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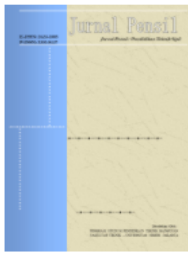

ANALYSIS OF LABOR PRODUCTIVITY OF BEAM AND FLOOR PLATE WORK WITH WORK SAMPLING METHOD

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Abstract

Productivity is a crucial parameter in achieving project objectives. This research aims to obtain the value of labor productivity on the beam structure and floor plate in home construction using the work sampling method and analyze the comparison of the labor coefficient to the Analysis of Unit Price of Work (AHSP) in 2022. Experimental quantitative research describes this approach, utilizing information gathered through documentation, questionnaires, and participant observation. Data analysis in this research includes Data Uniformity Analysis, Data Sufficiency Analysis, Labor Utilization Rate (LUR), and Spearman Correlation. The findings revealed that the beam concreting job in home construction achieved a labor productivity rate (LUR) of 61.61% and 84.417 kg/person. In the floor plate concreting work, labor productivity reached 98.787 kg/person with a LUR value of 54.10%. Meanwhile, in formwork work, labor productivity reached 3.577 m/person with a LUR value of 53.37%, and in casting work, labor productivity reached 1.287 m/hour with a LUR value of 53.37%. Correlation analysis shows a positive relationship between Labor Utilization Rate and labor coefficient in concreting and formwork works. This indicates that the more efficient the labor, the higher the productivity in carrying out these activities, and the smaller the coefficient value obtained

Keywords: Home Construction, Productivity, Work Sampling

Introduction

A construction project consists of a number of tasks that must be performed, completed, and allocated within a specified duration to achieve a specific purpose (Giri, 2019; Marcher et al., 2020). Resources include people, things, tools, cash, and methods (Fewings & Henjewele, 2019). The workforce directly involved in the execution of a specific construction task is one of the crucial components of the project itself (Shazwan et al., 2017). With technological advancements in today's construction business, there is a critical need for skilled, qualified, and productivity-driven professionals (Perera et al., 2020). Data from the Ministry of Public Works and home construction (PUPR) in 2022, noted that by September 2022 more than 34 thousand workers need to be competently upgraded in the human resources (HR) section of construction work. To improve the ability of workers in the field of building where experts and experienced Directorate General of Bina Konstruksi Ministry of PUPR Yudha Mediawan continues to strive to carry out guidance and certification for building workers (TKK).

The plan must be carried out from all parties to be involved to improve the quality of the workforce, so that it will have an impact on the productivity of the construction workforce in carrying out project development (Hasan et al., 2018; Valverde-Gascueña et al., 2011). Productivity starts with establishing awareness and commitment to the importance of labor productivity in the construction sector (Montaser et al., 2018). In this case, productivity has additional implications for reducing working time, which has an impact on reducing labor operating costs, creating competitive prices for implementers, and can be achieved by developing a productive culture, management systems, social and technological innovation, and the quality of human resources (Kianto et al., 2019). A construction project is inseparable from construction labor which is the main actor in project development (Yap et al., 2019). One of the factors that can affect labor efficiency is key in the implementation of construction projects, if worker productivity decreases it will increase work time and increase costs more (Sarihi et al., 2023). This has an impact on the idea of project management, namely the triple constraint, or the three main interconnected aspects of time, scope and cost (Zid et al., 2020). To effectively control and execute a project strategy, all three factors must be managed. In other words, the success or failure of the project will depend on these three factors, which will be decided by the project manager and stakeholders (Davis, 2017).

Construction project work is generally divided into structural, architectural and utility building work components (Aghazadeh et al., 2019; B. G. Hwang et al., 2017). Structural work itself is divided into several components including superstructure and substructure (Shrestha et al., 2017). Which has a percentage ratio in structural costs of 77.60% superstructure and 22.40% substructure. The scope of this research is superstructure work, namely beam and floor plate structures which have a ratio of 34% and 27.82%, greater than the ratio of column structure work which is only 11.49% (Moscoso et al., 2024). Construction methods on beam and plate structures are generally carried out in the same time interval (Jiang et al., 2021; Johnson & Wang, 2018). This is the reason for choosing beam and floor plate work as the object for productivity analysis because it has the largest ratio and construction methods that are possible to be observed simultaneously (Latief et al., 2023).

The resulting productivity value affects the coefficient value. The greater the productivity value produced, the value of the coefficient which is needed to complete the construction task, especially the beam and floor plate, can be minimized (Baharin et al., 2020). Good productivity can minimize construction costs because the required coefficients can be reduced (B.-G. Hwang et al., 2017). This research focuses on analyzing the efficiency of worker performance on beam and plate structures in residential construction (Rafi & Oetomo, 2023). The productivity value and the level of labor effectiveness are obtained using the Labor Utilization Rate (LUR) method and then processed into a labor coefficient value (Azzam et al., 2019). The coefficient value will then be analyzed and calculated the comparison ratio against the current regulatory standards, namely the "Analysis of Unit Price of Work (AHSP)" in 2022 for the Human Settlements and Home construction Sector issued by the "Ministry of Public Works and Public Home construction (PUPR) Number 1 Year 2022". Furthermore, a correlation analysis was conducted between the Labor Utilization Rate (LUR) value and the labor coefficient to determine whether there is a relationship between the two values (Ahmed & Kialashaki, 2023). Analysis of the Unit Price of Work (AHSP) in 2022 for the Human Settlements and Home construction Sector sets the standard for the coefficient of construction labor in general in the field of Cipta Karya and home construction which includes planning and development of residential areas, building arrangements, development of drinking water supply systems, development of wastewater systems, development of environmental drainage and waste (Rizqi et al., 2022).

The 2022 Analysis of Unit Price of Work (AHSP) does not provide a standard labor coefficient specifically for residential construction (Putra & Setyandito, 2023). This creates a level of uncertainty in the calculation of the value of the labor coefficient in the construction cost budget planning (Gebrehiwet & Luo, 2017). Therefore, a special study is needed regarding the value of the coefficient of workers in residential construction. So that the results of the study can be obtained productivity values which are then processed into a labor coefficient for residential construction. The purpose of this study is to determine the value of labor productivity and the level of worker effectiveness in the value of Labor Utilization Rate (LUR), in the construction of the XYZ cluster using the work sampling method on beam and floor plate structure work.

Research Methodology

This research applies quantitative research techniques with experimental where techniques in field observations use the principle of time and motion study (Sugiyono, 2013). Primary data was collected through work sampling, namely by watching the processes of forming, formwork, and casting on beam and plate structures. Observations made of objects focus on work activities that occur. These activities are classified into effective, contributory and ineffective processes. The population in this research is the number of construction of XYZ Cluster residential units. The sample selection method in this research is cluster-based random sampling. The number of samples needed in this research in each population group is calculated using the Slovin method, so that the number of samples in this research is 23. The method of collecting data in this research is through observation, questionnaires, documentation and interviews (Creswell, 2017). Data analysis applied in this research is uniformity analysis, data sufficiency analysis, labor utilization rate (LUR) and spearman correlation.

Research Results and Discussion

1. Data Uniformity Analysis
   - Reinforcement Work for Beams:

     Observation Data:
     - PT A: 53 productive observations (P = 0.815).
     - PT B: 77 productive observations (P = 0.828).
     - PT C: 78 productive observations (P = 0.813).
     - PT D: 125 productive observations (P = 0.822).
     - PT E: 30 productive observations (P = 0.732).

     Conclusion: All observation values are within the upper and lower control limits, indicating uniformity of data across all contractors.
   - Reinforcement Work for Floor Slabs:

     Observation Data:
     - PT A: 96 productive observations (P = 0.835).
     - PT B: 111 productive observations (P = 0.847).
     - PT C: 100 productive observations (P = 0.826).

- PT D: 108 productive observations (P = 0.844).
- PT E: 50 productive observations (P = 0.820).

Conclusion: All contractors demonstrate good data uniformity, with observation values within control limits.

- Formwork for Beams and Floor Slabs:
  Observation Data:
  - PT A: 60 productive observations (P = 0.870).
  - PT B: 123 productive observations (P = 0.898).

  Conclusion: Productive observations show high data uniformity, with all values within control limits.
- Concrete Casting for Beams and Floor Slabs:
  Observation Data:
  - PT D: 26 productive observations (P = 0.808).
  - PT E: 15 productive observations (P = 0.867).

  Conclusion: Despite a decline in productive activities due to weather conditions, data uniformity is maintained within control limits.

2. Data Sufficiency Analysis
- Beam Casting:
  Total Observations (IN): 1,224 observations (P = 0.8361).
  Minimum Observations (N'): 314 observations.
  Conclusion: The data is sufficient and valid for further analysis.
- Floor Slab Casting:
  Total Observations (IN): 487 observations (P = 0.8482).
  Minimum Observations (N'): 287 observations.
  Conclusion: The data is sufficient and valid.
- Formwork for Beams and Floor Slabs:
  Total Observations (IN): 2,353 observations (P = 0.8722).
  Minimum Observations (N'): 235 observations.
  Conclusion: The data is sufficient and valid.
- Concrete Casting for Beams and Floor Slabs:
  Total Observations (IN): 129 observations (P = 0.6816).
  Minimum Observations (N'): 748 observations.
  Conclusion: The data is insufficient for further LUR analysis.

3. Labor Utilization Rate (LUR) Analysis
- Beam Casting:
  LUR PT A: 64.73%.
  Average LUR Across All Contractors: 62%.
  Conclusion: Labor productivity is reasonably effective.
- Floor Slab Casting:
  LUR PT A: 56.25%.
  Average LUR Across All Contractors: 54.10%.
  Conclusion: Labor productivity is reasonably effective.
- Formwork for Beams and Floor Slabs:
  LUR PT A: 56.64%.
  Average LUR Across All Contractors: 53.37%.
  Conclusion: Labor productivity is reasonably effective.
- Concrete Casting for Beams and Floor Slabs:
  LUR PT A: 49.09%.
  Average LUR Across All Contractors: 53.37%.
  Conclusion: Labor productivity is still reasonably effective, though slightly below 50%.

4. Labor Coefficient Analysis
   - Beam Casting:
     Average Daily Productivity: 568.735 Kg.
     Average Number of Workers: 6.37 persons.
     Labor Coefficient: 0.0112 OH/Kg (higher than AHSP 2022: 0.008).
   - Floor Slab Casting:
     Average Daily Productivity: 596.250 Kg.
     Average Number of Workers: 5.66 persons.
     Labor Coefficient: 0.0095 OH/Kg (higher than AHSP 2022: 0.008).
   - Formwork for Beams and Floor Slabs:
     Average Daily Productivity: 31.113 m^3.
     Average Number of Workers: 7.86 persons.
     Labor Coefficient: 0.253 OH/m^3 (much lower than AHSP 2022: 0.754).
   - Concrete Casting for Beams and Floor Slabs:
     Average Daily Productivity: 9.765 m^3/day.
     Average Number of Workers: 7.625 persons.
     Labor Coefficient: 0.168 person/hour/m^3 (much lower than AHSP 2022: 3.657).
5. Spearman Correlation Analysis between LUR and Labor Coefficient
   - Beam Casting:
     Spearman Coefficient (rs): 0.4, indicating a positive relationship.
   - Floor Slab Casting:
     rs: 0.4, indicating a positive relationship.
   - Formwork for Beams and Floor Slabs:
     rs: 0.4, indicating a positive relationship.
   - Concrete Casting for Beams and Floor Slabs:
     rs: -0.8, indicating no significant relationship.

Data Uniformity Analysis

a. Data Uniformity Analysis of Beam Fixing Work

Analysis of data uniformity of beam work is an important part of monitoring and controlling the quality of construction project implementation. This study focuses on analyzing the uniformity of data on beam framing carried out by contractors PT A, PT B, PT C, PT D, and PT E in the construction of the XYZ cluster. The method used is work sampling observation, which provides an overview of productive and unproductive activities and work uniformity. In analyzing the data uniformity of beam reinforcement work, the results obtained from each contractor show that all observation values are between the upper control limit (BKA) and the lower control limit (BKB), which indicates the uniformity of the work sampling observation data. This indicates that the observation process is carried out on work activities that run under normal conditions (Rausch et al., 2020) (Patel & Shabana, 2018).

At contractor PT. A, the total observations of productive activities (C PR) were 53 observations, with a ratio of productive activities to total observations (P) of 0.815. While at the PT. B contractor, the total observations of productive activities (I. PR) were 77 observations, with a ratio of productive activities to total observations (P) of 0.828. Contractor PT. C has a total of 78 observations of productive activity (I PR), with a ratio of productive activity to total observations (P) of 0.813. PT D has a total of 125 observations of productive activity (I PR), with a ratio of productive activity to total observations (P) of 0.822. Finally, PT E has a total of 30 observations of productive activity (PR), with a ratio of productive activity to total observations (P) of 0.732. Although there are fluctuations in the percentage of productive activity on some days of observation, overall, the uniformity of the work sampling data of beam fixings for the five contractors shows that the observation process is carried out under normal working conditions. This analysis provides a clear picture of the quality of the implementation of beam framing work by these contractors in the XYZ cluster construction project.

b. Data Uniformity Analysis of Floor Plate Reinforcement Work

Analysis of data uniformity of floor plate reinforcement work on the XYZ cluster construction project involves five contractors: PT. A, PT. B, PT. C, PT. D, and PT. E. The method used is observation work sampling to evaluate productive and unproductive activities and work uniformity. At contractor PT. A, there are 96 productive activity observations with a productivity ratio of 0.835. PT. B contractor has 111 observations with a ratio of 0.847. PT. C has 100 observations with a ratio of 0.826. PT. D has 108 observations with a ratio of 0.844. Finally, PT. E has 50 observations with a ratio of 0.820. Although there are daily fluctuations in the percentage of productive activity, the uniformity of the work sampling data shows that the observation process is carried out under normal working conditions.

The analysis results show that all observation values for the five contractors are within the range of upper control limits and lower control limits, indicating the uniformity of the work sampling data. It is clear from the study's findings that the data on work sampling is consistent on the floor plate concreting work indicates that the contractors are carrying out work under conditions that are in accordance with the standard (Molkens & Van Gysel, 2021). This analysis provides a clear picture of the quality of the implementation of floor plate reinforcement work by these contractors in the XYZ cluster construction project.

c. Data Uniformity Analysis of Beam and Floor Plate Formwork Work

Data uniformity analysis of beam and floor plate formwork work on the XYZ cluster construction project was carried out for five contractors, namely PT. A and PT. B. The method used is observation work sampling to evaluate productive and unproductive activities and work uniformity. At contractor PT. A, there are 60 observations of productive activities with a productivity ratio of 0.870. Contractor PT. B has 123 observations with a ratio of 0.898. Although there are daily fluctuations in the percentage of productive activities, the uniformity of work sampling data shows that the observation process is carried out under normal work conditions. The analysis results show that all observation values for both contractors are within the range of upper control limits and lower control limits, indicating the uniformity of work sampling data. From the results of the analysis, it can be concluded that the uniformity of work sampling data on beam and floor plate formwork work shows that these contractors carry out work under conditions that are in accordance with the standard (Agudze et al., 2018). This analysis provides a clear picture of the quality of the implementation of beam and floor plate formwork by these contractors in the XYZ cluster construction project.

d. Data uniformity analysis of beam and floor plate formwork work

This analysis was conducted for contractors PT.C and PT.D on the XYZ cluster construction project. Contractor PT. C has a productivity ratio of 0.918 with a total of 147 observations. While the PT. D contractor has a productivity ratio of 0.913 with a total of 241 observations. Despite daily fluctuations in the percentage of productive activities, the uniformity of the work sampling data shows that the observation process is carried out under normal working conditions (Wang et al., 2021). All observation values on both contractors are within the range of upper control limits and lower control limits, indicating the uniformity of work sampling data. From the results of this analysis, it can be concluded that the uniformity of work sampling data on beam and floor plate formwork work shows that these contractors carry out work under conditions that are in accordance with the standard. This analysis provides a clear picture of the quality of the implementation of beam and floor plate formwork by these contractors in the XYZ cluster construction project.

e. Data uniformity analysis on beam and floor plate casting work was carried out for PT D and PT E contractors in the XYZ cluster construction project.

Contractor PT D has a productivity ratio of 0.808 with a total of 26 observations. Meanwhile, contractor PT E has a productivity ratio of 0.867 with a total of 15 observations. On the second day of observation, rain caused casting to be delayed, which led to a considerable fall in the proportion of productive activities at contractor PT. D. However, all observation values remain within the range of upper control limits and lower control limits, indicating the uniformity of work sampling data. Meanwhile, contractor E experienced a significant decrease in the percentage of productive activity on the second and third day observations. Nevertheless, all observation values remain within the range of upper control limits and lower control limits, indicating the uniformity of work sampling data.

The uniformity of the work sampling data on the beam and floor plate casting work indicates that both contractors are performing work in accordance with the standard. This analysis provides a clear picture of the quality of the implementation of beam and floor plate casting work by these contractors in the XYZ cluster construction project. In construction projects, it is important to monitor the uniformity of work sampling data in order to determine the quality of work execution by contractors. By understanding the uniformity of work sampling data, project managers can identify problems by taking appropriate measures to determine if tasks are performed efficiently and in line with predetermined schedules (Yu et al., 2019).

In addition, the uniformity of work sampling data can also help in making decisions related to resource management, such as labor arrangements and material procurement. By understanding the uniformity pattern of work sampling data, project managers can maximize the utilization of available resources to achieve the best output in construction projects (Markov et al., 2020). Uniformity of work sampling data is also an important indicator in evaluating contractor performance and can be the basis for making decisions related to contractor assessment. By monitoring the uniformity of work sampling data on a regular basis, project managers can assess the contractor's performance and confirm if activities are being carried out correctly and in line with established guidelines. In construction projects, uniformity of work sampling data is one of the keys to success in confirming that activities are being performed correctly and in line with established guidelines. By understanding and monitoring the uniformity of work sampling data on a regular basis, project managers can identify issues where they may arise and act accordingly to ensure that the project progresses in an orderly manner and in line with the agenda that has been set.

Data Sufficiency Analysis

Data sufficiency analysis on beam concreting work shows that the work sampling observations made in the PT. A contractor population group are sufficient and valid. This can be seen from the total value of observations in the entire sample (IN) of 1,224 observations, with an overall average value of the percentage of productive activities (P) of 0.8361. Based on this value, the minimum observation value (N') is 314 observations, and because IN> N', the work sampling observation of beam concreting work is sufficient and valid. Furthermore, the data sufficiency analysis on the floor plate concreting work also shows that the work sampling observations in the PT. A contractor population group are sufficient and valid. The total value of observations in the entire sample (IN) is 487 observations, with an overall average value of the percentage of productive activities (P) of 0.8482. Based on this value, the minimum observation value (N') is 287 observations, and because IN> N', the observation of work sampling of floor plate reinforcement work is sufficient and valid.

In addition, the data sufficiency analysis on beam and floor plate formwork work also shows that the work sampling observations in the PT. A contractor population group are sufficient and valid. The total value of observations in the entire sample (IN) was 2,353 observations, with an overall average value of the percentage of productive activities (P) of 0.8722. Based on this value, the minimum observation value (N') is 235 observations, and because IN > N', the work sampling observation of beam and floor plate formwork work is sufficient and valid. However, for the beam and floor plate casting work, the data sufficiency analysis shows that the work sampling observations in the PT. A contractor population group are not sufficient and valid.

The total value of observations in the entire sample (IN) is 129 observations, with an overall average value of the percentage of productive activities (P) of 0.6816. Based on this value, the minimum observation value (N') is 748 observations, and because IN < N', the observation of work sampling of beam and floor plate casting work is not sufficient and valid for further analysis, namely Labor Utilization Rate (LUR) analysis. This is due to the duration of observation that can only be done in a limited time interval. Thus, the results of the data sufficiency analysis on the four types of work show that the work sampling observations are sufficient and valid except for the beam and floor plate casting work in the contractor population group of PT. A. Therefore, it is necessary to add observations to the work so that the data obtained is sufficient and valid for further analysis.

Analysis Labor Utilization Rate (LUR)

In structural work including beams and floor slabs, the efficacy and efficiency of labour in producing productivity is measured by Labour Utilisation Rate (LUR) analysis. By determining the relative importance of each activity type, this study applies LUR to beam, plate, formwork, and casting tasks. The results of the LUR analysis of beam concreting work show that the LUR value is 64.73% for contractor PT. A, with an average LUR value for all contractors of 62%. These results indicate that labor productivity in all contractor population groups is quite effective, in accordance with Oglesby's theory mentioned by Kevin et al. (2019). For floor plate concreting work, the LUR value of PT. A contractor is 56.25%, with an average LUR value of all contractors of 54.10%. This also shows that labor productivity is quite effective based on the same theory (Andi Andi et al., 2004).

The LUR analysis of the beam and floor plate formwork showed a LUR value of 56.64% for contractor PT. A, with an average LUR value of 53.37% for all contractors. This indicates that labor productivity in all contractor population groups is quite effective. Meanwhile, the LUR analysis on the beam and floor plate casting works showed a LUR value of 49.09% for contractor PT. A, with an average LUR value of all contractors of 53.37%. Although this value is slightly below 50%, it still indicates that labor productivity is quite effective. Thus, the Labor Utilization Rate (LUR) analysis provides an overview of the effectiveness and efficiency of labor in generating productivity in the beam and floor plate structure work activities in this study (Yuanto et al., 2018).

Labor Coefficient Analysis

Labor Coefficient Analysis is used to evaluate labor productivity in beam and floor plate structure construction projects. Data for the calculation of the labor coefficient is obtained from field observations related to daily labor productivity and the number of workers used (Rajeshkumar & Sreevidya, 2019) :

At contractor PT A, the labor coefficient for various construction activities was evaluated. For beam concreting work, the average daily productivity is 568.735 Kg with an average number of workers being 6.37 people, resulting in a labor coefficient of 0.0112 (OH/Kg), which is higher than the AHSP 2022 standard of 0.008. Similarly, the floor plate reinforcement work shows an average daily productivity of 596,250 Kg with an average labor force of 5.66 people, yielding a labor coefficient of 0.0095 (OH/Kg), again exceeding the AHSP 2022 standard of 0.008. In contrast, the labor coefficient for formwork of beams and floor plates is found to be 0.253 (OH/m^3), based on an average daily productivity of 31.113 m and an average labor force of 7.86 people, which is significantly lower than the AHSP 2022 standard of 0.754. Finally, the labor coefficient for casting beams and floor slabs is calculated at 0.168 (person/hour/m^3), with an average hourly casting productivity of 9.765 m^3/day and an average labor force of 7.625 people, also much lower than the AHSP 2022 standard of 3.657.

In all analyses, it can be seen that the value of the labor coefficient at contractor PT. A tends to be higher or lower than the AHSP 2022 standard, depending on the type of construction work performed. This difference is due to the different construction methods and technologies used in the project.

Spearman Correlation Analysis Between Labor Utilization Rate (LUR) and Labor Coefficient

Spearman correlation analysis was used in the study to determine the relationship between Labour Utilization Rate (LUR) and Labour Coefficient values and whether they are related. Spearman's theory is suitable for use when data is ordinal or does not meet the assumption of normality. An example is LUR and labor coefficient data, which are ordinal and refer to population groups. This analysis is also suitable if the data has outliers. This research analyzes the activities of beam concreting, floor plate concreting, formwork, and casting. The results of the analysis show the relationship between the value of the labor coefficient and the LUR produced by workers. The smaller the labor coefficient, the greater the LUR value, indicating the efficiency and productivity of workers in the activity. In the beam concreting activity, the Spearman correlation coefficient (rs) of 0.4 indicates a positive relationship between the two variables. The analysis of the floor plate concreting activity also showed a positive relationship with rs = 0.4. While in the beam and floor plate formwork activities, rs = 0.4 shows a positive relationship between the two variables. However, in the beam and floor plate casting activity, no relationship was found between the two variables with rs = -0.8. This research provides guidance for improving productivity in future residential construction projects by considering factors that affect worker productivity. Special handling of outlier data is required so as not to affect the results of statistical analysis.

Conclusion

The results of the analysis and discussion of the research show labor productivity on beam and floor plate structures in the construction of XYZ cluster residential houses as well as a comparison of the labor coefficient with the standard Analysis of Unit Prices (AHSP) in 2022. Labor productivity in beam concreting reached 84.417 kg/person with an LUR of 61.61%, while in floor slabs it reached 98.787 kg/person with an LUR of 54.10%. For formwork, productivity reached 3.577 m/person with a LUR of 53.37%, and in casting it reached 1.287 m/hour with a LUR of 53.37%. Furthermore, there is a significant difference in the labor coefficient compared to the 2022 AHSP. In beam concreting, the average coefficient of all samples was 1.492 times greater, while that of floor slabs was 1.33 times greater. However, in formwork and casting, the average coefficient ratio of all samples was 0.379 and 0.045 times smaller, respectively. Correlation analysis shows a positive relationship between the Labor Utilization Rate value and the labor coefficient in formwork and casting, indicating that the more efficient the labor, the more productive the workers are in the activity.

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