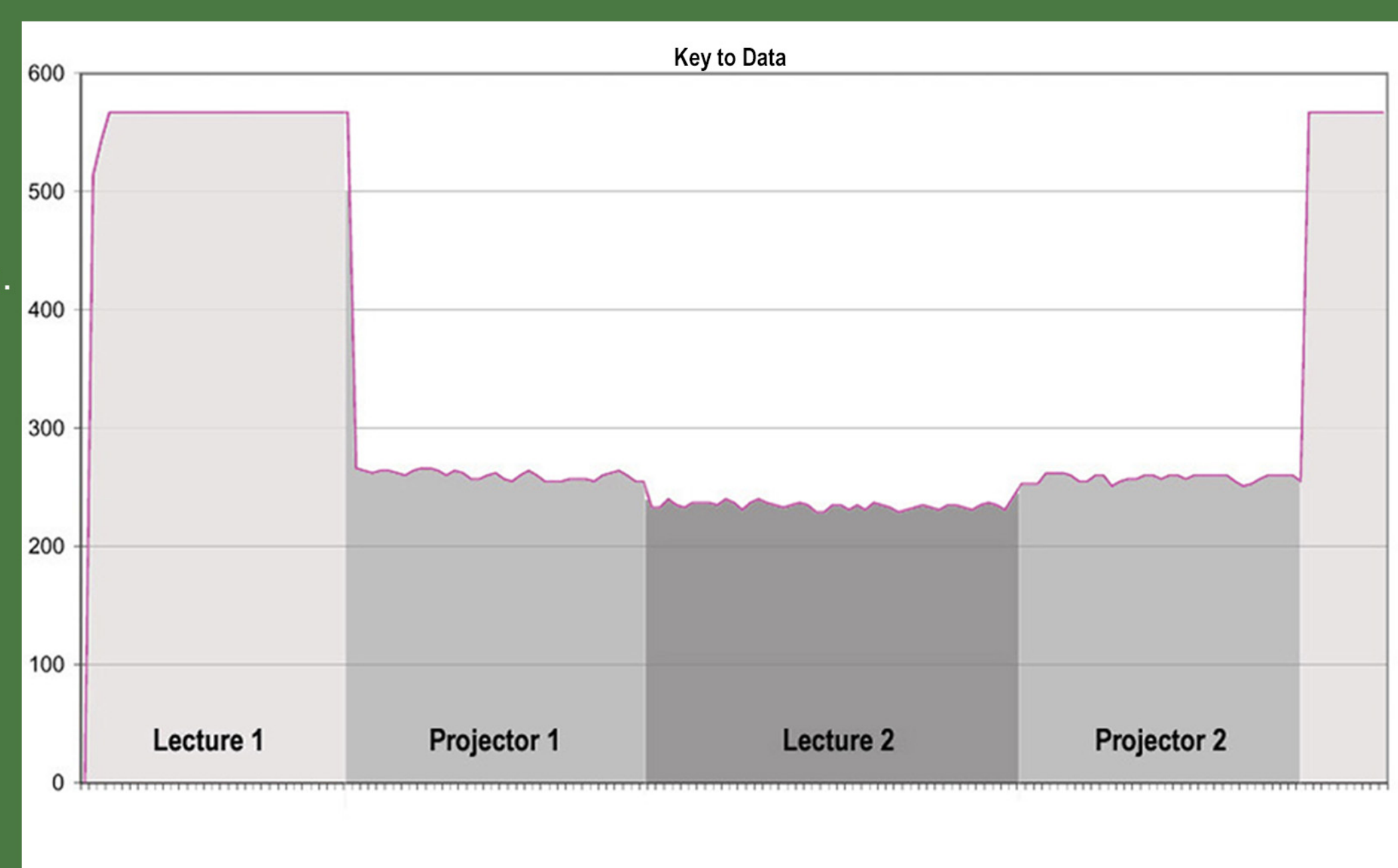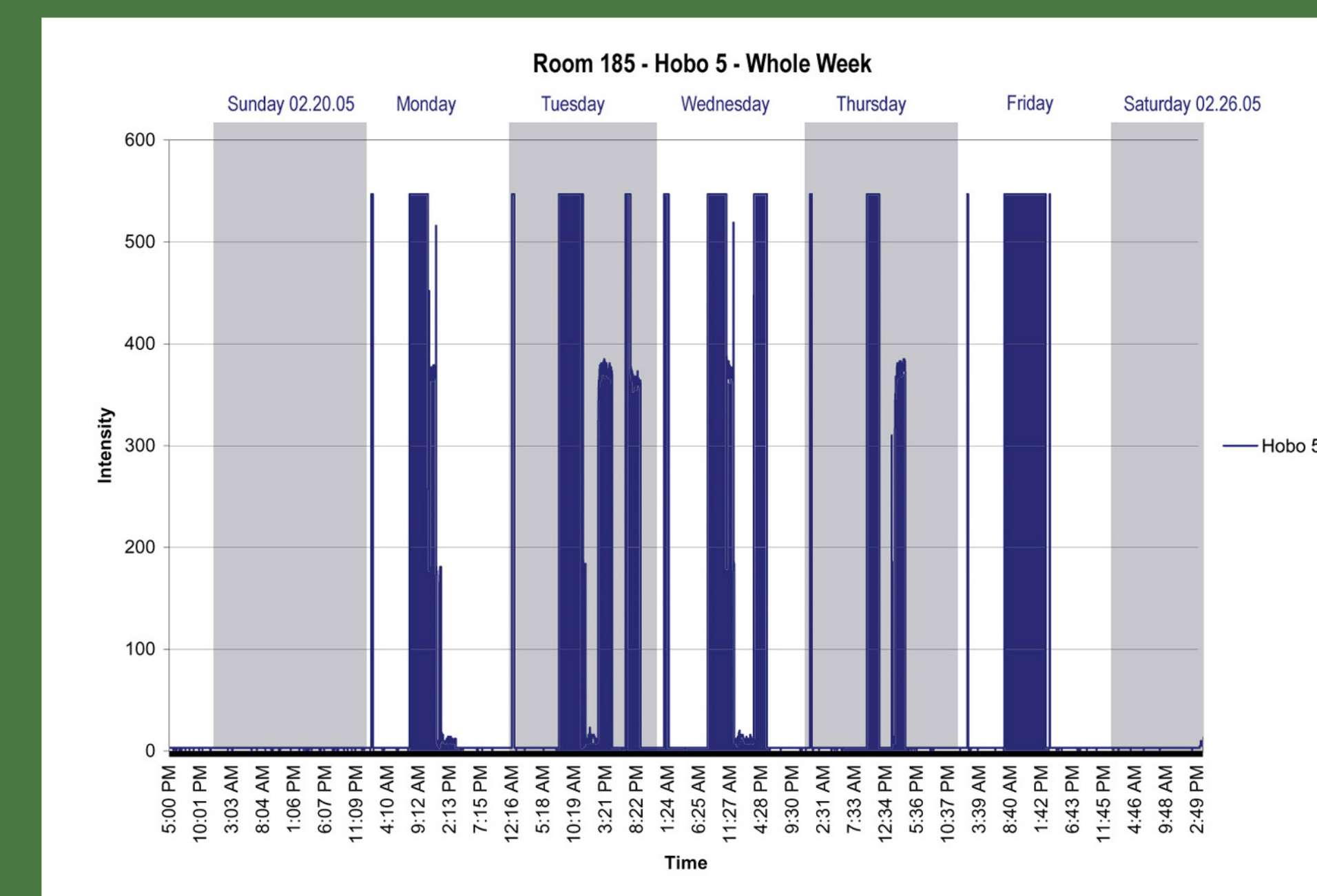Fig. 11: Key to Patterns of Use data.


Fig. 11

Fig. 12: Patterns of Use data for one week from one Hobo sensor.

Fig. 13: Class in session.

Fig. 14: Patterns of Use data for one day from one Hobo sensor.
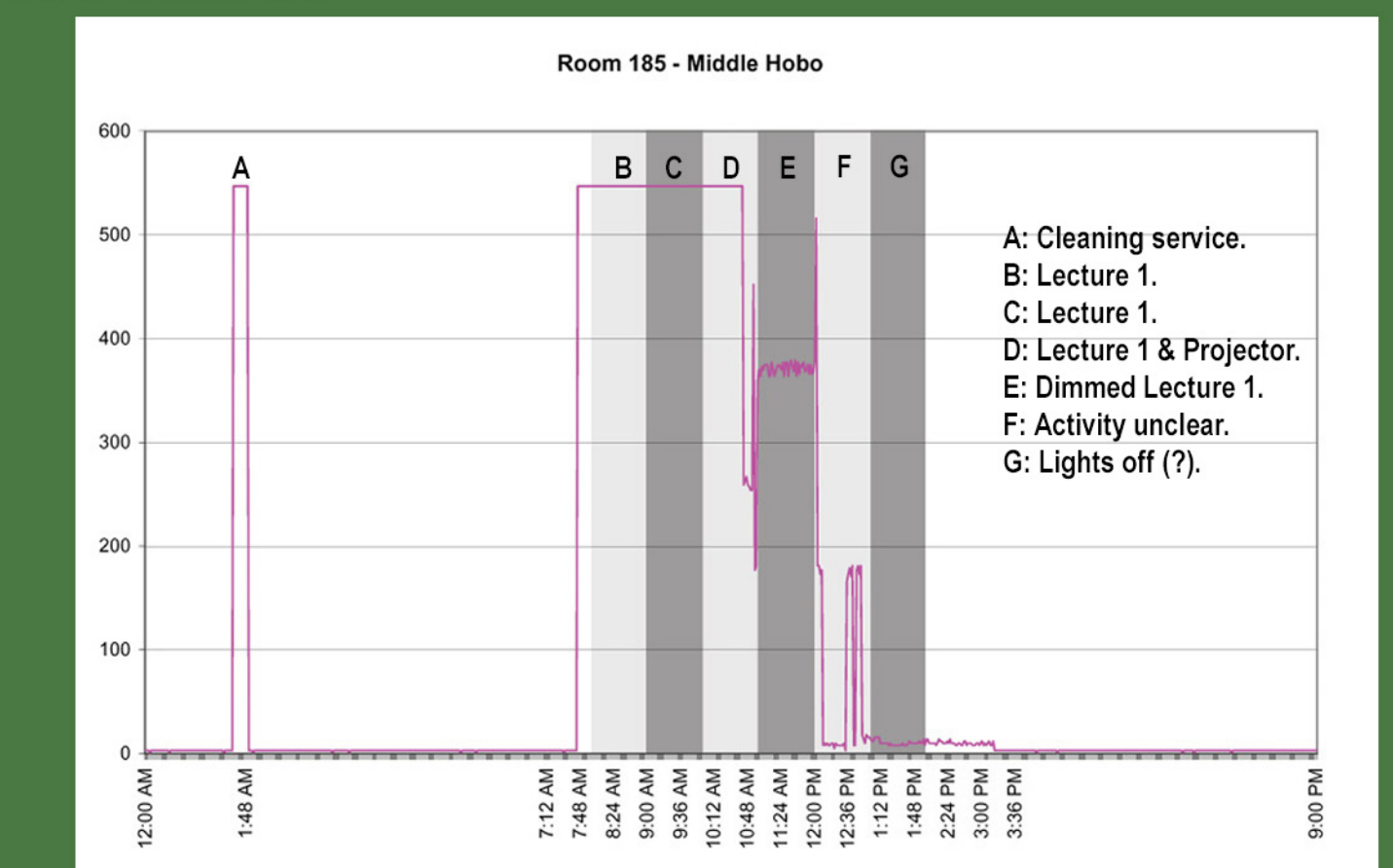

Fig. 12


Fig. 13


Fig. 14

## CONCLUSIONS

Illuminance Study: Based on the data we gathered the design intentions are not being consistently met, yet in comparison to published standards, the measured levels are still within the desirable range.
Patterns of Use: Based on the data gathered, we can determine that the lighting systems are not turning on at odd times of the day or night. We can also conclude that the electric lighting presets are being used throughout class periods.

## FUTURE STUDIES

Study illumination levels for the other presets: lecture 2, projector 1, and projector 2.

Lighting Power Density study.

Conduct Patterns of Use study in coordination with instructor interviews.

Follow up Patterns of Use study with more in-depth analysis of data; use direct observation to help interpret graphical data collected.

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Lillis Busines Complex Electric Lighting Case Study