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Research Article

Application of the Five-Minute Rating Method in Measuring Labor Productivity in the Jakarta Office Tower Project

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Abstract

Labor productivity is a critical factor in construction projects, directly influencing the successful achievement of time and cost targets. In the Office Tower Construction Project selected as the case study, schedule delays necessitated the implementation of overtime work as an acceleration measure; however, the effectiveness of this policy on labor productivity in the field has yet to be objectively measured. This study aims to compare labor productivity levels between regular hours and overtime using the Five-Minute Rating method. The research employed a descriptive quantitative approach, observing workers' activities and classifying them as effective, essential, or ineffective. The results indicate a notable difference in productivity between regular and overtime hours. During regular hours, the average Labor Utilization Rate (LUR) was 60.8%, with the highest levels in the morning (60.8%–71.5%) and declines in the afternoon and evening. In contrast, during overtime hours, the average LUR was lower, at 53.6%, and exhibited a declining trend throughout the night shift. The average decrease in productivity during overtime was 7.2%, with the highest decline on the third day at 9.6%. Dominant factors contributing to the decline in productivity over time include cumulative fatigue from regular shifts, suboptimal lighting conditions, and an increased proportion of contributory activities relative to direct work. These findings indicate that implementing overtime should be accompanied by appropriate mitigation strategies to maintain labor productivity.

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Introduction

In the construction industry, labor productivity is a key factor in determining the success of a building project, interacting dynamically with other factors such as the availability and quality of materials, equipment, and work methods. The ability of a well-organized workforce to efficiently transform materials into buildings is the operational definition of productivity in this context (Kristiana & Ramadhan, 2025). In the construction context, productivity is often defined as labor efficiency, measured by comparing output volume to the work time expended (Boy, 1986). This definition emphasizes a process's ability to complete a certain amount of work with available input resources

(Halpin & Riggs, 1992). The overall success of a construction project essentially depends on the effective completion of each task (Gunawan & Setyawan, 2022; Manurung et al., 2023; Stringer et al., 2025), where labor productivity plays a crucial role (Ibrahim et al., 2024), which will greatly influence the magnitude of the project's profits or losses (Prananda et al., 2024).

However, achieving optimal productivity during project implementation is often hampered by various field issues. The characteristics of Indonesia's construction workforce, dominated by unskilled and semi-skilled workers with limited formal training, pose a major challenge (Mirnayani & Prakoso, 2024). This low level of skill and competency standardization has the potential to affect consistent work quality and implementation speed. During the implementation process, various nonproductive activities by workers, such as idleness, chatting, eating, drinking, and smoking outside break times, further exacerbate inefficiencies and slow project progress (Thenu et al., 2019). Project delays often stem from time wasted on nonproductive activities during working hours (Pradhana et al., 2025). These activities, such as idleness, chatting, eating, drinking, and smoking outside of designated break times, significantly exacerbate inefficiencies and slow project progress (Thenu et al., 2019).

Labor productivity issues become increasingly complex when projects face time pressures that require overtime (Yunita & Hidayat, 2024). Physical and mental fatigue from long working hours can lead to decreased concentration and work quality. Weak supervision intensity from project management during overtime shifts is also a major trigger for decreased active worker participation (Kristiana & Ramadhan, 2025). This condition emphasizes the need for an accurate, practical measurement method to support the management and improvement of labor productivity under both normal and overtime conditions. To address this productivity measurement problem, an effective and efficient method is needed. One commonly used method is work sampling (Mirnayani & Prakoso, 2024). Work sampling is a random observation method that does not require continuous observation of each work group and aims to calculate the time spent on direct work activities (Prananda et al., 2024). This method can be divided into three approaches: field rating, five-minute rating, and productivity rating (Iroth et al., 2024; Thenu et al., 2019).

Of these three approaches, the Five-Minute Rating was developed specifically for its superior simplicity and speed in data collection (Januardi et al., 2025). This method is effective for general work evaluations. The Five-Minute Rating is a measurement method that uses relatively brief observation samples (Iroth et al., 2024; Januardi et al., 2025; Prananda et al., 2024) to provide reliable data (Tanne et al., 2024). This method is used to increase management awareness of the root causes of delays, evaluate workforce effectiveness, and identify areas where comprehensive and detailed planning can create cost efficiencies (Tanne et al., 2024).

The Five-Minute Rating method is implemented through continuous observation of a worker or crew unit over a specific time interval, typically five minutes. At each interval, researchers recorded performance ratings based on visual assessments of work tempo and efficiency levels (Januardi et al., 2025; Prakoso & Ratnayanti, 2021). These observations were repeated in several cycles to obtain representative data. The productivity variable resulting from this analysis is the Labor Utilization Factor (LUF), a metric that represents the percentage of time allocated to productive work activities (effective work) relative to the total observation duration (Prakoso & Ratnayanti, 2021).

The productivity measure resulting from this analysis is the Labor Utilization Factor (LUF) or Labor Utilization Rate (LUR) (Prasetyo et al., 2017; Thenu et al., 2019). The LUF value is the ratio of the time workers spend on productive activities (direct work) to the total available work time (Prananda et al., 2024), which also includes time wasted on non-productive activities (indirect work and delays). Thus, the LUF value serves as a quantitative indicator to determine the level of effective workforce utilization (Mirnayani & Prakoso, 2024). The higher the LUF percentage (approaching 100%), the more optimal the workforce productivity, and conversely, a low value indicates inefficiency (Thenu et al., 2019). The higher the LUF percentage, the more optimal the workforce productivity, and conversely, a low value indicates inefficiency.

The Work Sampling method using the Productivity Rating approach has been widely used to measure Labor Utilization Factor (LUF) in various types of construction projects, from wall construction (Iroth et al., 2024), shear walls (Mirnayani & Prakoso, 2024), foundations (Bandu et al., 2023), to reinforced concrete (Thenu et al., 2019). Findings from various studies confirm that LUF values are significantly influenced by execution time, with productivity tending to be higher during morning hours than afternoon hours (Thenu et al., 2019) and during normal hours than during overtime

hours (Yunita & Hidayat, 2024). However, in terms of measurement methods, the Five-Minute Rating method remains relatively rare in studies calculating construction labor productivity.

Based on this background, this study focuses on measuring Labor Utilization Factor (LUF) values and comparing the proportions of productive, contributive, and non-productive labor activities under normal and overtime working hours in building construction projects. Therefore, this study aims to apply the Five-Minute Rating approach as a productivity evaluation instrument to assess the effectiveness of workforce utilization under both implementation time conditions.

Research Method

This study uses a descriptive quantitative approach to analyze labor productivity levels in floor slab construction. The quantitative approach was chosen to measure productivity numerically through direct field observation data.

Location, Object, and Subject of Research

The research was conducted at the Menara Jakarta Office Tower Development Project located at Arena PRJ Kemayoran, Jl. H. Benyamin Sueb No. 10, Kemayoran District, Central Jakarta. The research location map is presented in Figure 1. The object of the research is the work on floor slabs 15 Zone 1, which includes three types of work simultaneously: formwork (installing scaffolding and arranging plywood), reinforcement (fabrication and assembly of floor slab reinforcement), and concrete casting. The research subjects were 16 workers who were directly involved in the three types of work during the observation period.

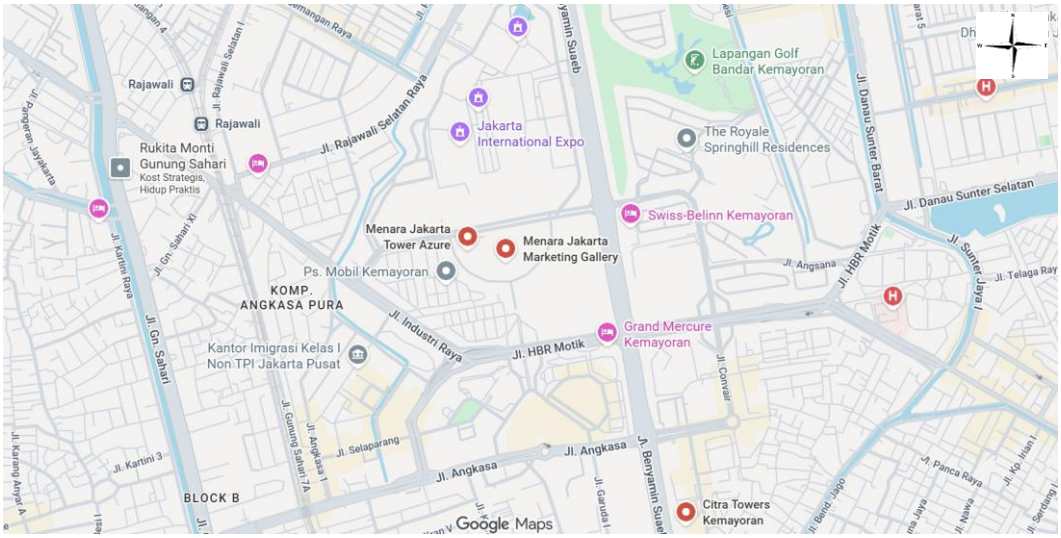


Figure 1. Location Map of the Menara Jakarta Office Tower Development Project (Source: Google Earth, edited by the author, 2025)

Data Collection

Primary data were obtained through observations of field workers' activities (craft labor) using a work-sampling method with a Five-Minute Rating approach. Worker activities were classified into the following three categories:

1. Effective Work: Productive activities that directly contribute to the completion of the work (e.g., compacting concrete, pouring concrete, assembling reinforcement, installing formwork).
2. Essential Contributory Work: Supporting activities necessary for the smooth running of the work but not directly producing output (e.g., transporting materials, operating a crane, cleaning the work area, receiving instructions).
3. Ineffective Work: Unproductive activities that do not add value to the work (e.g., chatting, smoking, waiting, walking aimlessly).

Observations were conducted at 5-minute intervals by two observers simultaneously for three consecutive days. To ensure consistency in assessments between observers, a common understanding was established prior to the observations regarding the operational definitions of each activity category. This shared understanding refers to activity classification guidelines developed based on the type of work observed, ensuring that both observers share a common benchmark for categorizing worker activities.

Observation Time Distribution

The observation periods were purposively selected to capture productivity fluctuations at critical moments during a workday. During normal working hours, the first cycle (8:00–9:00 AM) was chosen to observe productivity at the beginning of the workday after morning roll call, where workers' physical condition and morale were assumed to be optimal. The second cycle (10:30–11:30 AM) was intended to observe productivity leading up to the lunch break, which is generally characterized by a decrease in work rhythm. The third cycle (1:00–2:00 PM) was chosen to evaluate productivity immediately after the lunch break, which is often marked by late returns to the work area. The fourth cycle (3:00–4:00 PM) was intended to observe productivity in the last hour before the end of normal working hours, where fatigue factors begin to appear. During overtime, the periods 7:00–8:00 PM and 9:00–10:00 PM were selected to represent the beginning and end of the overtime session, respectively, to identify potential productivity declines attributable to cumulative fatigue. The distribution of observation times is presented in Table 1.

Table 1. Distribution of Observation Time

Regular		**Overtime**	
Period	**Waktu**	**Period**	**Time**
1	08.00 - 09.00	1	19.00 - 20.00
2	10.30 - 11.30		
3	13.00 - 14.00	2	21.00 - 22.00
4	15.00 - 16.00		

Data Analysis

Recapitulation of Observation Data

Field observation data were summarized to calculate the total frequency of each activity category (effective work, essential contributory work, and ineffective work) during each observation period. This total frequency was then converted to time units (minutes) by multiplying it by the 5-minute observation interval.

Labor Utilization Rate (LUR) Calculation

Labor productivity is calculated using LUR using the following formula:

$$LUR = (\Sigma \text{ Effective Work} + \tfrac{1}{4} \Sigma \text{ Essential Work Contribution}) / \Sigma \text{ Number of Observations} \times 100\% \quad (1)$$

Σ Total Observations is the total frequency of all observation categories. The weighting of essential work contribution activities at 1/4 (25%) is based on the understanding that these activities do not directly contribute to the final completion of the work but are still necessary for the smooth running of the construction process. Clarkson et al. (1989) established this weighting as an empirical approach to represent the proportion of value added by supporting activities to overall productivity, where their contribution is not considered equal to effective work (weighted at 100%) but is still more valuable than ineffective work (weighted at 0%). This weighting approach has been widely used in construction productivity studies (Prakoso & Ratnayanti, 2021; Thenu et al., 2019; Abiyyu, 2021).

Comparative Analysis of Productivity

A comparison of productivity levels between normal working hours and overtime hours is performed by comparing the average LUR values for both conditions. The difference in productivity reduction is calculated using the equation:

$$\Delta LUR = LUR_normal - LUR_overtime \quad (2)$$

where ΔLUR is the difference or decrease in Labor Utilization Rate (%), LUR_normal is the average LUR during normal working hours (%), and LUR_overtime is the average LUR during overtime hours (%).

The calculation results are then presented in tables and graphs to illustrate daily productivity trends and their fluctuations between observation time cycles.

Results and Discussion

Observation Data

Direct observations were conducted over three days and focused on floor slab work activities. Every five-minute interval, worker activity was categorized into three main categories: effective work, essential contributory work, and ineffective work. Accumulated frequency data, converted to time units (minutes) for the entire observation period, are presented in full in Table 2.

Table 2. Distribution of Working Time (in Minutes) Per Observation Period

Period	*Effective Work*	*Essential Contributory Work*	*Ineffective Work*
Day 1			
08.00 - 09.00	121	52	19
10.30 - 11.30	101	63	28
13.00 - 14.00	95	43	54
15.00 - 16.00	88	41	63
19.00 - 20.00	103	50	39
21.00 - 22.00	73	66	53
Day 2			
08.00 - 09.00	127	41	24
10.30 - 11.30	116	48	28
13.00 - 14.00	130	36	26
15.00 - 16.00	67	49	76
19.00 - 20.00	82	59	51
21.00 - 22.00	108	50	34
Day 3			
08.00 - 09.00	115	64	13
10.30 - 11.30	88	43	61
13.00 - 14.00	132	50	10
15.00 - 16.00	78	44	70
19.00 - 20.00	67	63	62
21.00 - 22.00	99	52	41

Productivity Level Analysis

The working time data listed in Table 2 were then analyzed using the Labor Utilization Rate (LUR) formula explained in the methodology section. This LUR calculation yields productivity levels for each observation period, visualized in Figure 3 for normal hours and Figure 4 for overtime hours.

During normal hours, productivity patterns showed a consistent trend across all three observation days. In the morning (8:00–9:00 AM and 10:30–11:30 AM), productivity was generally high, with LURs ranging from 60.8% to 71.5%. This reflects workers' optimal physical and mental condition after the morning roll call and before fatigue accumulates.

During the afternoon and evening, productivity showed varying declines. The sharpest decline occurred on the second day, from 3:00–4:00 PM, when LURs plummeted by 41.3%. Based on field observation notes, most workers left the work area 10–15 minutes before the end of the working day, resulting in a significant increase in ineffective work, reaching 76 minutes out of the 192 minutes observed. A similar phenomenon was observed on the third day of the same period (LUR 46.4%), indicating a tendency for workers to end activities early, a pattern that requires attention from project management.

On the other hand, significant productivity increases occurred on the second day, from 1:00–2:00 PM (LUR 72.4%) and the third day, from 1:00–2:00 PM (LUR 75.3%). This increase is likely related to

external factors, namely the audit team's visit to the project area, which encouraged workers to demonstrate optimal performance immediately after the lunch break. These findings indicate that the presence of external supervision can be a positive stimulus for short-term increases in productivity.

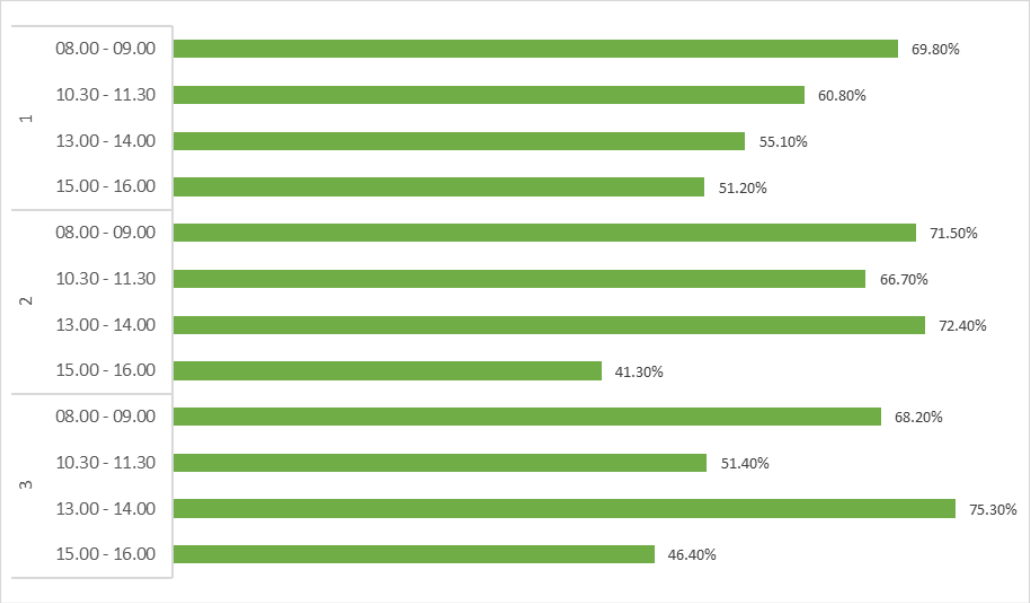


Figure 3. LUR Level During Normal Hours

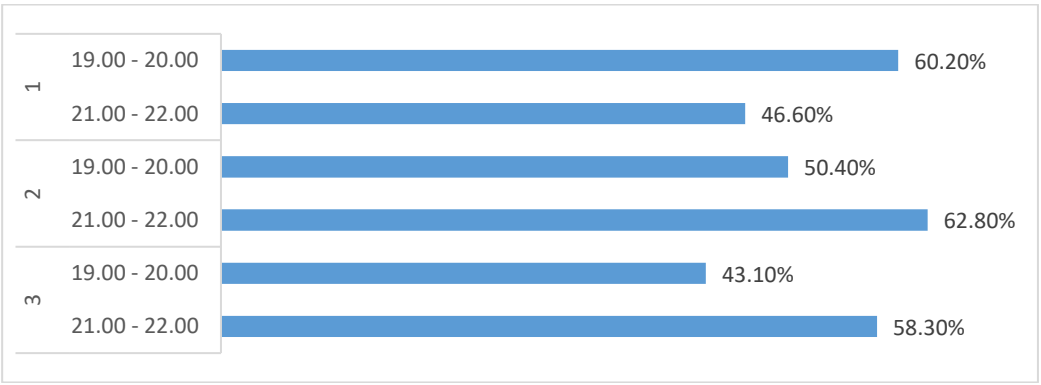
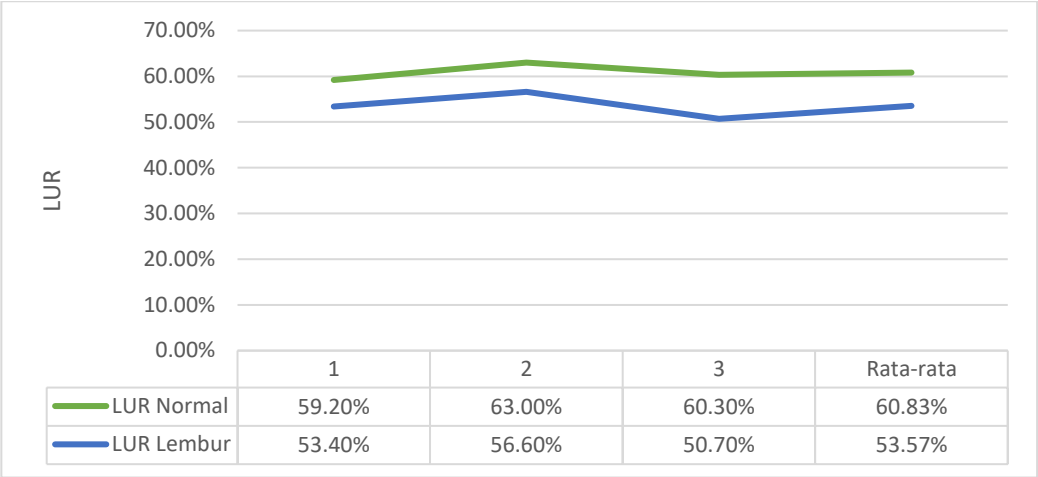


Figure 4. LUR Level During Overtime Hours

During overtime, productivity was consistently lower than during normal hours, with an average LUR of 53.6%. The pattern of declining productivity became increasingly apparent throughout the overtime shift, including on the first day, when the LUR dropped drastically from 60.2% (first session, 7:00–8:00 PM) to 46.6% (second session, 9:00–10:00 PM). This sharp decline is thought to be related to the body's circadian rhythm, in which sleepiness naturally peaks between 9:00 and 10:00 PM, just before the nighttime sleep phase. Furthermore, field observations showed that during the second overtime session, workers engaged in more contributing activities, such as cleaning the work area and preparing materials for the next day, rather than engaging in direct work (effective work).

On the third day, overtime productivity reached its lowest point (43.1% of the first session), indicating a significant accumulation of fatigue over time. This pattern consistently shows that on night shifts, workers tend to allocate more time to preparatory and support activities than to direct work, which reduces overall work effectiveness.



	1	2	3	Rata-rata
LUR Normal	59.20%	63.00%	60.30%	60.83%
LUR Lembur	53.40%	56.60%	50.70%	53.57%

Figure 5. Comparison Graph of Normal and Overtime Hour Productivity

Comparative Analysis and Productivity Decline

Based on the collected data, a comparative analysis of productivity between normal hours and overtime hours was conducted, as visualized in Figure 5. The results showed an average productivity decline of 7.2% during overtime hours. The highest decline occurred on the third day (9.6%), while the lowest occurred on the first day (5.8%). Despite this decline, worker utilization remained above 50%, making this result still considered satisfactory (Bandu et al., 2023; Kristiana & Ramadhan, 2025).

This pattern of productivity decline aligns with previous studies, which found a 3.26% to 5.19% decrease in labor productivity during the evening shift (Malik & Beatrix, 2025; Thenu et al., 2019). Abiyyu (2021) also reported an 8.9% decrease in LUR during overtime hours using the Five-Minute Rating method in an apartment project. Meanwhile, Yunita & Hidayat (2024) identified accumulative fatigue as the dominant factor in declining overtime productivity, a finding also confirmed in this study. Furthermore, the LUR value for overtime hours, at 53.6% in this study, remains within the normal range of construction worker productivity, which is 40–70% (Tanne et al., 2024). This study was limited to three days of observation, so inferential statistical analysis to test the significance of the differences was not possible. Further studies with longer observation periods are recommended to statistically strengthen the conclusions.

The results of this study confirm that overtime work still contributes to project completion, albeit at a lower level of efficiency compared to normal working hours. To mitigate this decline in productivity, project management can consider several measures, such as allocating high-concentration work to regular hours, increasing overtime supervision, and providing sufficient transition breaks before the start of the night shift.

Activity Composition Analysis

To better understand the factors contributing to decreased productivity during overtime, an analysis of the composition of workers' activities was conducted. Figure 6 presents a comparison of the proportions of effective work, essential contributory work, and ineffective work between normal and overtime hours.

It appears that the proportion of effective work decreased drastically from 77.9% during normal hours to only 46.2% during overtime. Conversely, the proportion of essential contributory work more than doubled from 12.1% to 29.5%, while ineffective work also increased from 10.0% to 24.3%. This shift in composition indicates that, over time, workers tend to allocate more time to preparatory and support activities than to direct work that produces output.

Based on field observations, the increase in essential contributory work during overtime hours was dominated by activities such as cleaning the work area, removing leftover materials, and preparing the area for the next day's work. Meanwhile, the increase in ineffective work was primarily due to fatigue, which prompted workers to take more frequent breaks, chat, or smoke outside of designated break times. Limited data recording, which did not reach the subcategory level, has prevented a more detailed quantitative analysis of the most dominant activity types and could be a focus of future research.

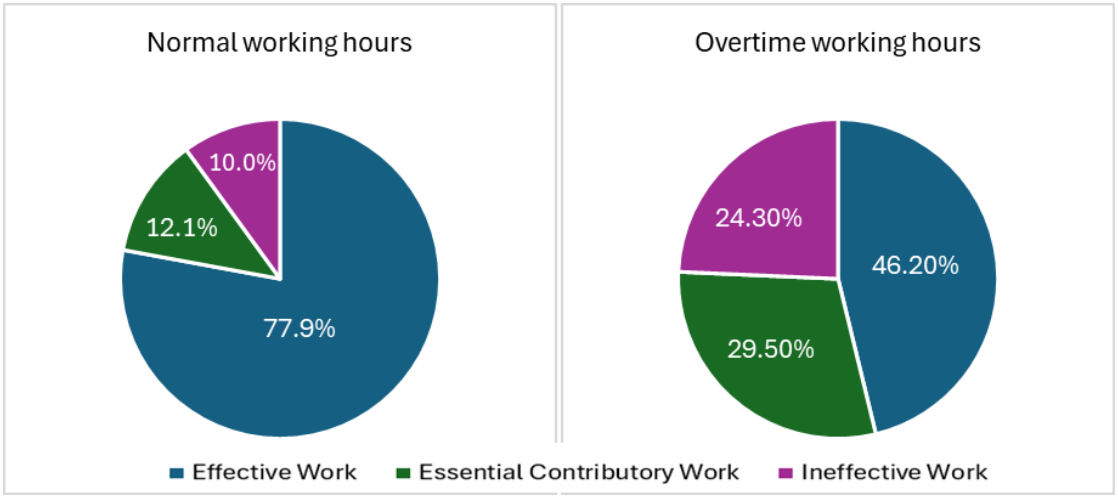


Figure 6. Composition of worker activities during normal hours and overtime hours

Conclusion

Based on research using the Five-Minute Rating method for floor slab work, it can be concluded that labor productivity differs significantly between normal hours and overtime. The average Labor Utilization Rate (LUR) during normal hours reached 60.8%, with the best performance in the morning (LUR 60.8%–71.5%), while during the overtime shift, this figure was lower, at 53.6%, with a decreasing trend becoming more apparent throughout the night shift. The average productivity difference was 7.2%, with the highest decrease occurring on the third day (9.6%). This condition was mainly influenced by decreased worker stamina after the normal shift, limited nighttime lighting, and an increasing proportion of contributing and unproductive activities relative to direct work.

Conflicts of Interest

The authors declare no conflict of interest.

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