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Analysis of Potential Hazards in Pipe Receiving Work using the Job Safety Analysis (JSA) Method and the ISO 45001 Approach at PT. XYZ

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Abstract. Pipe receiving is one of the operational activities with a high potential for occupational hazards because it involves unloading, lifting, transporting, and storing pipes using lifting equipment, as well as direct interaction between workers and heavy materials. Unsystematic hazard identification and control can increase the risk of workplace accidents, material damage, and operational disruption. This study aims to identify potential hazards at each stage of the pipe receiving process using the Job Safety Analysis (JSA) method and to evaluate its conformity with the ISO 45001:2018 approach at PT. XYZ. A descriptive method with a qualitative approach was employed. Data were collected through direct observation, interviews with workers and HSSE personnel, and documentation studies. The findings indicate that the pipe receiving process consists of ten work stages with various hazards, including being struck by materials, caught between objects, slipping, falling loads, and collisions with lifting equipment. Recommended control measures include toolbox meetings, equipment inspection, safe work procedures, barricade installation, improved compliance with Personal Protective Equipment (PPE), and regular supervision. The controls applied at PT. XYZ are generally consistent with Clauses 6.1.2, 8.1, and 9.1 of ISO 45001:2018, although continuous improvement in supervision and evaluation is still required.

Keywords: *Job Safety Analysis (JSA), ISO 45001:2018, Potential Hazards, Occupational Safety and Health, Pipe Receiving.*

A. INTRODUCTION

Occupational Safety and Health (OSH) plays a fundamental role in protecting workers from potential workplace hazards while ensuring the continuity and efficiency of organizational operations, particularly in the industrial and logistics sectors. In practice, many organizations adopt ISO 45001:2018 as the international standard for systematically and sustainably managing occupational safety risks (Aini, Darmansyah, & Apriyono, 2025). ISO 45001 provides a structured framework for organizations to identify workplace hazards, assess occupational risks, and implement effective control measures, thereby fostering a safer, more adaptive working environment with a strong emphasis on worker protection (Saputri, Aulya, Caroline, & Rosaline, 2024).

Industrial operations inherently involve numerous hazards that may lead to occupational accidents if risks are not identified, assessed, and controlled through a systematic approach. Workplace accidents not only jeopardize workers' health and safety but also result in substantial organizational losses, including damage to equipment and assets, operational disruptions, and reduced productivity (Pratama, Rusba, & Liku, 2026). One operational activity associated with a particularly high level of occupational risk is the receiving process within warehouse operations. This activity encompasses unloading, inspection, material handling, and storage, involving manual labor, heavy equipment such as forklifts and cranes, and direct interaction with industrial materials.

PT XYZ, a supporting company in the oil and gas industry specializing in the manufacturing, fabrication, and repair of drilling equipment through machining workshop

operations, performs pipe receiving as an integral component of its operational activities (Nurissa'adah, Ismiyah, & Rizqi, 2022). However, field observations indicate that some workers do not consistently comply with standard operating procedures (SOPs) and fail to wear the required personal protective equipment (PPE), thereby increasing the likelihood of occupational accidents such as being struck by falling materials, crushing injuries, slips, and injuries resulting from the improper use of handling equipment. These conditions underscore the importance of implementing a structured hazard identification process within receiving operations, as emphasized in effective occupational safety and health management systems (Al Aqsa, Andivas, & Kurnia, 2024).

To prevent workplace accidents, hazards should be identified and analyzed systematically using appropriate risk assessment methods, one of which is Job Safety Analysis (JSA). This method breaks down each work activity into individual tasks to identify potential hazards, assess the associated risks, and establish appropriate control measures (Muhlas, Putra, & Dakhi, 2025). Integrating JSA with the ISO 45001 framework has been shown to enhance the effectiveness of hazard identification and risk control because the combination enables a more structured assessment of risks ranging from low to very high severity (Puspa & Apfiasari, 2025). Inadequate implementation of risk assessment methods such as JSA in manufacturing industries has been associated with a higher incidence of occupational accidents caused by workplace hazards and poor compliance with PPE requirements (Anjani & Ismiyah, 2025).

Despite these efforts, hazards within receiving operations are often not comprehensively identified, and systematic risk assessments based on the ISO 45001 framework remain insufficient. Consequently, further investigation is required to support the implementation of a more effective occupational safety and health management system (Malinda & Soediantono, 2022). Accordingly, this study addresses the following research questions: (1) What potential hazards are present at each stage of the pipe receiving process based on the ISO 45001 framework and the Job Safety Analysis (JSA) method? (2) What hazard control recommendations can be proposed to minimize occupational risks associated with these activities?

This study is limited to the unloading and storage activities involved in pipe receiving operations at PT XYZ. The analysis adopts the ISO 45001:2018 framework, particularly Clause 6.1.2 (Hazard Identification and Assessment of Risks and Opportunities), Clause 8.1 (Operational Planning and Control), and Clause 9.1 (Performance Evaluation). The objectives of this study are to analyze occupational hazards associated with pipe receiving operations using the JSA method within the ISO 45001 framework and to develop JSA and ISO 45001 documentation as practical guidance for safe work procedures. The findings are expected to provide PT XYZ with evidence-based recommendations for implementing effective hazard control measures, preventing workplace accidents, and strengthening the overall implementation of occupational safety and health practices throughout the organization.

B. LITERATURE REVIEW

1. Occupational Safety and Health

Occupational Safety and Health (OSH) refers to the conditions and factors that influence the safety and health of workers and other individuals present in the workplace. Its primary objective is to safeguard workers' right to a safe working environment while promoting healthy and productive workplaces (Doifurrahman & Harlan, 2025). An occupational accident is an incident arising from the interaction among workers, equipment, materials, work methods, and the work environment, which may result in personal injury, damage to property, or other organizational losses. Consequently, accident prevention constitutes a fundamental component of effective OSH implementation (Sakinah, 2022). A hazard is defined as any condition,

source, situation, work process, equipment, machinery, material, or work method that has the potential to cause harm if not adequately controlled. Accordingly, hazard identification represents the first and most essential step in preventing occupational accidents (Sakinah, 2022).

2. Receiving Operations

Receiving is the initial stage of warehouse operations involving the acceptance of goods from suppliers, followed by inspection and inventory management within the warehouse. This process plays a critical role in ensuring inventory accuracy and maintaining the quality of stored goods (Azzahra & Prastawa, n.d.). Errors during the receiving process may negatively affect all downstream warehouse activities, including storage, order picking, and distribution (Hudori, 2016). Receiving is recognized as one of the five principal warehouse functions, together with putaway, storage, picking, and shipping (Saputra & Yuliana, 2020).

In general, the receiving process consists of several sequential activities, including the arrival of goods, document verification, physical inspection of materials, recording, labeling, and transfer to the storage area (putaway). Ineffective execution of these activities may lead to operational delays and inventory inaccuracies that adversely affect organizational performance (Astra, Suryani, & Mulyono, 2025; Budiawan, 2025).

3. Hazard Analysis Methods

Several methods are available for analyzing occupational hazards. Job Safety Analysis (JSA) evaluates each work step by identifying potential hazards and recommending appropriate control measures. Hazard and Operability Study (HAZOP) systematically identifies process deviations but generally requires significant time and the involvement of highly specialized personnel. Fault Tree Analysis (FTA) employs a deductive approach that traces the causes of a predefined top event. Hazard Identification, Risk Assessment, and Risk Control (HIRARC) consists of hazard identification, risk assessment, and risk control procedures, whereas Failure Mode and Effects Analysis (FMEA) evaluates the severity, occurrence, and detectability of potential failures to calculate a Risk Priority Number (RPN) (Sakinah, 2022).

4. Job Safety Analysis

Job Safety Analysis (JSA) is a systematic occupational safety and health method used to identify hazards associated with individual work tasks, evaluate their corresponding risks, and establish appropriate control measures to ensure that work can be performed safely (Rahman, Priyana, & Rizqi, 2022). The primary objectives of JSA include identifying workplace hazards, assessing risk levels, determining effective control measures, reducing occupational accident rates, and enhancing workers' awareness of OSH practices (Mamahit, Inkiriwang, & Tjakra, 2024).

The implementation of JSA offers numerous benefits, including early accident prevention, improved work efficiency, the development of safe work procedures, reduction of organizational losses, and the provision of training materials for new employees. Previous studies have demonstrated its effectiveness in identifying workplace hazards within manufacturing environments (Triadhi, 2020). The preparation of a JSA generally involves four stages: selecting the job to be analyzed, breaking the job down into basic tasks, identifying hazards associated with each task, and developing appropriate hazard control measures (Sakinah, 2022).

5. ISO 45001:2018

ISO 45001 is an international standard that provides organizations with a systematic framework for managing occupational safety and health risks through hazard identification, risk assessment, and risk control. It replaces OHSAS 18001 by introducing a more integrated and comprehensive approach to occupational safety management (Aini, Darmansyah, & Apriyono, 2025). The principal objectives of ISO 45001 include preventing occupational injuries and work-related illnesses, systematically controlling OSH risks, improving occupational safety performance, and establishing safe and healthy workplaces (Saputri, Aulya, Caroline, & Rosaline, 2024).

Organizations that implement ISO 45001 generally demonstrate a high level of compliance with occupational safety standards and greater preparedness for certification audits (Ramadhana & Pharmawati, 2025). In the present study, the implementation of ISO 45001 focuses on three clauses directly related to pipe receiving operations: Clause 6.1.2 (Hazard Identification and Assessment of Risks and Opportunities), Clause 8.1 (Operational Planning and Control), and Clause 9.1 (Monitoring, Measurement, Analysis, and Evaluation).

6. Personal Protective Equipment

Personal Protective Equipment (PPE) refers to equipment worn by workers to protect themselves from workplace hazards. PPE serves as the final layer of risk control after engineering controls and administrative controls have been implemented but residual risks remain. Field studies indicate that workers' compliance with PPE requirements, particularly the use of protective gloves, remains suboptimal because of discomfort, thereby increasing the risk of hand injuries and direct exposure to hazardous materials (Aini & Suwandi, 2023).

7. Previous Studies and Research Gap

Previous studies have demonstrated the relevance of integrating occupational safety management systems with hazard assessment techniques. Saputri et al. (2024) found that implementing an ISO 45001-based Occupational Safety and Health Management System effectively created safer working environments within the high-risk mining industry. Sakinah (2022) applied the JSA method to load-and-haul operations and reported that each work stage presented distinct hazards, with the highest risks arising from interactions between heavy equipment.

Similarly, Muhlas et al. (2025) employed both JSA and HIRARC in a fabrication workshop and identified risk levels ranging from low to extreme, highlighting the need for improved compliance with PPE requirements. Rahman et al. (2022) identified occupational hazards in fabrication processes based on likelihood and severity assessments, whereas Al Aqsa et al. (2024) concluded that JSA serves as an effective safe work guideline capable of reducing unsafe worker behaviors.

Although these studies have examined either JSA or ISO 45001 across various industrial sectors, they have generally investigated these approaches independently. The novelty of the present study lies in its integration of Job Safety Analysis (JSA) with an evaluation of compliance with ISO 45001:2018 during pipe receiving operations. This integrated approach enables an assessment of the extent to which hazard control recommendations generated through JSA are aligned with the relevant requirements of ISO 45001 implemented within the company, thereby providing a more comprehensive framework for improving occupational safety management.

C. METHOD

This study employed a descriptive qualitative approach, emphasizing systematic analysis and detailed description to identify workplace hazards, assess occupational risks, and examine risk control measures associated with unloading activities during the pipe receiving process. The research was conducted from April to June 2026 at PT XYZ, a company providing support services to the oil and gas industry in Kalimantan. Data collection and processing were facilitated using a laptop and a smartphone. The research utilized both primary data, obtained through field observations and interviews, and secondary data, collected from scientific literature and company documentation.

Data were collected through literature review and fieldwork. The literature review involved examining previous studies, standards, and other relevant references to establish the theoretical foundation for the research. Fieldwork consisted of direct workplace observations and semi-structured interviews with five respondents directly involved in pipe receiving operations: the HSE Officer, Receiving Supervisor, Crane Operator, Rigger, and Receiving Helper. These participants were purposively selected because of their direct involvement in each stage of the receiving process, ensuring that the information collected accurately reflected actual workplace conditions.

The collected data were analyzed manually using Microsoft Office software following the Job Safety Analysis (JSA) methodology. The analysis consisted of five sequential stages: (1) defining the scope of work, namely the pipe receiving process; (2) identifying the work activities involved in each stage of the process; (3) identifying potential hazards associated with each work activity; (4) determining appropriate control measures based on the hierarchy of controls, including elimination, substitution, engineering controls, administrative controls, and the use of Personal Protective Equipment (PPE); and (5) evaluating the JSA findings against the requirements of ISO 45001:2018, specifically Clause 6.1.2 (Hazard Identification and Assessment of Risks and Opportunities), Clause 8.1 (Operational Planning and Control), and Clause 9.1 (Monitoring, Measurement, Analysis, and Evaluation). This comparison was undertaken to assess the level of conformity of the company's Occupational Safety and Health Management System (OSHMS) with the ISO 45001 standard. The results of this evaluation served as the basis for developing recommendations aimed at improving occupational safety and health practices and strengthening compliance with ISO 45001 requirements at PT XYZ.

D. RESULT AND DISCUSSION

1. Data Collection Results

Data collection was conducted to obtain information regarding pipe receiving work activities, potential hazards at each stage of the work, and the implementation of occupational safety and health controls at PT. XYZ, through direct observation, interviews, and documentation studies. Observations were conducted from the time the transport vehicle entered the company area until the pipes were arranged at the storage location, as shown in Figure 1. The results of the observations showed that the receiving area was quite large, but some materials were placed near pedestrian paths, forklift paths crossed the same path as workers, some slings showed signs of wear, some workers had not used gloves when installing slings, there was no clear barricade in the lifting area, and there were still pieces of wood and straps that had not been tidied up in the work area, as summarized in Table 1.

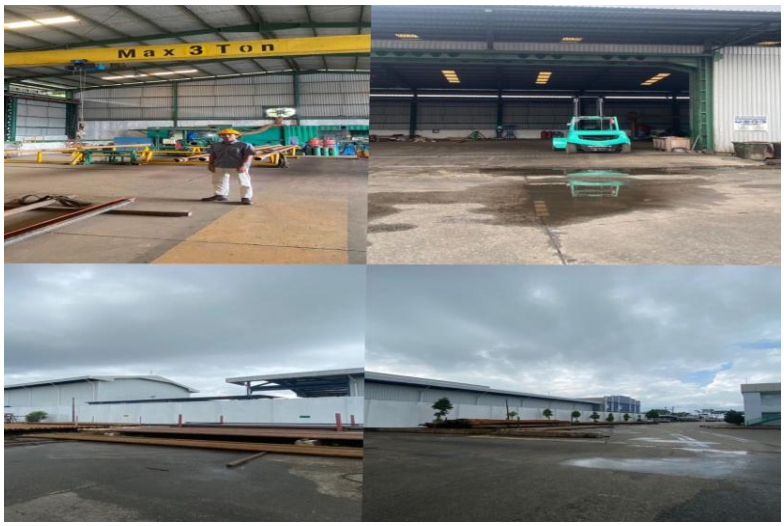

Figure 1. Field Observation on Pipe Receiving Process
Source: PT. XYZ (2026)

Table 1. Summary of Field Observation Results in the Pipe Receiving Area

No.	Observed Aspect	Observation Findings
1	Condition of the Receiving Area	The receiving area was sufficiently spacious; however, materials were placed close to pedestrian walkways, creating potential obstructions.
2	Forklift Traffic Route	Forklifts operated along the same routes used by pedestrians, creating potential interaction and collision risks between vehicles and workers.
3	Condition of the Crane and Slings	The crane was operating properly; however, some slings exhibited visible signs of surface wear.
4	Use of Personal Protective Equipment (PPE)	Most workers wore safety helmets, safety boots, and reflective vests. Nevertheless, some workers were observed not wearing protective gloves while attaching slings.
5	Lifting Area	No clearly defined barricades or exclusion zones were established around the pipe lifting area.
6	Housekeeping	The work area was generally clean, although pieces of wood and discarded binding straps had not been removed, creating minor housekeeping issues.

Source: Field observation results (2026).

Semi-structured interviews were conducted with five respondents: an HSE Officer, a Receiving Supervisor, a Crane Operator, a Rigger, and a Receiving Helper. The interview results showed that all respondents understood the stages of pipe receiving work, from preparation, inspection, unloading, to storage, and had interrelated tasks in the process, ranging from supervising the implementation of K3, operating lifting equipment, installing slings, to arranging pipes in the storage area. However, all respondents also acknowledged that compliance with the use of PPE and consistent implementation of safe work procedures still needed to be improved, particularly in the preparation stages of lifting equipment and lifting materials.

2. Pipe Receiving Work Stages

Based on the results of field observations, the pipe receiving work at PT. XYZ consists of ten stages: (1) toolbox meeting (TBM) and job briefing; (2) inspection of the receiving area; (3) inspection of lifting equipment (crane/forklift), sling, shackle, and hook; (4) truck entering

the receiving area; (5) removing the chain/lashing on the pipe; (6) lifting the pipe using a crane; (7) moving the pipe to the storage area; (8) lowering the pipe to the pipe rack; (9) visual inspection and identification of the pipe; and (10) recording and documentation of materials.

3. Identification of Potential Hazards, Controls, and Compliance with ISO 45001:2018

The analysis was conducted by breaking down each work stage into work activities, identifying potential hazards, developing control recommendations using the JSA method, and then aligning the results with the relevant ISO 45001:2018 clauses, as presented in Table 2.

Table 2. Identification of potential hazards, control recommendations, and compliance with ISO 45001:2018 clauses in pipe receiving work

No.	Work Activity	Potential Hazard	Recommended Control Measures	Relevant ISO 45001:2018 Clause
1	Toolbox Meeting (TBM) and pre-job briefing	Workers do not fully understand work procedures; ineffective communication	Conduct two-way communication when explaining Standard Operating Procedures (SOPs), assigning responsibilities, and reviewing the Job Safety Analysis (JSA) before work begins	**Clause 6.1.2** – Hazard Identification and Risk Assessment
2	Inspection of the receiving area	Slippery surfaces, scattered materials, inadequate lighting	Implement proper housekeeping, install barricades or safety cones, and ensure that the work area is free from obstructions	**Clause 6.1.2** – Hazard Identification and Risk Assessment
3	Inspection of lifting equipment (crane/forklift), slings, shackles, and hooks	Sling failure, damaged hooks, or unserviceable lifting equipment	Perform pre-use inspections, use certified lifting equipment, and ensure operators hold valid certifications	**Clause 8.1** – Operational Planning and Control
4	Truck entering the receiving area	Collision with workers or nearby facilities	Assign a banksman/signalman, enforce low vehicle speeds, establish clearly designated traffic routes, and use wheel chocks	**Clause 8.1** – Operational Planning and Control
5	Removing chains or lashings securing the pipes	Sudden release of chains or securing devices	Maintain a safe standing position, remove restraints gradually, and ensure the pipe remains stable throughout the process	**Clause 8.1** – Operational Planning and Control
6	Lifting pipes using a crane	Falling loads, sling detachment, swinging loads	Develop a lifting plan, inspect slings before use, prohibit personnel from standing beneath	**Clause 8.1** – Operational Planning and Control

			suspended loads, and use taglines to control load movement	
7	Transporting pipes to the storage area	Workers caught between pipes and structures; swinging loads	Use a signalman to guide the crane operator, maintain safe separation distances, and restrict access to the lifting zone	**Clause 8.1** – Operational Planning and Control
8	Lowering pipes onto storage racks	Finger crush injuries; pipes rolling from the rack	Use stoppers or chocks, ensure the pipe rack is stable, and remove slings only after the load has been securely positioned	**Clause 8.1** – Operational Planning and Control
9	Visual inspection and identification of pipes	Sharp edges, corrosion, and metal splinters	Perform inspections using a standardized checklist and verify materials against the Delivery Order, Packing List, and Material Test Certificate	**Clause 9.1** – Monitoring, Measurement, Analysis, and Evaluation
10	Recording and documenting materials	Poor ergonomic working posture	Complete the Receiving Report, update inventory records, document the receiving process with photographs, and evaluate any identified nonconformities	**Clause 9.1** – Monitoring, Measurement, Analysis, and Evaluation

Source: Data Processing (2026)

As presented in Table 2, the activities of lifting pipes using a crane, transporting pipes to the storage area, and placing pipes onto storage racks represent the stages with the highest occupational risk. These activities involve heavy lifting operations and expose workers to hazards such as falling loads, suspended materials, and pinch points between pipes and surrounding structures. The findings indicate that lifting operations constitute the primary source of risk during the pipe receiving process and therefore require rigorous control measures, including systematic inspection of lifting equipment, implementation of approved lifting plans, the use of taglines to control suspended loads, and continuous supervision by competent lifting personnel.

The analysis further demonstrates a clear correspondence between the work activities and the requirements of ISO 45001:2018. The initial stages, comprising the toolbox meeting and inspection of the receiving area, align with Clause 6.1.2, as they emphasize hazard identification and risk assessment prior to commencing work. The core operational activities, ranging from the inspection of lifting equipment to the placement of pipes on storage racks, are predominantly associated with Clause 8.1 (Operational Planning and Control). These activities involve pre-use equipment inspections, the deployment of competent crane operators and riggers, implementation of lifting plans, and the appropriate use of personal protective equipment (PPE). The final stages, consisting of visual inspection and documentation of received materials, correspond to Clause 9.1 (Monitoring, Measurement, Analysis, and Evaluation) through performance monitoring, verification of material conditions, and evaluation of operational outcomes. This pattern suggests that the control measures developed through the Job Safety Analysis (JSA) are generally consistent with the principles of ISO

45001:2018 implemented at PT XYZ, despite the company not yet holding formal ISO 45001 certification.

The findings of this study reinforce those reported by Sakinah (2022), who demonstrated that the JSA method effectively identifies workplace hazards at each stage of an operational process. Although Sakinah's study focused on load-and-haul operations in the mining sector, whereas the present study examined pipe receiving activities within a warehouse environment, both studies confirm the value of task-based hazard analysis for identifying activity-specific risks and developing targeted control measures. Similarly, the present findings are consistent with those of Muhlas et al. (2025), who emphasized the importance of improving compliance with personal protective equipment (PPE) requirements and implementing safe work procedures to reduce occupational risks in fabrication workshops.

Furthermore, the results support the conclusions of Al Aqsa et al. (2024), who identified Job Safety Analysis as an effective safe work guideline that enhances workers' awareness of occupational safety and health while reducing unsafe behaviors. The present study also corroborates the findings of Saputri et al. (2024), who reported that the implementation of ISO 45001 improves the effectiveness of occupational risk management through systematic hazard identification, operational control, and continuous performance monitoring.

The principal contribution of this study lies in its integration of Job Safety Analysis (JSA) with an evaluation of compliance with ISO 45001:2018 within the specific context of pipe receiving operations. Unlike previous studies, which generally examined JSA or ISO 45001 independently across different industrial settings, this research directly links task-specific hazard identification with the relevant ISO 45001 clauses. This integrated approach provides a more comprehensive basis for developing risk control measures and offers practical recommendations for strengthening the Occupational Safety and Health Management System (OSHMS) at PT XYZ.

E. CONCLUSION

Based on the findings of this study on hazard identification in pipe receiving operations using the Job Safety Analysis (JSA) method and the ISO 45001:2018 framework at PT XYZ, it can be concluded that the receiving process comprises ten sequential work activities, each associated with distinct occupational hazards. These hazards include being struck by falling materials, sling pinch injuries, collisions with forklifts, slips caused by poor workplace conditions, falling loads during lifting operations, and impacts involving lifting equipment. Among all work stages, lifting and transporting pipes using a crane present the highest level of occupational risk because they involve suspended heavy loads and the operation of lifting equipment.

The hazard control measures developed through the JSA and aligned with ISO 45001:2018 include conducting toolbox meetings before work begins, performing routine inspections of cranes and lifting slings, implementing safe work procedures, ensuring the proper use of Personal Protective Equipment (PPE), installing barricades around lifting areas, improving communication between crane operators and riggers, strengthening supervision by supervisors and HSE officers, and periodically reviewing and updating JSA documentation. The conformity assessment indicates that most of the existing control measures implemented at PT XYZ are consistent with the requirements of Clause 6.1.2 (Hazard Identification and Assessment of Risks and Opportunities), Clause 8.1 (Operational Planning and Control), and Clause 9.1 (Monitoring, Measurement, Analysis, and Evaluation) of ISO 45001:2018. Nevertheless, the company has not yet obtained formal ISO 45001 certification and should further strengthen supervision of PPE compliance, adherence to established work procedures, and periodic evaluation of the effectiveness of existing risk control measures.

Based on these findings, it is recommended that PT XYZ consistently implement Job Safety Analysis (JSA) as a mandatory document before all pipe receiving activities are performed. The company should also conduct routine inspections of cranes, forklifts, slings, shackles, hooks, and wire ropes to ensure their operational integrity and safety. Furthermore, pursuing formal ISO 45001:2018 certification should be considered to strengthen the organization's Occupational Safety and Health Management System (OSHMS). Future research is recommended to incorporate other occupational risk assessment methods, such as Hazard Identification, Risk Assessment, and Risk Control (HIRARC) or Failure Mode and Effects Analysis (FMEA), for comparative analysis. Expanding the scope of investigation to other operational activities within PT XYZ would also provide a more comprehensive evaluation of the effectiveness of hazard control measures across the organization.

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