



**CHALMERS**  
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# **A Blind Spot in Construction**

*An investigation into the prevalence and perception of construction logistics management*

Master's Thesis in Design and Construction Project Management

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## **Abstract**

Logistics is an integral part of any current day construction project, with a growing importance as a result of urbanization and sustainability efforts. However, it is still unclear as to how these logistical tasks are managed on construction sites on a daily basis. Combining data from a set of on-site observations with qualitative data from interviews with members of site management, logistics experts, and recruiters, we highlight the prevalence and perceptions regarding logistical management in construction. Following which we can conclude that logistics takes up a significant amount of supervisors' time and effort, while not being met with requisite presence in recruitment and job specifications. Currently logistics is often seen as an activity to enable other work efforts, resulting it often being performed in a reactive fashion. Instead, allocating logistics to those specialised in it or building further knowledge on how to interact with logistics, can provide multiple benefits connected to quality, cost, and time by further planning and streamlining logistics flows ahead of time.

Keywords: Construction logistics, Logistics management, Logistical responsibility of Site management, Urban construction, Logistics expertise.

Ett förbisett ämne inom byggbranschen – En undersökning kring förekomsten och uppfattningarna av logistikhantering inom byggbranschen

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## Sammanfattning

Logistik är en väsentlig del av moderna byggprojekt, med en växande betydelse då urbanisering och antalet hållbarhetsinitiativ ökar. Dock är det fortfarande osäkert hur logistiska uppgifter hanteras på byggarbetsplatserna dagligen. Genom att kombinera data från observationer på byggarbetsplatser med kvalitativa data från intervjuer med medlemmar av platsledning, logistikexperter, och rekryterare, lyfter vi fram förekomsten och uppfattningarna om logistikhantering inom byggsektorn. Vi kan från detta dra slutsatsen att logistik tar upp en betydande mängd av arbetsledarnas tid och energi, samtidigt som det inte möts med en nödvändig närvaro i rekrytering och arbetsbeskrivningar. Logistik ses ofta som en aktivitet för att möjliggöra andra arbetsuppgifter, vilket resulterar i att den ofta utförs reaktivt. Om logistik tilldelas de som är specialiserade på det, eller om mer kunskap kring integrering av logistik byggs upp, kan det ge fördelar kopplade till kvalitet, kostnad, och tid genom att i förväg planera och effektivisera logistikflöden.

Nyckelord: Bygglogistik, Logistikhantering, Logistikansvar för platsledning, Logistik i stadsmiljöer, Logistikkunskap

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Gothenburg, June 2024

Eric John Campbell and Floris van der Horst

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# GLOSSARY OF KEY TERMS AND LIST OF ACRONYMS

The following is a list of key terms and commonly used acronyms that have been used in the thesis.

Site management.....	Contractors' site managers and supervisors
Site manager.....	In Swedish known as "platschef"
Supervisor .....	In Swedish known as "arbetsledare"
SCM.....	Supply chain management
TPL.....	Third Party Logistics
CCC.....	Construction consolidation centre
SDP.....	Site Disposition plan (in Swedish APD)
JIT.....	Just-in-time

# 1. INTRODUCTION

In each construction project, having the right materials, equipment and people at the right place and the right time is crucial (Swamidass, 2000). Not fulfilling these fundamental needs, defined as construction logistics, render building impossible. Therefore, the importance of construction logistics seems self-evident, however, research indicates that only recently expertise towards this topic has been developed in construction (Janné & Fredriksson, 2019). Being driven by the accelerating urbanization and increasing importance of social and environmental sustainability (Isaksson & Rosvall, 2020); (Janné, 2018), such expertise needs to develop further. Highlighting the importance of construction logistics in the increasing challenge of delivering projects within time, budget, and quality.

Traditionally, the responsibility for logistics on a construction site falls to the main contractor, delegating the logistics related tasks to the site management team, comprising of site managers and supervisors. Despite this delegation suggesting that a part of site management work is devoted to managing the on-site logistics, their primary strengths lie in technical knowledge and production proficiency (Ying et al., 2018). Contradicting the recognition of logistics management as a specialised field requiring distinct knowledge and competencies. Thereby creating the basis for the upcoming yet niche trend of specialised logistics managers adopted from other industries (Ekeskär & Rudberg, 2016); (Sullivan et al., 2010).

Therefore, our hypothesis is that while logistics makes up much of site management's work, it is being met with minimal requirements and expectations for expertise in this area. This proves problematic, as inadequate logistical know-how can lead to detrimental effects on project timelines, quality standards, and cost efficiency (Hulthén & Sundquist, 2019). This research aims to shed light on the current logistical management practices within construction projects in Sweden. By doing so, we seek to highlight the importance of construction logistics management. This research is guided by the following research questions:

- How much time is spent on logistics by main contractors' site management, and what do they do in this time?
- In what way is logistics reflected in the job descriptions and requirements for site management positions?
- What can be learned from the specialised role of a logistics manager?

To answer these questions, we have performed a set of observations and interviews of site managers and supervisor, and screened job descriptions for positions in site management. This is complemented by additional interviews with logistics experts and HR representatives granting insight into the topic, as well as performing a literature review to cover previous research. It is important to note that this research does not aim to evaluate the individual performance of site management experts in handling logistics. Instead, it focuses on understanding the broader practices and challenges associated with logistical management in construction projects.

## 2. BACKGROUND

In this chapter numerous literary sources are gathered in an effort to inform the reader of established research on the topic. First is introduced a definition of construction logistics, followed by a categorisation of on-site logistics activities that is later in the paper used as a basis for the observations. Thirdly is presented a highlighting of the scattered nature of managing logistics and the lacking nature of research into the time aspect of the topic to show the uncertainty in the field. Finally, an investigation into previous literature on requirements in construction job descriptions is outlined together with an introduction to alternative strategies in construction logistics.

### 2.1 Defining construction logistics and its relation to Supply Chain Management

The subject of construction logistics has been increasingly studied over the last decades, which has led to numerous interpretations of the topic. In the late 20<sup>th</sup> century Agapiou et al. (1998) states that logistics is about movement and storage, and in the construction industry this involves planning, organization, coordination, and control of material flows. A few years later, Lambert & Cooper (2000b) describe logistics as a part of the supply chain process with the focus of effective and efficient movement of products, services and data. Both definitions separately highlight that construction logistics encompasses everything from the extraction of raw materials to the point of consumption, with the aim to meet customer demands.

Despite the different initial definitions of construction logistics, it is also stated that the role of logistics in the construction industry around that time was minor (Agapiou et al., 1998). This is confirmed by Sullivan et al. (2010) who claims that insufficient attention was given to logistics. In their book 'Managing Construction Logistics' the authors refer to reports in the UK that identified various reasons why the UK construction sector has not adopted dedicated logistics solutions (Strategic Forum for Construction Logistics, 2005). Among those reasons are the fragmented industry and the short-term projects, which complicates long-term change. Poor logistics management can lead to large financial losses, poor quality, increased project time and increased risk to health and safety (Balqis & Tabarak, 2009). Sullivan et al. (2010) underlines this by stating that the improvement of construction logistics has been highlighted among numerous recommendations in studies ranging from 1994 to 2002.

It can be concluded that the phenomenon of logistics awareness is relatively new in construction (Janné & Fredriksson, 2019), while at the same time construction logistics is gaining increased attention both among practitioners and academics (Janné, 2018). Thus, recent studies provided a more detailed explanation of construction logistics. Lindholm & Browne (2015) divides construction logistics in two parts: external and internal logistics. The authors explain that external logistics in construction refers to the management of flows of resources from outside the construction site to the site itself, while internal logistics focuses on managing activities and resources on the actual construction site. This explanation is in line with research by Sezer & Fredriksson (2021) who also describes that construction logistics is about the management of deliveries, coordination of fragmented sourcing of resources, transport to/from the site, and

coordination of materials and traffic flows on the site itself. Examples of key elements of both external and internal logistics are: providing construction sites with resources like materials, people and machines, counterflow of waste, traffic flows, road safety, environmental impacts like air quality and noise, and urban freight. Managing those activities is centred around the so-called *'7 rights of logistics'*: to deliver the right product; in the right quantity; and the right condition; to the right place; at the right time; for the right customer; at the right price (Swamidass, 2000).

Important in the understanding of the concept of construction logistics is the correlation with supply chain management (SCM), as the concepts are often used interchangeably. Supply chain management in essence comes down to managing relationships in a network of stakeholders, as explained by Lambert & Cooper (2000b). They portray that SCM is about integration of businesses, networks, and management components to add value for customers and other stakeholders. In this network of businesses and relationships, logistics is only a part of SCM, as it focuses on the planning, implementation and movement of specific materials and information flows. This view aligns with the *'unionist'* perception, as presented by Larson & Halldorsson (2004), who in their study argue that there are different ways to see the connection between construction logistics and SCM. In their argumentation four basic perceptions can be recognised: *Traditionalist* - SCM is part of logistics, *Relabelling* - SCM is the same as logistics, *Unionist* - logistics is part of SCM, and *Intersectionist* - both concepts are separate but partly overlapping. Based on an international conducted survey among various stakeholders in different industries, the authors concluded that logistics and SCM share a significant amount of common ground. Even though respondents rated certain topics such as transportation, materials handling, and warehousing, as significantly more important for logistics compared to SCM there is an overlap in the content of the two concepts. As such, a clear correlation between the two concepts exists, but this can be viewed in different ways. Nevertheless, additional sources also seem to argue that logistics is part of a broader supply network. The Council of Supply Chain Management Professionals defines logistics management as:

*'That part of SCM that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements. This implicitly means that logistics is part of SCM and that the management of logistics activities is a part of SCM'.*

This is backed up by Ekeskär & Rudberg (2016), who also argues that logistics management is part of SCM. This would suggest that there is a general trend in the understanding of the specific role of logistics as part of the bigger perspective of SCM.

As can be seen, construction logistics has been explained in different ways over the last decades, resulting in varying conceptualizations. This is important to make note of, as it shows that construction logistics is often referred to as both a rather specific set of actions, and also generally seen as part of a larger supply chain. While the primary focus of this study is focused on on-site logistics, the connection to the supply chain is vital and the two intertwine with one-another. Therefore, it is unavoidable to talk about one without mentioning the other.

## 2.2 Categorizing on-site logistics activities

In addition to the segmentation by Lindholm & Browne (2015), Hulthén & Sundquist (2019) create their own characterisation of construction logistics activities (below category 1-7) with some minor differences. Next to the off-site logistics, which the authors explain as the supply chain and includes the manufacturing and distribution of resources, the on-site logistics activities are specified in different subcategories (see Figure 1). The respective seven categories fall under the concept of 'material handling' and form the basis for the observation study, as further described in chapter 3, and thus will be explained in more detail:

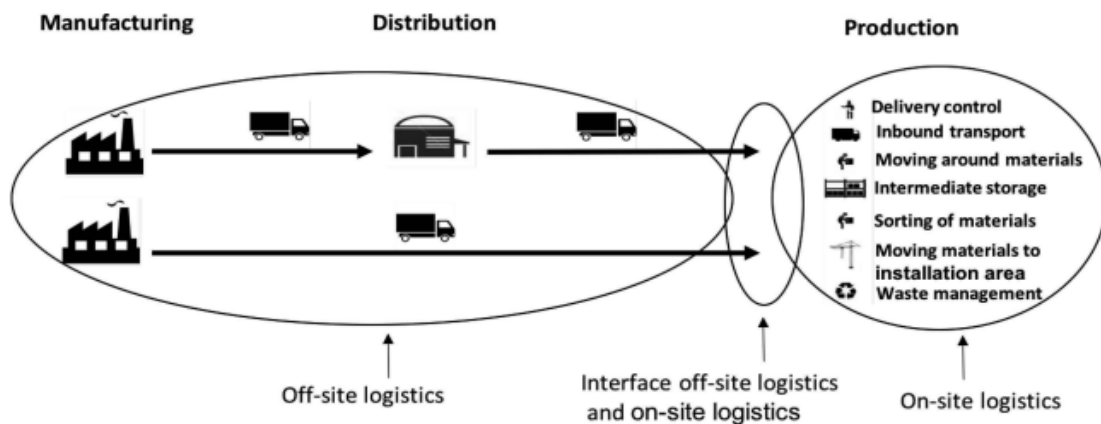


Figure 1. A visualisation of the different stages of logistics, with involved subcategories for on-site logistics by Hulthén & Sundquist (2019).

### Category 1: Delivery control

When material, equipment, machinery, or other things are delivered on site, it should be checked if this is according to the 7 rights of logistics, excepting the right price (Swamidass, 2000). At the moment of delivery, a visual inspection should be made by designated personnel before signing off on the delivery. This includes coordinating with suppliers, who ideally receive specific instruction how to pack the materials. The use of barcoding or radio-frequency identification technology, such as RFID, can contribute to a more efficient and controlled delivery process (Sullivan et al. 2010). According to research by Thunberg & Persson (2013), less than 40% of the total supply to Swedish construction sites was delivered according to the 7 rights of logistics, due to complexity, inadequate communication, and lack of standardization in construction supply chains. This is underlined by Lindén & Josephson (2013), who state that one of the most prevalent issues in the construction industry is the inability of the contractor to make sure the needed materials are delivered at the right time and place.

### Category 2: Inbound transport

Inbound transport refers to the process of transporting materials from suppliers to the construction site (Sullivan et al., 2010). In 2010, 22% of all Swedish freight transportation in urban areas was related to construction (Sveriges Byggindeindustri, 2010). Coordination of in- and outgoing transport is vital, as a construction site on average receives 2 – 10 deliveries on a daily basis, in addition the average turnaround time, the time from when a vehicle arrives at the gate until it drives out of the gate, is 34 – 60 minutes, of which 18 – 36 minutes is spent on waiting to be unloaded (Guerlain et al. 2019). On top of that, research by Sezer & Fredriksson (2021) shows

that most deliveries take place between 07:00 and 09:00 in the morning. This is underlined by Sullivan et al. (2010), who state that generally the available unloading hours are not utilized in an optimal way. Additionally, the study by Sezer & Fredriksson (2021) makes clear that the types of deliveries are highly diverse in size and weight, and that the utilization of different types of vehicles requires different ways of material handling. The authors emphasize the importance of sufficient logistical planning, Sullivan et al. (2010) seconds this importance yet makes note the practical challenges that can occur nonetheless, like delayed arrivals or unskilled personnel unloading the truck.

As in other industries, a recognized trend is the use of just-in-time (JIT) delivery system. This enables the movement of materials directly to the installation area and can help to prevent unnecessary movement of materials and resources. Described by Hulthén & Sundquist (2019), JIT requires a system where deliveries are closely coordinated, for example by use of an advanced planning system. An upcoming trend to facilitate JIT deliveries is the use of external warehouses, or construction consolidation centres (CCC). As highlighted by Guerlain et al. (2019), this enables storage of materials, and limits transports to and from site, with the aim to grant more control, save on-site space, and reduce the environmental impact. While several studies mention the positive aspects, it should also be noted that this requires large scale coordination, management, and governance efforts, as highlighted by Janné & Fredriksson (2019).

### **Category 3: Moving around materials**

Once materials have arrived on site (see category 2) and have been checked (see category 1), the materials have to be moved. Ideally, the materials go directly to the installation area (see category 6). However, as mentioned by Dubois et al. (2019), materials are often moved around to different places on site before installation. On average, a pallet of goods is moved seven times at a construction site, as storage areas are not planned and material quantities did not match the production schedule (Svensdotter, 2013). Therefore, poor planning increases the risks of damage, spacing conflicts, and lost time. In addition, Sullivan et al. (2010) explains that there are different ways of moving materials, such as crane, hoist, lifts or manually, and a variety of individuals involved in the process.

### **Category 4: Intermediate storage**

Intermediate storage entails the temporary storage of materials on the construction site, before it is used for installation. However, intermediate storage preferably should be kept to a minimum, as highlighted by Dubois et al. (2019), since this leads to more handling efforts, thus increasing the risk of quality issues. Moreover, storage should be avoided considering the limited space most construction projects have (Said & El-Rayes, 2011), a challenge that will only grow with the increasing density of urban area's (Spillane & Oyedele, 2017).

### **Category 5: Sorting of materials**

While existing literature on the subject of sorting on-site materials is lacking, and often refers to sorting of waste, it can be derived from both Hulthén & Sundquist (2019) and Dubois et al. (2019), that sorting of materials on the construction site itself should be avoided since this hamper efficient resource utilisation. The sorting should instead be preponed to off-site logistics. So that when the materials arrive on the site, they are ready to be installed. However, such an effort

involves several steps that can be considered SCM, and therefore requires sufficient planning and coordination with suppliers and transporters.

#### **Category 6: Moving materials to installation area**

As moving around materials, intermediate storage, and sorting of materials on site should be avoided, it should be the aim to move materials directly to the location where it needs to be installed after delivery. Immediate movement of materials to the installation area reduces the risk of damage and loss of materials (Dubois et al., 2019). On average, construction workers spend around 15% of their working time moving equipment and materials to assembly areas (Strandberg & Josephson, 2005). JIT deliveries aim to avoid such waste, however working in a JIT fashion requires accurate planning and coordination of both the on-site and off-site logistics.

#### **Category 7: Waste Management**

All the incoming material and building activities create a lot of waste on construction sites, as much as 30% of all waste within the European Union (Osmani, 2011). This huge amount of waste also comprises a wide variety of waste fractions (for example steel, concrete, wood, plastic, cardboard, glass, asphalt), that all need to be separately disposed. With the fast-growing importance of environmental sustainability, pushed by laws and regulations, sufficient waste management practices are essential to handle on-site operations. The considerable amount of different waste containers tends to take up a lot of space on-site, needs to be accessible, as well as requiring a systemic emptying approach.

## **2.3 Management and Organisation**

One of the most important efforts to control logistics on construction sites is the so called '*site materials management*' (SMM) (Sunquist et al., 2017). This includes the management of spaces for delivery, handling, storage, and resources. This is confirmed by Dui-Yong et al. (2014), who describes logistics management as an essential management tool for ensuring the production material flow. The authors explain that precise delivery schedules that align with the site plan are necessary for logistics management. If not, it will result in resource waste during the handling, transportation, and storage process, as well as delays and disruptions to the construction schedule. However, various studies show that managing the logistics is challenging to many. As described by Hulthén & Sundquist (2019) the logistics performance is generally low, and relates to issues with tools, equipment and material supply, impeding efficient production leading to delays and increased costs. The authors emphasize that logistics operations are integrated into a wider range of activities, and in order to produce a satisfactory outcome, all of these interlinked on- and off-site activities must be coordinated.

In construction project organizations, the main contractor is the stakeholder responsible for the building site. However, as Dubois et al. (2019) mention in their study, contractors and subcontractors frequently manage their own supply chains independently from one another, which presents a significant challenge to the effective management of logistics and transportation. This is supported by Ying et al. (2018) who state that key participants in the logistics process, including suppliers, subcontractors and main contractors, view the logistics process from their own point of view. The authors explain that each actor follows their own best logic, causing tensions to grow between them. This is further underlined by Hulthén & Sundquist

(2019), who claims that the supply chain is defined by the main contractor in accordance with the requirements of each project as well as its suppliers and subcontractors. Efforts to effectively manage this supply chain from a project perspective may clash with agreements made by suppliers and subcontractors. As a result, there is lack of coordinated effort in the entire set of logistics and transport related construction activities.

Dubois et al. (2016) analysed how the purchasing behaviours of contractors and subcontractors affect transport and logistics activities. The authors explain that both type of actors have agreements with suppliers that include 'free' site transportation; the cost of transportation is factored into the product price. This results in an ordering process that often includes delivery the day after the order date, increasing number of transports. Lack of coordination can lead to multiple individual deliveries and partially filled trucks, even when multiple orders may be placed by the same actor and are destined for the same site. In addition, Dubois et al. (2019) argue that some of these causes might be the results of suboptimizing business processes; for example, when subcontractors want to handle their own construction supplies in order to increase their profit margins. Moreover, purchasing can be handled in a centralized- and decentralized way, both impacting the logistics differently. As Cavinato (1992) explains, centralized purchasing, controlled internally by the company, generally offers streamlined coordination and financial bulk transport deals, but also has a higher risk of delays. Decentralized purchasing results in ordering being managed on the projects themselves, which improves flexibility and response time. However, this can have the downside of leading to more improvised decision making, resulting in higher costs and less certainty. Frödell et al. (2013) emphasize that a combination of approaches is often utilized in a more hybrid purchasing organisation. While theoretically utilizing the positives of both approaches, practically it can be challenging as it requires effective coordination and strong communication with several stakeholders. These practical implications have been present in the industry the last decades, with the fragmentation showcased by Agapiou et al. (1998) in their research on *'Logistics in the materials flow control process'*. They highlight that the purchasing and planning of deliveries often happens on a reactive basis. Some materials are purchased just before they are needed, which causes delays and interruptions, while other materials are procured in bulk without meeting the on-site needs. This then results in wasting resources in the handling, stocking, and shipping processes.

Dubois et al. (2019) illustrate the fragmented approach by their so-called 'decentralized configuration' (see Figure 2). Based on seven years of research with 56 interviews, multiple visits and observations on Swedish construction sites, they conclude that most projects organisations tend to favour this decentralized configuration, wherein each actor handles the coordination of their own transportation and logistical needs in addition to the production activities:

*"In the de-centralised coordinated configuration, on-site efficiency is low in production [...]. Both materials handling and production activities are dependent on the same resources, such as cranes and elevators, and construction workers alter between these activities. The waiting time for using resources, the need of excessive capacity for moving around materials at the site, and working hours to search for and sorting materials hamper efficient resource utilisation."*

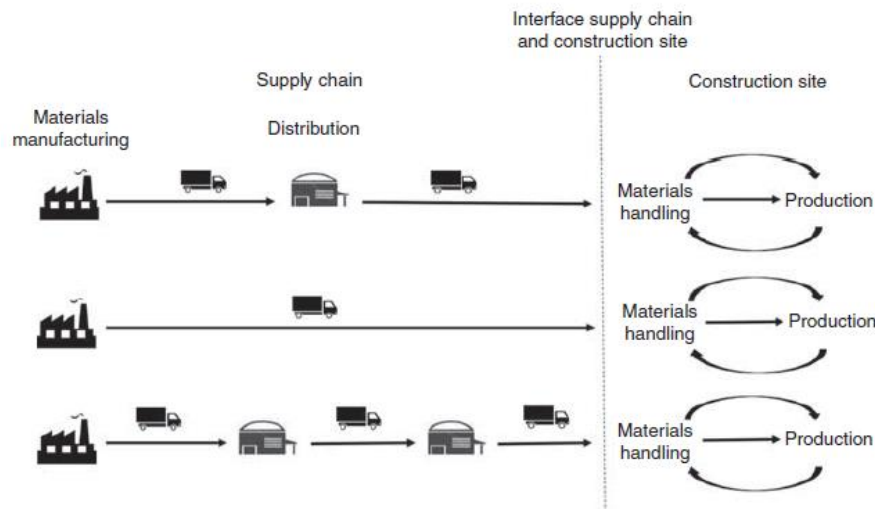


Figure 2. An illustration of different supply chain distribution formats created by Dubois et al. (2019)

## 2.4 Site management and construction logistics

Managing logistics on construction sites is a fragmented and complex practice. Each project requires extensive planning and organisation to enable the coordination of the various activities, while at the same time many stakeholders try to control their own business on a provisional base to increase productivity or create value (Hulthén & Sundquist, 2019). This puts a lot of pressure on the main contractor, as this actor is the so-called ‘spider in the web’. Coordination of the disparate operations and managing flows of materials and resources to, from and on the site, all require a significant amount of effort, as Ekeskär & Rudberg (2016) summarize. Further illustrated by Lindén & Josephson (2013), it is stated that this demands ‘*a great deal of attention from workers and construction managers*’. The limited amount of studies found primarily focus on the time workers spent on logistics related tasks. Research on managers on construction sites seems to be lacking in regard to accuracy or care for time spent. Both will be presented in the next section.

Pettersson & Skoglund (2020) found that a supervisor on a Swedish construction site spent approximately 22 hours of a 5-day workweek (assuming 40 hours), equating to roughly 50%, on logistics related activities. The authors considered these activities as ‘waste’ and thus non-value adding. Examples of these identified activities observed in this research are for example: ‘*moving around materials*’, ‘*looking for storage areas*’, and ‘*meeting regarding the placement of a construction elevator*’. It is highlighted that this does not imply that the tasks are irrelevant, and in most situations, they are required to be performed. However, the study suggests that by outsourcing these identified ‘waste’ activities to an external specialised company, the supervisors could spend their time on tasks directly contributing to project productivity. The paper states that the shift enhances overall project performance by allowing supervisors to focus on their primary tasks, which are tasks that directly contribute to project progress and quality. This would suggest that Pettersson & Skoglund (2020) believe that supervisors should focus on technical construction related aspects, such as coordinating the installation of windows or pouring of concrete. However, the authors do not clarify what these primary tasks are, nor do they explain the exact meaning of ‘increased productivity’ or ‘overall project performance’. Additionally, while the study did provide both a quantitative and qualitative identification of how construction managers spent

their time in relation to logistics, it should be noted that the accuracy of observation data is considered minimal in terms of sample group, timeframe, and details of the observation logbook.

When looking at time expenditure in Swedish construction, there is one key study by Josephson & Saukkoriipi (2005) which followed the workers, recording their active working time, downtime, indirect work and breaks. The authors note that on average workers spend 14% of their time moving around materials and a significant amount of time either waiting for materials/tools or doing preparatory work. Wanting to see the impact that logistics could have on how workers spent their time, Dahlström et al. (2010) recreated the observation in their master thesis research, with a key difference in how the on-site logistics were handled. In essence, the material handling was outsourced to specialised personnel. This resulted in an increase in the amount of time spent doing work, with the time spent waiting reduced to near nothing. Josephson & Saukkoriipi (2005) comes to some conclusions as to the reasons why change like this is so slow to happen, highlighting a common theme of perceived conservatism as well as changes coming in the form of additions rather than reforms.

## 2.5 Logistics related job requirements for site management

Following the logic that contractors' on-site management experts have a significant responsibility in managing the logistics, thus putting time and effort in these practices daily, would suggest that there should be a connection between these practices and the requirements put on site managers and supervisors. In a study on *understanding demands for project manager competences in the construction industry*, Zheng et al. (2020) analysed almost 250.000 Chinese job advertisements for site managers in the Chinese construction industry. And while the Chinese construction market likely differs from the Swedish one there were no such large-scale studies performed in a more relevant market. Based on their data the researchers identified eight different topics and highlighted the most present words in the job descriptions (see Figure 3). Analysing these findings make clear the term 'logistics' is not a common buzzword. There are words that could be interpreted as closely connected to construction logistics, such as 'coordinate', 'project schedule' or 'communicate', however it is hard to say if the use of such words directly implies a search for logistical competences. The same applies for their categories 3 'construction site management', 6 'coordination and communication' and 8 'organizational management capabilities', as logistics could be part of those topics. Further explanation of the eight different categories by the authors, reveals that the closest reference to construction logistics is category 3 'construction site management' which is only included in 16.1% of job descriptions.



Figure 3. The summary of key characteristics across 250.000 Chinese job advertisements. Highlighting 8 core areas of competency and buzzwords included in each category. (Zheng et al. 2020)

In another research originated from the UK, Harris & Watts (2021) found out that there are significant gaps existing between the curricula taught in their university modules and what is asked in construction professional job descriptions. While this study was focused on construction in general rather than construction logistics in particular, it paints a clear picture of the existing discrepancy in the field. The authors claim that while university modules generally equip students with essential technical knowledge of construction principles, they fail to fully cover practical soft skills like agility, communication, problem solving that are increasingly demanded by employers. To be better prepared for the diverse, collaborative and dynamic demands of the construction industry, which can be correlated with logistics management, Harris & Watts (2021) suggest to integrate more adaptive and interdisciplinary approaches to stimulate the development of 'softer' management capabilities.

## 2.6 The development of logistics specialists

Over the last decade, logistics specialists have become important actors in the construction industry (Ekeskär & Rudberg, 2016). Logistics specialists are responsible for reorganizing activities and material flows among supply chain actors (Hulthén & Sundquist, 2019). Their aim is to increase the efficiency of on-site operations, and to handle logistical challenges related to the supply of equipment and material. In the construction industry, different ways of filling in this role as logistics specialist have emerged, both internal and external.

Bengtsson (2019) explains the different setups of a dedicated logistics specialist on a more systematic way. Basing their thoughts on a comprehensive literature study, three different construction logistics models are identified:

- The '*company-based model*' - internal logistics specialist at the main contractor, focusing on a single project.
- The '*project-based model*' - external logistics specialist involved for a single project.
- The '*system-based model*' - external logistics specialist involved for multiple projects.

Based on numerous case studies, Bengtsson (2019) finds that having an internal logistics manager in the contractors' organisation is a relatively new solution and considered more as a support function for the contractors' managers. While the main driver for contractors to invest in this solution is to reduce the costs, the connection with financial management seems to be challenging as it appears to be hard to quantify costs savings. The biggest challenge for logistical managers is stated to have subcontractors that understand this logistical approach, where the subcontractors often see it as a risk instead. When reflecting on the involvement of a Third-party logistics (TPL) partner, the most common form of external logistics specialist, the participating contractors did not believe in this solution, for reasons such as "we lose part of our revenue with a TPL involved" and "the solution exists within the project". However, the findings of a project that adopted the 'project-based model', and involved an external logistics specialist, showed rather positive results. In this example, it is important to mention that an external developer (client) initiated this solution from the early stages, which included a fully outsourced logistics approach (Ekeskär & Rudberg, 2016). In this instance the main- and subcontractor were aware of the specific way of working when tendering for the project. This is in line with how Bengtsson (2019) explains that strict management, from the client and external logistics manager towards the contractors, allowing zero flexibility, was vital to implement this approach:

*“Having worked as a contractor for many years, the Senior Construction Manager (from the developer) has steered the contractors with a firm hand, making sure everyone is on-board with the change and help change their work processes in line with the model. The Logistics Site Manager from the TPL agrees that steering the contractors with a firm hand has been the key success factor for implementing the model.”*

*- Bengtsson (2019)*

While this instance had a positive result, Bengtsson (2019) emphasizes that when the number of involved actors increase, as with the ‘system-based project’, the coordination becomes increasingly more difficult. A broad set of actors will lead to focus on contracts and procurement, and the formal setup will make communication and coordination even more challenging, putting more pressure on the role of the developers as driving forces. Concluding the study, Bengtsson (2019) highlights that while the general aim to adopt coordinated construction logistics is to increase productivity, it should also focus on enhancing collaboration, learning, innovation, and reduction of environmental impacts. To strive for these objectives, strong leadership, commitment, communication, and cooperation are the management skills that should be acquired.

Sullivan et al. (2010) states similar ideals regarding a logistical manager extensively highlighting the capabilities of a dedicated logistics manager. Highlighting how the role is centred around key characteristics such as: communication, coordination, leadership, authority, planning, agility, flexibility, standardization, and understanding of construction, materials, and equipment, among others. Combining all these efforts daily should lead to working in a less reactive fashion, commonly referred to as ‘*firefighting*’, thereby mitigating risks and reducing costs. As this dedicated role has many similarities with ‘traditional’ construction managers, Sullivan et al. (2010) claim that many supervisors and site managers are undoubtedly able logisticians, whether they are aware of it or not. However, as projects, and thus the logistics, become larger and more complex, the authors nuance this by recommending a dedicated specialist to take care of the logistics management, as this job requires sufficient logistical knowledge and skill.

### **2.6.1 Change in company approaches**

The upcoming niche market of external logistics providers is partly due to the lack of logistics know-how from contractors (Ekeskär & Rudberg, 2016). It seems that contractors are slowly starting to acknowledge the importance of having sufficient logistics management expertise in-house. In research by Hulthén & Sundquist (2019) an example is presented in which a main contractor appointed an internal logistics coordinator to oversee material deliveries and handle on-site logistics, fostering better communication and coordination with different subcontractors and suppliers through regular meetings and updates. Despite some occurring challenges, like last-minute scheduling changes leading to inefficiencies, unnecessary movement of materials, and minor material damages, this approach was perceived as successful by the contractor. Positive outcomes included improved delivery coordination, reduced plan deviation and quality gains in the production process. These benefits outweighed the drawbacks, resulting in the contractor deciding to implement this approach in future projects.

Lindén & Josephson (2013) reviewed a different approach of the use of an external logistics provider. In this configuration, the external party acted to perform only part of the logistics function on projects, namely the on-site material handling. The authors compared this to a project where the construction workers handled the materials, commonly referred to as the 'traditional' way (Strandberg & Josephson, 2005; Sullivan et al., 2010). Namely three projects where an external logistics party provider was consulted to handle the materials was used for the comparison. Their analysis showed that utilizing the systematic approach of logistics providers positively impacted the on-site material handling. It minimized unnecessary movement of materials, reduced damage risks, and optimized storage locations. Furthermore, the study showed that outsourcing the material handling resulted in increased insights in the generally 'hidden cost' of logistics in the construction processes. Lindén & Josephson (2013) explain that contractors' cost estimators often lack knowledge in calculating the wasted time when workers are interrupted for unloading and transporting material, as is the practice in the 'traditional' way. Also, the competitive nature in the sector can lead to cost estimators avoiding adding new cost aspects, even if this potentially leads to cost reductions elsewhere. By adopting an external logistics provider, such as a TPL, these respective costs become visible. The authors claim that this results in overall cost reductions, as they exemplify this by stating that costs were reduced by approximately 20% when out-sourcing material handling for gypsum board (Lindén & Josephson, 2013).

While the adoption of logistics expertise involved in projects is becoming more prevalent, with studies claiming that this clearly benefits the overall project performance (Ekeskär & Rudberg, 2016; Hulthén & Sundquist, 2019), there is also a resistance to logistics management being implemented in projects (Lindén & Josephson, 2013). Next to the financial argument, often put forward by the contractors, there also seems to be a certain cultural resistance to change. With the general construction industry is often being characterized as conservative, the adoption of this reluctant attitude towards coordinated construction logistics is portrayed in following statement:

*"Some site managers were convinced that there are significant economic gains to be made if material handling is prioritised earlier in the project phase. However, many of them pointed out that changes of this kind are hard to implement due to the general culture and nature of the industry. They described the industry as conservative and hostile to change and this negatively impacts material handling since new working methods are viewed with great scepticism."*

*- Lindén & Josephson (2013)*

Lindén & Josephson (2013) further discuss that some managers view material handling as an integral part of the construction process, believing it should be managed by the craftsmen within their working hours. They see this task as some form of buffer or 'second-hand' priority activity. While highlighting these views the author also takes the time to highlight that they are changing, pointing to a trend among construction managers in Scandinavia that support the idea of procuring specialist to handle the logistics.

## 3. METHODOLOGY

To research the hypothesis as described in the introduction, this study has been conducted following an inductive approach. This setup, as described by Bell et al. (2018), entails a theory being developed in a 'data-driver manner'. To test the assumption that on-site logistics takes up a considerable amount of site management's time, a set of field observations was combined with interviews. Both field observations and interviews were held with a combination of site managers and supervisors. While this study has a clear qualitative viewpoint with the interest being on understanding the subject, the quantitative observation data formed a numerical basis, whereas the interview study provided context to this data. Furthermore, a screening of job descriptions was combined with shortform interviews of HR-representatives from construction companies to juxtapose against the gathered data.

We have written this paper to those active in the construction industry on various levels: practical, academic, and scientific. More specifically, this paper is especially intended for those experts who have the power to drive changes, form policies and make decisions. This can either be practitioners, specifically working for main contractors, to raise their awareness on the current state and importance of logistics in their building projects. But this can also be educators who adopt the findings of this research on construction logistics in their curriculum, and in this way raise the awareness on this topic among future experts.

### 3.1 Observations

The first step of this research was performing observations, with the goal to get an idea of the presence of logistics on construction projects. More specifically, the interest was to review how much time supervisors and site managers, referred to as 'site management' in the report, spent on logistics related activities. In this way a better picture of the prevalence and perception of the subject could be identified.

The construction projects were selected based on a few criteria. Primarily the projects were to be located in urbanized areas in Sweden, predominantly in the Gothenburg region. As mentioned in the introduction the increasing urbanization leads to more logistical complications on construction sites. Researching projects in this setting will give a perspective on the future challenges of construction logistics. Secondly, the projects needed to be in an active phase of construction, to enable a view into the practicality of the on-site situations. Thirdly, the projects should be centred around a building rather than an infrastructure project. This is done to narrow down the scope and produce more comparable results.

To get access to such sites, multiple supervisors and site managers from various construction projects and contractors were contacted via email and follow-up telephone calls, particularly making use of '*polite persistence*' (Bell et al., 2018). This resulted in observations on three different construction projects, carried out in a timeframe of six weeks throughout February and March 2024. No two projects had the same main contractor and were in different stages of construction during the observation period. In total 5 supervisors and 2 site managers have been

observed, spread over 18 observation days and 114 total observation hours. A closer look at the division of observed hours across projects can be found in Table 1 below.

*Table 1. A description of observed sites, site managers, and supervisors. Containing information regarding time observed, stage of project, and experience of the observed subject.*

	PROJECT TYPE	PROJECT STAGE	ROLE OF PARTICIPANT	WORK EXPERIENCE IN CONSTRUCTION [years]	OBSERVED DAYS [number]	TOTAL OBSERVED TIME PER PARTICIPANT [hours]	TOTAL OBSERVED TIME PER PROJECT [hours]
Project A	Renovation of office building in city centre	3/4 years (75%)	Supervisor A	3 (3) <sup>1</sup>	3	20:33	32:37
			Site manager A	30 (25) <sup>1</sup>	3	12:04	
Project B	New apartment building in city centre	1/4 years (10%)	Supervisor B1	11 (3) <sup>1</sup>	3	21:42	43:28
			Supervisor B2	5 (2) <sup>1</sup>	3	17:06	
			Supervisor B3	8 (8) <sup>1</sup>	1	04:40	
Project C	Extension of existing building in urban area	0.5/1.5 years (35%)	Supervisor C	10 (2) <sup>1</sup>	2	15:24	38:35
			Site manager C	10 (5) <sup>1</sup>	3	23:11	
<b>TOTAL:</b>					<b>18</b>	<b>114:40</b>	

<sup>1</sup> Number in parentheses indicates number of years the subject has been working in their current role

During the observations, the supervisors and site managers were followed during multiple workdays (07.00 – 16.00). The focus of the observations was on different aspects, which are similar to the dimensions as described by Spradley (2016): Primarily, the interest was to observe the activities that site management conducts and how much time the subjects spent on each event, noted in minutes. If found necessary, the space (physical layout of the site), actors (range of people involved), acts (single actions people undertake) and goals (things that people are trying to accomplish) were also noted. Each activity was filtered based on if it was related to logistics or not. A non-logistics related activity would not receive a number coding, while a logistics related activity would be qualified based on nine different logistical categories (number 1-9). Basis for these classifications were the on-site logistical categories as described in chapter 2.2. However, adjustments and additions were made, primarily based on the observed actions of site management, see chapter 4.1 for further details.

The observations were performed in a passive ethnographic role, which can be classified as ‘detachment’ as described by Gold (1958) or ‘shadowing’ (McDonald, 2005). Verbal contact between the observers and observants was minimal, apart from infrequent concise questions to clarify the observants activities. The observers operated in a role in between overt and covert, meaning that the actual- and initially communicated research intention overlap to great extent, where only the focus area was different. This touches upon ethical considerations and is discussed in more detail in chapter 3.4.

The observations were registered on a physical field observation logbook (pen and paper) and afterwards transferred to a digital copy (Excel). In order to work with objective data, the ‘time on break’ has been deducted from the ‘total observed time’. In this way focus was on the time the observed subjects spent working, which then resulted in time and percentage of logistics related work. This was then evaluated in more detail, focusing on the specific logistics categories (numbered 1-9). Alongside the quantitative data regarding time spent, documentation was taken of events or interactions of note which has been presented alongside the information gathered in the interviews where related, as well as in chapter 4.3. This was made with the aim to provide some depth and context to the observation data and answers from interviewees.

## 3.2 Interviews

To support the quantitative data from observations, qualitative information was also obtained by performing an interview study. Meeting the qualitative angle of this research, semi-structured interviews formed the logical step to give context to the data and increase the understanding of the practical outcomes. In total 11 interviews were conducted from January till April 2024, with the participants including: the observed subjects, HR-representatives from construction companies, experienced site management members, and holders of expert knowledge on the topic.

Firstly, the observed supervisors and site managers were interviewed following up on the observations. The interviews followed a clear structure with prepared questions [see appendix 4 for the interview guideline], however there was still room for spontaneous additional questions. The structure of the interviews was developed following the ideas of Bell et al. (2018), using the introductory questions to establish the interviewee's general information. Following this the logistics focus was introduced and the next set of questions were centred around the nine different logistical observation categories (numbered 1-9). This allowed them to reflect and present their own perspective of their work, giving a more holistic view of the findings from the observations. The last few questions aimed to let the interviewees contemplate the amount of time they spent on logistics related activities.

Additionally, interviews with representatives from contractors' HR departments were conducted. The aim of these interviews was to review what recruiters are looking for when hiring supervisors and site managers, specifically if they are looking for any logistical related requirements, skills, and experiences. This was approached by asking general questions to review what they find important when hiring supervisors and site managers. If there was no mention regarding logistics, the interviewees were asked more specific question regarding the subject. In this way the importance of logistical requirements could be interpreted, while attempting to avoid any subject bias.

To help answer the third research question, interviews with logistical specialists were performed. The two experts interviewed in this study worked at a TPL-provider, and both were actively involved in assisting the logistics on construction sites. The focus of these interviews was on providing insight into the topic of construction logistics, while at the same time allowing a point of comparison to the findings from the observations and interviews with the site management from construction sites, where there is no TPL involved. The interviews followed the same structure as the interviews conducted with the site management, so that a qualitative comparison could be made.

The interviews were, after agreement of the interviewees, recorded on two devices to avoid losing data to technical malfunction. The recording was then transcribed making use of automated transcription software, in combination with manual checks and adjustments. Half of the interviews were conducted in Swedish, which required additional awareness in the translation to English to not misrepresent any information. After the interview transcriptions were verified by both researchers, four main themes were developed which were used to colour code the interviews: *'Time and effort on logistics'*; *'Impact of logistics on project execution'*;

‘Strategies in construction logistics’; and ‘Differences and similarities in job expectations vs. reality’. These categories were then used to structure the information gathered into clusters before being analysed and presented.

Table 2. A listing of interview subjects, their role, their years of experience, and if they were included in our observation data.

<b>TYPE OF COMPANY</b>	<b>INTERVIEWEE DESIGNATION</b>	<b>EXPERIENCE IN CONSTRUCTION [years]</b>	<b>OBSERVED [yes / no]</b>
Contractor	Site manager A	30 (25) <sup>1</sup>	Yes
Contractor	Site manager C	10 (5) <sup>1</sup>	Yes
Contractor	Site manager D	20 (3) <sup>1</sup>	No
Contractor	Supervisor A	3 (3) <sup>1</sup>	Yes
Contractor	Supervisor B1	11 (3) <sup>1</sup>	Yes
Contractor	Supervisor B2	5 (2) <sup>1</sup>	Yes
Contractor	Supervisor C	10 (2) <sup>1</sup>	Yes
TPL	Logistics manager E	4 (4) <sup>1</sup>	No
TPL	Logistics manager F	15 (3) <sup>1</sup>	No
Contractor	Recruiter G	12 (12) <sup>1</sup>	No
Contractor	Recruiter H	6 (6) <sup>1</sup>	No

<sup>1</sup> Number in parentheses indicates number of years the subject has been working in their current role

### 3.2.1 Screening of Job descriptions

To support the information collected in the interviews, particularly those with recruiters, we chose to do a screening in which seven job descriptions were evaluated. These were selected at random from numerous large Swedish construction companies’ webpages. Following selection, we sorted through the information and focused on statements that related to either a description of the position or what characteristics the person applying to the position should have. These were then summarized in a table for easier comparison before being evaluated. Upon summary we reevaluated the subcategories for any potential connection to logistics before evaluating similarities and differences.

## 3.3 Literature

Following the observations and in conjunction with the handling of information from the interviews, a literature study was conducted regarding construction logistics, defining the construction logistics, surveying current trends, and investigating the existence of expert knowledge. The aim of the literature research was to provide an overview of this extensive, yet niche field of expertise and at the same time providing information to act as a point of comparison. This includes defining the term ‘logistics’, proving a synopsis of the different interpretation on this subject. The literature was obtained by building on the information from the ‘Construction logistics and Supply Chain management’ course (Chalmers University course code: ACE130) and searching for relevant keywords in Google Scholar and Chalmers library database. There keywords included: *construction logistics, site manager, supervisor, time,*

*contractor, logistics manager, job description, and logistics solutions.* The sources were critically evaluated, with a focus on the Swedish construction industry and contemporary studies where possible.

### 3.4 Ethical considerations

The research structure as described in this chapter has certain aspects that need additional clarification. The primary ethical consideration was the decision to purposely obscure the full extent of the research to the majority of the participants. It was found prudent to not express the particular focus of logistics, due to the potential influence this could have on the participants, thus impacting the study results. As such, the participants were initially told that this research looked at what managers on construction sites do and how they spent their time, building on previous similar research from Mintzberg (1970). This statement is not untrue, rather only the specific focus on construction logistics was undisclosed. After confirmation for the thesis supervisor, this approach was found reasonable and carried out with ethical responsibility. The participants were informed about the actual research intentions at the end of their participation, prompting only positive responses.

All experts that participated in this research have been presented with full anonymity, meaning no mentioning of names, age, company names, or projects. Prior to their participation, both when initially contacted and when communicating with the participants during the observations and interviews, they have been informed about the defining information that would be included in the thesis: type of company (contractor or TPL), role/function, years of experience, type of project and current project phase. Including this information contributes to the quality of the study, as it shows the level of expertise and variety in data sources. All participants gave full consent to these conditions.

This paper was supervised by an external supervisor from Svensk Bygglogistik AB, helping to guide our work and provide access to contact information. As Svensk Bygglogistik AB is a company working as a third-party logistics (TPL) service it is in the external supervisors' interest to guide us towards painting what they do in a positive light. However, at no point did the external supervisor comment on particular wording of the report, nor request us to change any content of the research.

In the process of transcribing and translating the interviews, the use of software algorithms such as those by OpenAI (ChatGPT) have been utilized. However, it is important to mention that the information that have been uploaded in the algorithm did not include any sensitive or confidential information. This means that details about company- and project names, names of people or any related information have been manually filtered out before using these documents. Additionally, all the recordings from the interviews were deleted in close connection with the completion of the research report, in accordance with the GDPR regulations.

### 3.5 Limitations

As this research had a qualitative approach, backed up with quantitative observations data, all of which was gathered in the Gothenburg region of Sweden, its results portray the tendencies of

that area. As such it would be presumptuous to assume such tendencies to apply far outside of the context of Sweden. Beyond that, only building projects in a tight urban environment were included in the study which makes conclusions for other types of projects (such as infrastructure) hard to make. For the observation process, there could not be any involvement of an external provider of logistical services. This niche solution, as exemplified in chapter 2.6, would move the majority of the logistical responsibility away from the observed site management. While such a solution has value in providing a point of comparison for the efficacy of an external provider of logistical services it is outside the scope of this thesis.

During the observations the two authors were apart for the most part, where each individually followed either a supervisor or site manager while being on the same construction project. This resulted in more gathered data in the available time, however, this can have implications for the occurrence of variance in the observation data. Despite working on the same goal and according to similar structure, certain situations can be interpreted differently, which can lead to minor differences in categorization or explanation of an activity.

Additionally, it is important to mention that only one of the two authors speaks Swedish fluently. This created a language barrier when being on site, as the spoken language on the observation project was Swedish. It was challenging for the author that did not speak Swedish to interpret certain situations, and therefore had to ask more questions to the observees. Even though the observees were always rather accurate in their English explanation, this language barrier highlights a limitation. Similar arguments apply to the interview study, where both authors also carried out most of the interviews individually due to time constraints and scheduling conflicts. And while the interviews followed a prepared outline, there was still room for additional questions based on the specific interview. Furthermore, the language barrier can potentially be an influential factor with the interviews. Half of the interviews were carried out in English, having the downside of an increased risk of inadequate expression by the interviewees, who were all native Swedes. The other half was carried out in Swedish, which can lead to discrepancies when translating the transcriptions to English.

The screening that was performed in this work was done in a supporting fashion and as such is not extensive. Job descriptions were selected from varying companies to avoid evaluating a single company, however with the size of the selection certain companies still represent up to 33% of the screening. No job descriptions were selected for positions outside of Sweden to avoid variance from culture or nationality.

## 4. OBSERVATION RESULTS

This chapter presents the results from the quantitative part of the research. Observations were held on three different construction projects. In total 5 supervisors and 2 site managers have been observed, spread over 18 observation days and 114 total observation hours. These projects have been designated as Project A, B, & C and are briefly described below.

Project A was a renovation of an office building in the city centre, running the length of a block and spread over several office floors. The building was completely stripped and rebuilt, from façade to interior, while parts of the offices were being used during different phases of renovation. Combined with an operational store, other neighbouring infrastructure construction projects, and extensive traffic flows around the site, this site required demanding efforts from the main contractor. During the observations, the project was in the final part of renovation, with one year of construction remaining. Various building activities were active on all floors, both outside and inside.

Project B included the construction of an extensive apartment complex, consisting of two newbuilt main buildings over ten storeys high. The project is located centrally in the city, along a trafficked road and surrounded by many existing apartment- and office buildings, limiting the space and surrounding traffic flows. At the time of observations, the project is in the initial stages and current building activities were focused on finalizing the foundations (excavating, sheet piling, and casting), as well as demolishing existing concrete constructions.

Project C was centred around an extension of an existing building, including both a restaurant and numerous floors of separated office spaces. The project is located alongside a main transport route with a common occurrence of emergency transports due to nearby institutions, putting higher requirements on not inhibiting traffic flows. For the duration of the observation period, the project was in an intermediary stage of production. The main focus at the time was the exterior shell of the building, roof and walls, as well as the final touches to the frame of the building.

### 4.1 Change of categorisation

During the observations the seven on-site logistics categories that formed the basis for the site observations, derived from Hulthén & Sundquist (2019) and described in chapter 2.2, were considered to not completely align with the practical situation. Therefore, it was decided to adapt the categorization based on the on-site experiences. In the following section the changes from the seven base categories to the nine applied categories will be explained.

Table 3. Showing the adaptation done in this work to the base categories by Hulthén & Sundquist (2019), based on experiences during the observation of site managers and supervisors.

BASE CATEGORIZATION OF ON-SITE LOGISTICS ACTIVITIES <sup>1</sup>		ADAPTED CATEGORIZATION OF ON-SITE LOGISTICS ACTIVITIES <sup>2</sup>	
1	Delivery control	Delivery control	Removed Category
2	Inbound transport	Inbound transport	New Category
3	Moving around materials	Moving around materials	
4	Intermediate storage	Enabling work and surroundings (flows)	
5	Sorting of materials	Sorting of materials	
6	Moving materials to installation site	Moving materials to installation site	
7	Waste Management	Waste Management	
8	-	Coordinating people	
9	-	Logistics Planning	

<sup>1</sup> Based on Hulthén & Sundquist (2019)

<sup>2</sup> Adapted based on our observations

It became clear early on that the category ‘intermediate storage’ (4) was redundant for this research. This due to when observing the subjects’ actions it became difficult to establish an action as part of ‘intermediate storage’ (4) rather than ‘moving around materials’ (3) or ‘sorting of materials’ (5). This was largely due to the lack of intermediate storage on the sites visited. Next to that it proved to be difficult to point out activities to this specific category, since it was not always clear where and for what reason materials were moved. Therefore, most of those situations have been categorized under category 3: moving around materials.

In addition, three additional categories have been identified. Category 4 was set to ‘enabling work and surroundings’ (note that there is no relation to previous number 4: intermediate storage). This category contains activities that are often seen as minor, but essential to continued smooth logistical flows. Examples include giving people access to the site, aligning traffic barriers or gates, or fixing electrical infrastructure. In addition, category 8 and 9 have been added. Category 8 entails the ‘coordination of people’ and includes all the communication efforts with various people on site, related to logistical tasks. Often it was observed that the site management instructed workers to perform or direct logistics activities, while these could have been categorized according to the tasks workers were asked to perform it did not create an accurate representation of how site management spent their time. Lastly, category 9 contains the ‘planning for logistics’, this can be extensive discussions during meetings with different stakeholders about how to organise the logistics operations, but also a short phone call to a specific supplier discussing how to plan deliveries. Besides the clear appearance of these categories during the observation, they are also in line with the study from Hulthén & Sundquist (2019) from which the seven base categories were derived. In their paper the authors emphasize that “on-site logistics activities include logistics planning and coordination [...]”, however they were not present in the overview (Figure 1) as described in chapter 2.2. In order to include these relevant aspects, it was found necessary to assign specific observation categories to them.

## 4.2 Time spent on construction logistics

Table 4 shows an overview of the total statistics from the observation data, where the findings include the general high percentage of the time spent on logistics (>20%). A stark distinction between the time spent on logistics by site managers (21%) and supervisors (48%) is visible. For

site managers, the percentage is lower and deviates between 9% and 33% based on singular day data (see appendix 1). For supervisors however, the results are considerably higher. Close to half of their average working day is dedicated to logistics, although there is substantial variation daily, with percentages fluctuating between a minimum of 26% to a maximum of 69%. In this data it can be noted that what would constitute a logistics filled day for a site manager would equate to a ‘slow’ day in regard to logistics for a supervisor.

Table 4. A summary of the data collected, divided by site and position, highlighting total time spent observing each role per project, how much time was spent on tasks that related to logistics, and then showing how large part (in percent) of the observed working hours logistics takes up.

SITE MANAGERS				
	PROJECT A	PROJECT B	PROJECT C	CUMULATIVE
NET TOTAL TIME OBSERVED <sup>1</sup> [hours]	12:04	-	23:11	35:15
TOTAL TIME ON LOGISTICS [hours]	1:48	-	5:38	7:26
PERCENTAGE OF TIME ON LOGISTICS	15%	-	24%	21%

SUPERVISORS				
	PROJECT A	PROJECT B	PROJECT C	CUMULATIVE
NET TOTAL TIME OBSERVED <sup>1</sup> [hours]	20:33	43:28	15:24	79:25
TOTAL TIME ON LOGISTICS [hours]	9:03	21:21	7:28	37:52
PERCENTAGE OF TIME ON LOGISTICS	44%	49%	48%	48%

<sup>1</sup> Net total time observed = Total time observed - Total time on break

There is a deviation in the time spent on logistics between the two site managers observed. When looking closer at the individual breakdown it can be seen that site manager A spends a lot of time on ‘delivery control (4)’, contrary to site manager C who spends the majority of their time in regard to logistics on ‘logistics planning (9)’. This is likely caused by the two projects being in different stages, varying the things that the site managers need to do in addition to an altercation with the colouring of piping (which is further explained in 4.3). To note however, was that during the observations of Site manager A there were multiple times where the researchers could not join in on longer form meetings due to the sensitive nature of the information shared during those meetings. Contrary to the variance between site managers, the time spent on logistics by supervisors appears uniform no matter the stage of the project. However, as is shown in Figure 4, Figure 5, Figure 6, and more in depth in the charts presented in Appendix 3, how the supervisors and site managers spend their time on logistics varies a lot. The charts show different dominant categories for every individual each day, exemplifying the breadth of the area of logistics.

To further evaluate the variance in time spent on logistics, the distribution between our nine categories, as can be seen sorted according to project in Figure 4, Figure 5, & Figure 6, was observed. These charts display how large of a percentage of time spent on logistics was on any given category. Across the three projects there is a variance in the difference of time spent on the category 9 ‘logistics planning’. In project A, which was in its later stages during the observation period, ‘logistics planning’ (9) takes up under ten percent of the time of both supervisor and site

manager, as can be seen in Figure 4. Instead, when viewing project C, which is in the middle of production, ‘logistics planning’ is the largest factor for Site manager C and the second largest factor for Supervisor C. Surprisingly, for Project B which was in the early stages of production ‘logistics planning’ (9) takes a middle role in time allocation (seen in Figure 5). This can be connected to the statement by Supervisor B1 who pointed out: “we don’t have any guys on site at the moment and so we have to do a lot of the fill-in work ourselves until the project really starts to get going”. Thereby, requiring the supervisors to be more involved in tasks they would otherwise be delegating to others. When looking closer at the distribution of Project C (Figure 6), it is notable that neither Supervisor C or Site manager C spend much time on ‘moving materials to installation site’ (6), ‘Waste management’ (7) or ‘Coordinating people’ (8). Instead, as mentioned earlier spending a significant portion on ‘logistics planning’ (9), more most of the observed subjects from other sites.

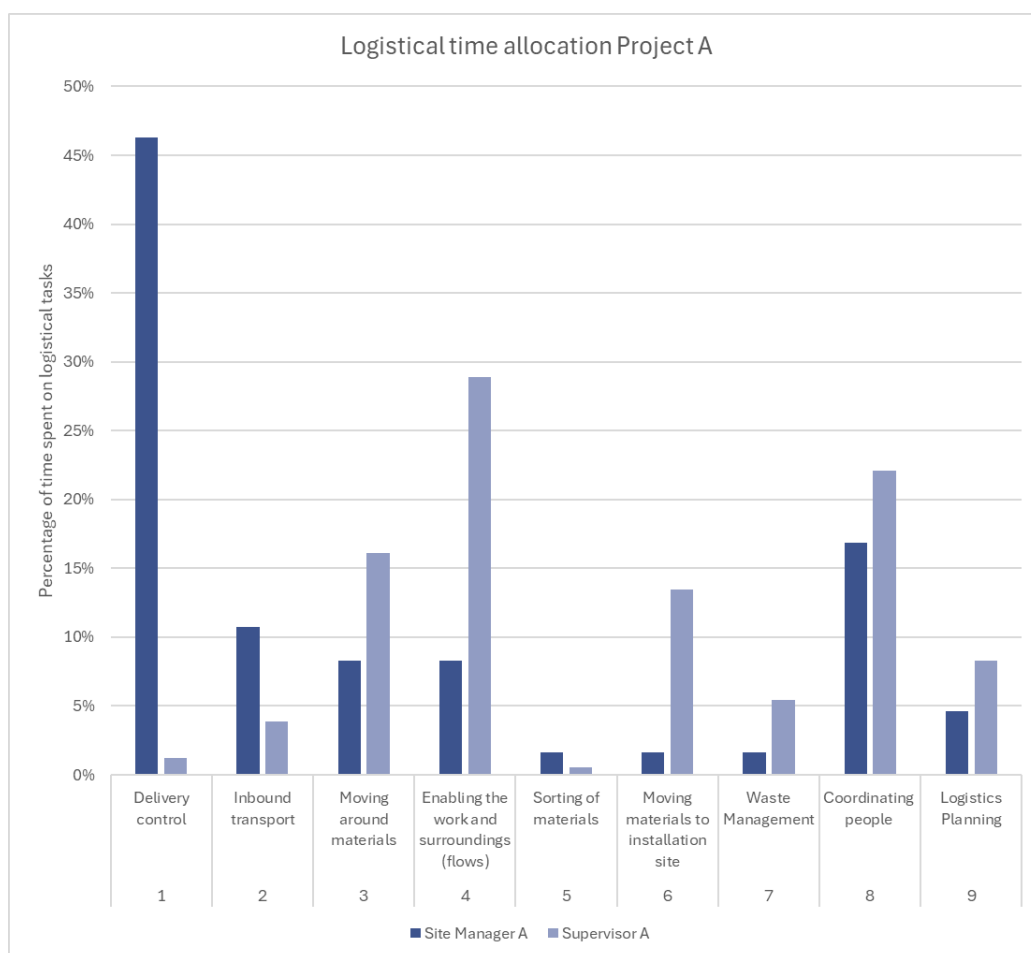


Figure 4. Logistical time allocation of observed subjects on Project A. Presenting which logistical categories Site manager A and Supervisor A spent their time on as a percentage of their total time spent on logistics.

A notable outlier is the time spent ‘delivery control’ (1), by Site manager A. This deviation was caused by an error occurring with a set of deliveries of pipes and airducts. Unfortunately, one of the subcontractors on site had, when procuring the colour for the pipes for the project, been working with a painting company that did not use the designated colour code for their paint, but instead used one that was supposed to be equivalent. This was not the case, and it had a slight offset in colour gradient. Additionally, the shine the paint was supposed to have been, was not

the same for all the various parts and ranged over a large span of variance. Therefore, the site manager was forced to spend a lot of time and energy in how they were to resolve the situation, centred around question such as: should they get new paint and repaint them on site, or return them to the supplier and request a proper repaint? How long would it take and what would be the impact of the various scenarios? Site manager A later in the interview talked about this situation and highlighted the importance of reflecting afterwards to evaluate such scenarios and learn from them if you want to avoid similar logistics failures in the future.

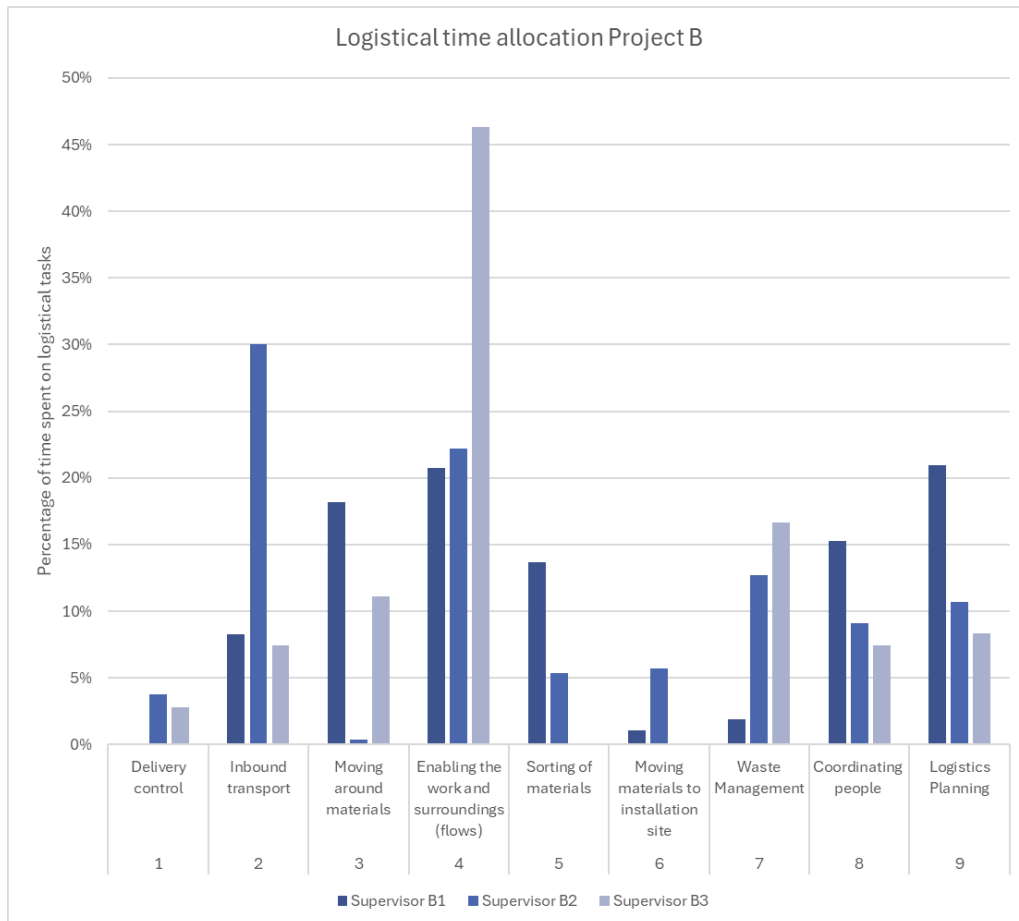


Figure 5. Logistical time allocation of observed subjects on Project B. Presenting which logistical categories Supervisor B1, Supervisor B2, and Supervisor B3 spent their time on as a percentage of their total time spent on logistics.

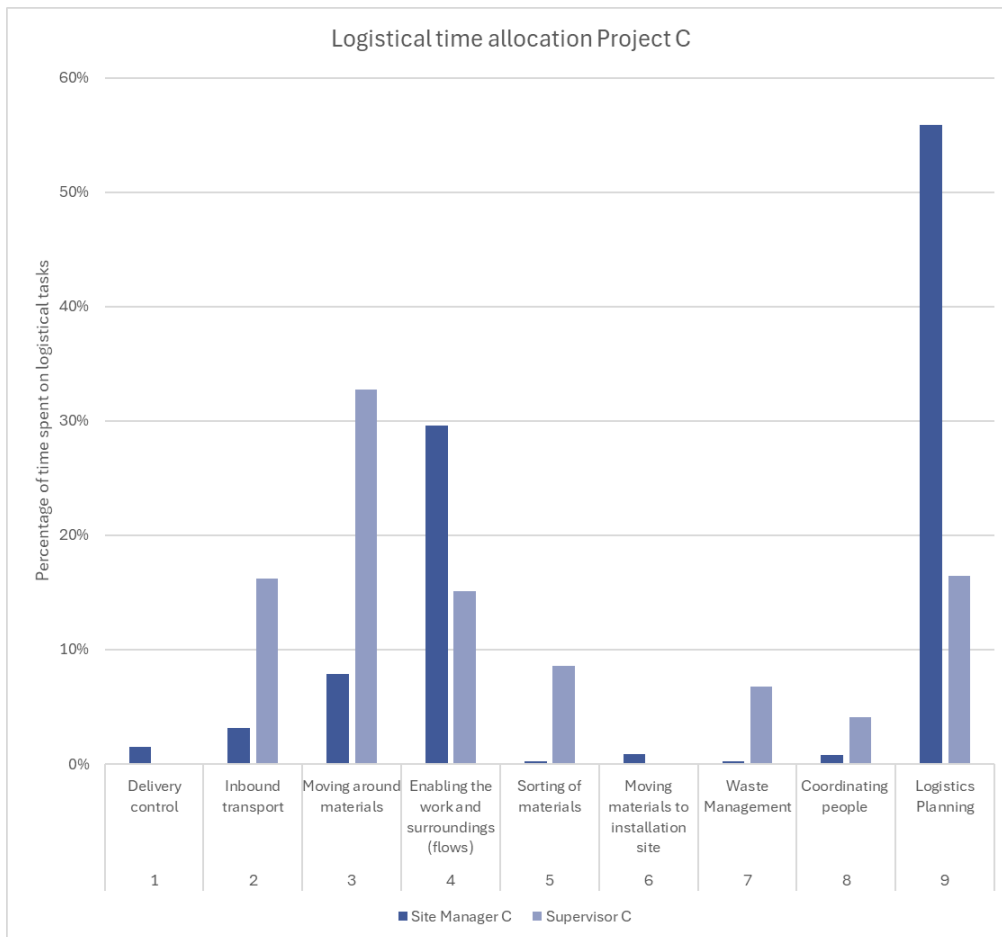


Figure 6. Logistical time allocation of observed subjects on Project C. Presenting which logistical categories Site manager C and Supervisor C spent their time on as a percentage of their total time spent on logistics.

### 4.3 Notable events during the observations

The statistical findings as presented in the previous section show the high percentage of time spend on logistics, especially by supervisors. To provide a clearer picture of what logistics on site entails on the observed projects, certain notable events that was observed will be described.

Project A gave the overall impression of a site management team that worked closely together, where the four supervisors helped each other dealing with logistical matters as they appeared, and the site manager standing-by for advice. As such, the logistics management happened mostly on a reactive problem-solving basis. To illustrate, during the observations there was a large steel frame located on the roof which needed to be removed. Unfortunately, the task of removing it had been delayed and the mobile crane they were to use for the task was leaving that same day. This resulted in Supervisor A putting in a lot of effort spread over the day to coordinate the situation: instructing workers to cut loose the steel; consultation with the crane driver; discussions with neighbouring contractor to use their storage space temporarily; directing subcontractor workers who were to remove the steel construction from the site. At the same time Supervisor A was informed that the public road, which had been temporarily closed, was due to re-open the next day. However, there was still a lot of different material and equipment stored on the road, and on inspection the supervisor found that a hole in the asphalt was not fixed yet. Therefore, Supervisor A, with assistance from both the site manager and a colleague

supervisor, needed to organise various activities to manage the situation. Taking on a role connecting the many moving pieces Supervisor A instructed workers and communicated with the crane driver, while also making multiple phone calls to the municipality and suppliers (for asphalt to fill the hole in the road). By the end of the day everything had been resolved and Supervisor A described their day as *“as bit more intense than expected”*. However, due to this series of events, other activities that were planned to take place on the roof were postponed to the next day. Unfortunately, during the night there were some heavy snowfalls which caused multiple additional logistical issues. Deliveries were delayed, Supervisor A had to make sure the transport route was accessible, and additional effort had to go into clearing snow of the roof to enable tasks that had originally been planned for the day before. This was an unexpected situation but shows the need for certain reactive efforts to work with logistics.

Another observation of note was the difference between Supervisor A being in their office and when being out on-site. The limited moments they were in their office working on their computer, the logistical demands were relatively low: some phone calls regarding deliveries or people coming in for access related questions. However, the moment Supervisor A stepped out of the office and started moving around the site, there was a remarkable increase in logistics related activities such as: organising electricity infrastructure, materials in the wrong location, directing surrounding traffic, or dealing with an elevator not working. This varied collection of events was often handled deftly by Supervisor A, however they did take up a lot of their time due to the commonality of problems arising.

On project B three different supervisors were observed, for varying lengths of time. During the observation supervisor B1 & B3 were taking care of the general site management, as their responsibility of building the future apartments would begin in the near future. This made their activities rather varied, which was shown through the actions of Supervisor B1 where they spent most of their time on moving and sorting materials together with a forklift driver. As this also conflicted with the storage space of a neighbouring contractor, there were frequent coordination talks with the other contractor to align the activities. Another aspect Supervisor B1 devoted their time to, was the preparation of an upcoming site visit by a class of students, that for a school project were to redesign the logistics of the site from scratch. Supervisor B1 explained that they had good hopes that this would give them interesting new perspectives on the logistical challenges they face in the project. These challenges also became apparent when Supervisor B1 and B3 had an extensive four-hour internal meeting together with site managers and logistics experts from the company. Largely centred around the limited space on site combined with the high time pressure of the project. Particularly, the access road and unloading approach was reviewed, including factors such as scaffolding conflict, crane position, lifts, and packaging. Different scenarios were discussed, involving strategies such as: delaying sections of the work to gain more available space; changing order of sections being built to alleviate the required flow of deliveries; increase crane utilization by adding extra crane driver and work in shift; and potential involvement of a TPL solution for on-site material handling outside of regular working hours.

Supervisor B2 was not involved in these specific planning efforts, as their main responsibility during the observation period was the ongoing ground- and concrete work. This work was currently requiring their attention as the excavation and construction of the concrete foundation

was moving forward at full pace. The first two days of observations Supervisor B2 was preparing a specific area for pouring the concrete base plate on day three. Next to all the technical production tasks they were coordinating, this also included a considerable amount of logistics. Supervisor B2 was coordinating the flows of the concrete transports, positioning of the pump truck, making sure the right resources (materials, equipment, people) were ready. Supervisor B2 spent a lot of time watching over the construction site, which was later explained that they were mostly considering the logistics process and steps involved in this time. During the concrete pouring some issues arose with the trucks that were delayed. On top of that, it also turned out that too little concrete was ordered resulting in a sequence of improvised problem solving. They later acknowledged that even though they had planned out everything in their head, problems like these could still occur.

Project C was in the middle of its production phase, which led to a lot of different activities taking place on site. Most of the ongoing work was carried out by subcontractors, and the two supervisors and site manager from the main contractor made clear that the subcontractors were largely responsible for their own material supply and handling. Therefore, the role of the site management was to coordinate and streamline the logistics needs, by controlling the delivery planning and coordinating material flows. However, some more practical situations became clear during the observation. One example of this was when the crane they utilized in the project was slightly under dimension. This led to the crane not being able to lift all the packages onto the roof, requiring the larger packages to be split into two before they were hoisted into place. Another example situation was when on the fourth observation day a logistical disruption caused some delays on site. Two vehicles needed to occupy the offloading space on site, one a timber delivery that had been booked at 09:30 that arrived 35 minutes late. The second, a concrete delivery was booked at 11:00, which required the concrete pump truck to position and install its equipment one hour beforehand. Therefore, at 10:05, the two trucks needed to make use of the same unloading space. Supervisor C had to resolve this situation in the moment, which they did by making use of the larger on-site crane to lift the trailer that the concrete pump was on over the wood delivery truck thereby reversing their positions and allowing them both to proceed. However, this took 15 minutes to organise which meant that it was 10:20 before the wood delivery truck could start unloading (50 minutes late). As such, when the concrete delivery arrived at 11:00 barely half of the wood had been unloaded and the remaining wood was sent away as the concrete truck took precedence. As part of resolving the situation, it turned out that the concrete subcontractor had only booked in a time from 11:00 in the delivery calendar, which the foreman then substantiated to Supervisor C by saying: *"We always needed the pump there an hour before. We have done this way [of working] throughout the project so far, so you should know by now that this is how we do it"*. Displaying the frustration of the subcontractor in the moment and highlighting the importance of clear communication in advance of a situation.

# 5. INTERVIEW STUDY

This chapter presents the results of the qualitative part of the study, displaying the information gathered through interviews with members of site management, logistics experts and recruitment officers. Highlighting a multitude of thoughts and insights within time and effort spent on logistics, the perceptions of logistics, strategies used to streamline the logistics in a construction project, and how coordinating and working with others impacts logistics. In addition to the raw qualitative data, information from relevant situations that occurred during the observations has been added to provide further context.

## 5.1 Site management

The interviews with the observed site managements' participants, as well as one additional site manager, showing results that are grouped according to their connection to our research questions. In the following headings the responses from site managers and supervisors will be presented.

### 5.1.1 Time and effort on construction logistics

The interviews reveal that the contractors' site management experts all acknowledge that a considerable amount of their time and effort goes into managing logistics. This can vary a lot based on the project phase and the current materials that are being used. When asked to estimate how much of their time is spent on logistics a common answer was roughly 30%. Particularly the supervisors are more accurate in evaluating themselves, exemplifying that logistics takes up between two and four hours per day, that it is in the area of 20-40%, or even more accurate: *"I would say 45% on average, but a few weeks ago I think it was 80%"* - Supervisor A. The latter part of the statement could likely be connected to a situation which Supervisor A explained during the observations, where recently they had to urgently resolve an issue with a large delivery of material. Supervisor A explained that they realised that the crane was leaving soon, the façade through which they hoisted in material was closing as well, and they still needed a lot of gypsum board for the renovation of the interior. Quick adaption was necessary to order materials, make space for storage, arrange temporary trestles, coordinate with workers and crane driver to avoid later complications and higher costs. Supervisor A explained with a note of pride in his voice that this took a lot of time, but they managed to do it, while also acknowledging that they could have foreseen the situation earlier. The site managers, give their estimations on the lower end, however, they tend to answer more in the project perspective rather than their own contribution: *"30% of the work is 'eaten up' by logistics"* - Site manager A.

When looking closer at what logistical activities site management spent their time on, the most consistently highlighted categories were: 'moving around materials' (3), 'coordinating people' (8) and 'logistics planning' (9). Especially the need for coordination and communication among various stakeholders, of which most importantly between the main- and subcontractors, was strongly emphasised in order to streamline the logistics of the project. Supervisor C exemplifies this by saying:

*"It's such a damn tough balancing act because [...] you need to be friends with them for it to be an easier journey. But you also need to be able to be the boss, and [be able to] just say: 'you have to do this, and it needs to be done now.'"*

This task falls mostly under the responsibility of the supervisors, as they coordinate most of the daily on-site operations. In addition, 'logistics planning' (9) was seen as something that was continuously involved throughout the process to make sure the conditions were good. Therefore, coordinating people' (8) together with 'logistics planning' (9), was mutually agreed by the interviewees that these two categories form the basis of their logistical management. The third category 'moving around materials' (3) was often discussed as a time consuming and demanding activity by the interviewees, yet something that was done as an extra, often to enable other tasks. Similarly, a slightly less, yet still commonly highlighted activity that takes up a lot of time and effort is the on-site 'waste management' (7). Managing waste efficiently is a challenge across projects, complicated by the space restrictions and the need for efficient sorting and disposal practices. While site managers and supervisors are not directly handling waste, it becomes clear that their role in planning and coordinating waste management is extensive. Particularly, as it is regularly stated in the interviews that it often comes down to the responsibility of the supervisor to keep track of how much waste is building up on site and to call for when the containers need to be emptied. While there was no category that was ruled out as unimportant, some received singular emphasis of their importance, such as 'enabling work and surroundings' (4), 'inbound transport' (2), and 'sorting of materials' (5). However, mention of these categories is more dependent on specific project phases and responsibility area of the individual.

### **5.1.2 Perceptions of logistics in the site management job**

In the interviews, the site managers and supervisors were asked to describe their job. When answering this question, they were not aware of the logistical perspective of interviews and the prior conducted observations. Only two out of the seven interviewees, Supervisor A and Site manager C, briefly mentioned logistics in their own job descriptions. These two indicated logistics as part of their responsibilities, while the other site managements' experts did not include logistics as part of their job description. When describing their roles they instead emphasized the diverse nature and the wide range of tasks they perform, from leading daily work to planning, with a mix between practical and execution. A recurring theme is the need for adaptability and quick problem solving, while still trying to work in a structured way. The dynamic construction environment requires individuals to be flexible and have the capability to address unexpected challenges that arise. When additionally asked, what skills were needed to fulfil their role, the importance of communication and interpersonal skills were repeatedly mentioned.

After the interviewees were informed about the logistical angle of this research, followed by discussing various logistical focused questions, all the participants acknowledged the importance and presence of construction logistics in their jobs (as exemplified in paragraph 5.1.1). A relevant follow-up question was then to ask where they acquired their logistical knowledge. Was this something that was already expected from them when they were applied for the job? A clear pattern in the answers shows valuing experience over formal education. Site manager C does not consider their expertise in logistics to have come from education, but rather something that has

evolved over time as well as being dependant on personality. This is confirmed by the other participants, who review managing the logistics is based on experience:

*“No, no, no, of course that's nothing you learn in school or something. It's something you learn by doing. But of course I've become better in it, because I've worked with it now for a long time. These [logistical] situations you are experiencing them every day, so for me it's the basics right now. And I still keep getting better in it every day. It's a process.”*

– Supervisor A

In addition, some of the supervisors were unaware of the significant part of logistics embedded in their jobs. Supervisors B1 & B2 clarifies that the job description they applied for was more about supervising, checking the production, working according to the time frame and planning. However, supervisor B2 experiences the real work is much more varied and involves a lot of logistics management. Supervisor B1 does not express similar sentiments, rather stating that personally they do not put too much time on logistics, while spending nearly 60% of their time on tasks related to logistics.

### 5.1.3 Strategies in managing construction logistics

Through the interviews it becomes clear that all the interviewees see the impact of lacking space on a project. Many of them stating that without proper logistics the work is impossible to perform. A colleague supervisor on project C stated: *“You can plan for all the people you need to build. But if the logistics don't work, nothing will happen. So that's among the most important, if not the most important thing we have”*, when asked if they had anything to add to the discussion of logistics. Primarily, the interviewees quote the lacking availability of on-site space causing a horde of issues, in areas such as waste management, workflow, or material storage, requiring quick and flexible thinking to resolve. Another fallout of the lack of on-site space is the philosophy to move materials directly to installation areas. While this is a common ideal among the majority of interviewees there is also a reoccurring thought that unavoidable conflicts will arise, leading to such material movement not always being possible. One informal moment during the observation on Project C illustrates this discrepancy, as a truck driver arriving with a delivery stated: *“What planning?! No one knows what is going on”* while waiting for instruction where to drop off his delivery.

Furthermore, it becomes clear that the different participating contractors, and their studied site management teams, have various ways how to handle the logistics on their projects. To deal with the repeatedly mentioned challenge of space limitations on and around the sites, all observed projects used a variation of an external storage facility, similar to a CCC, allowing storage of large quantities of materials that are then brought to the site when needed for installation. Multiple interviewees are positive regarding this logistical solution, enhancing JIT deliveries, reducing the amounts of transports and saving on-site space. Site manager D describes their CCC solution as something that they use throughout their company, but also highlights the importance of good communication to utilize this approach. Supervisor B2 emphasises that the subcontractors need to be informed to use the external warehouse, as well as coordinating with the warehouse itself is important. This strategy, aiming to reduce the on-site congestion, is closely connected to the use of scheduling tools. This is done through digital systems, using them to create and manage

the delivery schedules, as highlighted by the site management of project B and C. Initially, the subcontractors can schedule their deliveries themselves in this online environment, which is then being approved or adjusted by a dedicated administrator. In the case of project B this was the responsibility of a supervisors, and in project C the site manager. In their estimates this as a functional system, with the benefits of spreading out deliveries, minimizing the on-site congestion and environmental impact. Project B used a designated scheduling program, while on project C they created their own solution by use of a shared Outlook calendar. A more barebones approach is used in project A, where both Supervisor A and Site manager A explain that they used a physical delivery whiteboard in earlier phases of the project. The different supervisors on Project A were therefore responsible for their 'own' orders and deliveries, and sometimes they communicated with the suppliers to combine transports. A similar sentiment was highlighted by Supervisor C, who claims that they put a lot of effort in coordination with suppliers to make sure that there is as much material delivered on each transport as possible.

In order to streamline the management of the logistics, most interviewees highlight the importance of having meetings each week where logistical related aspects are discussed. This includes a short morning meeting with the workers, in which they go through the activities of that day, including incoming transports, waste disposal or movement of equipment. Project B & C also have additional regular meetings, where they go more in-depth into the logistics planning. However, from the observations it becomes clear that a lot of the communication about logistics happens in between other activities. Especially at Project A, it seemed that the discussions about logistics take place in an unstructured and reactive basis, as neither Supervisor A nor Site manager A did not mention any specific meetings where they talk about logistics. This reflected what was observed on-site, where a lot of discussions on various topics, including logistics, took place in between activities or during breaks. Commonly the discussion during a ping-pong match could be related to how to solve various issues around the project, with reoccurring comment of *"We will solve that"* often closing the discussion.

Some of the interviewees mentioned how suppliers can be instructed to pack or sort the delivery in a certain way. However, this usually incurs an extra cost, Supervisor C adds. To connect the marking of the materials to an overview on-site, Site manager D also explains that they make use of numerous 'site disposition plans' (SDP). On such plans they plan the layout of the site and mark where on-site materials are to be placed, then use more detailed floor plans to exactly locate where to place a given material. In this way there is a clear overview of the designated locations of materials. This is somewhat contrary to responses from others claiming that it quite regularly happens that it is unclear where materials are or where they are supposed to go. For example, Supervisor A states that it is their responsibility as a supervisor to keep track of the location and quantity of the materials, but that it is difficult due to the significant size of the project. An informally asked question regarding the use of a logistical plan on their project to Supervisor A and a colleague supervisor during the observation resulted in an unclear and somewhat joking discussion. Supervisor A stating that there was no logistics plan, where the colleague retorts with claiming that they made a logistics plan long ago. The discussion continues, drawing the conclusion that there might be a logistics plan, but no one has paid much attention to it since its creation.

Another aspect that most of the site management interviewees experience as challenging, is how to deal with all the waste that is generated during the production. As site manager D illustrates: *"We're better at getting the materials to the site, than we are getting it [away] from the site"*. In order to sort the waste, it is frequently necessary to have a large number of different containers, which cause issues with the already limited area on sites. There were differing perspectives on how to go about this, commonly done through a set emptying schedule or working on an as-needed basis. Site manager C explained the reasoning further by stating that it was a matter of cost: *"it costs more to order a transport than it does to have a rented container standing on site"*. However, it was also stated that there are periods where, knowing that there will be a lot of waste generated by the upcoming work, they set up a schedule to avoid dealing with an overflowing waste container. All the projects had contracted a dedicated company to remove the waste containers, resulting in most of the management coming down to coordination of the subcontractors that use waste disposal facilities. A frequently highlighted solution is to have smaller disposal bins or bags on various locations on the site, with the downside that this requires additional movement of waste and complicates the sorting. As mentioned by Site manager A, there is also the possibility to get a government permit to have it sorted off-site, in case the lack of space complicates the sorting options on site.

#### **5.1.4 Coordinating and working with external parties**

With the large size of the projects, it became clear from observations that a common strategy to manage the production was the use of subcontractors for workforce and dividing the project into manageable parts. As a result, it was identified during the observations that oftentimes subcontractors are responsible for their own materials, both while receiving deliveries and handling. The site management team oversees the process on when deliveries are to arrive and coordinates the separate teams, however, are not directly involved with the material handling. This has led to multiple examples being given of conflicts between main- and sub-contractors, these are largely seen as inevitable and the resolution of which being a part of the job. Most commonly the issues coincide with the amount of material being brought on site, with some subcontractors bringing in excessive amounts considering only their own need for space. A clear example of this was found on Project C, where a subcontractor brought in a larger amount of material than was currently required, and that there was no designated storage space for. Resulting in additional work for Supervisor C in managing the movement of these surplus materials in between other work.

As many interviewees highlight, the cooperation of the subcontractors and suppliers is essential for a well-functioning logistics approach. Site manager C explains that the contractual obligations with the subcontractors form the basis to make sure the subcontractors are meeting the projects' standard. In their contracts, the routines and rules that need to be followed for incoming deliveries are described. In addition, the importance of coding the material is emphasised. Supervisor B2 states that they have high demands on suppliers for marking the materials in an extensive manner. This is further explained by Site manager D, who describes that when they order materials, they ask the supplier to use colour coding or text to assign the right location on the site. This can for example be the apartment number or which side of the building to deliver to.

When the interviewees were asked what they think of having a dedicated logistics manager on their projects, some varying answers followed. Supervisor B2 was very positive about this idea:

*"[...] especially on such a tight site it will take an enormous amount of time to keep track of everything and to make the logistics go smooth. So it would be fantastic to have just one person having the main responsibility of managing the logistics."*

However, a common concern is viewing cost as blocking such an initiative. Many view such a position as an additional one rather than a substitution for a supervisor or site manager. This is due to the amount of production parts and number of subcontractors being extensive. Site manager D notes that a dedicated logistics manager might be useful, but only in setting the framework for the logistics. Arguing that such a role could add value by making a plan for how to organise inbound transports, gates, and unloading process. Site manager D sees this role more as preparative rather than operative, arguing that when the on-site logistics are active then the contractors' supervisor should oversee the logistical management. However, Supervisor B1 argues that such a position should not be solely an office position for most projects, rather involving the individual in the execution of on-site logistics for most projects.

## 5.2 Recruitment

In the interviews with recruitment experts from different contractors, the initial questions were focused on what they are looking for when hiring site managers and supervisors. The interviewees stressed the importance of both technical competencies and personal qualities. Often specific competency profiles are created for each position in consultation with the manager responsible for staffing the projects, as they are the ones initiating the request for a new site manager or supervisor. Experience in specific construction tasks is often required, as well as a proactive attitude, being engaged and fitting in the company culture. Site managers have broader responsibilities corresponding to finances and overall site management, while supervisors tend to have more focused, on-site responsibilities, managing specific areas of the project. Preferred is a mix between educational background and practical understanding, where particularly experience in relevant construction tasks is highly valued. Nevertheless, when asked if having higher education is necessary the clear answer was no, craftsmen workers do not have, or have minor educational background can become construction managers. Recruiter H states: *"experience is just as important"* emphasising that there are times when they prefer to select someone who has already shown that they fit in the company environment. Both interviewees do however make a note that this kind of selection will most of the time happen from craftsmen within the company, who they are already familiar with.

Excluded from their initial answers was the mention of responsibility for, or working with, construction logistics. When asked to describe a typical working day, Recruiter G clarifies that site managers mostly delegate responsibilities to supervisors about specific production parts, spend some time of financial management, care about the work environment and personnel, and ensure compliance with all guidelines and laws. Furthermore, Recruiter H states that supervisors spend about 80% of their time on-site, ensuring the smooth flow of the work, quality and safety.

The remaining 20% of their time involves administrative tasks such as handling invoices and quantities of materials.

When later prompted to evaluate the importance of logistical expertise in the hiring process, the interviewees acknowledge the importance and complexity of managing the logistics in construction projects. Recruiter H explains that the lack of space requires careful coordination to avoid conflicts and to ensure a good flow of material and equipment. This is underlined by recruiter G, who clarifies it is important that the supervisors and site managers should be able to handle the huge quantity of building materials, which requires them to be structured, orderly and organized. Having said that, the recruiters unanimously agree that this not an aspect they are explicitly looking for. It is something that 'comes with the job', as recruiter G expresses it. Stating that logistics is sometimes brought up during the job interviews, and that the project manager can make a proper judgement if the interviewees requisite knowledge seems sufficient. Shared between the interviews is that the expected logistical knowledge is thoroughly based on experience:

*" [...] I wouldn't say [logistics] is a competency that we specifically highlight. Often, one naturally acquires it with previous experience in the role because, in one way or another, you have to work with logistics in that job".*

*- Recruiter H*

### **5.2.1 Screening of job descriptions**

Table 5 displays the common descriptors and desired traits in positions in site management. The common themes found among these descriptions are that they focus on the need to be able to communicate and work with others, manage the economy of the project, and being able to plan and lead the daily work for craftsmen. There is notably a lack of clarification regarding the need for logistical know-how, only exemplified in the work being in close connection to subcontractors and suppliers, having the ability to coordinate own resources, or having the ability to structure and coordinate the work in an efficient manner. There is no direct reference to logistics, material handling/planning or supply chain management outside of the earlier mentioned examples.

Table 5. The results of the screening of seven job descriptions. Containing a list of highlighted job and personality descriptions as well as the corresponding job descriptions that include the particular descriptors.

	SUPERVISORS					SITE MANAGERS	
	JOB DESCRIPTION 1	JOB DESCRIPTION 2	JOB DESCRIPTION 3	JOB DESCRIPTION 4	JOB DESCRIPTION 5	JOB DESCRIPTION 1	JOB DESCRIPTION 2
<i>Develop others and the team</i>	X		X	X		X	
<i>Run daily production</i>	X	X			X		
<i>Plan lead and divide daily work</i>	X	X	X	X		X	
<i>Ensure work is done according to the plan and in accordance with laws rules and regulations regarding work safety and environment</i>	X	X	X	X		X	X
<i>Close contact with subcontractors, clients and suppliers</i>	X	X		X			X
<i>Plan work to be done safely and efficiently</i>	X	X					
<i>Develop and check time schedules</i>	X	X	X	X			
<i>Direct craftsmen and subcontractors</i>	X	X	X	X			
<i>Handle project economy and aim for set profit goals</i>	X	X	X	X	X	X	X
<i>Daily checks and follow-ups of work</i>	X	X					
<i>The role is varied and you get to take own responsibility</i>			X	X			
<i>Teamwork is important</i>			X	X	X	X	X
<i>Looking for someone with 3-5 years worth of relevant studies</i>			X	X	X		X
<i>Looking for a buisnesslike team player</i>			X	X		X	
<i>Driven by creating good results</i>			X	X		X	
<i>Good communicative ability</i>			X	X	X	X	X
<i>Experience with working with digital systems</i>					X		X
<i>Have relevant previous work life experience</i>					X	X	X
<i>Have an optimistic viewpoint</i>					X		
<i>Have the ability to coordinate own resources</i>						X	
<i>Comfortable in a leadership role and willing to delegate</i>						X	
<i>Able to communicate in Swedish</i>						X	X
<i>Able to communicate in English</i>						X	
<i>Have good knowledge of regulatory statures (such as ABT06)</i>						X	
<i>Able to listen to others</i>						X	
<i>Balance both the details and the whole project</i>						X	
<i>Ability to structure and coordinate the work in an efficient manner</i>						X	
<i>Give off a professional impression and create confidence in others</i>					X		X

## 5.3 Logistics experts

The interviews with two logistics managers, both working for the same TPL company, provide valuable input to compare with the findings from contractors' site management participants in chapter 5.1. While both interviewees are working on different projects, the reconstruction of an active prison and hospital respectively, the results illustrate patterns in the management of construction logistics.

### 5.3.1 Working as a Logistics manager

What becomes clear from both interviews, is the clear focus on constant communication and collaboration with main- and subcontractors as well as suppliers. Both logistics managers gave similar descriptions of their function, highlighting key characteristics such as good communicative skills, working in a systematic way, and being both organized and flexible. Logistics manager G emphasizes the importance of acting in an open-minded fashion and understand others' views and solutions. Therefore, social skills are very important, as in their job they are the 'middleman', in which they need to constantly collect and distribute information to and from stakeholders. Logistics manager F emphasises that there is a lot of administration and the importance of simultaneously keeping track of events on-site. They also add that the position entails a lot of indirect financial management, trying to reduce unnecessary costs by streamlining the workflow and material handling processes. Although they aim to plan all the on-site logistics, changing daily situations can require them to be able to adapt quickly. However, this is something that they actively work towards preventing, for instance through planning out temporary electricity infrastructure for the project that will not be damaged or required intermittent moving as the project progresses.

When asked about their ways of working with logistics they have quite the extensive list of actions they implement. Both interviewees highlight the use of extensive SDPs, and the importance of constantly updating these. The plans are developed on different detail levels: for the whole site, specific site sections, and floorplans. Deliveries are booked in an online booking system with designated offloading areas, accessible for all parties on site to see. The main- and subcontractors must schedule their own deliveries, which are then double-checked by the logistics planner who approves the bookings and assists in solving any occurring scheduling conflicts. In addition to scheduling the delivery software tracks environmental impact through CO<sub>2</sub>-emissions of the incoming transports. Personell at the gates and camera surveillance of the site allow for greater control over the in- and outflow of transports. Additionally, the project that Logistics manager F worked on utilized an external warehouse and checkpoint solution to further regulate the transport- and material flows. When materials arrived on site, the designated location should be apparent on the SDP and the materials should be moved directly to, or close to, the installation area. In both projects they make use of TPL-personnel that handles the materials in the 'after hours', meaning this workforce is moving the materials to the installation area in the evening when no production activities are taking place. The interviewees explain that this separates workflows, which can enable the production team to focus on production. Quality control is also among the task of such TPL-personnel, which communicates any damages to the main contractors avoiding such actions taking up time while waiting for installation. Therefore, in the opinion of the interviewed logistics managers, moving the handling of materials into the hands of dedicated personnel, creates benefits for the time and quality while saving on costs.

When asked which of our nine categories the logistics managers spent the most of their time on, they both clearly state that all of them are included in their work. However, for most of the activities they have only brief interactions in which they delegate the tasks to other employees. When more focusing on their own efforts, both interviewees highlight 'logistics planning' (9), as their work is about constantly planning with the main- and subcontractors. Thereafter, Logistics manager E highlights 'waste management' (7) and 'coordinating people' (8), while Logistics manager F puts more focus on 'delivery control' (1) and 'enabling the work and surroundings' (4). This difference is connected to project variance, as Logistics manager E emphasizes that his project deals with a lot of expensive deliveries which requires an extensive delivery control system, and at the same time they are managing the logistics in an operational hospital so there is a lot of both internal and external flows complicating the project. While the waste management on logistics manager F's site is outsourced, Logistics manager E explains that they are in charge of organizing the waste outflow. Which is done by initially collecting the waste as close to the buildings as possible in smaller waste bins. These are then emptied into bigger containers, being sorted into 13 different categories, thereby requiring more attention from Logistics manager E. As such, both projects the logistics managers are involved in have different conditions and circumstances, requiring different areas of focus.

Neither of the interviewed logistics managers work alone on their projects, both emphasizing that they work in close cooperation with a dedicated logistics planner. Where the logistics planner is responsible for the daily logistical operation, including the delivery planning and determining placement of materials, the logistics managers control the project overview and plans ahead for the upcoming 3 months. As Logistics manager E explains, they are doing the prework for the logistics planner, while also helping with the daily activities if needed. In addition to this, the logistics managers are responsible for organizing and attending various weekly logistics meetings. Logistics manager E explains that they have three different meetings each week, where each meeting is focusing on varying parts of the site. During the meetings the logistics planner has the lead, coordinating the operative logistics. The logistics manager is present to share their expertise and to make sure all the required actors are present. Furthermore, both logistics managers highlight their presence in the main- and subcontractors production meetings. In this way they keep up to date about the ongoing and upcoming building activities on-site.

### **5.3.2 Perceived challenges of logistics management**

In order to manage the logistics, logistics manager and planner creates a framework with rules and guidelines on how the construction logistics on their projects should work. This includes how the materials should be ordered, how the deliveries should be packed, and how the order- and communication systems should be used. This framework forms the basis for the main- and subcontractors on how they should operate. Logistics manager E explicitly emphasises: *"We help them to get into the right discussions and to the right thoughts, while following our rules"*. In their opinion for such framework to function, a collaborative attitude from the contractors is essential, with the biggest challenge being getting all parties involved to understand the importance of working in a new fashion.

*'Especially to get people to understand [logistics]. That's mainly the problem now. More and more people are getting used to work with logistics on the building site, but also many people are like: "we haven't worked like that in the past, so we can't [do that] right now. We have always worked without [a TPL] in the past, so we do the same as we always did." That's mainly the biggest issue we have''.*

*- Logistics manager E*

And while creating understanding for logistics is perceived as their greatest challenge there are other challenges to deal many tying into the struggles of creating understanding. According to Logistics manager E, it is the main contractors that are difficult to convince, explaining that they are tied to a building site for multiple years, while subcontractors move around from site to site regularly. This results in the subcontractors experiencing different ways of working frequently, making them able to adapt easier. However, Logistics manager F puts more focus on the subcontractors that, especially in the beginning of their involvement in a project, have difficulties understanding new ways of working such as using the delivery calendar. Both interviewees highlight that sometimes problems occur when main- or subcontractors are not putting deliveries correctly in the schedule or they forget to book it. If this is mistake that only happens occasionally then the logistics planner able to assist resolving the situation, however if this occurs more often it can lead to larger conflicts that will require further actions from the logistics manager. An additional issue logistics manager E identified, is that often only the contractors' top management personnel read the contractual conditions from a TPL, which is used as a basis for the later created framework for the new working methods. Then, when the project is operational, the site managers and supervisors are not informed well by their superiors creating conflicts between the staff of the main contractor and those from a TPL. The logistics managers explain that they have to make clear to the main contractor that they should ensure the subcontractors follow the contractual obligations, or otherwise they will be punished by fines.

Another implication, which Logistics manager E phrases as *"the dark side of logistics"*, is that the contractors order too early or in too much quantity. This then needs to be stored and moved additional times on-site, which causes costs and time complications that are difficult to trace. Logistics manager F actively tried to manage this by verifying frequently if the subcontractors really need to have ordered material at that specific time. Often, he finds this is not the case and the delivery can be postponed. A similar challenge is to make clear to the main- and subcontractor that they need to communicate an exact location where to put the materials: *"So not only 'floor 3', but also which room and where in that [room] exactly"* Logistics manager F states. This will then be updated on the SDPs. One final challenge that logistics manager E highlights is that he spends roughly 30% of his time on non-logistics related aspects. He explains that this is mostly due to other stakeholders' misconceptions of what 'logistics management' entails:

*"It's not really a logistics question from our point of view, but from their (the main- or subcontractors) point of view. So that's the general [lack of] understanding of logistics''.*

*- Logistics manager E*

From the interviews we get the impression that even with thoroughly planned logistics, daily challenges still occur. Nevertheless, both logistics managers are positive about their influence in

the projects and also claim that, once the various parties are used to their way of working, they largely receive positive feedback. Logistics manager F states that the main contractor is satisfied because the logistics are managed in a clear structure, which takes away working load from the main contractor. Additionally, he believes the subcontractors are gratified since they do not have to worry about the material handling, which saves them time and effort. Logistics manager E explains that, once all parties are used to 'the TPL way of working', it is often perceived as positive by the main- and subcontractors. To portray his future perspective of construction logistics and the involvement of logistical experts, Logistics manager F believes this TPL way of working is the way every project should work. He is convinced that in the future every big contractor is going to make use of logistics solutions, mainly driven by time and costs savings. He thinks that the main contractors will prefer to hire external experts to manage the logistics, as he clarifies: *"I think they don't have the time and they don't want to pay the money to their own people, [...] because it's easier to rent someone that performs the entire job"*.

## 6. DISCUSSION

To explore the research questions and surrounding topic, this chapter aims to develop our ideas further by discussing our thoughts on the topic. The discussion comments on the patterns and perceptions of logistics, including those who work in site management, recruitment, and logistics specialists. The gathered quantitative data from observations is placed alongside the qualitative data from the interviews and reflected on the existing literature to present a comprehensive image of logistics in construction. Furthermore, it discusses the value that can be gained from utilizing specialised logistics management.

### 6.1 Ambiguous definitions, yet clear presence

Throughout our research, we have been continuously met with exclamations regarding how important logistics is to a construction project, both in unprompted discussions and when inquiring about logistics. Yet while asking others and searching through academic literature the definitions of construction logistics are varied presenting differing conceptualizations. 'External vs. internal', 'off-site vs. on-site logistics', or 'supply chain management vs. logistics management' are all different literary outlining's of the boundaries of the topic (Lindholm & Browne, 2015; Hulthén & Sundquist, 2019; Lambert & Cooper, 2000b; Larson & Halldorsson, 2004). Such variance is reinforced in our study when seeing the variation in how site management spends their time. Across all three observed projects there has been a significant spread in time spent across our nine construction logistics categories. The participants correctly identified 'logistics planning' (9) & 'moving around materials' (3) as taking up a large part of their logistics work. However, one that is only mentioned by some participants yet is recurring across all participants is 'enabling the work and surroundings' (4). Likely as it is a category which identifies logistics tasks done to enable other work. Beyond the three mentioned categories some of the variance is clearly connected to what stage the project is in. Exemplified in the variance of time spent on category 9 - 'logistics planning' between the projects, with Project A being in an early stage not spending a lot of time on it where Project C being in the middle of the project spending a significant portion. As such it can be surmised that with such a varied experience of interacting with logistics, it is no wonder that the definition of the topic is muddled.

When reviewing how much time is spent on logistics by the main contractors' site management, the main finding is the high amount of time spent on logistics related activities by supervisors, with site managers spending significantly less. And while our study supports the results of Petterson & Skoglund (2020), wherein they roughly estimated the time spent on logistics by supervisors to 50%, it also shows that there is a clear difference in how site managers and supervisors spend their time in relation to logistics. As such, the pressure of dealing with on-site logistics being largely placed on the supervisors with the site manager stepping in during more demanding situations, or to lead planning efforts. One aspect of working with logistics that we could not identify properly was the amount of thinking going into it. Highlighted by Supervisor B2 and how during breaks there would be constant discussions on how to solve various situations (logistical and otherwise). We therefore believe that there is a significant amount of time spent considering how to work with logistics that is not expressed in a meeting, action, or discussion.

## 6.2 Perception of logistics – the blind spot

When prompting the various participants in this study to give a description of what site management does, the topic of logistics is hardly mentioned. Most of the site managers and supervisors do not bring it up when describing their job, similarly recruiters are not specifically highlighting the importance of logistical know-how when hiring site management. When conducting supplementary inspection of various job descriptions for contractors' job vacancies, we also find that it is not common to mention logistics. This seems a particularly large vacuum, especially considering that all interviewed members of the site management highlight its importance at various points throughout the observations and interviews. As such, when considering that a large part of the supervisors' time goes into various tasks related to logistics, it would not be exaggerated to call this a blind spot.

What then is the cause of such a blind spot? As mentioned, it is not that the contractors are unaware of the presence of logistics in their work, as they consider it very important when prompted to discuss this topic. We suspect instead that logistics is viewed as such a natural skill that no specific competence in it is required. During the interviews and when reviewing the job descriptions, there is a tendency towards mentioning a structured or organised person. This could be construed to cover the supposed need for logistical skill, as logistics requires a structured way of working. At the same time, the job descriptions, recruiters, and site management members all emphasize the importance of being adaptive and flexible, which are also important skills in dealing with logistics. When making a comparison with the literature, it becomes clear that the skills and competencies that are required for logistics management, have a large overlap with the perceptions of the site management job. Both Zheng et al. (2020) and Sullivan et al. (2010) mention similar required skills: coordination, communication, scheduling, organizing, planning, leadership, and the importance of experience. In addition, it can be concluded that both 'construction management' and 'logistics management' are aiming for similar goals: reducing costs, mitigating risks, and ensuring quality. However, there seems to be an important difference: logistics management aims to reduce reactive 'firefighting' and working proactively to prevent problems arising, while construction management seems to focus more on actively solving current problems and those in the near future. While some of the site management interviewees emphasize their desire to plan as much as possible, what is most prevalent from the interviews is their strong drive to solve problems. This is demonstrated by examples such as Supervisor A's resolution of the gypsum shortage on site, supervisor B1 spending a large amount of time impromptu organising material storage, or resolving the offloading crash between the wood truck and concrete on project C. Our experience during the observations confirms this way of managing, as most of the daily activities, especially those the supervisors undertake to manage logistics, are improvised as problems arise.

It is important to realize that problem-solving in essence is not something negative and reflects being adaptive and flexible. However, it can and should be questioned why those problems occur in the first place. For example, there is a considerable amount of time that is being spent on 'moving around materials' (3). As described by Dubois et al. (2019), this is considered as something negative, as 'moving materials to installation site' (6) is the preferred step following offloading. Additional movement of material increases the risk of damages, takes up time and effort, requires more space and equipment, and in the end costs money, as both the literature

and practice show. It is not that the site management is unaware of this, they also want to bring the material directly to place where they are installed. However, in practice this seems to be challenging. As to why this is challenging, no clear reasoning can be concluded from the interviewees. Oftentimes, when questioned regarding it, the answers are vague and relating to unforeseen events that inhibit the planned-out measures, or not having enough time to plan properly. Similarly, a common answer is to highlight the complexity of projects, such as limited space and timeframes, and the fact that the work site is always changing in one way or another. Furthermore, the commonality between all these answers is that it is not something that you can know by studying, but rather it is something that comes with experience.

With such a common belief in the value of experience it can be understood that recruitment views previous experience as key. Additionally, by having previous experience they argue that this should include the base level of knowledge needed for handling logistics. However, it is important to clarify that they do not mean experience in logistics. The shared vision of both recruiters and site management, is that general working experience in the construction industry will provide a required level of logistics know-how. What this working experience is, is not relevant per-se: a craftsman can become a supervisor (Site manager A, Supervisor B1 and C) the same as someone with education in construction management can (Site manager C, Supervisor A and B2). When looking at education, the study by Harris & Watts (2021) draws an interesting conclusion that, especially in terms of soft skills, the university theory does not align with the requirements and expectations from the construction industry. While this research does not have explicitly construction logistics in focus but rather construction as a whole, we argue that this provides some insights into the gap between theory and practice, as it has been shown that especially the 'soft skills' are highly important when managing logistics. This also aligns with what we can derive from interviews with especially younger supervisors that have had 'higher' education in construction prior to their work in their current role (A & B2). Both clearly state that their logistical capabilities are not something that they have learned in their education and that this 'comes with the job'.

When viewed alongside the availability in varying paths to the supervisor position, we estimate that it leads to a non-standardisation in the way of working. Often relying on the individuals involved and their previous experiences. This leads us to the conclusion that the competency of logistics is one that has 'a low skill floor, but a high skill ceiling'. Meaning that almost anyone can meet the base capabilities needed to make use of logistics. However, as the complexity grows, there is more and more possibilities for creating additional value through higher levels of competence and knowledge, which will be more thoroughly discussed in 5.3. It can also suggest that the problem-solving mentality is reaching its limits, as the problems are growing too complex. The view of site managers that logistics is something that is done in between other tasks by supervisors, is at odds with our findings that supervisors dedicate upwards of 50% of their day to logistics. With such a high percentage of time spent on logistics likely being caused by creeping increases in complexity.

### **6.3 Similar tools, different value**

When looking at the various logistics tools and solution that are implemented and talked about, two things stand out. Firstly, there are many similarities between the strategies implemented by

the contractors and by TPLs. There are many shared tools, such as JIT deliveries, CCCs, and SDPs, trying to minimize material movement, optimizing the utilization of storage space, have some form of delivery schedule, or partly outsourced waste management. We reiterate that it is not that the contractor is unaware of the strategies that can be used to streamline the logistics. However, we argue that while a lot of the site management experts have a base understanding of what the solutions are and make use of them to some extent, it is often in a simplified fashion and with the intent to use logistics to enable production tasks.

In our opinion, a good example of this is the booking calendar, which was found to have different levels of dedication and professionalism to it. While the booking calendar used by the logistics managers includes time for delivery, offloading location, material storage location, where the material is to be used in the project, and additional handling instructions, those used by contractors where more rudimentary preferring to designate time and subcontractor handling it. Moreover, the contractors used different variations of such a system, ranging from digital company-wide solutions to project based in their extent, such as a manual whiteboard or an improvised shared Outlook calendar. But more importantly than the system itself, there was a different management approach to it. While the TPL the logistics managers worked for clearly had one dedicated fulltime role to coordinate and operate this tool, the logistics planner, within the contractors this was something the site managers and supervisors did on the side, if this was actively managed at all. In this we argue that while both parties apply similar toolboxes, the value that can be gained out of them varies.

The different management approaches illustrate the pattern we have seen throughout this research: they have similar logistics toolboxes, but managers with different expertise handling the tools. And this is an important point as emphasized by Ekeskär & Rudberg (2016) when reflecting on the involvement of a TPL: it is not the TPL solution itself that creates the value, it is the competences and knowledge that the logistics managers have. When reflecting this on the statements put forward by Pettersson & Skoglund (2020), who consider logistics management by the contractor as 'waste' or 'non-value adding', we find similar trends yet disagree on viewing a contractor's involvement in logistics management as 'non-value adding'. Due to the sentiment expressed by both contractors and logistics specialist in that there will always need to be someone on site who can handle unforeseen issues. As such it is also not simply a matter of handing off all responsibility for logistics to dedicated logistics managers, rather creating a greater shared understanding for logistics steps taken is important.

Another important aspect is the importance of authority when managing logistics (Ekeskär & Rudberg, 2016, Sullivan et al., 2010). Applying Ekeskär & Rudberg (2016) tells that an external solution only works if the logistics managers have a certain mandate over the main- and subcontractor to regulate the logistics. It is important that the rules, guidelines, and regulations they develop and update are being followed, in addition to having the authority to correct other stakeholders if this is not done properly. Their study strongly suggests that the TPL solution primarily worked because the main- and subcontractors were 'forced' to work in this way, by contractual obligations and strong and dedicated leadership from the client's side. When comparing this to the approaches that we came across in our observations and interviews, it was more common that the management of logistics was a shared responsibility between supervisors

and done in-between other tasks. These approaches are at odds with our findings in which nearly 50% of supervisors time is spent on logistics related tasks, suggesting that it is not something done in-between other tasks. Yet it is indeed a shared responsibility, exemplified in how the supervisors on Project B all spent a significant amount of time on different areas of logistics. In such an instance, we would question how a supervisor can show the proper authority and have a strong mandate in an aspect that takes up 50% of their time, if it is something that is a shared responsibility.

## 6.4 The value of logistics management

As previous research and our study show, construction projects are becoming more complex, further raising the demands for more logistics management. The rise of logistics managers is therefore in our opinion a logical next step of the industry adapting to the market gap. Where a construction manager adds value by knowing how to manage a building process, a logistics manager does this by applying their knowledge of construction logistics. This simple line of thought indicates the upcoming tendency to view the two positions as having separated areas of expertise.

While most contractors leave the logistics to the site management team, research shows that there are two other ways this gap can be filled: by consulting an external party for their logistical management capabilities, or by developing this expertise internally within the contractor (Bengtsson, 2019). The latter is a relatively new solution and is more viewed as a support function within the contractor's organisation which was reinforced during the observations of Project B. During a longer meeting, in which the logistical challenges were discussed, two internal logistics experts from the contractor joined with site management. Their contributions were largely through providing singular advice on initiative of the site management team. In that sense it was a good initiative to involve people with expertise, and of the three observed projects they were the only one that did this. However, it gave the impression that the contractor deals with the logistics in a problem-solving mentality. Such solutions inevitably fall into the space of reactive problem solving and are commonly seen as a way through which value is being created. This is exemplified in the note of pride in the voice of the interviewees when talking about past experiences such as the need for more gypsum on Project A. While a tremendous effort to resolve the situation, such a mindset hints to us some lacking commitment to prevent logistics issues. This reminds us of similarities to past experiences where a guest lecturer regarding construction logistics was stating large goals and ambitious expectations regarding an internal logistics department within the contractor he worked. Yet, when asked about how many in his company of thousands of employees worked with the topic, he said that there was not more than ten people in his department. These examples show once again that the contractors are aware of the presence of logistics, and that it takes time before a full dedicated logistics approach is set up. However, to us it gives the impression of lacking the full dedication which is required to make a logistical management approach work well. In addition, during the observations we noted the disjointed nature of managing subcontractors and suppliers, which confirms prior research by Dubois et al. (2019) who explains that contractors and subcontractors frequently manage their own supply chains independently, defined as the decentralized configuration. As both the literature and our interviews indicate, this inevitably leads to conflicts and unclear situations,

likely increasing the degree of improvisation among site management thus increasing the workload of supervisors.

When instead viewing those working in a specialised logistics fashion there is a difference in the focus and determination of those involved. Where the logistical solutions used are very much comparable to the ones implemented by site management and the characteristics of the construction managers show great similarities to the logistical managers, in our view there are vital differences in the dedication, structure and clarity when considering construction logistics. As both logistical managers explain during the interviews, an important aspect of their approach is that they are developing a structured plan how the logistics on-site works, consisting of rules, regulations, and instructions. The main- and subcontractor as well as their suppliers are bound by contracts to operate according to this structure. The contractors are still operating most of their own logistics within this framework, while the logistics manager acts as a coordinator of the process. The logistics manager, with a logistics planner as their right-hand, can steer the project and really put emphasis on managing the logistics of the project according to their established framework. In addition, the financial aspect is more emphasized, as one of the interviewed logistics managers clearly explains that finding ways to show and cut costs is an important part of his job.

Research from Lindén & Josephson (2013) shows that relatively simple forms of logistical specialism have significant positive effects on time, quality, and costs. In particular the study shows that outsourcing logistics makes the costs for logistics visible. We consider this an important aspect to highlight as the argument from contractors not to implement external expertism is often centred around the financial aspect. Statements about the high costs to consult external logistical providers have been heard throughout various interviews. Our impression is that this is mostly due to it being difficult for the contractor to allocate the costs of logistics, which is referred to as 'the hidden costs for logistics' (Lindén & Josephson , 2013). Connecting this to the contractors' perception that logistics is 'just part of the job', our conclusion is that the reason why external logistics companies are seen as expensive, is because for the first time the 'real' costs for logistics become visible. It is our impression that while this visibility is a daunting up-front cost, it can in fact prove beneficial for the financial management of the project by identifying previously hidden costs.

A TPL-solution can sound very similar to what site management proposes, however, it is important to highlight that only two logistics experts were interviewed in comparison to the seven members of site management. In this we want to highlight the difference in knowledge between an individual logistics expert and a member of site management. The two logistics managers explained a holistic approach to logistics management, with their aligning thoughts and understandings being aligned. It took more interviews with site management to get a similar holistic idea of how contractors manage logistics and what different solutions could be used. With the clearly varied nature of logistics in construction demonstrated our observation (see appendix 3 for further examples), the value of having an understanding of all of the aspects of logistics and the different strategies that are available is in our opinion a substantial boon to any construction project.

While bringing in an external party to give instructions and insights can cause other issues to arise, such as those caused by a further need for coordination and communication, there is a need from contractors to work in an open and collaborative fashion to gain the largest benefits. Oftentimes early on experts are met with resistance, quotes such as *“we have always done it this way and it has worked fine in the past, why should we change it now?”* are common sentiments. However, as the projects are growing and changing, so do the methods used need to grow and change. Adapting the ‘project-based model’ is our recommended initial step to take, allowing for contractors to learn-by-doing, adhering their ideas of learning logistics through experience.

## 7. CONCLUSION

Throughout this research effort it has become clear that the topic of construction logistics is one inherently lacking in clarity. Varying descriptions, interpretations, and topic boundaries all plague the subject leading to varying understandings and misconceptions. While the topic has developed over the last decades through increased attention in research, so has the increased variance in interpretations of construction logistics. As a result, the differing views and lack of clarity of how SCM interface with logistics blurs the boundaries of what logistics entails. This perception stands confirmed by the observed members of site management and interviewed recruiters who do not highlight logistics instead viewing it as a task that is performed to enable other work. When asked about logistics it is perceived as a skill based on experience, reinforcing the scattered understanding of the topic.

This study concludes that site managers spend roughly 20% of their time on actions related to logistics, understandably prioritizing it less. However, supervisors spend on average close to 50% of their time on activities that involve a variety of the nine identified logistics activities. Confirming our hypothesis that logistics is being met with minimal requirements while taking up a significant part of site management's work. 'Logistics planning' (9) and 'moving around materials' (3) are two recognised ways in which a lot of time is spent on logistics, yet a shared logistics practice that does not receive adequate recognition is 'enabling the work and surroundings' (4). These three categories make up the majority of the large amount of time spent on logistics by supervisors.

In line with previous research, experts on the topic highlight the importance of proper dedication and focus for the effective execution of construction logistics. Logistics managers retain more knowledge of potential solutions that can be used and how these can be implemented to gain greater benefits rather than using them in a rudimentary fashion. One of the greatest identified challenges in working more in depth with logistics is creating shared understanding for what logistics is. With the most common argument against involving a logistics specialist being the additional cost, however this is an issue of perception, as the costs of logistics exist either way, they are simply not as visible. The work involved in logistics will always need to be performed in one fashion or another, as quoted by Site manager A "*without logistics we couldn't build*". In our estimation it is therefore preferable to have an expert working to minimize those costs, while simultaneously removing the responsibility of logistics from others, allowing them to direct their focus to their given tasks. While we would prefer to see there being a widespread effort to make use of logistics expertise, we understand that this is not something that can be implemented internally in a short period of time. Therefore, we argue that making use of an external solution provides a great opportunity to introduce working with logistics expertise.

Due to the limited timeframe of this research, no sites were visited utilizing the services of an external logistics manager. Therefore, we suggest future research to investigate and compare the situations, identifying how the involvement of an external logistics manager changes the time spent on logistics for site management. Furthermore, the factors that determine supervisors' time allocation in regard to logistics could be studied, as during this research multiple factors were identified which potentially influence how supervisors interact with logistics. Examples of such factors are subcontractor responsibilities/interactions or how working in a more logistics

mindful manner impacts supervisors' daily work. Through commitment from researchers and practitioners of construction logistics we believe that a unified understanding of on-site logistics can be created. Allowing for clearer communication and a more efficient workflow to be established.

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# APPENDIX A

Project:	Project A
Date:	7-2-2024
Observant:	Supervisor A
Experience:	3 years
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

Working hours observed:	7:11
Time on break:	1:29
Time spent on logistics:	4:08
Percentage of observed day spent on logistics:	58%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
7:10	7:45	0:35	0:31	E	Showing observers the building site		FALSE	0:00	FALSE	0:00
7:27	7:28	0:01	0:01	C, E, 2	Phone call regarding incoming transport		TRUE	0:01	FALSE	0:00
7:31	7:32	0:01	0:01	D, E	Chat with workers		FALSE	0:00	FALSE	0:00
7:32	7:33	0:01	0:01	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
7:37	7:38	0:01	0:01	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
7:45	8:06	0:21	0:16	B, F	Working in Dalux software to check drawings for the electrician		FALSE	0:00	FALSE	0:00
7:50	7:51	0:01	0:01	B, C, F	Phone call from a colleague regarding the Dalux software drawings		FALSE	0:00	FALSE	0:00
8:02	8:06	0:04	0:04	B, C, F	Phone call regarding painting the staircase		FALSE	0:00	FALSE	0:00
8:07	8:10	0:03	0:03	B, D, F, 4, 8	Two workers from a subcontractor asking for a new card to enter the building site		TRUE	0:03	FALSE	0:00
8:10	8:11	0:01	0:01	B, C, F	Phone call to the electrician regarding financial matters		FALSE	0:00	FALSE	0:00
8:11	8:39	0:28	0:28	B, F	Scheduling hand-over deadlines for subcontractors		FALSE	0:00	FALSE	0:00
8:39	8:40	0:01	0:01	C, F	Phone call from a college to get breakfast at the supermarket		FALSE	0:00	FALSE	0:00
8:40	8:54	0:14	0:14	E, G	Off to the supermarket		FALSE	0:00	TRUE	0:14
8:54	9:02	0:08	0:08	D, F, 3	Discussion with a colleague supervisor about moving materials inside the building for temporary storage (conflict with other building activities)		TRUE	0:08	FALSE	0:00
9:02	9:30	0:28	0:23	F, G	Breakfast break		FALSE	0:00	TRUE	0:23
9:04	9:06	0:02	0:02	C, F, 3, 8	Phone call to crane driver regarding moving materials		TRUE	0:02	FALSE	0:00
9:14	9:17	0:03	0:03	C, F, 3, 8	Phone call from crane driver regarding moving materials		TRUE	0:03	FALSE	0:00
9:30	9:33	0:03	0:03	D, F, 4, 8	Discussion with the two workers regarding their entrance card to the building site		TRUE	0:03	FALSE	0:00
9:33	9:58	0:25	0:15	E, 3	Checking a steel construction on the roof that needs to be removed by the crane		TRUE	0:25	FALSE	0:00
9:41	9:42	0:01	0:01	C, E, 3, 8	Phone call to worker to loosen the steel construction from the roof		TRUE	0:01	FALSE	0:00
9:42	9:43	0:01	0:01	C, E, 3, 8	Phone call to crane specialist to double check if the steel construction can be moved		TRUE	0:01	FALSE	0:00
9:48	9:49	0:01	0:01	D, E	Discussion with worker about pressure on certain walls		FALSE	0:00	FALSE	0:00
9:50	9:57	0:07	0:07	D, E, 3, 8	Giving workers instruction to move the steel construction from the roof		TRUE	0:07	FALSE	0:00
9:51	9:52	0:01	0:01	C, E, 3, 8	Phone call to ask colleague supervisor about moving the steel construction with the crane		TRUE	0:01	FALSE	0:00
9:57	10:08	0:11	0:09	E, 3	Fixing ventilation in a hallway, including moving materials for the ventilation		TRUE	0:11	FALSE	0:00
10:02	10:04	0:02	0:02	C, E, 4, 8	Phone call regarding the personnel movement for the work around the crane		TRUE	0:02	FALSE	0:00
10:08	10:09	0:01	0:01	D, E	Discussion with worker about plastic covering for something		FALSE	0:00	FALSE	0:00
10:14	10:18	0:04	0:04	D, E	Discussion with worker about a safety task that they did not perform on time		FALSE	0:00	FALSE	0:00
10:22	10:25	0:03	0:03	E	Light randomly turned off so the supervisor needed to fix this		FALSE	0:00	FALSE	0:00
10:27	10:49	0:22	0:13	B, D, F	Discussion with colleagues about the fire system		FALSE	0:00	FALSE	0:00
10:30	10:33	0:03	0:03	C, F, 3, 8	Phone call from crane driver regarding moving the steel construction on the roof		TRUE	0:03	FALSE	0:00
10:38	10:40	0:02	0:02	C, F	Phone call to workers to fix the roof after the steel construction is moved by the crane		FALSE	0:00	FALSE	0:00
10:40	10:44	0:04	0:04	C, F, 3, 4	Phone call to neighbor contractor to ask if their space can be used to store the steel construction		TRUE	0:04	FALSE	0:00
10:49	10:57	0:08	0:08	B, F	Checking and answering emails		FALSE	0:00	FALSE	0:00
10:57	10:58	0:01	0:01	C, F, 3, 4	Phone call from neighbor contractor regarding the storage space on their construction site		TRUE	0:01	FALSE	0:00
10:58	11:10	0:12	0:12	D, E, 3, 4	Discussion with site manager from neighbor contractor regarding the storage space on their construction site		TRUE	0:12	FALSE	0:00
11:10	11:12	0:02	0:02	C, F, 3, 8	Phone call to crane driver to give instruction for moving the steel construction		TRUE	0:02	FALSE	0:00
11:12	11:14	0:02	0:02	C, F	Phone call from workers on the roof regarding a safety line they needs to perform their task to loosen the steel construction		FALSE	0:00	FALSE	0:00

11:14	11:15	0:01	0:01	C, F	Phone call to a colleague to check where the safety line is		FALSE	0:00	FALSE	0:00
11:15	11:20	0:05	0:03	E, 4	Searching for, and bringing the safety line to the worker at the installation area		TRUE	0:05	FALSE	0:00
11:16	11:18	0:02	0:02	C, E, 3, 8	Phone call from the crane driver regarding moving the steel construction		TRUE	0:02	FALSE	0:00
11:23	11:25	0:02	0:02	C, F, 2	Phone call from a supplier that is (unexpected) delivering a door		TRUE	0:02	FALSE	0:00
11:25	11:28	0:03	0:03	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
11:28	11:47	0:19	0:18	G	Table tennis break with college		FALSE	0:00	TRUE	0:18
11:41	11:42	0:01	0:01	C	Phone call from worker about loosening the steel construction on the roof		FALSE	0:00	FALSE	0:00
11:47	11:49	0:02	0:02	C, F, 7	Phone call about emptying the waste containers		TRUE	0:02	FALSE	0:00
11:49	11:51	0:02	0:02	D, F	Discussion with site manager about some building related matter		FALSE	0:00	FALSE	0:00
11:51	11:53	0:02	0:02	C, F, 7	Phone call about emptying the waste containers		TRUE	0:02	FALSE	0:00
11:53	12:15	0:22	0:13	B, F	Working on subcontractors' extra work sheet		FALSE	0:00	FALSE	0:00
11:57	11:59	0:02	0:02	C, F, 2	Phone call from a supplier that is (unexpected) delivering a door		TRUE	0:02	FALSE	0:00
11:59	12:00	0:01	0:01	C, F, 2, 8	Called a worker to handle the door that is (unexpected) delivered		TRUE	0:01	FALSE	0:00
12:06	12:10	0:04	0:04	D, F, 1, 2, 3, 8	Worker brings the invoice from the door + discussion where the worker has to store the door		TRUE	0:04	FALSE	0:00
12:10	12:12	0:02	0:02	D, F, 1, 2, 3, 8	Phone call from another worker about where they should place the door that has been delivered		TRUE	0:02	FALSE	0:00
12:15	12:40	0:25	0:20	G	Lunch break		FALSE	0:00	TRUE	0:20
12:31	12:32	0:01	0:01	C, F, 3, 8	Phone call from worker on the roof asking how the steel construction will be moved		TRUE	0:01	FALSE	0:00
12:32	12:35	0:03	0:03	D, F	Chat with site manager about some building related matter		FALSE	0:00	FALSE	0:00
12:35	12:36	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
12:40	12:41	0:01	0:01	C, F, 7, 8	Phone call from worker on the roof to ask if the crane is also bringing down the waste		TRUE	0:01	FALSE	0:00
12:41	12:42	0:01	0:01	C, F, 2, 3, 4	Phone call from subcontractor about removing the traffic barriers and fences today		TRUE	0:01	FALSE	0:00
12:42	12:52	0:10	0:10	D, E, 3, 4, 8	Going outside to manage the situation around the traffic barriers/fences and check a hole in the asphalt that has to be fixed		TRUE	0:10	FALSE	0:00
12:53	12:55	0:02	0:02	D, F, 4	Discussion with the site manager about the hole in the asphalt and how to manage the traffic situation		TRUE	0:02	FALSE	0:00
12:55	12:58	0:03	0:03	C, F, 4, 8	Phone call to the responsible person to fix the hole in the asphalt construction		TRUE	0:03	FALSE	0:00
12:58	13:22	0:24	0:24	A, F, 9	Meeting with subcontractor regarding green roofing and safety issues	Logistics factor 1/3	TRUE	0:08	FALSE	0:00
13:22	13:23	0:01	0:01	C, F, 2, 4, 8	Phone call regarding traffic barriers/fences that are going to be removed		TRUE	0:01	FALSE	0:00
13:23	13:42	0:19	0:14	D, E, 4, 8	Managing the traffic situation outside		TRUE	0:19	FALSE	0:00
13:28	13:29	0:01	0:01	C, E, 3, 4	Phone call regarding traffic situation and removing traffic barriers/fences		TRUE	0:01	FALSE	0:00
13:29	13:30	0:01	0:01	C, E, 3, 4	Phone call regarding traffic situation and removing traffic barriers/fences		TRUE	0:01	FALSE	0:00
13:34	13:35	0:01	0:01	C, E, 3, 4	Phone call regarding traffic situation and removing traffic barriers/fences		TRUE	0:01	FALSE	0:00
13:37	13:39	0:02	0:02	C, E, 3, 4	Phone call regarding traffic situation and removing traffic barriers/fences		TRUE	0:02	FALSE	0:00
13:42	13:48	0:06	0:05	D, E, 3, 8	Checking the state of the steel construction on the roof and discussing how the crane is going to lift it		TRUE	0:06	FALSE	0:00
13:46	13:47	0:01	0:01	C, E	Phone call regarding a covering a door hole in plastic		FALSE	0:00	FALSE	0:00
13:48	13:50	0:02	0:02	D, E	Discussion with workers about covering a door hole in plastic		FALSE	0:00	FALSE	0:00
13:50	13:51	0:01	0:01	C, F, 3, 8	Phone call about lifting the steel construction from the roof later this afternoon		TRUE	0:01	FALSE	0:00
13:51	13:53	0:02	0:02	C, F	Phone call to workers on the roof to give instruction to cover the holes in the roof after the steel construction is removed by the crane		FALSE	0:00	FALSE	0:00
13:54	13:56	0:02	0:02	C, F	Phone call to colleague about covering the holes in the roof after steel construction is removed by the crane		FALSE	0:00	FALSE	0:00
13:56	14:01	0:05	0:05	D, F	Unrelated chat with colleague		FALSE	0:00	FALSE	0:00
14:01	14:02	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
14:02	14:03	0:01	0:01	C, F, 7, 8	Phone call to worker on the roof about lifting waste down with the crane		TRUE	0:01	FALSE	0:00
14:03	14:17	0:14	0:14	G	Table tennis break with college		FALSE	0:00	TRUE	0:14
14:17	14:25	0:08	0:08	D, F	Discussion about the green roof with a colleague		FALSE	0:00	FALSE	0:00
14:25	14:26	0:01	0:01	C, F, 3, 8	Phone call from worker on the roof about issues with the steel construction that is stuck on the roof		TRUE	0:01	FALSE	0:00
14:27	14:41	0:14	0:12	D, E, 3, 8	Managing lifting the steel construction with the crane		TRUE	0:14	FALSE	0:00
14:28	14:29	0:01	0:01	C, E	Phone call from subcontractor that is coming on Friday		FALSE	0:00	FALSE	0:00
14:38	14:39	0:01	0:01	C, E, 3	Phone call from college about lifting the steel construction		TRUE	0:01	FALSE	0:00
14:43	14:44	0:01	0:01	C, E, 3, 8	Phone call to worker on the roof about lifting the steel construction		TRUE	0:01	FALSE	0:00
14:44	14:51	0:07	0:07	B, F	Answering some emails		FALSE	0:00	FALSE	0:00
14:51	14:55	0:04	0:04	C, F	Phone call from worker about some technical matter regarding a steel-concrete intersection on the ground floor		FALSE	0:00	FALSE	0:00
14:55	14:59	0:04	0:04	C, F	Phone call from worker about fixing the carpet in a hallway		FALSE	0:00	FALSE	0:00
15:00	15:34	0:34	0:24	D, E, 3, 4, 8	Managing lifting the steel construction with the crane + managing the traffic situation around the barriers and the hole in the asphalt		TRUE	0:34	FALSE	0:00
15:09	15:19	0:10	0:10	C, E, 3, 8	Phone call regarding lifting the steel construction		TRUE	0:10	FALSE	0:00
15:34	15:50	0:16	0:16	D, F, 3	Waiting until the steel construction is lifted from the roof to the storage space on the neighboring construction site		TRUE	0:16	FALSE	0:00

Project:	Project A
Date:	8-2-2024
Observant:	Supervisor A
Experience:	3 years
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

Working hours observed:	6:53
Time on break:	1:46
Time spent on logistics:	2:51
Percentage of observed day spent on logistics:	42%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
7:09	7:12	0:03	0:03	D, F	Safety chat		FALSE	0:00	FALSE	0:00
7:12	7:13	0:01	0:01	C, F	Phone call from co-worker checking in		FALSE	0:00	FALSE	0:00
7:13	7:26	0:13	0:13	D, G	Morning coffee with colleagues		FALSE	0:00	TRUE	0:13
7:26	7:29	0:03	0:03	D, F, 3	Discussion with workers where to put some material		TRUE	0:03	FALSE	0:00
7:29	7:31	0:02	0:02	D, F, 4, 8	Discussion with worker regarding the right keys to get access to a specific area		TRUE	0:02	FALSE	0:00
7:31	7:33	0:02	0:02	D, F	Signing some safety document		FALSE	0:00	FALSE	0:00
7:33	7:34	0:01	0:01	C, F	Phone call from the site manager that they will be late		FALSE	0:00	FALSE	0:00
7:34	7:50	0:16	0:05	B, F	Answering emails		FALSE	0:00	FALSE	0:00
7:37	7:40	0:03	0:03	C, F	Phone call to a worker to give instruction to cover holes in the roof		FALSE	0:00	FALSE	0:00
7:43	7:47	0:04	0:04	C, F	Phone call from site manager about random things		FALSE	0:00	FALSE	0:00
7:47	7:48	0:01	0:01	C, F, 3, 4, 8	Phone call from workers about removing snow from the steel construction so that it can be transported		TRUE	0:01	FALSE	0:00
7:48	7:49	0:01	0:01	C, F, 2, 4, 7	Phone call regarding a waste truck that got stuck on the icy road and needs help to get away		TRUE	0:01	FALSE	0:00
7:49	7:51	0:02	0:02	C, F, 4, 8	Phone call regarding the snow on the steel and that the supervisor is bringing a broom to remove the snow		TRUE	0:02	FALSE	0:00
7:51	8:01	0:10	0:10	E, 4	Searching for a broom to remove ice from the steel construction and bags of gravel for the icy road		TRUE	0:10	FALSE	0:00
8:01	8:06	0:05	0:05	E, 4	Spreading the gravel on the ground in order for the traffic to continue safely		TRUE	0:05	FALSE	0:00
8:06	8:12	0:06	0:06	D, E, 4	Bringing the broom to the workers at the steel construction		TRUE	0:06	FALSE	0:00
8:12	8:16	0:04	0:04	B, F	Checking things on computer		FALSE	0:00	FALSE	0:00
8:16	8:18	0:02	0:02	D, F	Discussion with worker about the holes in the roof		FALSE	0:00	FALSE	0:00
8:18	8:34	0:16	0:14	D, F, 9	Having a discussion with a colleague about that they need more material and how to get it into place		TRUE	0:14	FALSE	0:00
8:27	8:29	0:02	0:02	C, F	Phone call about the concrete/gips wall		FALSE	0:00	FALSE	0:00
8:38	9:31	0:53	0:49	G	Breakfast break		FALSE	0:00	TRUE	0:49
9:10	9:12	0:02	0:02	C, F, 4, 7	Phone call about waste management (traffic flows)		TRUE	0:02	FALSE	0:00
9:17	9:19	0:02	0:02	C, F, 4, 7	Phone call about waste management (traffic flows)		TRUE	0:02	FALSE	0:00
9:32	9:34	0:02	0:02	C, F, 5	Phone call about sorting of cable materials		TRUE	0:02	FALSE	0:00
9:35	9:37	0:02	0:02	D, F, 5	Discussion with site manager about the sorting of cable materials		TRUE	0:02	FALSE	0:00
9:36	9:48	0:12	0:11	B, F	Things on the computer		FALSE	0:00	FALSE	0:00
9:39	9:40	0:01	0:01	D, F	Worker asks about technical issue related to cables		FALSE	0:00	FALSE	0:00
9:48	9:52	0:04	0:04	E	Measuring dimensions of concrete ceiling		FALSE	0:00	FALSE	0:00
9:52	9:54	0:02	0:02	C, F	Phone call about dimensions of concrete ceiling		FALSE	0:00	FALSE	0:00
9:54	9:55	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
9:55	10:20	0:25	0:21	F	Computer things (email, drawings etc.)		FALSE	0:00	FALSE	0:00
9:57	9:58	0:01	0:01	C, F	Phone call regarding fixing water issues		FALSE	0:00	FALSE	0:00
10:05	10:06	0:01	0:01	C, F	Phone call to double check if the worker knows how to fill the holes in the roof		FALSE	0:00	FALSE	0:00
10:11	10:13	0:02	0:02	C, F	Phone call about the concrete floor and if it is dry enough for coating		FALSE	0:00	FALSE	0:00
10:20	10:35	0:15	0:14	E, 6, 8	Searching for pallets of bricks and coordinating that they will go the installation location		TRUE	0:14	FALSE	0:00
10:22	10:23	0:01	0:01	C, E, 6, 8	Phone call regarding the coordination of moving the bricks to the installation location		TRUE	0:01	FALSE	0:00
10:35	10:40	0:05	0:05	D, E, 2	Discussion with workers about the outbound transport of the steel construction		TRUE	0:05	FALSE	0:00
10:40	10:42	0:02	0:02	C, F	Phone call with the guy that is fixing the water leakage		FALSE	0:00	FALSE	0:00
10:45	10:50	0:05	0:05	C, F	Phone call regarding a concrete beam		FALSE	0:00	FALSE	0:00
10:50	11:01	0:11	0:11	D, F	Chat with colleague supervisor		FALSE	0:00	FALSE	0:00
11:01	11:08	0:07	0:07	D, F	Discussion with site manager and colleague supervisor		FALSE	0:00	FALSE	0:00
11:08	11:23	0:15	0:10	E	Checking progression on the roof + checking concrete beam + checking concrete floor		FALSE	0:00	FALSE	0:00

11:09	11:13	0:04	0:04	D, E, 2	Discussion about opening fences for outbound truck		TRUE	0:04	FALSE	0:00
11:15	11:16	0:01	0:01	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
11:24	11:25	0:01	0:01	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
11:29	11:32	0:03	0:02	D, E	Discussion with worker about the work on the roof		FALSE	0:00	FALSE	0:00
11:30	11:31	0:01	0:01	C, E	Phone call to worker about the roof covering		FALSE	0:00	FALSE	0:00
11:32	11:38	0:06	0:06	D, E	Discussion with colleague supervisor about the work on the roof		FALSE	0:00	FALSE	0:00
11:38	12:38	1:00	0:59	D, E, 4, 6, 8	Managing moving and lifting the bricks to the installation area, including managing the traffic situation on the public road		TRUE	0:59	FALSE	0:00
12:18	12:19	0:01	0:01	C, E	Phone call about an opening in some concrete wall for the door		FALSE	0:00	FALSE	0:00
12:38	12:54	0:16	0:16	D, F	Discussion with site manager and supervisors		FALSE	0:00	FALSE	0:00
12:54	13:15	0:21	0:17	G	Lunch break		FALSE	0:00	TRUE	0:17
12:56	12:57	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
13:04	13:06	0:02	0:02	C, E, 4	Phone call to get give someone excess to the building site		TRUE	0:02	FALSE	0:00
13:07	13:08	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
13:15	13:38	0:23	0:23	D, E, 9	Inspecting the roof with representative from subcontractor to discuss how to install safety protection when green roofs will be installed	Logistics factor 1/2	TRUE	0:11	FALSE	0:00
13:38	14:01	0:23	0:23	D, F, 4, 6	Planning the logistics (how to get material on the roof) (defining logistics for the safety measures while installing green roof)		TRUE	0:23	FALSE	0:00
14:10	14:48	0:38	0:36	D, E	Measuring dimensions and discussion with workers how to renovate specific area		FALSE	0:00	FALSE	0:00
14:18	14:19	0:01	0:01	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
14:39	14:40	0:01	0:01	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
14:51	14:57	0:06	0:06	D, E	Discussion about the concrete beam with worker		FALSE	0:00	FALSE	0:00
14:57	15:10	0:13	0:11	D, E	Discussion with colleague about some technical matter		FALSE	0:00	FALSE	0:00
15:04	15:06	0:02	0:02	D, E	Chat with worker about something random		FALSE	0:00	FALSE	0:00
15:10	15:38	0:28	0:27	G	Ping Pong break		FALSE	0:00	TRUE	0:27
15:18	15:19	0:01	0:01	D, E	Chat with worker about holes in the roof		FALSE	0:00	FALSE	0:00
15:38	15:53	0:15	0:13	B, D, F	Going through 'extra work overview' with site manager		FALSE	0:00	FALSE	0:00
15:44	15:45	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
15:47	15:48	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00

Project:	Project A
Date:	13-2-2024
Observant:	Supervisor A
Experience:	3 years
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

Working hours observed:	6:29
Time on break:	2:32
Time spent on logistics:	2:04
Percentage of observed day spent on logistics:	32%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:49	7:35	0:46	0:27	B, F	Starting up, checking emails, working in Dalux to prepare meeting regarding quality control documents		FALSE	0:00	FALSE	0:00
6:55	6:57	0:02	0:02	D, F	A worker comes in and tells someone had pooped (!?) in the garage		FALSE	0:00	FALSE	0:00
7:01	7:03	0:02	0:02	D, F	Morning chat with colleague supervisor		FALSE	0:00	FALSE	0:00
7:03	7:07	0:04	0:04	B, D, F	Discussion with colleague supervisor regarding Dalux		FALSE	0:00	FALSE	0:00
7:11	7:12	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
7:12	7:13	0:01	0:01	D, F, 4, 8	Providing worker with a site access card		TRUE	0:01	FALSE	0:00
7:15	7:16	0:01	0:01	D, F	Morning chat with another colleague supervisor		FALSE	0:00	FALSE	0:00
7:16	7:17	0:01	0:01	C, F	Phone call from site manager checking in		FALSE	0:00	FALSE	0:00
7:24	7:26	0:02	0:02	D, F	Discussion with colleagues		FALSE	0:00	FALSE	0:00
7:29	7:31	0:02	0:02	C, F	Phone call from worker regarding some concrete that needs to be demolished		FALSE	0:00	FALSE	0:00
7:31	7:32	0:01	0:01	C, F, 3	Phone call from colleague supervisor about water leakage and that some materials needs to be removed from that place		TRUE	0:01	FALSE	0:00
7:32	7:34	0:02	0:02	C, F, 4, 8	Phone call to worker regarding cleaning snow for accessibility to the construction site		TRUE	0:02	FALSE	0:00
7:35	7:43	0:08	0:08	D, E, 3, 8	Giving workers instructions to move materials from the roof		TRUE	0:08	FALSE	0:00
7:43	7:50	0:07	0:07	D, E, D, E, 3, 8	Giving other workers instructions to remove materials from inside area		TRUE	0:07	FALSE	0:00
7:50	7:51	0:01	0:01	C, E	Phone call about painting the walls		FALSE	0:00	FALSE	0:00
7:52	7:54	0:02	0:02	C, E	Phone call about painting the walls		FALSE	0:00	FALSE	0:00
7:54	7:55	0:01	0:01	C, E	Phone call about painting the walls		FALSE	0:00	FALSE	0:00
8:00	8:03	0:03	0:03	D, F	Discussion with colleague supervisor about quality control documents		FALSE	0:00	FALSE	0:00
8:03	8:43	0:40	0:28	B, F	Checking emails and preparing the meeting regarding quality control documents		FALSE	0:00	FALSE	0:00
8:16	8:18	0:02	0:02	D, F, 3, 8	Workers asks where to put materials		TRUE	0:02	FALSE	0:00
8:18	8:19	0:01	0:01	C, F, 4, 8	Phone call from someone to ask for the access code to the site		TRUE	0:01	FALSE	0:00
8:22	8:23	0:01	0:01	C, F, 5, 8	Phone call from worker asking what to do with materials		TRUE	0:01	FALSE	0:00
8:30	8:32	0:02	0:02	C, F, 2	Phone call from worker asking about a door that is going to be delivered		TRUE	0:02	FALSE	0:00
8:37	8:43	0:06	0:06	D, F	Discussion with colleague supervisor about quality control of windows that are installed		FALSE	0:00	FALSE	0:00
8:43	9:28	0:45	0:44	G	Breakfast break		FALSE	0:00	TRUE	0:44
9:14	9:15	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
9:28	9:29	0:01	0:01	C, F	Unrelated phone call		FALSE	0:00	FALSE	0:00
9:30	9:46	0:16	0:16	C, F, 4, 7, 9	Phone call with colleagues from other project that asks for help to fix logistical issues regarding waste containers, parking spaces and traffic flows		TRUE	0:16	FALSE	0:00
9:46	9:50	0:04	0:04	C, F, 4, 7, 9	Phone call to site manager regarding the other projects logistical issues		TRUE	0:04	FALSE	0:00
9:50	9:54	0:04	0:04	C, F, 4, 7, 9	Phone call to colleague at the other project about the logistical issues		TRUE	0:04	FALSE	0:00
9:54	9:59	0:05	0:05	C, F, 4, 7, 9	Phone call to site manager regarding the other projects logistical issues		TRUE	0:05	FALSE	0:00
10:00	10:36	0:36	0:36	A	Meeting with project managers about the quality control documents		FALSE	0:00	FALSE	0:00
10:41	10:44	0:03	0:03	C, F, 2, 4, 8	Phone call about ordering materials and movement of personnel		TRUE	0:03	FALSE	0:00
10:45	11:05	0:20	0:20	E	Check around the building site		FALSE	0:00	FALSE	0:00
10:46	10:47	0:01	0:01	D, E	Discussion workers about carpeting work		FALSE	0:00	FALSE	0:00
10:47	10:48	0:01	0:01	C, E, 2, 4, 8, 9	Phone call to carpenter about when they are coming, materials and personnel		TRUE	0:01	FALSE	0:00
10:50	10:52	0:02	0:02	C, E, 3, 8	Phone call to give instruction to move materials		TRUE	0:02	FALSE	0:00
10:54	10:56	0:02	0:02	D, E	Giving workers instruction to fix some doors		FALSE	0:00	FALSE	0:00
10:56	10:57	0:01	0:01	D, E, 7, 8	Helping workers with carrying waste		TRUE	0:01	FALSE	0:00
10:57	11:05	0:08	0:08	D, E, 3, 7, 8	Giving workers instructions how do demolish specific parts and how to remove/handle the waste materials		TRUE	0:08	FALSE	0:00
11:11	11:17	0:06	0:06	D, E	Discussion with a worker about some technical issue related to concrete		FALSE	0:00	FALSE	0:00
11:17	11:22	0:05	0:05	E, 1, 2	Receiving material for a door		TRUE	0:05	FALSE	0:00

11:22	11:35	0:13	0:13	E, 6	Bringing the material for the door to destined location for installation	TRUE	0:13	FALSE	0:00
11:35	11:47	0:12	0:12	D, E	Discussion with worker about making a door opening in some concrete construction	FALSE	0:00	FALSE	0:00
11:47	12:02	0:15	0:08	B, F	Checking emails	FALSE	0:00	FALSE	0:00
11:51	11:55	0:04	0:04	D, F	Worker asks about some technical matter related to concrete	FALSE	0:00	FALSE	0:00
11:59	12:02	0:03	0:03	D, F, 4, 8	Giving a worker the right key for a specific area	TRUE	0:03	FALSE	0:00
12:02	12:24	0:22	0:22	G	Chats with colleagues	FALSE	0:00	TRUE	0:22
12:24	12:30	0:06	0:06	B, F	Checking emails	FALSE	0:00	FALSE	0:00
12:30	13:17	0:47	0:47	G	Lunch break	FALSE	0:00	TRUE	0:47
13:17	13:28	0:11	0:11	B, F	Checking emails	FALSE	0:00	FALSE	0:00
13:28	13:35	0:07	0:07	D, E	Giving workers instructions to fix water damaged wall	FALSE	0:00	FALSE	0:00
13:35	13:37	0:02	0:02	C, F	Phone call to subcontractor that sent an offer for the green area	FALSE	0:00	FALSE	0:00
13:37	13:51	0:14	0:14	B, F	Reviewing subcontractor's offer for the green area	FALSE	0:00	FALSE	0:00
13:51	14:02	0:11	0:11	B, D, F, 4, 6, 9	Discussing the subcontractors offer for the green area with the site manager, including discussion about the transport of materials to the installation site	TRUE	0:11	FALSE	0:00
14:02	14:07	0:05	0:05	C, F	Planning the demolition work in the basement	FALSE	0:00	FALSE	0:00
14:07	14:30	0:23	0:23	E, 4	Light in the basement randomly went off, so had to fix it	TRUE	0:23	FALSE	0:00
14:30	14:55	0:25	0:25	B, D, F	Discussions with colleagues about technical matters	FALSE	0:00	FALSE	0:00
14:55	15:01	0:06	0:06	C, F	Phone call regarding personnel	FALSE	0:00	FALSE	0:00
15:01	15:40	0:39	0:39	G	Ping Pong break	FALSE	0:00	TRUE	0:39
15:41	15:50	0:09	0:09	D, F	Discussion with site manager about finances	FALSE	0:00	FALSE	0:00

Project:	Project A
Date:	7-2-2024
Observant:	Site manager A
Experience:	30 years
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

Working hours observed:	4:12
Time on break:	0:53
Time spent on logistics:	0:36
Percentage of observed day spent on logistics:	14%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
7:48	8:13	0:25	0:19	D	Meeting regarding door/fire safety check		FALSE	0:00	FALSE	0:00
7:52	7:54	0:02	0:02	C	Call regarding door/fire safety check		FALSE	0:00	FALSE	0:00
7:54	7:55	0:01	0:01	C	Call regarding door/fire safety check		FALSE	0:00	FALSE	0:00
7:55	7:57	0:02	0:02	D	Chat with workers		FALSE	0:00	FALSE	0:00
8:00	8:00	0:00	0:00	C	Call regarding door/fire safety check		FALSE	0:00	FALSE	0:00
8:07	8:08	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
8:14	9:01	0:47	0:32	A	Coordinating drawings with client for an upcoming inspection		FALSE	0:00	FALSE	0:00
8:17	8:20	0:03	0:03	D	Coordinating door opening for safety check		FALSE	0:00	FALSE	0:00
8:18	8:19	0:01	0:01	C	Coordinating door opening for safety check		FALSE	0:00	FALSE	0:00
8:22	8:23	0:01	0:01	C	Coordinating Alarm not going off		FALSE	0:00	FALSE	0:00
8:24	8:25	0:01	0:01	C	Coordinating Alarm not going off		FALSE	0:00	FALSE	0:00
8:49	8:50	0:01	0:01	C, 4	Space coordination towards nearby square, do they need the space or not?		TRUE	0:01	FALSE	0:00
8:53	8:59	0:06	0:06	D, 2, 3	The have pulled in all the Gips ahead of time, thus leaving a 2m limit for future material as the crane is leaving this week		TRUE	0:06	FALSE	0:00
8:59	9:01	0:02	0:02	D, 3, 6	Discussion: "what if we need more materials?"		TRUE	0:02	FALSE	0:00
9:01	9:05	0:04	0:04	D	Coordinating plans (schedule) for tomorrow		FALSE	0:00	FALSE	0:00
9:05	9:12	0:07	0:07	G	Ping pong break		FALSE	0:00	TRUE	0:07
9:12	9:13	0:01	0:01	C	Confirm alarm ok		FALSE	0:00	FALSE	0:00
9:13	9:14	0:01	0:01	B	Unrelated computer activity		FALSE	0:00	FALSE	0:00
9:14	9:30	0:16	0:16	G	Ping pong break		FALSE	0:00	TRUE	0:16
9:30	9:36	0:06	0:06	D	Greetings to colleagues		FALSE	0:00	FALSE	0:00
9:36	11:18	1:42	1:42	A, 8	Neighboring lacking waste management, Discussed personnel needs (logistics of people), Importance of coordinating what drawings are evaluated, Delegating delivery delay	Logistics factor 1/5	TRUE	0:20	FALSE	0:00
11:18	11:19	0:01	0:01	D	Getting contact info		FALSE	0:00	FALSE	0:00
11:19	11:25	0:06	0:06	D	Talking with supervisor about completed work		FALSE	0:00	FALSE	0:00
11:25	11:30	0:05	0:05	C	Solving faulty radiators		FALSE	0:00	FALSE	0:00
11:30	12:30	1:00	0:30	G	Lunch		FALSE	0:00	TRUE	0:30
11:47	11:48	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
11:50	11:52	0:02	0:02	D, 2, 3	Discussing inbound transport		TRUE	0:02	FALSE	0:00
11:55	11:56	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
11:56	11:59	0:03	0:03	C, 4	Coordinating incoming subcontractor		TRUE	0:03	FALSE	0:00
12:04	12:05	0:01	0:01	D	Communicating info from meeting to supervisor		FALSE	0:00	FALSE	0:00
12:07	12:08	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
12:09	12:29	0:20	0:20	D	Alarm inspector, talking regarding safety check		FALSE	0:00	FALSE	0:00
12:29	12:30	0:01	0:01	D	Brief talk with supervisor regarding finances		FALSE	0:00	FALSE	0:00
12:30	12:36	0:06	0:06	D	talk with supervisor regarding upcoming economy meeting (safety & work share)		FALSE	0:00	FALSE	0:00
12:36	12:45	0:09	0:09	C	Coordinating work timeline		FALSE	0:00	FALSE	0:00
12:46	12:47	0:01	0:01	D	supervisor		FALSE	0:00	FALSE	0:00
12:47	12:49	0:02	0:02	D	Prep for electrical pathways		FALSE	0:00	FALSE	0:00
12:49	12:50	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
12:51	12:53	0:02	0:02	D, 4	Problem solve a hole in the road		TRUE	0:02	FALSE	0:00

Subject left to a meeting that observer could not join

Project:	Project A
Date:	8-2-2024
Observant:	Site manager A
Experience:	30 years
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

Working hours observed:	3:07
Time on break:	0:22
Time spent on logistics:	0:27
Percentage of observed day spent on logistics:	14%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
9:20	9:32	0:12	0:09	D, 1	Talking about delivery, what is similar to what? Related to the color of pipes		TRUE	0:09	FALSE	0:00
9:28	9:31	0:03	0:03	C	Contacting a guy for color identifier tool		FALSE	0:00	FALSE	0:00
9:32	11:02	1:30	1:29	A	Work not observed due to sensitivity or other reasons, internal economy meeting with electrician		FALSE	0:00	FALSE	0:00
9:35	9:36	0:01	0:01	D	came out and discussed an issue with supervisor		FALSE	0:00	FALSE	0:00
11:02	11:06	0:04	0:04	D, 4	Coordinating Building elevators		TRUE	0:04	FALSE	0:00
11:06	11:07	0:01	0:01	D	Coordinating outcome of economy/electrician meeting with supervisor		FALSE	0:00	FALSE	0:00
11:07	11:09	0:02	0:02	D, 1	Issues with pipe paint, Discussing with another supervisor		TRUE	0:02	FALSE	0:00
11:09	11:19	0:10	0:10	C, 1	Talking with supplier to organize a fix		TRUE	0:10	FALSE	0:00
11:19	11:35	0:16	0:06	D, B	Discussing technical solution, going through old emails together		FALSE	0:00	FALSE	0:00
11:25	11:35	0:10	0:10	C	Call to architect on what solution to take in regard to pipes		FALSE	0:00	FALSE	0:00
11:36	11:38	0:02	0:02	D	Questions regarding functionality		FALSE	0:00	FALSE	0:00
11:38	11:40	0:02	0:02	D	Economy		FALSE	0:00	FALSE	0:00
11:40	11:45	0:05	0:05	E	Moving car		FALSE	0:00	FALSE	0:00
11:45	12:30	0:45	0:22	G	Lunch		FALSE	0:00	TRUE	0:22
12:02	12:04	0:02	0:02	C	Ventilation		FALSE	0:00	FALSE	0:00
12:04	12:07	0:03	0:03	D	fixes before Inspection		FALSE	0:00	FALSE	0:00
12:07	12:09	0:02	0:02	C, 1	Color selection		TRUE	0:02	FALSE	0:00
12:09	12:11	0:02	0:02	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
12:11	12:12	0:01	0:01	D	Technical solution		FALSE	0:00	FALSE	0:00
12:13	12:26	0:13	0:13	B	Unrelated computer activity		FALSE	0:00	FALSE	0:00
12:31	12:32	0:01	0:01	C	Coordinating workers		FALSE	0:00	FALSE	0:00
12:33	12:36	0:03	0:03	C	Coordinating costs		FALSE	0:00	FALSE	0:00
12:37	12:40	0:03	0:03	D	Talk work to maintain safety		FALSE	0:00	FALSE	0:00
12:41	12:55	0:14	0:14	D	Chat with supervisors, some economy, some bills, some problems		FALSE	0:00	FALSE	0:00
12:48	12:49	0:01	0:01	C	coordinating with incoming supervisor		FALSE	0:00	FALSE	0:00

Project:	Project A
Date:	9-2-2024
Observant:	Site manager A
Experience:	30 years
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

Working hours observed:	4:45
Time on break:	1:15
Time spent on logistics:	0:44
Percentage of observed day spent on logistics:	16%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
9:27	9:55	0:28	0:28	A, 9	Looking at drawings, planning new section of the building. Pipes, double checks with workers and planning. Meeting planning the next stages of the project	Logistics factor 1/5	TRUE	0:05	FALSE	0:00
9:55	9:56	0:01	0:01	D	Coordinating work checks with supervisor		FALSE	0:00	FALSE	0:00
9:57	9:59	0:02	0:02	D	Getting info about meeting supervisor had		FALSE	0:00	FALSE	0:00
9:59	10:03	0:04	0:04	C	Coordinating workers		FALSE	0:00	FALSE	0:00
10:03	10:04	0:01	0:01	C	Coordinating workers		FALSE	0:00	FALSE	0:00
10:04	10:14	0:10	0:10	D	Talk with supervisor and guest (architect) about color issue from yesterday		FALSE	0:00	FALSE	0:00
10:14	10:34	0:20	0:20	E, D	Comparing drawing to site, finding implementation, ventilation capacity		FALSE	0:00	FALSE	0:00
10:34	10:45	0:11	0:11	D, 1	Meet Architect on site, check color of pipes, who is responsible for issue?		TRUE	0:11	FALSE	0:00
10:45	11:06	0:21	0:17	E, D	potential extra space, Show and talk with Architect		FALSE	0:00	FALSE	0:00
10:50	10:51	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
10:54	10:55	0:01	0:01	C	Technical question		FALSE	0:00	FALSE	0:00
10:59	11:00	0:01	0:01	D	Social chat with worker		FALSE	0:00	FALSE	0:00
11:04	11:05	0:01	0:01	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
11:06	11:07	0:01	0:01	C	Filters need replacing		FALSE	0:00	FALSE	0:00
11:07	11:09	0:02	0:02	C, 2	When can a delivery happen?		TRUE	0:02	FALSE	0:00
11:09	11:11	0:02	0:02	D	If an issue has happened, we need to report through proper channels		FALSE	0:00	FALSE	0:00
11:11	11:16	0:05	0:05	E	Went to move car,		FALSE	0:00	FALSE	0:00
11:16	11:21	0:05	0:05	D	Social chat with worker		FALSE	0:00	FALSE	0:00
11:21	11:32	0:11	0:11	B	Unrelated computer activity		FALSE	0:00	FALSE	0:00
11:25	11:27	0:02	0:02	C, 5, 7	Material storage, waste lying around site, delegation reminder		TRUE	0:02	FALSE	0:00
11:27	11:28	0:01	0:01	C, 2, 1	Material delivery timeline		TRUE	0:01	FALSE	0:00
11:28	11:29	0:01	0:01	C	Coordinating entrance build plan		FALSE	0:00	FALSE	0:00
11:32	11:33	0:01	0:01	C, 2	Coordinate entrance materials delivery planning		TRUE	0:01	FALSE	0:00
11:33	12:13	0:40	0:40	G	Lunch (was away for lunch could not observe)		FALSE	0:00	TRUE	0:40
12:13	12:17	0:04	0:04	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
12:17	12:25	0:08	0:07	D	Solving fire safety issue, who needs to solve it, some pipe color discussion		FALSE	0:00	FALSE	0:00
12:23	12:24	0:01	0:01	C	Project planning		FALSE	0:00	FALSE	0:00
12:25	12:35	0:10	0:06	B	Unrelated computer activity		FALSE	0:00	FALSE	0:00
12:25	12:26	0:01	0:01	D, 2	Delivery planning, material purchasing		TRUE	0:01	FALSE	0:00
12:32	12:35	0:03	0:03	D	Construction woes		FALSE	0:00	FALSE	0:00
12:35	12:49	0:14	0:08	G	Ping pong break		FALSE	0:00	TRUE	0:08
12:39	12:40	0:01	0:01	D	Worker asking directions		FALSE	0:00	FALSE	0:00
12:43	12:48	0:05	0:05	D	Who to contact in regard to fire safety issue, some minor organization issues		FALSE	0:00	FALSE	0:00
12:49	12:53	0:04	0:04	D	Planning with supervisor		FALSE	0:00	FALSE	0:00
12:53	13:10	0:17	0:17	D	Sensitive info		FALSE	0:00	FALSE	0:00
13:10	13:12	0:02	0:02	C	Safety (fire)		FALSE	0:00	FALSE	0:00
13:12	13:22	0:10	0:10	C	Safety (fire)		FALSE	0:00	FALSE	0:00
13:22	13:24	0:02	0:02	D	Supervisor		FALSE	0:00	FALSE	0:00
13:24	13:37	0:13	0:10	G	Break		FALSE	0:00	TRUE	0:10
13:30	13:33	0:03	0:03	C	Unrelated phone call		FALSE	0:00	FALSE	0:00
13:37	14:12	0:35	0:35	A	Leading coordination meeting		FALSE	0:00	FALSE	0:00

14:12	14:18	0:06	0:06	D, 1	Supplier has made a mistake on the color of pipes (admitted) talking options, repainting on site, get new, send to get repainted	TRUE	0:06	FALSE	0:00
14:18	14:38	0:20	0:09	B	Unrelated computer activity	FALSE	0:00	FALSE	0:00
14:22	14:23	0:01	0:01	C	Unrelated phone call	FALSE	0:00	FALSE	0:00
14:28	14:31	0:03	0:03	C	Worker's hours and billing	FALSE	0:00	FALSE	0:00
14:31	14:34	0:03	0:03	C	Discussing workers hours with one of the workers	FALSE	0:00	FALSE	0:00
14:34	14:38	0:04	0:04	C	Worker hours with another manager	FALSE	0:00	FALSE	0:00
14:38	14:40	0:02	0:02	D	Worker hours with a supervisor	FALSE	0:00	FALSE	0:00
14:40	14:44	0:04	0:04	C	Discussing safety inspection that was on Wednesday morning and the relating issues	FALSE	0:00	FALSE	0:00
14:44	14:59	0:15	0:15	D, 1	Discussing color issue again as well as some general reflection	TRUE	0:15	FALSE	0:00
14:59	15:16	0:17	0:17	G	Unrelated computer activity	FALSE	0:00	TRUE	0:17
15:16	15:28	0:12	0:05	B, D	Discuss prep for new carpet work, communication questions, what has been said on the topic so far	FALSE	0:00	FALSE	0:00
15:19	15:23	0:04	0:04	C	Communicating solved fire safety issue	FALSE	0:00	FALSE	0:00
15:24	15:27	0:03	0:03	C	Project coordination	FALSE	0:00	FALSE	0:00

Project:	Project B
Date:	21-2-2024
Observant:	Supervisor B1
Experience:	11 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings in city centre

Working hours observed:	7:38
Time on break:	1:07
Time spent on logistics:	5:16
Percentage of observed day spent on logistics:	69%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
7:00	8:06	1:06	1:05	A, F	Tour in the office and introduction presentation about [Company name] and the project.		FALSE	0:00	FALSE	0:00
7:26	7:27	0:01	0:01	C, F	Phone call about something with colleague [Supervisor 2]		FALSE	0:00	FALSE	0:00
8:06	8:29	0:23	0:23	D, E, 2, 3, 5	Discussion with colleague supervisor about moving, sorting and ordering materials		TRUE	0:23	FALSE	0:00
8:29	8:32	0:03	0:03	C, E, 3, 8	Phone call with driver of the lull forklift regarding materials that need to be moved today		TRUE	0:03	FALSE	0:00
8:32	8:55	0:23	0:23	D, E, 3, 8	Coordination of the lull forklift that is moving materials		TRUE	0:23	FALSE	0:00
8:55	9:00	0:05	0:05	D, E, 2, 3, 4, 8	Discussion with the supervisor from neighbor project about an incoming transport that has a conflict with the materials that need to be moved		TRUE	0:05	FALSE	0:00
9:00	9:02	0:02	0:02	E, 3	The supervisor is moving some materials		TRUE	0:02	FALSE	0:00
9:02	9:05	0:03	0:03	D, E, 4	Having a short chat with the electrician to coordinate opening of the access gate		TRUE	0:03	FALSE	0:00
9:05	9:08	0:03	0:03	E, 4	Searching for a lashing strap that is needed to move materials with the lull forklift		TRUE	0:03	FALSE	0:00
9:08	9:15	0:07	0:07	E, 3	The supervisor is moving some materials		TRUE	0:07	FALSE	0:00
9:15	9:31	0:16	0:13	D, E, 2, 3, 4, 8	Waiting for inbound transport, discussion with lull forklift driver, moving some materials		TRUE	0:13	FALSE	0:00
9:21	9:24	0:03	0:03	C, E, 4	Phone call to colleague about electrical cable that is missing for access gate, and that this needs to be ordered		TRUE	0:03	FALSE	0:00
9:31	9:40	0:09	0:09	E, 2, 4	Coordinating the entrance gate for inbound transport		TRUE	0:09	FALSE	0:00
9:40	10:07	0:27	0:27	G	Breakfast break		FALSE	0:00	TRUE	0:27
10:07	10:25	0:18	0:15	B, F	Starting laptop, checking emails		FALSE	0:00	FALSE	0:00
10:10	10:13	0:03	0:03	D, F, 4	Discussion with colleagues about electrical cable that needs to be ordered		TRUE	0:03	FALSE	0:00
10:25	10:36	0:11	0:11	D, E, 4	Discussion with supervisor contractor to coordinate the workflow about moving materials and traffic flows		TRUE	0:11	FALSE	0:00
10:36	11:01	0:25	0:25	E, 3, 5, 8	Coordinating and helping lull forklift driver with moving and sorting materials		TRUE	0:25	FALSE	0:00
11:01	11:04	0:03	0:03	D, E, 4, 8	Managing construction traffic flows at access gate to move materials		TRUE	0:03	FALSE	0:00
11:04	11:05	0:01	0:01	C, E, 3	Phone call regarding moving materials		TRUE	0:01	FALSE	0:00
11:05	11:06	0:01	0:01	D, E, 3, 8	Discussion with workers about moving materials		TRUE	0:01	FALSE	0:00
11:06	11:07	0:01	0:01	D, E, 4, 8	Instructing driver of the excavator to make space for the workflow of moving materials		TRUE	0:01	FALSE	0:00
11:07	11:08	0:01	0:01	D, E, 3, 8	Giving worker instructions to move material		TRUE	0:01	FALSE	0:00
11:08	12:10	1:02	0:56	E, 2, 3, 4, 5, 8	Supervisor moved and sorted different materials, coordinating the lull forklift and coordinating incoming transports		TRUE	0:56	FALSE	0:00
11:10	11:14	0:04	0:04	D, 4, 7, 8	Discussion with neighbor contractor and waste subcontractor to coordinate traffic flow of the waste truck (fencing)		TRUE	0:04	FALSE	0:00
11:24	11:25	0:01	0:01	E, 4	Opening fence		TRUE	0:01	FALSE	0:00
11:35	11:36	0:01	0:01	E, 4	Checking received packages		TRUE	0:01	FALSE	0:00
12:10	12:50	0:40	0:40	G	Lunch break		FALSE	0:00	TRUE	0:40
12:50	13:07	0:17	0:16	B, F	Checking emails + other laptop things		FALSE	0:00	FALSE	0:00
12:55	12:56	0:01	0:01	C, F, 8	Phone call with lull forklift driver to coordinate moving materials		TRUE	0:01	FALSE	0:00
13:07	14:15	1:08	1:07	E, 3, 4, 5, 8	Continue sorting and moving materials, plus coordinating the lull forklift		TRUE	1:07	FALSE	0:00
13:33	13:34	0:01	0:01	C, E, 4	Phone call regarding an entrance gate that has been open for a long time		TRUE	0:01	FALSE	0:00
14:15	14:31	0:16	0:16	E, 6, 8	Coordinating the moving of reinforcement to the installation area with the lull forklift		TRUE	0:16	FALSE	0:00
14:31	14:44	0:13	0:13	E, 3, 5, 8	Moving fences		TRUE	0:13	FALSE	0:00
14:44	14:46	0:02	0:02	E, 7	Dumping waste in waste containers		TRUE	0:02	FALSE	0:00
14:46	15:00	0:14	0:14	E, 3, 5	Moving some materials like lights		TRUE	0:14	FALSE	0:00
15:00	15:45	0:45	0:45	B, F	Ending the day by some administrative things on the computer		FALSE	0:00	FALSE	0:00

Project:	Project B
Date:	22-2-2024
Observant:	Supervisor B1
Experience:	11 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings

Working hours observed:	7:53
Time on break:	1:22
Time spent on logistics:	4:43
Percentage of observed day spent on logistics:	60%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	6:55	0:10	0:10	A, 9	Morning meeting, the plan for today on site, some logistics mentioned	Logistic factor 1/3	TRUE	0:03	FALSE	0:00
6:55	7:55	1:00	0:57	A, 4, 9	Largely logistics planning, some coordinating study visit for logistics students		TRUE	0:57	FALSE	0:00
7:17	7:18	0:01	0:01	D, F	Talking work with another supervisor, technical solution		FALSE	0:00	FALSE	0:00
7:42	7:44	0:02	0:02	D, F	Talking work with another supervisor, technical solution		FALSE	0:00	FALSE	0:00
7:55	8:02	0:07	0:07	F			FALSE	0:00	FALSE	0:00
8:02	8:46	0:44	0:44	A, 9	Logistics meeting have two extra logistics specialists from [Company name] attends		TRUE	0:44	FALSE	0:00
8:46	9:14	0:28	0:28	G	Breakfast		FALSE	0:00	TRUE	0:28
9:14	11:10	1:56	1:53	A, 9	Continued logistics meeting		TRUE	1:53	FALSE	0:00
9:23	9:24	0:01	0:01	C, F	stepped out to take a call		FALSE	0:00	FALSE	0:00
10:16	10:17	0:01	0:01	C, F	stepped out to take a call		FALSE	0:00	FALSE	0:00
10:55	10:56	0:01	0:01	E	Stepped out of meeting to grab something		FALSE	0:00	FALSE	0:00
11:10	11:19	0:09	0:05	G	Coffee break		FALSE	0:00	TRUE	0:05
11:12	11:16	0:04	0:04	D, F, 9	Chat with logistics expert about site plans		TRUE	0:04	FALSE	0:00
11:19	11:53	0:34	0:34	A, 9	Continued logistics meeting		TRUE	0:34	FALSE	0:00
11:53	12:03	0:10	0:09	B	Sending over files		FALSE	0:00	FALSE	0:00
11:54	11:55	0:01	0:01	D, F	socializing		FALSE	0:00	FALSE	0:00
12:03	12:44	0:41	0:41	G	Lunch		FALSE	0:00	TRUE	0:41
12:44	12:50	0:06	0:06	B			FALSE	0:00	FALSE	0:00
12:50	13:16	0:26	0:26	E	Doing some measurements and grabbing packages on the way in		FALSE	0:00	FALSE	0:00
13:16	13:17	0:01	0:01	D, F, 2, 3	dropping off packages to supervisors		TRUE	0:01	FALSE	0:00
13:17	13:25	0:08	0:08	B			FALSE	0:00	FALSE	0:00
13:25	13:30	0:05	0:05	G	Cake time		FALSE	0:00	TRUE	0:05
13:30	13:37	0:07	0:07	B			FALSE	0:00	FALSE	0:00
13:37	13:38	0:01	0:01	C, F, 4	Incoming coworker		TRUE	0:01	FALSE	0:00
13:38	13:41	0:03	0:03	D, E	Heading to meeting together		FALSE	0:00	FALSE	0:00
13:41	15:00	1:19	1:19	A, 9	Electrician planning meeting, where to draw wires for construction and the needs of the building	Logistics factor 1/3	TRUE	0:26	FALSE	0:00
15:00	15:05	0:05	0:05	D, F	Overview of the site from office with electrician		FALSE	0:00	FALSE	0:00
15:05	15:08	0:03	0:03	G			FALSE	0:00	TRUE	0:03
15:08	15:10	0:02	0:02	C, F	Personal call		FALSE	0:00	FALSE	0:00
15:10	16:00	0:50	0:50	B, D	End of day rounding out, doing a course for certification		FALSE	0:00	FALSE	0:00

Project:	Project B
Date:	23-2-2024
Observant:	Supervisor B1
Experience:	11 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings

Working hours observed:	6:11
Time on break:	3:00
Time spent on logistics:	2:41
Percentage of observed day spent on logistics:	43%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	6:50	0:05	0:05	A	Morning meeting plan for the day		FALSE	0:00	FALSE	0:00
6:50	6:56	0:06	0:06	B	Start of day checks email		FALSE	0:00	FALSE	0:00
6:56	6:57	0:01	0:01	C, F, 2	Incoming delivery		TRUE	0:01	FALSE	0:00
6:57	7:23	0:26	0:18	E, 2, 7	Return of construction lights and some waste management		TRUE	0:18	FALSE	0:00
7:01	7:02	0:01	0:01	C, E			FALSE	0:00	FALSE	0:00
7:04	7:05	0:01	0:01	E, 4	Coordinating traffic		TRUE	0:01	FALSE	0:00
7:08	7:11	0:03	0:03	E	Measuring covers for materials		FALSE	0:00	FALSE	0:00
7:11	7:14	0:03	0:03	D, E			FALSE	0:00	FALSE	0:00
7:23	7:38	0:15	0:15	E	Putting up first aid signs and kits		FALSE	0:00	FALSE	0:00
7:38	7:43	0:05	0:05	E, 3, 7, 5	Tidying site, throwing away some waste		TRUE	0:05	FALSE	0:00
7:43	7:44	0:01	0:01	D, E, 4	Letting a worker through the gate and discussing parking options		TRUE	0:01	FALSE	0:00
7:44	7:55	0:11	0:10	E, 4	Setting up safety tape where a bit of a drop has appeared on site		TRUE	0:10	FALSE	0:00
7:47	7:48	0:01	0:01	D, E	Chat with super visor and site manager in passing		FALSE	0:00	FALSE	0:00
7:55	8:03	0:08	0:08	D, E	Helping another supervisor screw some boards apart		FALSE	0:00	FALSE	0:00
8:03	8:06	0:03	0:03	E	Surveying site and some throwing waste		FALSE	0:00	FALSE	0:00
8:06	8:07	0:01	0:01	D, E, 3, 8	Chat with excavator driver, asking to lift some barricades		TRUE	0:01	FALSE	0:00
8:07	8:14	0:07	0:07	4, E	Setting up safety barriers instead of tejp by the drop		TRUE	0:07	FALSE	0:00
8:14	8:21	0:07	0:07	E, 3	prepping materials for moving/securing them so they don't blow away		TRUE	0:07	FALSE	0:00
8:16	8:17	0:01	0:01	D, E	another supervisor checks in on progress		FALSE	0:00	FALSE	0:00
8:21	8:22	0:01	0:01	D, E	Coordinate work		FALSE	0:00	FALSE	0:00
8:22	8:26	0:04	0:04	E, G	Heading to Ica for breakfast. Interrupted due to some materials flying away.		FALSE	0:00	TRUE	0:04
8:26	8:36	0:10	0:10	3, E	Organizing materials, putting them back into place and putting weights on top to prevent them from getting blown away		TRUE	0:10	FALSE	0:00
8:36	9:12	0:36	0:36	G	Breakfast		FALSE	0:00	TRUE	0:36
9:12	9:28	0:16	0:16	G	Fika paus		FALSE	0:00	TRUE	0:16
9:28	9:33	0:05	0:05	D, E	Discussing upcoming work, pouring concrete		FALSE	0:00	FALSE	0:00
9:33	9:48	0:15	0:15	E, 4	Solving water and fixing gate sign		TRUE	0:15	FALSE	0:00
9:48	10:05	0:17	0:15	E	Looking for ID06		FALSE	0:00	FALSE	0:00
9:50	9:51	0:01	0:01	C, E	Can you fix the water? Another supervisor asks		FALSE	0:00	FALSE	0:00
9:57	9:58	0:01	0:01	C, E	Asking back, did you already fix the water or need me to do something more?		FALSE	0:00	FALSE	0:00
10:05	10:08	0:03	0:03	D, E	Chat with coworker on the way back inside		FALSE	0:00	FALSE	0:00
10:08	10:25	0:17	0:16	B, 9	Looking at potential building elevator solution		TRUE	0:16	FALSE	0:00
10:17	10:18	0:01	0:01	D, F	Supervisor checking in		FALSE	0:00	FALSE	0:00
10:25	10:30	0:05	0:05	C, F, 9	Planning meeting for fall protection		TRUE	0:05	FALSE	0:00
10:30	11:51	1:21	1:05	B	Reviewing drawings		FALSE	0:00	FALSE	0:00
10:56	10:59	0:03	0:03	D, F, 9	Talking about scaffolding solutions with site manager		TRUE	0:03	FALSE	0:00
11:05	11:12	0:07	0:07	C, F, 9	Looking into scaffolding options		TRUE	0:07	FALSE	0:00
11:19	11:25	0:06	0:06	C, F, 9	Looking for suggestion/opinion for scaffolding option		TRUE	0:06	FALSE	0:00
11:51	13:55	2:04	2:04	G	Off to a different function		FALSE	0:00	TRUE	2:04
13:55	14:04	0:09	0:08	B	Buying protective gear for upcoming visitors		FALSE	0:00	FALSE	0:00
13:59	14:00	0:01	0:01	D, E	conferring with site manager about safety gear purchase		FALSE	0:00	FALSE	0:00
14:04	14:10	0:06	0:06	D, E, 5	Taking inventory of safety gear with another supervisor		TRUE	0:06	FALSE	0:00
14:10	14:43	0:33	0:03	B			FALSE	0:00	FALSE	0:00

14:18	14:20	0:02	0:02	C, F	Planning safety meeting (fall protection)		FALSE	0:00	FALSE	0:00
14:20	14:24	0:04	0:04	D, F	Asking other supervisors/site managers if they want to join meeting.		FALSE	0:00	FALSE	0:00
14:24	14:47	0:23	0:23	B			FALSE	0:00	FALSE	0:00
14:30	14:31	0:01	0:01	D, F, 9	Check with site manager when they have a crane available		TRUE	0:01	FALSE	0:00
14:43	14:47	0:04	0:04	D, F, 4	Conferring with supervisor regarding gate fix		TRUE	0:04	FALSE	0:00
14:47	15:11	0:24	0:22	E, 4	Heading out to fix gate (plug it in)		TRUE	0:22	FALSE	0:00
14:55	14:57	0:02	0:02	C, E	two calls about fixing power to the gate		FALSE	0:00	FALSE	0:00
15:11	15:12	0:01	0:01	D, E	Check in with truck driver for cementing crane truck		FALSE	0:00	FALSE	0:00
15:12	15:27	0:15	0:15	E, 4	Seeing over electricity for rest of the site, laying out extension cables		TRUE	0:15	FALSE	0:00
15:27	15:33	0:06	0:06	D, F	Talking about rounding out the day and work well done with supervisor		FALSE	0:00	FALSE	0:00
15:33	15:56	0:23	0:23	B	Keeping up to date on company news. Making a to do list for next week's work		FALSE	0:00	FALSE	0:00

Project:	Project B
Date:	21-2-2024
Observant:	Supervisor B2
Experience:	5 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings

Working hours observed:	2:17
Time on break:	0:22
Time spent on logistics:	0:48
Percentage of observed day spent on logistics:	35%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
8:00	8:02	0:02	0:02	D, F	Introducing project to observer		FALSE	0:00	FALSE	0:00
8:02	8:03	0:01	0:01	D, F	Talk to another supervisor about upcoming meeting		FALSE	0:00	FALSE	0:00
8:03	8:08	0:05	0:05	B	Looking at drawings for upcoming casting meeting. Some worries about structural integrity.		FALSE	0:00	FALSE	0:00
8:08	8:09	0:01	0:01	E	Heading to meeting room		FALSE	0:00	FALSE	0:00
8:09	8:18	0:09	0:05	D, F	Talking to another supervisor while waiting for meeting to start		FALSE	0:00	FALSE	0:00
8:14	8:15	0:01	0:01	C, F, 4	Another supervisor calling to ask them to call an incoming worker		TRUE	0:01	FALSE	0:00
8:15	8:16	0:01	0:01	C, F, 4	Talking to incoming worker who needs access to site to be able to check a faulty gate		TRUE	0:01	FALSE	0:00
8:16	8:18	0:02	0:02	C, F, 4	Calling coworker to let in the worker at the gate		TRUE	0:02	FALSE	0:00
8:18	9:04	0:46	0:41	A	Basement walls casting meeting, Different heights on the walls in the basement. What is our solution? Additionally talk about type of concrete to be used		FALSE	0:00	FALSE	0:00
8:24	8:26	0:02	0:02	A	Talking about timeline of the project, when do different stages start		FALSE	0:00	FALSE	0:00
8:30	8:32	0:02	0:02	A, 9	How many work teams are needed? Where does the work start? Limits to space, need extra transports?		TRUE	0:02	FALSE	0:00
8:40	8:40	0:00	0:00	D, F	Worker poking their head into meeting for 10 sec asking for a tool		FALSE	0:00	FALSE	0:00
8:41	8:42	0:01	0:01	C, F	Stepped out to take a call		FALSE	0:00	FALSE	0:00
9:04	9:11	0:07	0:07	A	Planning order of building walls, timeline of work, replan based on height of walls,		FALSE	0:00	FALSE	0:00
9:11	9:18	0:07	0:07	D, F	Saying goodbye to concrete partner, interesting story of when ordering some concrete for fixing some holes in the walls of the ramp they ended up getting pure pigment for coloring concrete instead of concrete		FALSE	0:00	FALSE	0:00
9:18	10:01	0:43	0:22	G	Breakfast, filled with numerous small chats about work		FALSE	0:00	TRUE	0:22
9:21	9:23	0:02	0:02	C, F, 4	Gate fix check, making sure that things can move around		TRUE	0:02	FALSE	0:00
9:23	9:24	0:01	0:01	D, F	telling worker to check on pumping work		FALSE	0:00	FALSE	0:00
9:43	9:46	0:03	0:03	D, F, 2, 8	Talking the struggles of getting deliveries from DHL, they don't give proper notice and now has to go get the package from a nearby supermarket		TRUE	0:03	FALSE	0:00
9:46	9:47	0:01	0:01	D, F, 4	Discussing the gates being open		TRUE	0:01	FALSE	0:00
9:52	9:52	0:00	0:00	C, F	Called to check something, no answer		FALSE	0:00	FALSE	0:00
9:47	9:57	0:10	0:10	D, F	social/some spread work discussion with supervisor 1		FALSE	0:00	FALSE	0:00
9:57	10:01	0:04	0:04	D, F	Problem solving how to move past some bent reinforcements		FALSE	0:00	FALSE	0:00
10:01	10:32	0:31	0:31	E, 2	Going to get the package from a nearby grocery store that wasn't delivered properly		TRUE	0:31	FALSE	0:00
10:32	10:33	0:01	0:01	D, F	Social, some talk about coordinating work		FALSE	0:00	FALSE	0:00
10:33	10:39	0:06	0:01	B	Emails, invoice		FALSE	0:00	FALSE	0:00
10:34	10:35	0:01	0:01	C, F, 2	Coordinating delivery (returning items)		TRUE	0:01	FALSE	0:00
10:35	10:39	0:04	0:04	D, F, 7	Chat about waste removal		TRUE	0:04	FALSE	0:00

Project:	Project B
Date:	22-2-2024
Observant:	Supervisor B2
Experience:	5 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings

Working hours observed:	7:10
Time on break:	1:56
Time spent on logistics:	2:45
Percentage of observed day spent on logistics:	38%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	6:55	0:10	0:10	A, 9	Day starts with the subcontractors to discuss activities of the day. Partly about coordination of logistics	Logistics factor 1/3	TRUE	0:10	FALSE	0:00
6:55	7:25	0:30	0:08	B, F	Administrative work in software in which the supervisor(s) note some general statistics of today, like weather, subcontractors on site, working activities etc.		FALSE	0:00	FALSE	0:00
6:59	7:21	0:22	0:22	B, D, F	Discussion with colleagues about concrete floor that needs to be changed in order for the steel stamps to fit (as a result of too much ground pressure on the sheet pilings)		FALSE	0:00	FALSE	0:00
7:25	7:30	0:05	0:05	B, F	Checking emails and drawings		FALSE	0:00	FALSE	0:00
7:30	7:34	0:04	0:04	B, F, 7	Checking software in which all waste in being digitally tracked and presented in an overview (or in other words, managing the waste flows digitally)		TRUE	0:04	FALSE	0:00
7:34	7:41	0:07	0:07	B, F	Controlling quality documents of concrete construction		FALSE	0:00	FALSE	0:00
7:41	7:44	0:03	0:03	B, D, F	Discussion drawings of concrete floor with colleagues		FALSE	0:00	FALSE	0:00
7:44	7:49	0:05	0:05	D, F, 4	Discussion with colleagues about ordering some small material/equipment		TRUE	0:05	FALSE	0:00
7:49	7:58	0:09	0:09	B, D, F	Checking inspection protocol documents with colleague		FALSE	0:00	FALSE	0:00
7:58	8:20	0:22	0:22	G	Morning break		FALSE	0:00	TRUE	0:22
8:20	9:10	0:50	0:49	D, E	Coordinating subcontractor that is going to cut the concrete floor in order for the steel stamps to fit		FALSE	0:00	FALSE	0:00
9:06	9:07	0:01	0:01	C, E, 4	Phone call about access to the construction site		TRUE	0:01	FALSE	0:00
9:10	9:17	0:07	0:07	E, 4	Helping subcontractor for concrete work to attach equipment like water supply		TRUE	0:07	FALSE	0:00
9:17	9:22	0:05	0:05	D, F, 9	Discussion with subcontractor to coordinate installation of camera's and alarm system		TRUE	0:05	FALSE	0:00
9:22	9:24	0:02	0:02	D, F, 9	Discussion with site managers about the camera's		TRUE	0:02	FALSE	0:00
9:24	9:25	0:01	0:01	C, F, 4	Phone call from worker asking for specific tool/equipment		TRUE	0:01	FALSE	0:00
9:25	9:27	0:02	0:02	C, F, 4	Phone call about access to the construction site		TRUE	0:02	FALSE	0:00
9:27	10:15	0:48	0:46	G	Breakfast break		FALSE	0:00	TRUE	0:46
10:01	10:03	0:02	0:02	C, F, 7	Phone call about waste containers		TRUE	0:02	FALSE	0:00
10:15	10:20	0:05	0:05	B, F	Calculating m3 concrete for tomorrow		FALSE	0:00	FALSE	0:00
10:20	10:43	0:23	0:22	B, F	Checking emails and drawings		FALSE	0:00	FALSE	0:00
10:42	10:43	0:01	0:01	C, F, 9	Phone call to worker to discuss some logistical things about the concrete that is being poured tomorrow		TRUE	0:01	FALSE	0:00
10:43	10:45	0:02	0:02	C, F, 1	Phone call about signing delivery documents for incoming delivery of camera's		TRUE	0:02	FALSE	0:00
10:45	10:49	0:04	0:04	D, F, 9	Discussion with worker to coordinate the concrete truck, its reach and where to position it on the site		TRUE	0:04	FALSE	0:00
10:49	11:43	0:54	0:54	A, 7	Interview with some students regarding waste management (how they manage the waste on site and as a contractor in general)		TRUE	0:54	FALSE	0:00
11:43	11:46	0:03	0:03	C, F	Phone call from worker to discuss the concrete work		FALSE	0:00	FALSE	0:00
11:46	12:01	0:15	0:11	B, F	Checking emails and drawings		FALSE	0:00	FALSE	0:00
11:57	11:58	0:01	0:01	C, F, 3, 8, 6	Phone call to worker to give instructions to move the reinforcement		TRUE	0:01	FALSE	0:00
11:58	12:01	0:03	0:03	D, F, 5, 8	Coordinating and checking with worker if materials are on the right place		TRUE	0:03	FALSE	0:00
12:01	12:49	0:48	0:48	G	Lunch break		FALSE	0:00	TRUE	0:48
12:49	13:50	1:01	1:01	D, E	Checking concrete work, assisting and coordinating the landmeter guy and coordinating the reinforcement work		FALSE	0:00	FALSE	0:00
13:50	14:18	0:28	0:26	E, 6, 8	Helping moving the reinforcement to the installation place		TRUE	0:26	FALSE	0:00
14:05	14:07	0:02	0:02	C, E	Unrelated phone call		FALSE	0:00	FALSE	0:00
14:20	14:50	0:30	0:30	A, F, 9	Meeting with the electrician subcontractor to plan the work	Logistics factor 1/3	TRUE	0:30	FALSE	0:00
14:50	15:10	0:20	0:20	B, F	Calculating and reviewing concrete work of tomorrow		FALSE	0:00	FALSE	0:00
15:10	15:15	0:05	0:05	D, F	Chat with colleague supervisor about ???		FALSE	0:00	FALSE	0:00
15:20	15:25	0:05	0:05	D, F	Updating and finalizing daily logbook that the supervisor started in the morning		FALSE	0:00	FALSE	0:00
15:25	15:56	0:31	0:21	D, F	Computer stuff		FALSE	0:00	FALSE	0:00

15:30	15:35	0:05	0:05	C, F, 4, 6	Phone call from concrete worker to discuss concrete work for tomorrow, mostly about getting the materials and equipment ready on the right place		TRUE	0:05	FALSE	0:00
15:40	15:43	0:03	0:03	D, F	Chat with colleague supervisor about ???		FALSE	0:00	FALSE	0:00
15:49	15:51	0:02	0:02	D, F	Chat with colleague supervisor about ???		FALSE	0:00	FALSE	0:00

Project:	Project B
Date:	23-2-2024
Observant:	Supervisor B2
Experience:	5 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings

Working hours observed:	7:39
Time on break:	1:35
Time spent on logistics:	3:54
Percentage of observed day spent on logistics:	51%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	6:55	0:10	0:10	A, 8, 9	Day starts with the subcontractors to discuss activities of the day. Partly about coordination of logistics	Logistics factor 1/3	TRUE	0:03	FALSE	0:00
6:55	6:56	0:01	0:01	F, 4	Opening fence for subcontractor		TRUE	0:01	FALSE	0:00
6:56	6:58	0:02	0:02	C, F, 2, 4	Phone call to coordinate subcontractor entering the building site and giving instructions for locating		TRUE	0:02	FALSE	0:00
6:58	7:01	0:03	0:03	B, F	Daily logbook		FALSE	0:00	FALSE	0:00
7:01	7:03	0:02	0:02	C, F, 2, 4	Opening fence for subcontractor and giving instructions where to go		TRUE	0:02	FALSE	0:00
7:03	7:05	0:02	0:02	C, F	Phone call to concrete subcontractor about if they have the correct equipment (40m water supply cable) with them		FALSE	0:00	FALSE	0:00
7:05	7:07	0:02	0:02	D, F	Chat with site manager about casting concrete		FALSE	0:00	FALSE	0:00
7:07	7:32	0:25	0:21	D, E	Instructing concrete workers		FALSE	0:00	FALSE	0:00
7:23	7:27	0:04	0:04	E, 4	Helping concrete workers to install water supply cables		TRUE	0:04	FALSE	0:00
7:32	7:49	0:17	0:16	D, E, 5, 7	Coordinating reinforcement workers together with site manager. Few minutes on sorting material and waste	Logistics factor 1/3	TRUE	0:05	FALSE	0:00
7:48	7:49	0:01	0:01	E, 4	Giving keys to colleague supervisor		TRUE	0:01	FALSE	0:00
7:49	7:50	0:01	0:01	E, 3	Moving equipment (sawing machine)		TRUE	0:01	FALSE	0:00
7:50	7:58	0:08	0:08	D, E	Discussion with concrete workers about materials they need		FALSE	0:00	FALSE	0:00
7:58	8:15	0:17	0:17	C, E, 5	Moving materials with colleague supervisor		TRUE	0:17	FALSE	0:00
8:17	8:20	0:03	0:03	D, E, 9	Discussing the logistics of the concrete casting truck that is coming later today (where to put truck)		TRUE	0:03	FALSE	0:00
8:25	8:27	0:02	0:02	E, 7, 4	Bringing waste bags to workers		TRUE	0:02	FALSE	0:00
8:27	9:28	1:01	1:01	G	Morning break		FALSE	0:00	TRUE	1:01
9:28	9:40	0:12	0:12	E, 4	Fixing the water supply infrastructure for the concrete workers		TRUE	0:12	FALSE	0:00
9:40	9:47	0:07	0:07	C, F, 4	Phone calls about bringing a tool to fix the water supply		TRUE	0:07	FALSE	0:00
9:47	9:49	0:02	0:02	F, 4	Looking for tool to fix the water supply		TRUE	0:02	FALSE	0:00
9:49	9:50	0:01	0:01	C, F, 4	Phone call with the concrete workers about the tool to fix the water supply		TRUE	0:01	FALSE	0:00
9:50	9:51	0:01	0:01	C, F, 4	Phone call with colleague supervisor about the tool to fix the water supply		TRUE	0:01	FALSE	0:00
9:51	9:55	0:04	0:04	E, 4	Bringing the tool to the concrete workers		TRUE	0:04	FALSE	0:00
9:55	10:00	0:05	0:05	E, 4	Water supply broke so had to fix this		TRUE	0:05	FALSE	0:00
10:00	10:06	0:06	0:06	E, 4	Fixing saw machine because it broke		TRUE	0:06	FALSE	0:00
10:06	10:14	0:08	0:08	D, F	Discussion with site manager about if the concrete casting can take place with the strong wind conditions		FALSE	0:00	FALSE	0:00
10:16	10:18	0:02	0:02	D, F	Chat with colleague supervisor		FALSE	0:00	FALSE	0:00
10:18	10:25	0:07	0:07	D, F	Discussion with foreman of the concrete workers about the strong wind conditions and the concrete casting		FALSE	0:00	FALSE	0:00
10:35	10:55	0:20	0:20	D, E, 2, 4	Coordinating inbound concrete pump truck and position on site		TRUE	0:20	FALSE	0:00
10:55	11:00	0:05	0:05	D, E, 1, 2, 5	Coordinating and sorting inbound transport (packages)		TRUE	0:05	FALSE	0:00
11:00	11:29	0:29	0:27	E, 2	Waiting for concrete truck to arrive		TRUE	0:27	FALSE	0:00
11:19	11:21	0:02	0:02	C, E	Phone call from prefab concrete factory for a technical question		FALSE	0:00	FALSE	0:00
11:29	11:34	0:05	0:05	E, 1, 2	Coordinating inbound concrete truck		TRUE	0:05	FALSE	0:00
11:34	11:48	0:14	0:14	E	Coordinating concrete casting		FALSE	0:00	FALSE	0:00
11:48	11:50	0:02	0:02	E, 2	Waiting for concrete truck to arrive		TRUE	0:02	FALSE	0:00
11:50	11:53	0:03	0:03	E, 1, 2	Coordinating inbound concrete truck		TRUE	0:03	FALSE	0:00
11:53	12:02	0:09	0:09	E	Coordinating concrete casting		FALSE	0:00	FALSE	0:00
12:02	12:09	0:07	0:07	E, 2	Waiting for concrete truck to arrive		TRUE	0:07	FALSE	0:00
12:09	12:13	0:04	0:04	E, 1, 2	Coordinating inbound concrete truck		TRUE	0:04	FALSE	0:00
12:13	12:22	0:09	0:09	E	Coordinating concrete casting		FALSE	0:00	FALSE	0:00
12:22	12:29	0:07	0:07	E, 2	Waiting for concrete truck to arrive		TRUE	0:07	FALSE	0:00
12:29	12:33	0:04	0:04	E, 4	Electricity randomly shut off, so had to fix this in order for the concrete work to continue		TRUE	0:04	FALSE	0:00

12:33	12:50	0:17	0:17	E, 2	Waiting for concrete truck to arrive		TRUE	0:17	FALSE	0:00
12:50	12:55	0:05	0:05	E, 4	Concrete truck apparently is delayed, so managing situation		TRUE	0:05	FALSE	0:00
12:55	12:59	0:04	0:04	E, 2	Waiting for concrete truck to arrive		TRUE	0:04	FALSE	0:00
12:59	13:01	0:02	0:02	E, 1, 2	Coordinating inbound concrete truck		TRUE	0:02	FALSE	0:00
13:01	13:10	0:09	0:09	E	Coordinating concrete casting		FALSE	0:00	FALSE	0:00
13:10	13:12	0:02	0:02	C, E, 2, 4	Phone call to order an extra concrete truck		TRUE	0:02	FALSE	0:00
13:12	13:47	0:35	0:34	G	Lunch break		FALSE	0:00	TRUE	0:34
13:39	13:40	0:01	0:01	C, F, 2, 8	Coordinating workers for incoming concrete truck		TRUE	0:01	FALSE	0:00
13:47	14:01	0:14	0:14	C, F, 4, 8	Last truck had too little concrete, so the supervisor order more concrete and coordinates the workers about this situation		TRUE	0:14	FALSE	0:00
14:08	14:12	0:04	0:04	B, F	Updating logbook		FALSE	0:00	FALSE	0:00
14:12	14:20	0:08	0:08	B, F	Administration for concrete work		FALSE	0:00	FALSE	0:00
14:20	14:44	0:24	0:24	E, 2	Waiting for concrete truck to arrive		TRUE	0:24	FALSE	0:00
14:44	14:47	0:03	0:03	D, F	Chat with colleague supervisor and site manager		FALSE	0:00	FALSE	0:00
14:47	14:55	0:08	0:08	F	Watching concrete casting		FALSE	0:00	FALSE	0:00
14:55	14:57	0:02	0:02	C, F, 4	Phone call from colleague supervisor about access gate		TRUE	0:02	FALSE	0:00
15:00	15:59	0:59	0:59	D, F	Interview with researcher		FALSE	0:00	FALSE	0:00

Project:	Project B
Date:	23-2-2024
Observant:	Supervisor B3
Experience:	8 years
Construction time:	1/4 years (10%)
Project type:	New apartment buildings

Working hours observed:	4:40
Time on break:	0:58
Time spent on logistics:	1:13
Percentage of observed day spent on logistics:	26%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
10:01	10:46	0:45	0:34	B	Drawing control before inspection/approval, Crosschecking with contracts and comments.		FALSE	0:00	FALSE	0:00
10:22	10:28	0:06	0:06	D, F, 4, 9	Talking about deliveries ordering for tomorrow, looking for an item from an image, coordinating the use of lull		TRUE	0:06	FALSE	0:00
10:40	10:45	0:05	0:05	D, F	Saying goodbye to coworker and getting details for concrete guy		FALSE	0:00	FALSE	0:00
10:46	10:49	0:03	0:03	C, F, 4, 9	Coordinating contact for logistics deliveries, setting up certification and contact people for a subcontractor deliverer		TRUE	0:03	FALSE	0:00
10:49	10:52	0:03	0:03	C, F, 2, 3	incoming transport truck, returning surplus material		TRUE	0:03	FALSE	0:00
10:52	10:54	0:02	0:02	C, F, 2, 8	coordinating worker to meet up transport truck		TRUE	0:02	FALSE	0:00
10:54	10:55	0:01	0:01	C, F, 2, 8	call transport to make sure they meet worker		TRUE	0:01	FALSE	0:00
10:55	11:03	0:08	0:08	B, 4	Administrating all suppliers check to send in for certification		TRUE	0:08	FALSE	0:00
11:03	11:04	0:01	0:01	C, F, 4	Another supervisor asking if they can coordinate the use of lull		TRUE	0:01	FALSE	0:00
11:04	11:31	0:27	0:25	B	Check drawings before inspection/approval, prepare instructions for workers, how to describe to workers when you get there		FALSE	0:00	FALSE	0:00
11:09	11:10	0:01	0:01	D, F, 4	Asking other super visor for use of lull, approved when free		TRUE	0:01	FALSE	0:00
11:10	11:11	0:01	0:01	C, F, 4	Communicating the answer to the other supervisor		TRUE	0:01	FALSE	0:00
11:31	11:32	0:01	0:01	C, F, 2, 4	contacting a delivery,		TRUE	0:01	FALSE	0:00
11:32	12:01	0:29	0:27	B	Looking up items (chemicals used on site) their safety documentation		FALSE	0:00	FALSE	0:00
11:44	11:45	0:01	0:01	C, F, 1, 2	Has a delivery arrived?		TRUE	0:01	FALSE	0:00
11:57	11:58	0:01	0:01	D, F	chat with worker about work tasks		FALSE	0:00	FALSE	0:00
12:01	12:10	0:09	0:09	E	Collecting printed paper		FALSE	0:00	FALSE	0:00
12:10	12:53	0:43	0:43	G	Lunch		FALSE	0:00	TRUE	0:43
12:53	13:18	0:25	0:21	B	Preparing printed chemical safety papers		FALSE	0:00	FALSE	0:00
12:57	12:58	0:01	0:01	C, F			FALSE	0:00	FALSE	0:00
13:01	13:03	0:02	0:02	D, F	Talking about the safety papers with another supervisor and site manager		FALSE	0:00	FALSE	0:00
13:06	13:07	0:01	0:01	D, F	Talking about the safety papers with another supervisor and site manager		FALSE	0:00	FALSE	0:00
13:18	13:54	0:36	0:21	E	Putting out security info		FALSE	0:00	FALSE	0:00
13:27	13:31	0:04	0:04	D, E, 7, 4	getting a key, talking waste management		TRUE	0:04	FALSE	0:00
13:32	13:39	0:07	0:07	D, E	Meeting some inspectors on a spontaneous visit, leading them in to the site office		FALSE	0:00	FALSE	0:00
13:39	13:40	0:01	0:01	D, F			FALSE	0:00	FALSE	0:00
13:48	13:49	0:01	0:01	D, E			FALSE	0:00	FALSE	0:00
13:51	13:53	0:02	0:02	E, 1	checking packages		TRUE	0:02	FALSE	0:00
13:54	14:10	0:16	0:16	E	Marking places for chemicals and putting up safety info		FALSE	0:00	FALSE	0:00
14:13	14:16	0:03	0:03	C, E, 7	there is an onsite toilet, making a call to figure out who empties it		TRUE	0:03	FALSE	0:00
14:17	14:18	0:01	0:01	C, E, 7	there is an onsite toilet, making a call to figure out who empties it. Someone who was called earlier regarding this question calls back		TRUE	0:01	FALSE	0:00
14:18	14:20	0:02	0:02	D, 4	asked by another supervisor to check out the electricity leading to the exit gate		TRUE	0:02	FALSE	0:00
14:20	14:35	0:15	0:15	E, 4	Solving electrical wiring to make the gate work		TRUE	0:15	FALSE	0:00
14:35	14:43	0:08	0:08	D, 4, 3	gate is now working, checking some security fences and helping supervisor 1 move them		TRUE	0:08	FALSE	0:00
14:43	14:44	0:01	0:01	D, 3, 7, 8	chat with worker about moving extra material and waste with lull		TRUE	0:01	FALSE	0:00
14:44	14:49	0:05	0:05	E, 7	some tidying waste then time to head back inside to the office		TRUE	0:05	FALSE	0:00
14:49	14:53	0:04	0:04	D, E, 7, 8	Telling workers to keep tidy and showing an organized space		TRUE	0:04	FALSE	0:00
14:53	15:01	0:08	0:08	D, E	Heading back to office		FALSE	0:00	FALSE	0:00
15:01	15:03	0:02	0:02	D, F	Handing off packages and social talk		FALSE	0:00	FALSE	0:00
15:03	15:05	0:02	0:01	B			FALSE	0:00	FALSE	0:00
15:04	15:05	0:01	0:01	D, F	Site manager asking for some info		FALSE	0:00	FALSE	0:00
15:05	15:20	0:15	0:15	G			FALSE	0:00	TRUE	0:15

15:20	15:50	0:30	0:26	B		FALSE	0:00	FALSE	0:00
15:35	15:39	0:04	0:04	D, F	Talking with coworkers about tomorrow	FALSE	0:00	FALSE	0:00

Project:	Project C
Date:	11-3-2024
Observant:	Supervisor C
Experience:	10 years
Construction time:	0.5/1.5 years (35%)
Project type:	Extension of existing building in urban area

Working hours observed:	8:06
Time on break:	1:14
Time spent on logistics:	2:30
Percentage of observed day spent on logistics:	31%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	6:51	0:06	0:06	B, 9	Checking drawing details, machine rentals, waste bill	Logistics factor 1/3	TRUE	0:02	FALSE	0:00
6:51	8:06	1:15	1:05	D, E	Heading out with colleague supervisor, opening up a wall with client building		FALSE	0:00	FALSE	0:00
6:52	6:54	0:02	0:02	D, F, 9, 2	Work leader asking to check an item, asking for material they need today. But it's not here, maybe tomorrow		TRUE	0:02	FALSE	0:00
7:02	7:03	0:01	0:01	CE, 4	Call from client to see if they got into the building		TRUE	0:01	FALSE	0:00
7:07	7:08	0:01	0:01	D, E, 4	Ground keeper of the client has shown up. Simply observing the work after the first min of talking		TRUE	0:01	FALSE	0:00
7:27	7:28	0:01	0:01	D, E, 3	Discussing where to store something with groundkeeper		TRUE	0:01	FALSE	0:00
7:50	7:52	0:02	0:02	C, E	Planning holes in wall/floor		FALSE	0:00	FALSE	0:00
8:01	8:04	0:03	0:03	D, E, 3, 9	Talking to worker regarding logistics of their delivery/material storage		TRUE	0:03	FALSE	0:00
8:06	8:15	0:09	0:07	E, 3	Moving around materials for ventilation		TRUE	0:07	FALSE	0:00
8:13	8:15	0:02	0:02	D, E	Supervisor/site manager checking in		FALSE	0:00	FALSE	0:00
8:15	8:35	0:20	0:10	E	Checking on work progress		FALSE	0:00	FALSE	0:00
8:21	8:29	0:08	0:08	D, E, 3, 9	Discussing crane reach and possibilities of moving material, as well as storage options		TRUE	0:08	FALSE	0:00
8:30	8:32	0:02	0:02	C, E, 4	Elevator not working? Trouble shooting		TRUE	0:02	FALSE	0:00
8:35	8:48	0:13	0:13	B, 9	Purchasing wood and other material, estimating amount needed from drawings		TRUE	0:13	FALSE	0:00
8:48	9:13	0:25	0:22	G	Breakfast break		FALSE	0:00	TRUE	0:22
8:50	8:52	0:02	0:02	C, F	Material storage and purchasing		FALSE	0:00	FALSE	0:00
9:10	9:11	0:01	0:01	D, F, 9	Mention of next set of building units, they need to paint themselves		TRUE	0:01	FALSE	0:00
9:13	9:19	0:06	0:06	D, F, 3	Discussing work progress with colleague supervisor, as well as moving material		TRUE	0:06	FALSE	0:00
9:19	9:31	0:12	0:09	B	Purchasing		FALSE	0:00	FALSE	0:00
9:19	9:22	0:03	0:03	C, F, 2, 9	Question about material to purchase, add material to next delivery		TRUE	0:03	FALSE	0:00
9:31	10:36	1:05	1:01	A, 9	Team meeting - largely work planning, some logistics coordination	Logistics factor 1/2	TRUE	0:06	FALSE	0:00
9:47	9:50	0:03	0:03	D, F	Aiding in printing something, crane driver checking in on site		FALSE	0:00	FALSE	0:00
10:29	10:30	0:01	0:01	C, F	Stepped out of meeting		FALSE	0:00	FALSE	0:00
10:36	10:57	0:21	0:21	D, F, 3, 9	After meeting follow up with roofing guy, looking at delivery, moving up materials and intermitting storage		TRUE	0:21	FALSE	0:00
10:57	11:09	0:12	0:12	D, F	Asking for clarification about drilling a hole		FALSE	0:00	FALSE	0:00
11:09	11:25	0:16	0:12	B	Checking emails of various matters, looking at drawings		FALSE	0:00	FALSE	0:00
11:13	11:16	0:03	0:03	C, F	Personal matters		FALSE	0:00	FALSE	0:00
11:21	11:22	0:01	0:01	C, F	Check in on availability of coworker		FALSE	0:00	FALSE	0:00
11:25	11:27	0:02	0:02	G	Short break		FALSE	0:00	TRUE	0:02
11:27	11:29	0:02	0:02	C, F, 4	Elevator repair? Apparently working fine when there		TRUE	0:02	FALSE	0:00
11:32	11:45	0:13	0:11	D, F, 9	Discussing drawing details, upcoming work and deliveries	Logistics factor 1/4	TRUE	0:02	FALSE	0:00
11:34	11:36	0:02	0:02	C, F	Inquiring about drawings details		FALSE	0:00	FALSE	0:00
11:45	11:59	0:14	0:06	B	More purchasing		FALSE	0:00	FALSE	0:00
11:48	11:50	0:02	0:02	C, F	Coordinating with client		FALSE	0:00	FALSE	0:00
11:51	11:57	0:06	0:06	C, F, 2	Asking about a purchase, need a variant screw, can't find it on webpage		TRUE	0:06	FALSE	0:00
11:59	12:15	0:16	0:06	B	Looking at drawings		FALSE	0:00	FALSE	0:00
12:05	12:15	0:10	0:10	D, F	Supervisor/site manager checking in		FALSE	0:00	FALSE	0:00
12:15	13:05	0:50	0:50	G	Lunch break		FALSE	0:00	TRUE	0:50
13:05	13:50	0:45	0:31	E, 3, 7, 5	Working to organize a space to store roof beams		TRUE	0:31	FALSE	0:00
13:09	13:10	0:01	0:01	D, E, 3, 8	Asking worker to move item		TRUE	0:01	FALSE	0:00
13:15	13:16	0:01	0:01	D, E, 7	Instructing worker to be careful about the concrete waste		TRUE	0:01	FALSE	0:00
13:29	13:33	0:04	0:04	C, E, 2	Upcoming delivery		TRUE	0:04	FALSE	0:00

13:33	13:36	0:03	0:03	D, E	Talking about drilling holes in concrete floors and putting out markings	FALSE	0:00	FALSE	0:00
13:40	13:41	0:01	0:01	C, E		FALSE	0:00	FALSE	0:00
13:41	13:44	0:03	0:03	D, E, 3	Moving some materials of subcontractors	TRUE	0:03	FALSE	0:00
13:45	13:46	0:01	0:01	C, E, 2, 8	Instructing/coordinating incoming delivery	TRUE	0:01	FALSE	0:00
13:50	14:16	0:26	0:10	B	Reviewing invoices	FALSE	0:00	FALSE	0:00
13:51	13:54	0:03	0:03	D, F	Asking site manager about file for supplier	FALSE	0:00	FALSE	0:00
13:57	13:59	0:02	0:02	C, F	Incorrect invoice, informing supplier to redo	FALSE	0:00	FALSE	0:00
14:01	14:08	0:07	0:07	D, F	Discussion colleague supervisor, discussing drawings, did a guy that was here make some markings?	FALSE	0:00	FALSE	0:00
14:08	14:12	0:04	0:04	C, F	Called back regarding faulty invoice	FALSE	0:00	FALSE	0:00
14:14	14:16	0:02	0:02	C, F		FALSE	0:00	FALSE	0:00
14:16	14:17	0:01	0:01	C, F	Incoming person	FALSE	0:00	FALSE	0:00
14:17	14:23	0:06	0:06	E, 4	Giving person access to site	TRUE	0:06	FALSE	0:00
14:23	14:25	0:02	0:02	C, F		FALSE	0:00	FALSE	0:00
14:25	15:23	0:58	0:38	B	Calculating prices for purchase, then reviewing invoices and prepping ÅTA change documents	FALSE	0:00	FALSE	0:00
14:26	14:33	0:07	0:07	D, F	Worker wants drawing for concrete levels	FALSE	0:00	FALSE	0:00
14:30	14:31	0:01	0:01	C, F, 4	Someone has not arrived on site. Asked to call them check where they are	TRUE	0:01	FALSE	0:00
14:34	14:38	0:04	0:04	C, F, 4	Small talk with person and asking if they have been on site regarding the power cable	TRUE	0:04	FALSE	0:00
14:42	14:43	0:01	0:01	D, F	Supervisor checking in, mentions that the machine batteries are being used at the moment, so as to remember to keep track	FALSE	0:00	FALSE	0:00
14:46	14:47	0:01	0:01	C, F, 4	Coordinating worker regarding electrical cable that needs extra attention	TRUE	0:01	FALSE	0:00
15:02	15:05	0:03	0:03	C, F	Talking work options for a worker (different construction site)	FALSE	0:00	FALSE	0:00
15:15	15:18	0:03	0:03	C, F, 9	Coordinating incoming delivery tomorrow, getting details	TRUE	0:03	FALSE	0:00
15:23	15:45	0:22	0:18	B	Looking at what is included in climate calculation / project diary	FALSE	0:00	FALSE	0:00
15:34	15:37	0:03	0:03	D, F, 4	Site manager comes in discussing electrical rewiring	TRUE	0:03	FALSE	0:00
15:41	15:42	0:01	0:01	D, F	Asking another supervisor about what a subcontractor did today for project diary	FALSE	0:00	FALSE	0:00
15:45	16:00	0:15	0:15	A, D	Social end of the day gathering, discussing various work details intermittently	FALSE	0:00	FALSE	0:00
16:01	16:05	0:04	0:04	C, F, 9	Discussing details about a planned delivery	TRUE	0:04	FALSE	0:00

Project:	Project C
Date:	12-3-2024
Observant:	Supervisor C
Experience:	10 years
Construction time:	0.5/1.5 years (35%)
Project type:	Extension of existing building in urban area

Working hours observed:	7:18
Time on break:	1:59
Time spent on logistics:	4:58
Percentage of observed day spent on logistics:	68%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	6:59	0:14	0:14	B	Climate impact declaration		FALSE	0:00	FALSE	0:00
6:59	7:10	0:11	0:11	F, 5	Organizing office storage, fixing screw drivers		TRUE	0:11	FALSE	0:00
7:10	7:15	0:05	0:05	G			FALSE	0:00	TRUE	0:05
7:15	7:49	0:34	0:05	E	Survey the site		FALSE	0:00	FALSE	0:00
7:17	7:18	0:01	0:01	C, E, 3, 8	Call asking to get some workers to move materials		TRUE	0:01	FALSE	0:00
7:21	7:34	0:13	0:13	E, 3	Moving ventilation items		TRUE	0:13	FALSE	0:00
7:30	7:31	0:01	0:01	D, E, 3	Discussing how and why materials are being moved		TRUE	0:01	FALSE	0:00
7:35	7:48	0:13	0:13	D, E	Discussing work details / drawing with wall builders, A HDF is 2 cm off, blocking wall building		FALSE	0:00	FALSE	0:00
7:48	7:49	0:01	0:01	C, E			FALSE	0:00	FALSE	0:00
7:49	8:06	0:17	0:17	D, E, 2, 3	Discussing where to put material from delivery		TRUE	0:17	FALSE	0:00
7:54	7:55	0:01	0:01	E, 3	Moving materials to make space		TRUE	0:01	FALSE	0:00
7:55	7:58	0:03	0:03	D, E, 3, 9	Discussing space possibilities with a subcontractor		TRUE	0:03	FALSE	0:00
7:59	8:01	0:02	0:02	D, E, 2, 3, 8	Discussing options with crane driver		TRUE	0:02	FALSE	0:00
8:06	8:36	0:30	0:30	E, 3	Offloading delivery		TRUE	0:30	FALSE	0:00
8:36	8:41	0:05	0:05	D, E, 3, 9	Discussing material storage with worker		TRUE	0:05	FALSE	0:00
8:41	8:42	0:01	0:01	E	Heading back to office		FALSE	0:00	FALSE	0:00
8:42	8:49	0:07	0:07	D, F, 3, 7	Discussing where to have waste containers and where to move materials		TRUE	0:07	FALSE	0:00
8:49	8:51	0:02	0:02	C, F, 4	Call from worker regarding redrawing an electrical cable		TRUE	0:02	FALSE	0:00
8:48	9:31	0:43	0:32	G	Breakfast break		FALSE	0:00	TRUE	0:43
8:56	8:59	0:03	0:03	C, F, 2, 8	Giving instructions to delivery		TRUE	0:03	FALSE	0:00
9:22	9:30	0:08	0:08	D, F	Discussing work options with site manager		FALSE	0:00	FALSE	0:00
9:31	9:34	0:03	0:03	E	Heading out on site		FALSE	0:00	FALSE	0:00
9:34	9:47	0:13	0:13	D, E, 2	Receiving delivery and details regarding it		TRUE	0:13	FALSE	0:00
9:47	10:04	0:17	0:15	E	Looking over planned work with guest		FALSE	0:00	FALSE	0:00
9:48	9:50	0:02	0:02	C, E, 2, 9	Coordinating incoming delivery		TRUE	0:02	FALSE	0:00
10:04	10:08	0:04	0:04	E, 2, 3	Receiving incoming delivery truck		TRUE	0:04	FALSE	0:00
10:08	10:29	0:21	0:21	D, E, 2, 3	Mitigating a logistics crash. Concrete booked at 11. Pump truck there a 10. Timber delivery booked at 10. Due to pump not in schedule. Two vehicles need to swap position. Tight delivery schedule. One package needs to go to the top floor. Big crane can take it in between, but requires supervisor to check with crane driver and other workers to make it work		TRUE	0:21	FALSE	0:00
10:29	10:30	0:01	0:01	C, E, 2	Incoming delivery truck		TRUE	0:01	FALSE	0:00
10:30	10:38	0:08	0:08	D, E, 2, 3, 8	Talking to incoming delivery driver, giving drop-off instruction and receiving pallet of materials		TRUE	0:08	FALSE	0:00
10:38	10:39	0:01	0:01	D, E, 9, 8	Telling workers delivery shortly don't crowd entrance with material		TRUE	0:01	FALSE	0:00
10:38	10:41	0:03	0:03	E	Moving around site		FALSE	0:00	FALSE	0:00
10:41	10:51	0:10	0:10	D, E	Discussing work progress with worker (concrete), as well as upcoming details		FALSE	0:00	FALSE	0:00
10:49	10:50	0:01	0:01	C, E, 2, 4	Open the gate!		TRUE	0:01	FALSE	0:00
10:51	10:52	0:01	0:01	D, E, 2, 8	Concrete truck here, need to finish up timber offload		TRUE	0:01	FALSE	0:00
10:42	10:56	0:14	0:14	D, E, 2, 3	Second timber delivery here, let in and point out where to offload		TRUE	0:14	FALSE	0:00
10:56	11:11	0:15	0:09	E, 2, 8	Overseeing logistics conflicts		TRUE	0:09	FALSE	0:00
10:56	10:58	0:02	0:02	D, E, 8	Talking to timber delivery driver		TRUE	0:02	FALSE	0:00
10:59	11:03	0:04	0:04	D, E, 9	Talking to site manager regarding upcoming deliveries		TRUE	0:04	FALSE	0:00
11:08	11:11	0:03	0:03	D, E, 2, 3	Helping second timber delivery to pack up and leave		TRUE	0:03	FALSE	0:00
11:11	11:13	0:02	0:02	E, 3	Moving materials from delivery		TRUE	0:02	FALSE	0:00

11:13	11:14	0:01	0:01	E	Heading back to office		FALSE	0:00	FALSE	0:00
11:14	11:37	0:23	0:22	D, F	Discussing drawings with colleague supervisor		FALSE	0:00	FALSE	0:00
11:31	11:32	0:01	0:01	C, F			FALSE	0:00	FALSE	0:00
11:37	12:10	0:33	0:23	B	Looking at drawing details		FALSE	0:00	FALSE	0:00
11:42	11:43	0:01	0:01	C, F	Conveying construction details to worker from drawings		FALSE	0:00	FALSE	0:00
11:58	12:07	0:09	0:09	D, F, 7, 9	Discussing waste management and organizing space for container		TRUE	0:09	FALSE	0:00
12:10	12:15	0:05	0:05	D, F, 9	Discussing storage space		TRUE	0:05	FALSE	0:00
12:16	13:11	0:55	0:29	G	Lunch break		FALSE	0:00	TRUE	0:55
12:15	12:16	0:01	0:01	D, F	Discussing work progress		FALSE	0:00	FALSE	0:00
12:20	12:22	0:02	0:02	D, F, 9	Get some material for free and store on site maybe?		TRUE	0:02	FALSE	0:00
12:39	12:42	0:03	0:03	C, F, 9	Follow up to resolve the situation following transport trucks having to leave early		TRUE	0:03	FALSE	0:00
12:45	12:54	0:09	0:09	D, F	Continue discussion on work progress and spacing		FALSE	0:00	FALSE	0:00
12:46	12:54	0:08	0:08	B	Checking drawings with worker		FALSE	0:00	FALSE	0:00
13:03	13:07	0:04	0:04	D, F	Worker checking in on work progress		FALSE	0:00	FALSE	0:00
13:11	13:48	0:37	0:12	B	Emails		FALSE	0:00	FALSE	0:00
13:18	13:24	0:06	0:06	C, F, 9	Asking if an item has been delivered and discussing future deliveries		TRUE	0:06	FALSE	0:00
13:24	13:28	0:04	0:04	G			FALSE	0:00	TRUE	0:04
13:28	13:37	0:09	0:09	D, F	Asking site manager for advice		FALSE	0:00	FALSE	0:00
13:42	13:48	0:06	0:06	C, F	Discussing drawings details		FALSE	0:00	FALSE	0:00
13:48	13:50	0:02	0:02	E	Heading out on site		FALSE	0:00	FALSE	0:00
13:50	13:53	0:03	0:03	D, E	Discussing tools and workers regarding concrete		FALSE	0:00	FALSE	0:00
13:53	14:14	0:21	0:09	E	Attempting to remove patch of concrete, getting new tools because sledgehammer is missing		FALSE	0:00	FALSE	0:00
13:56	13:57	0:01	0:01	C, F	Invoicing		FALSE	0:00	FALSE	0:00
13:57	13:58	0:01	0:01	C, F	Asking about sledgehammer		FALSE	0:00	FALSE	0:00
14:02	14:09	0:07	0:07	D, E	Asking for sledgehammer and being informed about missing metal foot for pillar		FALSE	0:00	FALSE	0:00
14:08	14:11	0:03	0:03	D, E, 4	Assisting in adjusting entrance gate		TRUE	0:03	FALSE	0:00
14:14	14:45	0:31	0:28	D, E, 4	Asked to assist with gate - dig hole for electrical cable		TRUE	0:28	FALSE	0:00
14:18	14:19	0:01	0:01	D, E, 9	Asked about availability of extra material		TRUE	0:01	FALSE	0:00
14:23	14:25	0:02	0:02	D, E, 4	Discussing success levels of gate adjustment		TRUE	0:02	FALSE	0:00
14:45	15:06	0:21	0:19	D, E, 3, 4, 5	Cleaning up on site as a preparation for asphalt work		TRUE	0:19	FALSE	0:00
15:00	15:02	0:02	0:02	D, E, 9	Casting concrete worker asking for availability of crane		TRUE	0:02	FALSE	0:00
15:06	15:11	0:05	0:05	D, E, 9	Looking into availability of space on site		TRUE	0:05	FALSE	0:00
15:11	15:23	0:12	0:12	C, E, G	Social talk		FALSE	0:00	TRUE	0:12
15:23	15:27	0:04	0:04	D, E, 4	Discussing with workers about gate, explaining why is was changed		TRUE	0:04	FALSE	0:00
15:27	15:58	0:31	0:27	E, 4	Moving security fence to prepare for new building unit		TRUE	0:27	FALSE	0:00
15:34	15:35	0:01	0:01	C, E			FALSE	0:00	FALSE	0:00
15:42	15:45	0:03	0:03	D, E	Discussing upcoming work with concrete casting worker		FALSE	0:00	FALSE	0:00
15:58	16:02	0:04	0:04	D, E	Heading in overviewing and discussing site disposition		FALSE	0:00	FALSE	0:00

Project:	Project C
Date:	5-3-2024
Observant:	Site Manager C
Experience:	10 years
Construction time:	0.5/1.5 years (35%)
Project type:	Extension of existing building in urban area

Working hours observed:	7:55
Time on break:	1:20
Time spent on logistics:	0:43
Percentage of observed day spent on logistics:	9%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:55	7:01	0:06	0:06	A	Discussing the days, activities, things to keep in mind, some delivery discussion		FALSE	0:00	FALSE	0:00
7:01	7:02	0:01	0:01	D, F			FALSE	0:00	FALSE	0:00
7:02	8:42	1:40	1:17	B	Financial management - Managing project reports and change documents		FALSE	0:00	FALSE	0:00
7:04	7:09	0:05	0:05	D, F	Discussion with workers about change documents and technical solutions		FALSE	0:00	FALSE	0:00
7:14	7:17	0:03	0:03	D, F	Asked to consult on drawing interpretation by supervisor		FALSE	0:00	FALSE	0:00
7:22	7:27	0:05	0:05	C, D, F	Consulted on an interpretation question by supervisor (what size beams to use)		FALSE	0:00	FALSE	0:00
7:30	7:33	0:03	0:03	D, F, 3	How to move materials + work to protect materials from weather		TRUE	0:03	FALSE	0:00
7:47	7:48	0:01	0:01	D, F	Discussing access to one of their software systems		FALSE	0:00	FALSE	0:00
7:48	7:51	0:03	0:03	C, F	Phone call about access to software systems		FALSE	0:00	FALSE	0:00
7:56	7:57	0:01	0:01	D, F	Upcoming inspection, need to go over all drawings and subcontractors		FALSE	0:00	FALSE	0:00
8:10	8:12	0:02	0:02	D, F, 4	Battery has gone missing from their office storage, restrict access? Who has taken it?		TRUE	0:02	FALSE	0:00
8:42	9:24	0:42	0:33	G	Breakfast break		FALSE	0:00	TRUE	0:33
8:55	8:58	0:03	0:03	D, F, 3, 4	Discussing power central, moving it themselves or getting someone to do it? Moving materials with crane.		TRUE	0:03	FALSE	0:00
9:10	9:11	0:01	0:01	D, F	Issue with balconies brought up by supervisor getting a phone call. Can we solve it?		FALSE	0:00	FALSE	0:00
9:17	9:22	0:05	0:05	D, F, 3	Discussion about placement of ventilation item, space around and when to move		TRUE	0:05	FALSE	0:00
9:24	9:36	0:12	0:12	D, F	Greeting quality assurance people, getting coffee + laptop		FALSE	0:00	FALSE	0:00
9:36	10:02	0:26	0:25	A	Quality assurance meeting, talking about turning of alarm and water for adjacent building and the timing for it (for 6 minutes)		FALSE	0:00	FALSE	0:00
9:54	9:55	0:01	0:01	C, F	Phone call with coworker who is missing from the meeting		FALSE	0:00	FALSE	0:00
10:02	10:39	0:37	0:33	A	Taking a leading role on who needs to sign off on work completed according to specification		FALSE	0:00	FALSE	0:00
10:04	10:08	0:04	0:04	C, F	Stepped out meeting to take a phone call		FALSE	0:00	FALSE	0:00
10:39	10:43	0:04	0:04	D, F			FALSE	0:00	FALSE	0:00
10:43	12:11	1:28	0:09	E	Surveying the site (mentions logistics as a large challenge)		FALSE	0:00	FALSE	0:00
10:45	10:49	0:04	0:04	D, E	Check with workers		FALSE	0:00	FALSE	0:00
10:54	10:57	0:03	0:03		Explain logistics, working in segments based on size and weight		FALSE	0:00	FALSE	0:00
11:04	11:05	0:01	0:01	C, E			FALSE	0:00	FALSE	0:00
11:07	11:12	0:05	0:05	D, E, 4	Electricity on site and getting a lock to work		TRUE	0:05	FALSE	0:00
11:12	11:13	0:01	0:01	C, E	Asking supervisor if markings have been made		FALSE	0:00	FALSE	0:00
11:15	11:38	0:23	0:23	D, E	Worker wanting instructions, check in other building on pipes, they need permission, trying to coordinate schedule of access and schedule with other work		FALSE	0:00	FALSE	0:00
11:28	11:33	0:05	0:05	C, E	Phone call follow-up on quality assurance meeting		FALSE	0:00	FALSE	0:00
11:33	12:10	0:37	0:37	D, E	Discussing work details, like where pipes go and the work order		FALSE	0:00	FALSE	0:00
12:11	13:25	1:14	0:47	G	Lunch break (delivery calendar best thing ever! Simple, but super important and useful)		FALSE	0:00	TRUE	0:47
12:55	12:59	0:04	0:04	D, F	Talking about work details, if you don't have them what do? "I was standing around up there probably doing nothing as usual"		FALSE	0:00	FALSE	0:00
12:59	13:22	0:23	0:23	C, F	How to bill client on a matter. Safety requirement.		FALSE	0:00	FALSE	0:00
13:25	13:30	0:05	0:05	D, F	Workflow planning with worker and supervisor, tool for viewing drawings		FALSE	0:00	FALSE	0:00
13:30	14:16	0:46	0:37	B	Steam BIM, setup, tutorial, investigating upcoming work conditions and planning work		FALSE	0:00	FALSE	0:00
13:54	14:03	0:09	0:09	D, F, 4	Work needs doing, time plan, do we need seal/even an area. Talking work details with supervisor. By when do we need isolation material? (3min)	Logistics factor 1/3	TRUE	0:03	FALSE	0:00
14:16	14:25	0:09	0:09	C, F	Call to plumber regarding what sections need turning off in neighboring building		FALSE	0:00	FALSE	0:00
14:31	14:34	0:03	0:03	D, F, 2, 9	Supervisor needs to get in a delivery for some work into the delivery calendar		TRUE	0:03	FALSE	0:00
14:45	14:46	0:01	0:01	D, F	Project engineer asking about ATA (change documents)		FALSE	0:00	FALSE	0:00
14:48	14:52	0:04	0:04	D, F, 3, 6	Confirming when material is coming and following work		TRUE	0:04	FALSE	0:00
14:52	15:05	0:13	0:11	D, F, 4	Filling in the other supervisor about access to camera system		TRUE	0:11	FALSE	0:00

14:57	14:59	0:02	0:02	C, F, 4	Calling support regarding camera access system, sharing access	TRUE	0:02	FALSE	0:00
15:12	15:14	0:02	0:02	D, F, 3	Moving around materials, discussion with supervisor	TRUE	0:02	FALSE	0:00
15:25	16:15	0:50	0:41	B	Financial management	FALSE	0:00	FALSE	0:00
15:51	15:52	0:01	0:01	C, F	Organizing clarification on ATA (change documents)	FALSE	0:00	FALSE	0:00
15:54	15:55	0:01	0:01	D, F	Have you got a document regarding materials used	FALSE	0:00	FALSE	0:00
16:03	16:10	0:07	0:07	C, F	Planning workflow with subcontractor	FALSE	0:00	FALSE	0:00

Project:	Project C
Date:	6-3-2024
Observant:	Site Manager C
Experience:	10 years
Construction time:	0.5/1.5 years (35%)
Project type:	Extension of existing building in urban area

Working hours observed:	7:56
Time on break:	1:34
Time spent on logistics:	2:32
Percentage of observed day spent on logistics:	32%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:45	7:04	0:19	0:19	A	Morning start up meeting, add upcoming events co shared calendar. Updating supervision work that needs to be done. Days event + deliveries (1min)	Logistics factor 1/19	FALSE	0:00	FALSE	0:00
7:04	7:26	0:22	0:14	B	Setup IFC file		FALSE	0:00	FALSE	0:00
7:04	7:11	0:07	0:07	D, F	Talking about on site tests, contracts with project engineer		FALSE	0:00	FALSE	0:00
7:20	7:21	0:01	0:01	D, F	Handing of papers to supervisor		FALSE	0:00	FALSE	0:00
7:26	7:45	0:19	0:08	B, 4, 9	Planning establishment / building units		TRUE	0:08	FALSE	0:00
7:34	7:45	0:11	0:11	C, F, 9	Coordinating date by which they need to know what equipment is needed and consulting regarding building units		TRUE	0:11	FALSE	0:00
7:45	7:55	0:10	0:03	B	IFC setup		FALSE	0:00	FALSE	0:00
7:45	7:47	0:02	0:02	D, F	Comment on quality of subcontractor's work		FALSE	0:00	FALSE	0:00
7:50	7:55	0:05	0:05	C, F	Consulting regarding IFC file (stream beam)		FALSE	0:00	FALSE	0:00
7:55	8:10	0:15	0:15	B, B, 4, 9	Planning of building units		TRUE	0:15	FALSE	0:00
8:10	8:14	0:04	0:04	B	Looking over contacts to find responsibility area's		FALSE	0:00	FALSE	0:00
8:14	8:29	0:15	0:15	D, F	Supervisor coming in and consulting regarding a drawing detail		FALSE	0:00	FALSE	0:00
8:29	8:48	0:19	0:19	A	Extra meeting with supervisors about replanning the time schedule of the work subcontractors giving heads up on potential stressful work in the autumn		FALSE	0:00	FALSE	0:00
8:48	8:49	0:01	0:01	C, F			FALSE	0:00	FALSE	0:00
8:49	9:35	0:46	0:39	G	Breakfast break		FALSE	0:00	TRUE	0:39
9:27	9:34	0:07	0:07	D, F	Discussing industry and watching work happen via camera, discussing some site management		FALSE	0:00	FALSE	0:00
9:35	9:38	0:03	0:03	D, F	Talking to observant regarding upcoming schedule and borrowing conference room		FALSE	0:00	FALSE	0:00
9:38	9:50	0:12	0:12	D, F	Asking project engineer regarding holes in HDF		FALSE	0:00	FALSE	0:00
9:50	9:58	0:08	0:08	B	Own computer and coworker		FALSE	0:00	FALSE	0:00
9:58	11:13	1:15	1:15	D, E, 4, 9	Inspecting a upcoming section with client, looking at construction drawings. Discussions regarding new emergency exits and pathways	Logistics factor 2/3	TRUE	0:50	FALSE	0:00
11:13	11:26	0:13	0:13	D, E	Work leader thinks they need to change order of some work		FALSE	0:00	FALSE	0:00
11:26	11:41	0:15	0:15	D, E, 4, 8	Coordinating access for workers to neighboring building (3 min), then discussing upcoming work	Logistics factor 1/4	TRUE	0:03	FALSE	0:00
11:41	11:43	0:02	0:02	D, F	Talk with worker over work description regarding pipes at the roof		FALSE	0:00	FALSE	0:00
11:43	12:03	0:20	0:15	E	Inspecting balcony progress + roof		FALSE	0:00	FALSE	0:00
11:56	12:01	0:05	0:05	D, E, 4	Checking email + watching supervisor and worker interact + elevator doesn't work.		TRUE	0:05	FALSE	0:00
12:03	12:58	0:55	0:55	G	Lunch break		FALSE	0:00	TRUE	0:55
12:58	13:44	0:46	0:46	B	Handling bills		FALSE	0:00	FALSE	0:00
12:59	13:04	0:05	0:05	C, D, F, 4	Asking where other supervisor went, then calling them about where a thing should be & cement mixer as well thinking about power centrals		TRUE	0:05	FALSE	0:00
13:04	13:13	0:09	0:09	C, F, 4	Coordinating for a asphalt pouring to enable work flow. Planning digger work regarding emergency exit for next stage		TRUE	0:09	FALSE	0:00
13:17	13:18	0:01	0:01	D, F	Social chat		FALSE	0:00	FALSE	0:00
13:26	13:43	0:17	0:17	D, F, 9	Supervisor asking for advice regarding purchasing amount, discussion surrounding construction drawing to decide	Logistics factor 2/3	TRUE	0:11	FALSE	0:00
13:44	13:56	0:12	0:10	D, F	Discussing drawings, supervisor talking interaction with worker		FALSE	0:00	FALSE	0:00
13:45	13:47	0:02	0:02	C, F, 3, 4	Supervisor calls about where material is standing, its ok due to faulty elevator that is being fixed		TRUE	0:02	FALSE	0:00
13:56	14:32	0:36	0:22	B	Emailing about various issues, access to nearby building, drawing details		FALSE	0:00	FALSE	0:00
14:05	14:17	0:12	0:12	C, F, 9	Talking work and delivery times of items (2min), where pipes are to go to?	Logistics factor 1/5	TRUE	0:02	FALSE	0:00
14:29	14:31	0:02	0:02	C, F, 4, 9	Asking supervisor to take pictures of area to asphalt		TRUE	0:02	FALSE	0:00
14:32	15:01	0:29	0:29	B	Financial management, surveying site via camera and comparing to drawings in the office		FALSE	0:00	FALSE	0:00
15:01	15:04	0:03	0:03	D, F	Asking project engineer regarding file safety of windows		FALSE	0:00	FALSE	0:00
15:05	15:10	0:05	0:05	D, F, 9	Discussing images for asphalt and plan for deliveries		TRUE	0:05	FALSE	0:00
15:12	15:16	0:04	0:04	D, F	Talking subcontractor work with supervisor		FALSE	0:00	FALSE	0:00

15:20	15:26	0:06	0:06	D, F, 9	Back on the topic of asphalt		TRUE	0:06	FALSE	0:00
15:26	15:44	0:18	0:14	B, F, 9	Emailing regarding asphalt + planning deliveries		TRUE	0:14	FALSE	0:00
15:28	15:29	0:01	0:01	D	Fire safety in a wall with supervisor		FALSE	0:00	FALSE	0:00
15:32	15:35	0:03	0:03	D, F, 4, 9	Estimate space for asphalt work		TRUE	0:03	FALSE	0:00
15:44	15:55	0:11	0:09	B	Checking files for making new holes for installation		FALSE	0:00	FALSE	0:00
15:48	15:50	0:02	0:02	D, F	Fire safety chat, drawings don't align		FALSE	0:00	FALSE	0:00
15:55	16:15	0:20	0:20	B	Financial management		FALSE	0:00	FALSE	0:00

Project:	Project C
Date:	8-3-2024
Observant:	Site Manager C
Experience:	10 years
Construction time:	0.5/1.5 years (35%)
Project type:	Extension of existing building in urban area

Working hours observed:	7:20
Time on break:	1:50
Time spent on logistics:	2:23
Percentage of observed day spent on logistics:	33%

Code	Activity
A	Meeting
B	Computer
C	Phone call
D	Person-to-person chat
E	Moving
F	Office
G	Break
1	Delivery control
2	Inbound transport
3	Moving around materials
4	Enabling the work and surroundings (flows)
5	Sorting of materials
6	Moving materials to installation site
7	Waste Management
8	Coordinating people
9	Logistics Planning

Start time	End time	Duration [min]	Actual duration [min]	Code(s)	Activity	Comment	Logistical	Time on logistics [min]	Break	Time on break [min]
6:50	7:12	0:22	0:22	A	Morning meeting regarding what subcontractors to hire for purchasing of some sections		FALSE	0:00	FALSE	0:00
7:12	7:17	0:05	0:03	B	Checking emails		FALSE	0:00	FALSE	0:00
7:13	7:14	0:01	0:01	D, F, 5, 9	Asking where some materials are stored		TRUE	0:01	FALSE	0:00
7:16	7:17	0:01	0:01	D, F	Color for plywood in the hallways. Considering color, perhaps getting samples		FALSE	0:00	FALSE	0:00
7:17	7:18	0:01	0:01	D, F, 9	Have you added a thing to the delivery calendar?		TRUE	0:01	FALSE	0:00
7:17	7:20	0:03	0:02	B, 9	Adding delivery to calendar		TRUE	0:02	FALSE	0:00
7:20	7:24	0:04	0:04	B	Looking at drawings for holes for VVS		FALSE	0:00	FALSE	0:00
7:24	7:29	0:05	0:05	D, F, 4, 9	Worker asking about access to delivery calendar. Discussing how it works and the rules		TRUE	0:05	FALSE	0:00
7:29	8:42	1:13	1:04	B	Looking at drawings for holes for VVS		FALSE	0:00	FALSE	0:00
7:38	7:39	0:01	0:01	D, F	Replanning some drawings with supervisor		FALSE	0:00	FALSE	0:00
7:49	7:50	0:01	0:01	D, F	Supervisor talks a forgotten protocol, send it out		FALSE	0:00	FALSE	0:00
7:50	7:54	0:04	0:04	C, F	Access for a worker to a BIM model, using an old account for now until new one is up and running		FALSE	0:00	FALSE	0:00
8:12	8:15	0:03	0:03	C, F	Looking technical support. 2 phone calls about waterproofing of concrete		FALSE	0:00	FALSE	0:00
8:42	8:54	0:12	0:12	D, F, 9	Supervisor asking question regarding logistics of a delivery of light concrete block and how to fit it in the existing schedule		TRUE	0:12	FALSE	0:00
8:54	9:44	0:50	0:43	G	Breakfast break		FALSE	0:00	TRUE	0:43
8:59	9:02	0:03	0:03	D, F, 9	Discussing input delivery into calendar and how that delivery will proceed		TRUE	0:03	FALSE	0:00
9:38	9:39	0:01	0:01	D, F, 3, 7, 9	Some concrete bags were not stored properly and have now hardened and are thus unusable		TRUE	0:01	FALSE	0:00
9:41	9:44	0:03	0:03	D, F	Discussing some concrete pouring to be done		FALSE	0:00	FALSE	0:00
9:44	10:04	0:20	0:11	B	Emails, answering, clarification, additions, discussing project details with client		FALSE	0:00	FALSE	0:00
9:45	9:50	0:05	0:05	C, 9	Call regarding the moving of a crane		TRUE	0:05	FALSE	0:00
9:45	9:46	0:01	0:01	D, F, 9	Asking supervisor about progression crane		TRUE	0:01	FALSE	0:00
9:50	9:51	0:01	0:01	D, F, 9	Discussing incoming deliveries and their need for crane or if they have a crane themselves		TRUE	0:01	FALSE	0:00
10:00	10:02	0:02	0:02	D, F	Drawing details with project engineer		FALSE	0:00	FALSE	0:00
10:04	10:09	0:05	0:05	D, F	Supervisor discussing drawing of pipes and making the holes for them		FALSE	0:00	FALSE	0:00
10:09	10:20	0:11	0:11	D, F, 9	Issue with delivery, large amount coming they struggle with space for trucks, turn radius to smaller deliveries		TRUE	0:11	FALSE	0:00
10:20	10:27	0:07	0:07	G			FALSE	0:00	TRUE	0:07
10:27	10:46	0:19	0:19	E, 9	Inspecting and discussing the earlier paint		TRUE	0:19	FALSE	0:00
10:44	10:46	0:02	0:02	C, E			FALSE	0:00	FALSE	0:00
10:46	10:53	0:07	0:07	D, E, 3, 9	Discussing work of building wall	Logistics factor 1/3	TRUE	0:02	FALSE	0:00
10:53	11:34	0:41	0:19	E	Surveying site some discussion regarding ....		FALSE	0:00	FALSE	0:00
10:57	10:59	0:02	0:02	C, E			FALSE	0:00	FALSE	0:00
11:01	11:02	0:01	0:01	D, E	Checking in with scaffolding workers		FALSE	0:00	FALSE	0:00
11:10	11:14	0:04	0:04	D, E	Chat friendly with subcontractor		FALSE	0:00	FALSE	0:00
11:13	11:22	0:09	0:09	D, E	Check in with supervisor		FALSE	0:00	FALSE	0:00
11:22	11:27	0:05	0:05	C, E, 3, 9, 4	Coordinating crane use / availability where material is stored on site		TRUE	0:05	FALSE	0:00
11:27	11:28	0:01	0:01	D, E, 3	Talking to crane worker		TRUE	0:01	FALSE	0:00
11:34	11:36	0:02	0:02	D, F	Chat with supervisor		FALSE	0:00	FALSE	0:00
11:36	11:38	0:02	0:02	C, F	Private phone call		FALSE	0:00	FALSE	0:00
11:38	11:45	0:07	0:07	D, F	Drawing details with supervisor		FALSE	0:00	FALSE	0:00
11:45	12:00	0:15	0:15	E	Showing visitor around		FALSE	0:00	FALSE	0:00
12:00	12:51	0:51	0:51	G	Lunch break		FALSE	0:00	TRUE	0:51
12:51	13:35	0:44	0:16	E	Survey site		FALSE	0:00	FALSE	0:00

12:53	13:05	0:12	0:12	D, E	Ran into person with some wood paneling samples		FALSE	0:00	FALSE	0:00
12:58	13:04	0:06	0:06	D, E, 9	Talking to crane driver regarding placement		TRUE	0:06	FALSE	0:00
13:12	13:14	0:02	0:02	C, E	Phone call to client		FALSE	0:00	FALSE	0:00
13:20	13:27	0:07	0:07	E, 1	Inspecting delivery		TRUE	0:07	FALSE	0:00
13:23	13:24	0:01	0:01	D, E, 3	Talking to crane driver		TRUE	0:01	FALSE	0:00
13:35	13:41	0:06	0:06	G	Short break		FALSE	0:00	TRUE	0:06
13:41	13:42	0:01	0:01	C, F			FALSE	0:00	FALSE	0:00
13:42	13:44	0:02	0:02	C, F, 9, 3	Supervisor regarding placement of materials		TRUE	0:02	FALSE	0:00
13:44	13:49	0:05	0:05	D, E, F	Long distanced talk with supervisor		FALSE	0:00	FALSE	0:00
13:49	13:51	0:02	0:02	D, F			FALSE	0:00	FALSE	0:00
13:51	13:59	0:08	0:04	E	Heading to planning meeting		FALSE	0:00	FALSE	0:00
13:52	13:55	0:03	0:03	D, E	Talk upcoming work with plumbers		FALSE	0:00	FALSE	0:00
13:57	13:58	0:01	0:01	D, E	Check in with roofing guys		FALSE	0:00	FALSE	0:00
13:59	14:35	0:36	0:36	A, 2, 9	Next week planning, deliveries (12min), work, site, adjustments	Logistics factor 1/3	TRUE	0:12	FALSE	0:00
14:35	15:16	0:41	0:38	D, E, 9	Looking at construction units(bodar) as they need more shortly		TRUE	0:38	FALSE	0:00
14:49	14:50	0:01	0:01	C, E, 4	Calling groundskeeper to get access to check water and sewage connection availability		TRUE	0:01	FALSE	0:00
14:56	14:58	0:02	0:02	C, E			FALSE	0:00	FALSE	0:00
15:16	15:22	0:06	0:06	D, F, 3, 9	Material storage discussion		TRUE	0:06	FALSE	0:00
15:22	15:25	0:03	0:03	G	Dog distraction		FALSE	0:00	TRUE	0:03
15:25	16:00	0:35	0:35	A	Evaluating what subcontractors to use		FALSE	0:00	FALSE	0:00

## APPENDIX B

Project:	Project A
Construction time:	3/4 years (75%)
Project type:	Renovating office building in city centre

	CATEGORIES	SITE MANAGER A		SUPERVISOR A	
		TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS
DAY 1	1	0:00	0%	0:06	2%
	2	0:08	17%	0:14	5%
	3	0:10	22%	1:53	38%
	4	0:06	13%	1:11	24%
	5	0:00	0%	0:00	0%
	6	0:02	4%	0:00	0%
	7	0:00	0%	0:06	2%
	8	0:20	44%	1:20	27%
	9	0:00	0%	0:08	3%
DAY 2	1	00:23	85%	00:00	0%
	2	00:00	0%	00:10	3%
	3	00:00	0%	00:04	1%
	4	00:04	15%	01:55	34%
	5	00:00	0%	00:04	1%
	6	00:00	0%	01:37	29%
	7	00:00	0%	00:05	1%
	8	00:00	0%	01:19	23%
	9	00:00	0%	00:25	8%
DAY 3	1	00:33	69%	0:05	2%
	2	00:05	11%	0:11	4%
	3	00:00	0%	0:28	11%
	4	00:00	0%	1:14	28%
	5	00:02	4%	0:01	0%
	6	00:00	0%	0:24	9%
	7	00:02	4%	0:38	15%
	8	00:00	0%	0:40	15%
	9	00:05	12%	0:41	16%

TOTAL SITE MANAGER A		TOTAL SUPERVISOR A	
TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS
00:56	46%	00:11	1%
00:13	11%	00:35	4%
00:10	8%	02:25	16%
00:10	8%	04:20	29%
00:02	2%	00:05	1%
00:02	2%	02:01	13%
00:02	2%	00:49	5%
00:20	17%	03:19	22%
00:05	5%	01:14	8%

<b>Project:</b>	Project B
<b>Construction time</b>	1/4 years (10%)
<b>Project type:</b>	New apartment buildings

	CATEGORIES	SUPERVISOR B1		SUPERVISOR B2		SUPERVISOR B3		SUMMARY PER DAY	
		TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS
DAY 1	1	00:00	0%	00:00	0%	00:03	3%	00:03	0%
	2	01:46	11%	00:35	69%	00:08	7%	02:29	13%
	3	04:14	26%	00:00	0%	00:12	11%	04:26	23%
	4	03:04	18%	00:07	14%	00:50	46%	04:01	21%
	5	03:18	20%	00:00	0%	00:00	0%	03:18	17%
	6	00:16	2%	00:00	0%	00:00	0%	00:16	1%
	7	00:06	1%	00:04	8%	00:18	17%	00:28	2%
	8	03:52	23%	00:03	6%	00:08	7%	04:03	21%
	9	00:00	0%	00:02	4%	00:09	8%	00:11	1%
DAY 2	1	00:00	0%	00:02	1%			00:02	0%
	2	00:01	0%	00:00	0%			00:01	0%
	3	00:01	0%	00:01	0%			00:02	0%
	4	00:58	17%	00:21	10%			01:19	15%
	5	00:00	0%	00:03	1%			00:03	1%
	6	00:00	0%	00:32	16%			00:32	6%
	7	00:00	0%	01:00	30%			01:00	11%
	8	00:00	0%	00:30	15%			00:30	6%
	9	04:41	82%	00:52	26%			05:33	61%
DAY 3	1	00:00	0%	00:19	6%			00:19	4%
	2	00:19	10%	02:14	43%			02:33	31%
	3	00:23	12%	00:01	0%			00:24	5%
	4	01:15	39%	01:37	31%			02:52	34%
	5	00:11	6%	00:27	9%			00:38	8%
	6	00:00	0%	00:00	0%			00:00	0%
	7	00:23	12%	00:07	2%			00:30	6%
	8	00:01	1%	00:18	6%			00:19	4%
	9	00:38	20%	00:06	2%			00:44	9%

TOTAL SUPERVISORS B1 - B3	
TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS
00:24	1%
05:03	14%
04:52	13%
08:12	22%
03:59	11%
00:48	2%
01:58	5%
04:52	13%
06:29	18%

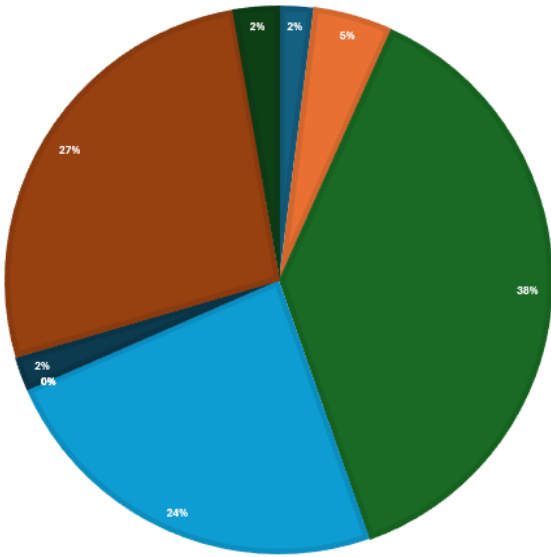
<b>Project:</b>	Project C
<b>Construction time:</b>	0.5/1.5 years (35%)
<b>Project type:</b>	Extension of existing building in urban area

	CATEGORIES	SITE MANAGER C		SUPERVISOR C	
		TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS
DAY 1	1	00:00	0%	00:00	0%
	2	00:03	6%	00:16	6%
	3	00:17	32%	01:21	32%
	4	00:26	49%	00:21	8%
	5	00:00	0%	00:31	12%
	6	00:04	8%	00:00	0%
	7	00:00	0%	00:32	13%
	8	00:00	0%	00:02	1%
	9	00:03	6%	01:08	27%
DAY 2	1	00:00	0%	00:00	0%
	2	00:00	0%	01:39	22%
	3	00:02	1%	02:31	33%
	4	01:42	43%	01:26	19%
	5	00:00	0%	00:30	7%
	6	00:00	0%	00:00	0%
	7	00:00	0%	00:16	4%
	8	00:03	2%	00:27	6%
	9	02:07	54%	00:48	11%
DAY 3	1	00:07	4%		
	2	00:12	7%		
	3	00:18	10%		
	4	00:11	6%		
	5	00:01	1%		
	6	00:00	0%		
	7	00:01	1%		
	8	00:00	0%		
	9	02:13	73%		

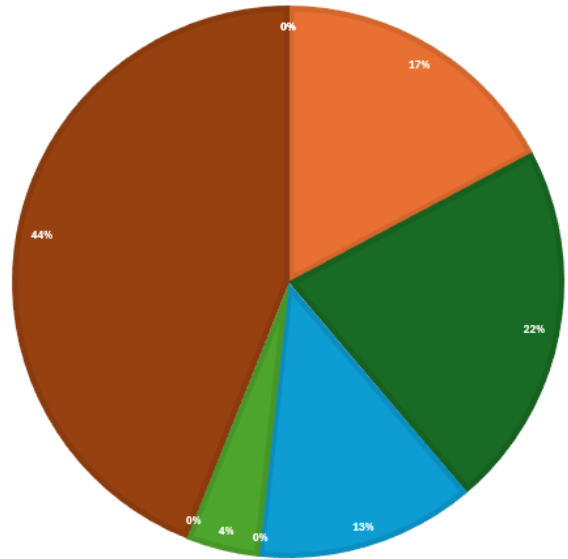
TOTAL SITE MANAGER C		TOTAL SUPERVISOR C	
TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS	TIME SPENT ON ACTIVITY	PERCENTAGE OF TOTAL TIME SPENT ON LOGISTICS
00:07	1%	00:00	0%
00:15	3%	01:55	16%
00:37	8%	03:52	33%
02:19	30%	01:47	15%
00:01	0%	01:01	9%
00:04	1%	00:00	0%
00:01	0%	00:48	7%
00:03	1%	00:29	4%
04:24	56%	01:56	16%

# Appendix C

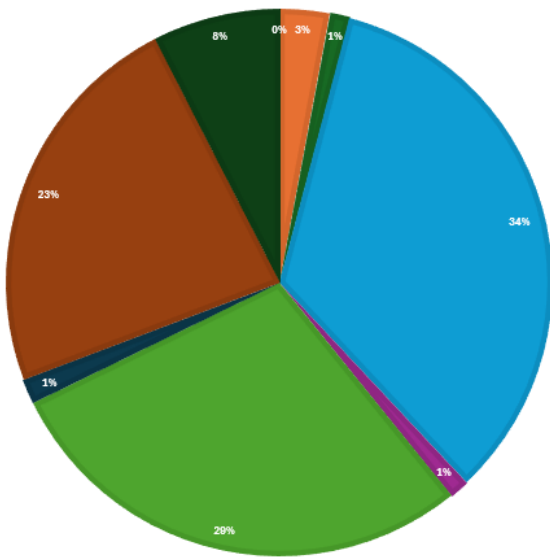
SUPERVISOR A - DAY 1



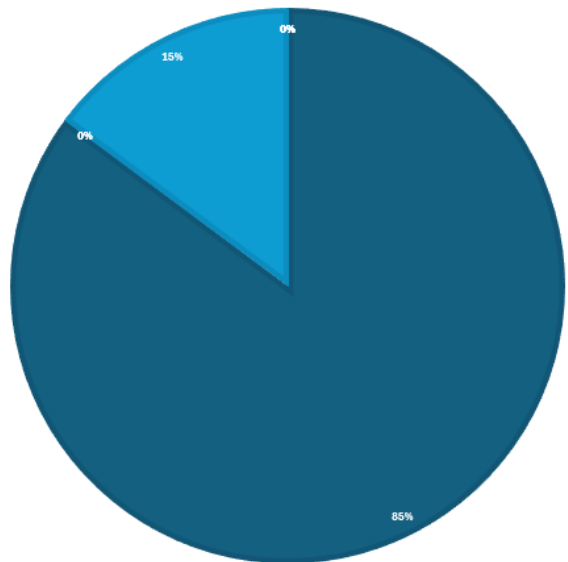
SITE MANAGER A - DAY 1



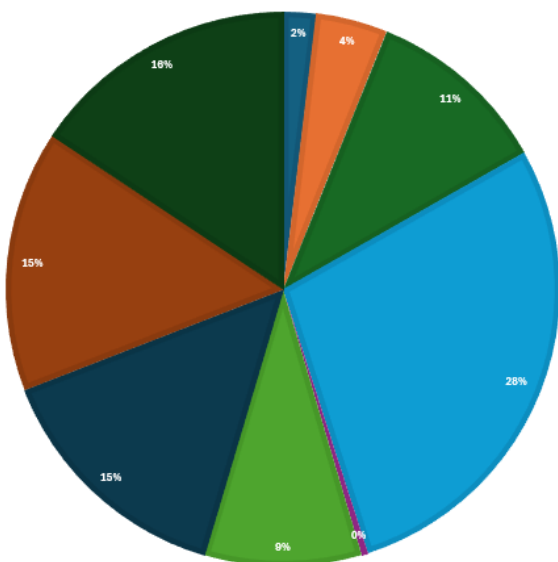
SUPERVISOR A - DAY 2



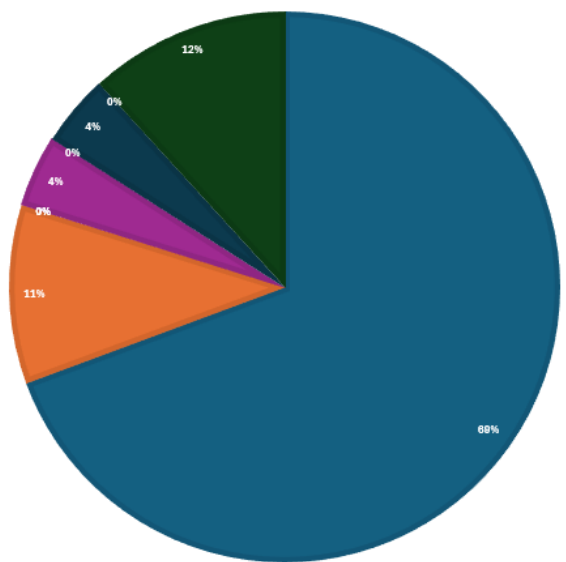
SITE MANAGER A - DAY 2



SUPERVISOR A - DAY 3

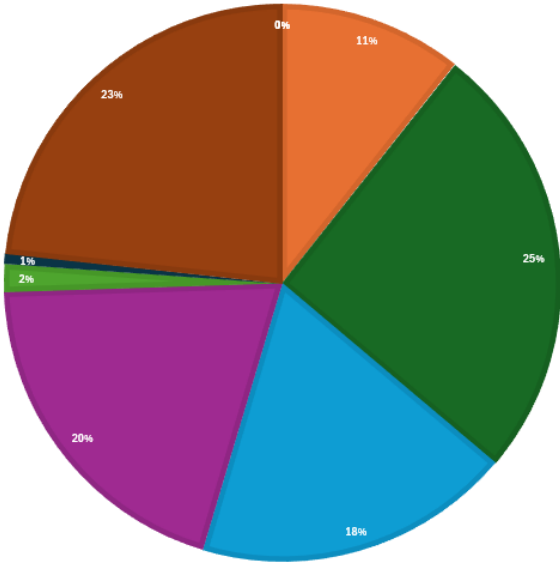


SITE MANAGER A - DAY 3

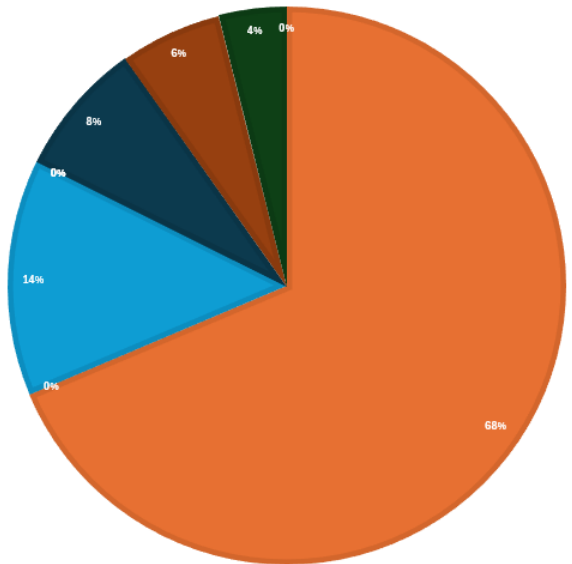


- Delivery control
- Enabling the work and surroundings (flows)
- Waste Management
- Inbound transport
- Sorting of materials
- Coordinating people
- Moving around materials
- Moving materials to installation site
- Logistics Planning

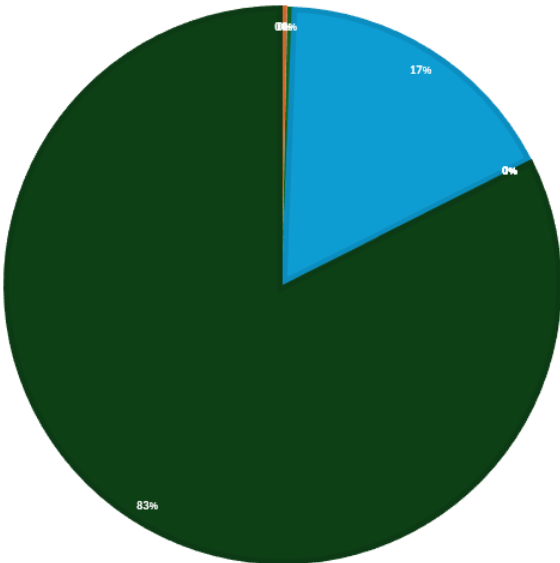
SUPERVISOR B1 - DAY 1



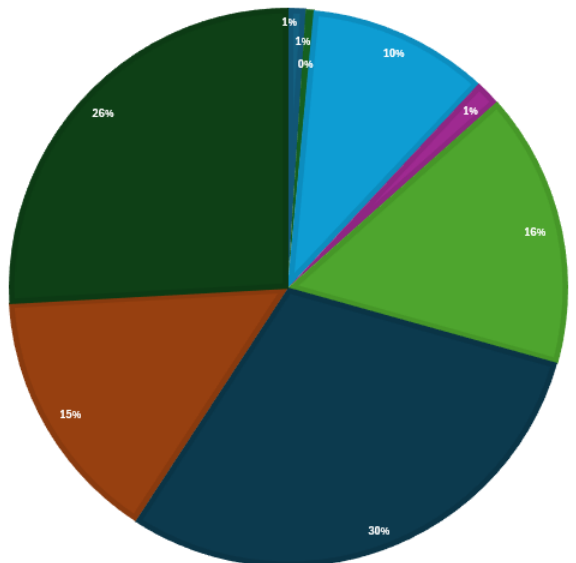
SUPERVISOR B2 - DAY 1



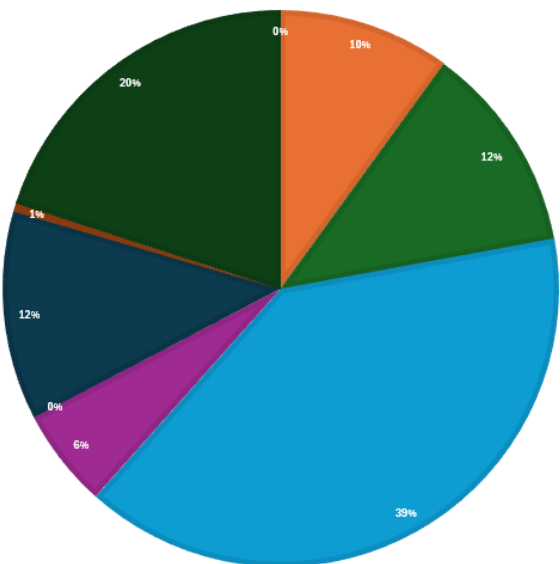
SUPERVISOR B1 - DAY 2



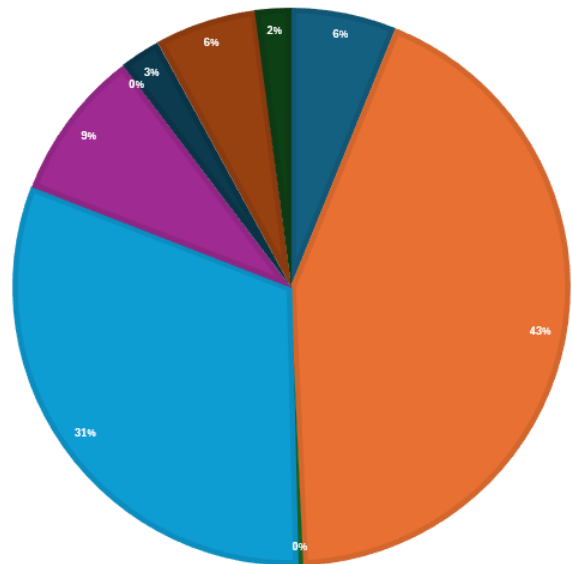
SUPERVISOR B2 - DAY 2



SUPERVISOR B1 - DAY 3

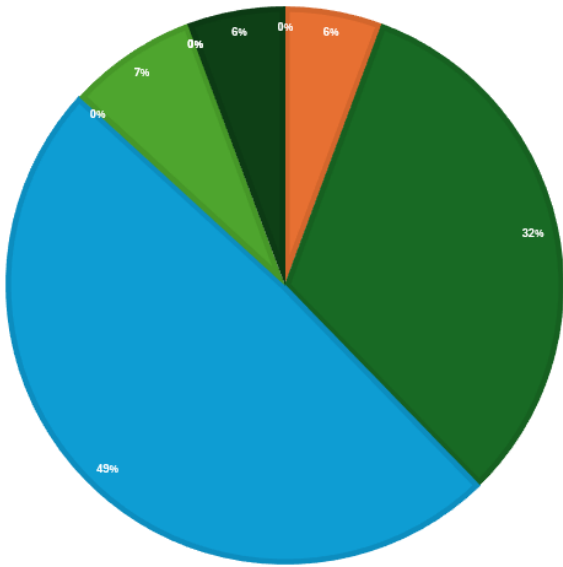


SUPERVISOR B2 - DAY 3

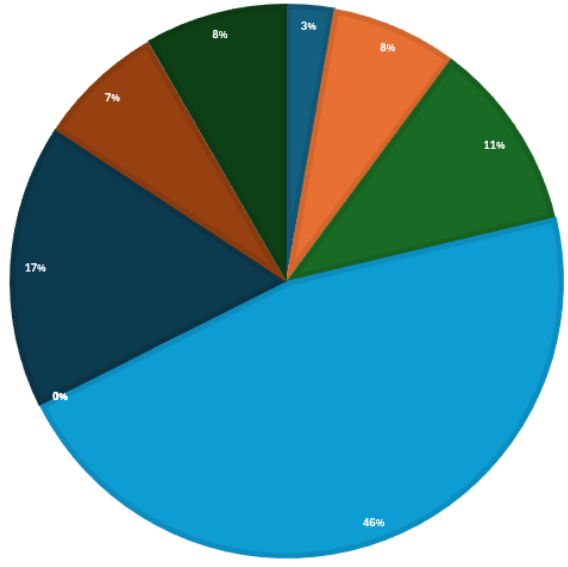


- Delivery control
- Enabling the work and surroundings (flows)
- Waste Management
- Inbound transport
- Sorting of materials
- Coordinating people
- Moving around materials
- Moving materials to installation site
- Logistics Planning

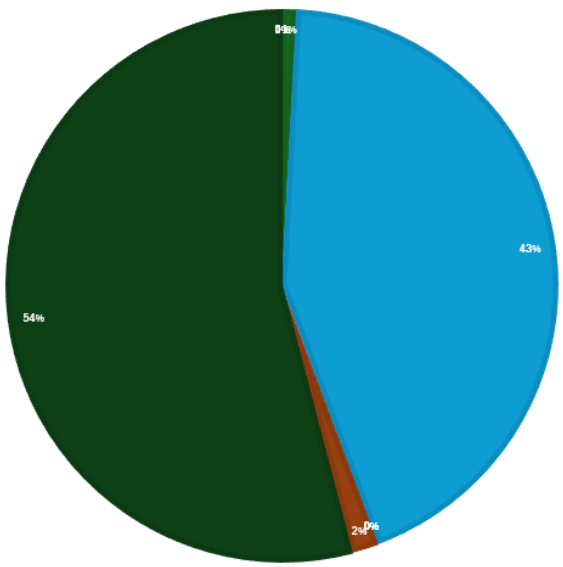
SITE MANAGER C - DAY 1



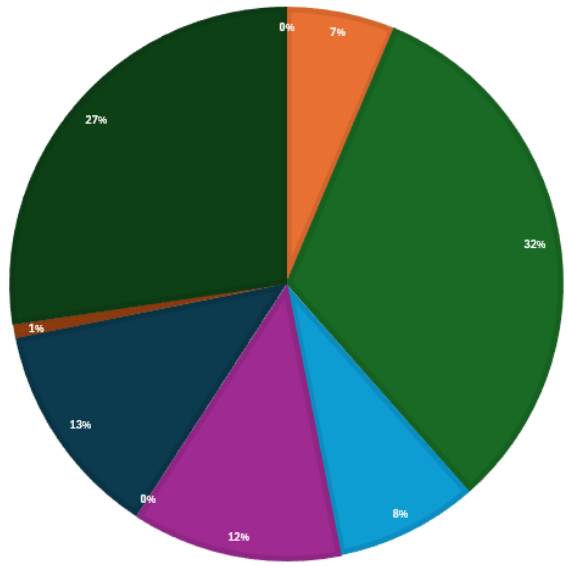
SUPERVISOR B3 - DAY 1



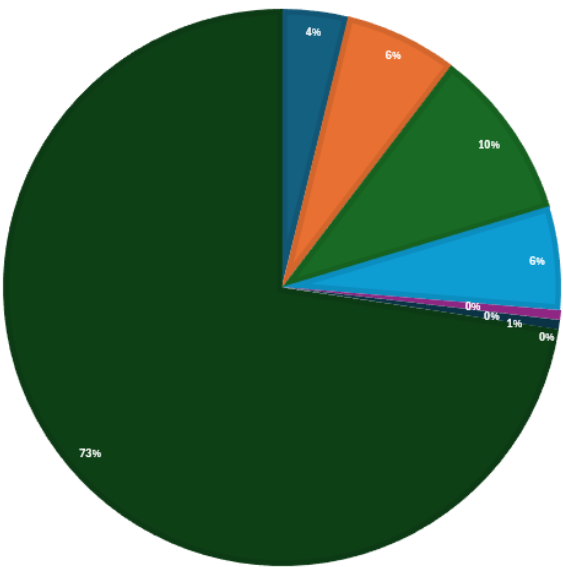
SITE MANAGER C - DAY 2



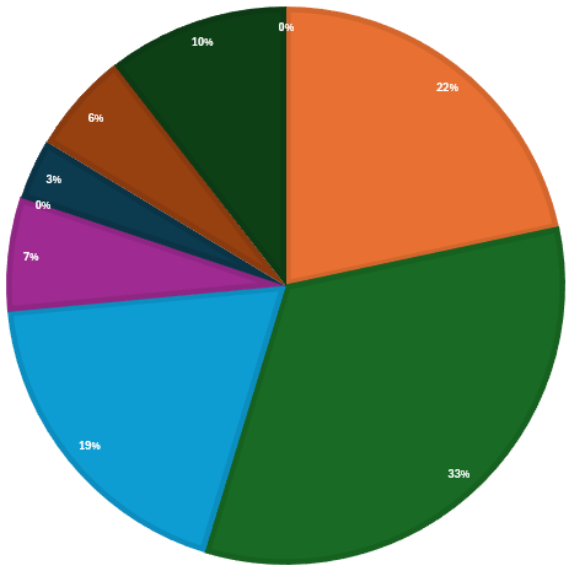
SUPERVISOR C - DAY 1



SITE MANAGER C - DAY 3



SUPERVISOR C - DAY 2



- Delivery control
- Enabling the work and surroundings (flows)
- Waste Management
- Inbound transport
- Sorting of materials
- Coordinating people
- Moving around materials
- Moving materials to installation site
- Logistics Planning

## APPENDIX D

### Interview questions – Contractor

- Can you briefly describe your career path to getting here?
  - o *How many previous jobs?*
  - o *As what?*
- Can you describe your job as a site manager / supervisor?
- What would you say are the core competencies and skills you use every day?
  - o *Would you say that you had these when you started or did they develop along the way?*

*Give short feedback about what we observed. Talk about that in particular our work is focused around logistics. Mention that the next question will be related to logistical activities and your view and experience in your daily work. For some of the topics we already experienced this when we observed you, but we would you to express your opinion.*

- How does your ordering process look like and what is your role in the process?
- How do you work with coordinating the in- and outbound transport to and from site?
- When materials are delivered on site, how do you work with checking the quality and state of the materials that are delivered?
- After the materials have been delivered and checked, do you move them around before installation?
  - o *Can you give an estimate how many times materials are moved before they are installed?*
  - o *Do you need to sort materials any additional times on site?*
- How much time goes into moving materials from storage to where it is then used for construction?
- Do you ever find that stored materials are conflicting or in the way of other work?
- How do you keep track of where various materials are?
  - o *How do you communicate this information to workers? For example, when they need the materials for installation.*
- What does your waste management practices look like?
  - o *How do you sort the waste on site?*
  - o *Is there a planned routine for waste or is it on a as needed basis?*
  - o *What is your role in managing the waste on site? Do you coordinate this transports or is this the responsibility of someone else?*
- What social skills do you use to streamline coordinating the people on site?
- Here is a list of the 9 logistical activities we have identified. Can you give a top 3 on which you spend the most time?
- Do you feel that there are any logistical activities outside of those already asked about that you do on a regular basis?
- How much time do you spend on logistics during your average working day?
  - o *Gross number in percentage*
- How do you know how to manage the logistics on site?
- What is your view on having one dedicated logistics manager?
- Do you have any experience with the involvement of a TPL?
- Is there anything you would like to come back to?

## Interview questions – Logistics Managers

- Can you briefly describe your career path to getting here?
  - o *How many previous jobs?*
  - o *As what?*
- Can you describe your job as a logistics manager?
- What would you say are the core competencies and skills you use every day?
  - o *Would you say that you had these when you started or did they develop along the way?*
  
- How does your ordering process look like and what is your role in the process?
- How do you work with coordinating the in- and outbound transport to and from site?
- When materials are delivered on site, how do you work with checking the quality and state of the materials that are delivered?
- After the materials have been delivered and checked, do you move them around before installation?
  - o *Can you give an estimate how many times materials are moved before they are installed?*
  - o *Do you need to sort materials any additional times on site?*
- How much time goes into moving materials from storage to where it is then used for construction?
- How do you keep track of where various materials are?
  - o *How do you communicate this information to workers? For example, when they need the materials for installation.*
- What does your waste management practices look like?
  - o *How do you sort the waste on site?*
  - o *Is there a planned routine for waste or is it on a as needed basis?*
  - o *What is your role in managing the waste on site? Do you coordinate this transports or is this the responsibility of someone else?*
  
- What social skills do you use to streamline coordinating the people on site?
- Has there been any challenges when working as a logistics manager?
- How does the contractor (your client) review the involvement of you as a TPL?
- Where would you place yourself on an organizational chart, in terms of communication?
  
- Here is a list of the 9 logistical activities we have identified. Can you give a top 3 on which you spend the most time? (show list)
- Do you feel that there are any logistical activities outside of those already asked about that you do on a regular basis?
- How much time do you spend on non-logistics during your average working day?
  - o *Gross number in percentage*
  
- Is there anything you would like to come back to?

## **Interview questions - HR / Recruitment**

- Introduce ourselves and our purpose (without mentioning logistics).
- Can you introduce yourself?
  - o What is your role?
  - o For how long have you been doing this function?
- What does the hiring decision making process look like and who is involved?
- What are you looking for when hiring a site manager and supervisor?
  - o Skills / competencies?
  - o Experience?
  - o Education?
  - o Disposition (How are they? How do they present themselves?)
- How do you recognize these characteristics?
- What is a supervisor and site manager supposed to do during a regular working day?
- Is there any feedback involved in this process?
  - o From the office? Or from the construction site?
- Question about the importance of logistics, but tailor how to ask based on their previous answers.

## APPENDIX E

	SUPERVISORS					SITE MANAGERS	
	JOB DESCRIPTION 1	JOB DESCRIPTION 2	JOB DESCRIPTION 3	JOB DESCRIPTION 4	JOB DESCRIPTION 5	JOB DESCRIPTION 1	JOB DESCRIPTION 2
<i>Develop others and the team</i>	X		X	X		X	
<i>Run daily production</i>	X	X			X		
<i>Plan lead and divide daily work</i>	X	X	X	X		X	
<i>Ensure work is done according to the plan and in accordance with laws rules and regulations regarding work safety and environment</i>	X	X	X	X		X	X
<i>Close contact with subcontractors, clients and suppliers</i>	X	X		X			X
<i>Plan work to be done safely and efficiently</i>	X	X					
<i>Develop and check time schedules</i>	X	X	X	X			
<i>Direct craftsmen and subcontractors</i>	X	X	X	X			
<i>Handle project economy and aim for set profit goals</i>	X	X	X	X	X	X	X
<i>Daily checks and follow-ups of work</i>	X	X					
<i>The role is varied and you get to take own responsibility</i>			X	X			
<i>Teamwork is important</i>			X	X	X	X	X
<i>Looking for someone with 3-5 years' worth of relevant studies</i>			X	X	X		X
<i>Looking for a business-like team player</i>			X	X		X	
<i>Driven by creating good results</i>			X	X		X	
<i>Good communicative ability</i>			X	X	X	X	X
<i>Experience with working with digital systems</i>					X		X
<i>Have relevant previous work life experience</i>					X	X	X
<i>Have an optimistic viewpoint</i>					X		
<i>Have the ability to coordinate own resources</i>						X	
<i>Comfortable in a leadership role and willing to delegate</i>						X	
<i>Able to communicate in Swedish</i>						X	X
<i>Able to communicate in English</i>						X	
<i>Have good knowledge of regulatory statures (such as ABT06)</i>						X	
<i>Able to listen to others</i>						X	
<i>Balance both the details and the whole project</i>						X	
<i>Ability to structure and coordinate the work in an efficient manner</i>						X	
<i>Give off a professional impression and create confidence in others</i>					X		X

# Job description 1 - Supervisor

Du älskar att utveckla andra lika mycket som du älskar att utvecklas själv.

Som arbetsledare styr och leder du den dagliga produktionen ute på våra arbetsplatser.

Du ansvarar för att planera, leda och fördela det dagliga arbetet för ditt arbetslag och säkerställa att produktionen styrs i enlighet med upprättade planer och enligt de lagar, regler och riktlinjer som finns kring arbetsmiljö och säkerhet.

I ditt arbete har du täta kontakter med underentreprenörer, våra beställare och leverantörer.

Andra arbetsuppgifter kan vara att:

- Upprätta arbetsberedningar över olika arbetsmoment och säkerställa att dessa utförs så säkert och effektivt som möjligt
- Upprätta och stämma av tidsplaner
- Leda hantverkare och underentreprenörer
- Hantera projektekonomi och styra mot uppsatta lönsamhetsmål
- Utföra dagliga avstämningar och uppföljningar.

## Job description 2 - Supervisor

Som arbetsledare styr och leder du den dagliga produktionen ute på våra arbetsplatser.

Du ansvarar för att planera, leda och fördela det dagliga arbetet för ditt arbetslag och säkerställa att produktionen styrs i enlighet med upprättade planer och enligt de lagar, regler och riktlinjer som finns kring arbetsmiljö och säkerhet.

I ditt arbete har du täta kontakter med underentreprenörer, våra beställare och leverantörer.

Bland dina arbetsuppgifter ingår tex:

- Upprätta arbetsberedningar över olika arbetsmoment och säkerställa att dessa utförs så säkert och effektivt som möjligt
- Upprätta och stämma av tidsplaner
- Leda hantverkare och underentreprenörer
- Hantera projektkonomi och styra mot uppsatta lönsamhetsmål
- Utföra dagliga avstämningar och uppföljningar.

## Job description 3 - Supervisor

Som arbetsledare hos oss kommer du att vara en del av ett härligt gäng med både tjänstemän och yrkesarbetare.

### **Rollen som Arbetsledare**

Rollen som arbetsledare är omväxlande där du får möjlighet att ta ett stort eget ansvar.

Varje projekt är ett lagarbete varför teamarbete är en viktig del för ett lyckat projekt. Din roll är att vara en engagerad och motiverad del av arbetsgruppen och att ditt arbetssätt bidrar till delaktighet både hos de du leder och övriga arbetsgruppen.

Utmärkande för [company]:s arbetsplatser är säkerhet, struktur, ordning och reda samt fokus på god arbetsmiljö.

I samarbete med platschefen planerar och leder du projekten framåt, följer upp tidplaner, fördelar resurser och ser till att vi håller vad vi lovar.

Du medverkar aktivt till projektets tekniska och ekonomiska genomförande samt leder och fördelar det löpande arbetet.

Du deltar vid framtagande av tidplaner, stämmer av egna aktiviteter och utför arbetsberedningar tillsammans med andra medarbetare i teamet.

### **Din profil**

Vi söker dig som har en eftergymnasial byggteknisk utbildning med minst 3–5 års erfarenhet av liknande roll.

För att vara framgångsrik i rollen som arbetsledare ser vi att du är en affärsmässig lagspelare som drivs av att skapa goda resultat.

Då rollen kräver många olika kontaktytor ser vi att du har en god kommunikativ förmåga.

Vi ser också att du har sinne för planering och beredning av arbete samt att du är kvalitetsmedveten.

# Job description 4 - Supervisor

## **Rollen som arbetsledare**

Rollen som arbetsledare är omväxlande där du får möjlighet att ta ett stort eget ansvar.

Varje projekt är ett lagarbete varför teamarbete är en viktig del för ett lyckat projekt.

Din roll är att vara en engagerad och motiverad del av arbetsgruppen och att ditt arbetssätt bidrar till delaktighet både hos de du leder och övriga arbetsgruppen.

Utmärkande för [COMPANY]:s arbetsplatser är säkerhet, struktur, ordning och reda samt fokus på god arbetsmiljö. I samarbete med platschefen planerar och leder du projekten framåt, följer upp tidplaner, fördelar resurser och ser till att det genomförs på ett bra sätt.

Du arbetar aktivt med projektets tekniska lösningar, leder och fördelar löpande arbetsuppgifter till Yrkesarbetare och UE men har samtidigt ett ansvar för projektets ekonomi.

Du deltar vid framtagande av tidplaner, stämmer av egna aktiviteter och utför arbetsberedningar tillsammans med kollegorna i teamet. Genom att säkerställa efterlevnaden av skydds- och säkerhetsföreskrifter i produktionen stöttar du platschefen att upprätthålla en säker arbetsmiljö på våra arbetsplatser.

## **Din Profil**

För att vara framgångsrik i rollen behöver du ha en byggteknisk utbildning och/eller motsvarande arbetslivserfarenhet.

Meriterande är också om du har erfarenhet av mark/anläggningsprojekt men vi välkomnar både dig som har längre erfarenhet som arbetsledare och dig som är mindre erfaren men med relevant utbildning och en vilja att utvecklas.

För att trivas som arbetsledare hos oss på [COMPANY] bör du vara en affärsmässig lagspelare som drivs av att skapa goda relationer såväl som goda resultat.

Som person gillar du utmaningar, är öppen inför att tänka nytt och med en ambition att utvecklas.

Dina personliga egenskaper är betydelsefulla och några av de viktigaste egenskaperna är att genom kommunikation, engagemang och vilja leda projektet framåt.

Du värdesätter ett företag som arbetar för en god arbetsmiljö och identifierar dig med våra värderingar: Ärlighet, Tillit och Respekt.

## Job description 5 - Supervisor

### **Din roll:**

Som Arbetsledare bistår du Platschefen, planerar, leder och fördelar arbetet. Du ansvarar för delar i projektet, vilket bl.a. innefattar kvalitetssäkring, arbetsmiljö, kundkontakt, ekonomisk uppföljning, planering av personal och maskiner, fakturering samt delaktighet vid budgetarbete.

Ditt ledarskap bedrivs både ute i fält samt genom hantering av alla våra digitala system.

### **Kvalifikationer:**

Du bör ha utbildning inom relevant område och/eller några års dokumenterad erfarenhet som arbetsledare inom branschen.

Du har erfarenhet av att arbeta med digitala system.

Då det dagliga arbetet innebär mycket kontakt med olika aktörer har du en hög social kompetens och lätt för att samarbeta.

Du inger ett professionellt intryck och har lätt för att skapa förtroende.

Du har en god kommunikativ förmåga och ditt ledarskap är tydligt, närvarande och entusiasmerande. Du ser möjligheter och gillar entreprenörskap.

# Job description 1 – Site manager

## Rollen som Platschef

Som platschef leder och fördelar du arbetsuppgifter och rapporterar till Operation managers, du ansvarar för den del av projektet som du leder och driver utifrån uppsatta mål inom projektplanering, resursanskaffning och genomförande avseende kvalitet, tid och ekonomi.

Vi jobbar i team där din roll i laget är att engagera och motivera genom delaktighet och utveckling och på detta sätt nå de mål och deadlines som är uppsatta.

Du kommer att vara en del av ett team där vi utmanar oss själva för att leverera de bästa lösningarna i en organisation med goda värderingar och en stark vilja att lyckas.

## Din profil

- Du har flera års erfarenhet från ledande befattning inom anläggningsprojekt med fokus på mark och grundläggning.
- Du upprätthåller en bra relation till kund och har förmåga att samordna egna resurser och underentreprenörer.
- Du är trygg i ledarrollen och har en god förmåga att delegera och ställa krav.
- Du kommunicerar obehindrat på såväl svenska som engelska.
- Du har goda kunskaper i entreprenadjuridik samt regelverk såsom AMA Anläggning, MER, AB04 och ABT06.

Arbetet ställer höga krav på din förmåga att leda och inspirera dina medarbetare samt balansera ett helhetsperspektiv och detaljer längs vägen.

Som person är du därför lyhörd och uppmärksammar andras förmågor för att på så sätt även kunna delegera effektivt.

Utöver detta så ser vi att du delar du vår uppfattning att en bra och säker arbetsmiljö gör skillnad.

Vidare bör du vara affärsmässig med ett resultat- och lönsamhetsfokus samt en förmåga att kunna koordinera, strukturera och kommunicera arbetet på ett effektivt sätt.

# Job description 2 – Site manager

## Om tjänsten

Som platschef på [Company] har du en central roll i våra projekt och är den som har det övergripande ansvaret för projektets utförande.

Du medverkar ofta redan från kalkylskedet, vidare in i produktion och har såväl personalansvar som arbetsmiljöansvar.

Du har ekonomiskt ansvar i projektet samt ytterst ansvar över kontakt med kunder och leverantörer.

Du har alltid stöttning av duktiga entreprenadingenjörer, administratörer, arbetsledare och skickliga yrkesarbetare.

Som Platschef är det du som leder projektet och dina medarbetare för att nå att skapa säkra och trivsamma utemiljöer.

## Kravprofil

- Du har utbildning inom relevant område och/eller några års erfarenhet som platschef inom branschen.
- Du har arbetat med liknande arbetsuppgifter tidigare. Erfarenhet från anläggning eller drift- och underhåll av vägar och vinterväghållning är meriterande.
- Du ska behärska det svenska språket i både tal och skrift, ha goda IT-kunskaper och körkort B och tillgång till bil är ett krav.

## Om dig

Då arbetet innebär mycket kontakt med olika aktörer har du en hög social kompetens och lätt för att samarbeta.

Du inger ett professionellt intryck och har lätt för att skapa förtroende.

Du har en god kommunikativ förmåga och ditt ledarskap är tydligt, närvarande och entusiasmerande.

DEPARTMENT OF ARCHITECTURE AND CIVIL ENGINEERING  
CHALMERS UNIVERSITY OF TECHNOLOGY

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