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Identification of Potential Hazards in Hazardous Waste Disposal Using Job Safety Analysis (JSA) At Infineon Technologies Batam

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Abstrak

PT Infineon Technologies Batam adalah perusahaan manufaktur yang dalam proses produksinya banyak menghasilkan limbah B3. Limbah B3 harus di kelola dengan tepat karena jika tidak dapat berpotensi membahayakan pekerja. Penelitian ini bertujuan mengidentfikasi potensi bahaya dan risiko menggunakan metode Job Safety Analysis (JSA) yang ada dalam urutan kerja, serta menentukan kriteria risiko, memberikan penilaian risiko dan pengendalian risiko guna menciptakan kesehatan dan keselamatan pada bagian hazardous waste management). Tahapan pengolahan data dimulai dari mengurutkan langkah pekerjaan, identifikasi bahaya dan risiko, penilaian risiko potensi bahaya dan menentukan usulan pengendalian potensi bahaya. Hasil penelitian ini di dapatkan bahwa potensi bahaya yang dapat menimbulkan cedera dan kecelakaan kerja pada hazardous waste management paling banyak adalah terkait dengan chemical spillage dan manual handling. Terdapat 10 pekerjaan memiliki nilai risiko 6 dan 2 pekerjaan memiliki nilai risiko 4. Peningkatan keselamatan kerja dapat dilakukan edukasi terutama kepada operator limbah dan melengkapi kabinet APD agar mudah dijangkau

Kata kunci: *Job Safety Analysis*, Limbah B3, Keselamatan dan Kesehatan Kerja, Potensi Bahaya

Abstract

PT Infineon Technologies Batam is a manufacturing company that produces a lot of hazardous waste in its production process. B3 waste must be managed properly because otherwise it can potentially endanger workers. This research aims to identify potential hazards and risks using the Job Safety Analysis (JSA) method that exist in the work sequence, as well as determining risk criteria, providing risk assessment and risk control in order to create health and safety in the hazardous waste management section.) The stages of data processing start from sequencing work steps, identifying hazards and risks, assessing the risk of potential hazards and determining proposals for controlling potential hazards. The results of this study found that the potential hazards that can cause injuries and work accidents in hazardous waste management are mostly related to chemical spillage and manual handling. There are 10 jobs that have a risk value of 6 and 2 jobs that have a risk value of 4. Improving work safety can be done by educating especially to waste operators and equipping PPE cabinets to be easily accessible.

Keywords: Job Safety Analysis, Hazardous Waste, Occupational Safety and Health, Potential Hazards

1. Introduction

Infineon Technologies Batam is one of the foreign manufacturing companies from Germany engaged in the semiconductor sector. Infineon exports more products for global distribution than domestic consumption. In its production process, Infineon produces a lot of hazardous waste. B3 waste is toxic and hazardous waste which if not handled properly can potentially endanger and risk workers. In doing their work, waste-related workers are likely to experience work accidents. Potential hazards that can

occur, for example, are eye or skin irritation due to contact with hazardous waste. Therefore, with the existence of these potential hazards, occupational health and safety (K3) control measures can be taken. Occupational Safety and Health (OSH) are all conditions and factors that can impact the occupational safety and health of the workforce and other people (contractors, suppliers, visitors and guests) in the workplace (ISO, 2007).

In addition, the hazardous waste storage area of Infineon Technologies Batam is located at the back of the company building, away from the crowd and the central work process of the company. There the waste is placed separately according to the type of waste. Waste packaging is also different according to the type of waste, some are placed in drums, jumbo bags and jerry cans. When the waste has finished being placed in its respective place, the TPS B3 door is closed to avoid potential hazards that may occur.

To minimize the hazards or risks that occur to workers, Infineon is committed to protecting its workforce through various efforts, one of which is by using the job safety analysis (JSA) method. Research conducted by Nurmayanti et al. (2023), Sulistyo et al. (2024). Faiq & Apsari (2024), Ghasemi et al. (2023), Abituta, M. H., & Yuamita, F. (2023). Identified potential hazards and risk analysis of work accidents in various industries or fields of work using the Job Safety Analysis (JSA) method to identify potential hazards, analyze risks, and offer recommendations for controls or preventive measures to improve work safety. The application of the JSA method aims to minimize the risk of work accidents and improve occupational safety and health conditions.

Lestari, D. A., Rizalmi, S. R. ., & Setiowati, N. O. . (2023), To overcome this challenge, a structured approach is a must in order to identify, analyze, and address potential risks in the work environment. This research has the main objective to conduct an in-depth identification of the various potential hazards associated with production process in the production house, and also to apply the Job Safety Analysis (JSA) method.

Based on the description above, the conceptual framework in this study can be seen in Figure 1.1

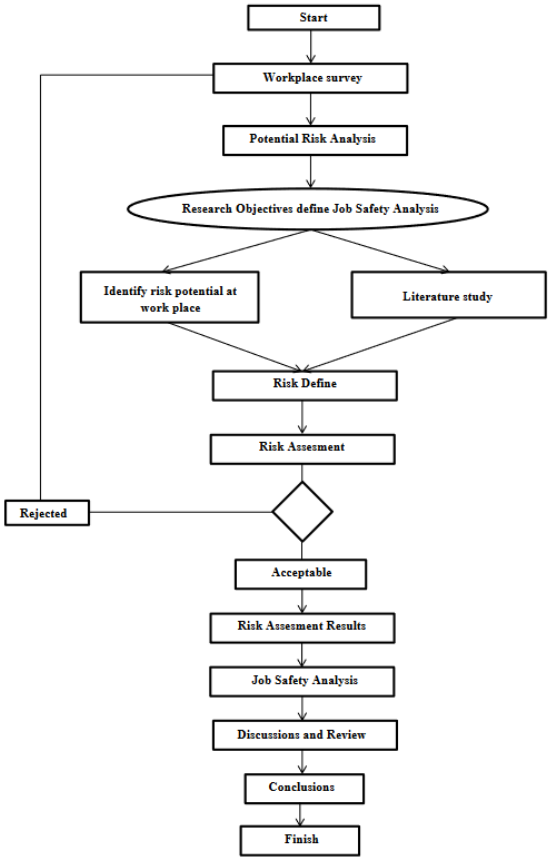

Figure 1.1 Conceptual Framework

2. Literature Review

Hazard

Hazards, according to Ministry of Health (MOH) regulation No. 48/2016, are intrinsic properties of a substance or process that can potentially cause damage or harm. This includes chemical (toxicity, corrosivity), physical (explosiveness, electricity, flammability), biological (infectious), and others. Hazards are defined as possible events that will occur and cause damage or loss. Hazards can also include potential causes of harm or hazardous situations, which are situations where exposure can cause occupational injury or illness. Hazards can occur anywhere in the workplace and the surrounding environment. Hazards can have serious effects if there is direct contact with the hazard. (Tranter, 1999).

Hazards classifies into 2 types, namely safety hazards and health hazards (WHS, 2015) :

a. Safety hazard is a potential direct risk hazard that can cause injuries such as burns and cuts. Examples include mechanical hazards, electrical hazards, fire hazards and explosion hazards.

b. Health hazard is a potential hazard that can have long-term effects on health and or cause occupational diseases. Examples include physical hazards, chemical hazards, ergonomic hazards, biological hazards and psychological hazards.

Risk

Risk is the chance of an event occurring that can have an effect on an object (AS/NZS, 2004). Risk is measured based on the value of likelihood (the possibility of an event occurring) and concequences (the impact caused by the event). Risk is a combination of probability and severity of an event.

Risk Management

Is a planned system effort to carry out risk control in a structured, planned and comprehensive manner in preventing accidents and occupational diseases within the scope of the company. OHS Risk Management refers to things that can endanger and harm the company. Uncontrolled occupational health and safety risks can threaten business continuity. Effective risk management results in a good level of performance and health from the activities carried out.

Risk control is one of the important and critical steps required in overall risk management. Risk control has a function to minimize or reduce the level of risk to a low level or a level that is in an acceptable place. Risk controls in risk management that can be applied include:

a. Elimination is a risk control method to minimize and eliminate a hazard. Elimination is done by eliminating existing risks.
b. Substitution is risk control by replacing materials, equipment or machinery with those that have a low risk level or are less dangerous. This risk control is done by replacing inputs and processes with lower risk ones.
c. Engineering is risk control by changing the structure of work objects to prevent labor from being exposed to potential hazards.
d. Administrative is risk control by reducing the risk of harm through procedures, regulations and signage (safety signs).
e. Personal protective equipment is a tool used to support work safety that protects parts of the body such as safety helmets, earbuds, and so on.

Job Safety Analysis (JSA)

Job safety analysis (JSA) is an effort to analyze the tasks and processes that exist in the industry (NOSA, 1999). Job safety analysis is one of the risk assessment and hazard identification systems whose implementation emphasizes the identification of hazards and risks that exist at every step of the job. Job safety analysis aims to enable workers to play an active role in the application of JSA in the work environment and increase awareness of work environment conditions to achieve safe work, protect the environment and minimize unsafe conditions and behavior in the work environment

3. Research Method

This research method is qualitative. This study used purposive sampling method in selecting research subjects. The purposive sampling method is one method of selecting research subjects by selecting samples based on the objectives and criteria needed.

Informants in this study are people who are related to object. The following informants or research subjects in table 3.1:

Table 3. 1 Research Subjects

No.	Position	Respondents
1	ESH Specialist	1
2	Hazardous Waste Supervisor	1
3	Hazardous Waste Operator	1
Total		3

4. Discussion and Results

Hazard and Risk Identification Discussion

Based on the results of the research analysis that has been obtained from the risk assessment of potential hazards in hazardous waste disposal Infineon Technologies Batam there are several jobs that have medium and low risk ratings. This is obtained from the results of interviews by research informants. The following are some of the causes of accidents at Infineon Technologies hazardous waste management based on the results of interviews with research

informants:

1. Spillage of hazardous waste brought to the storage area
2. Exposure to hazardous waste when checking hazardous waste
3. Hazardous waste that is accidentally mixed or placed in an inappropriate place
4. Tripping or falling while carrying the waste trolley
5. Falling drums or piles of jerry cans when checking or placing waste
6. Limbs pinched by hazardous waste boxes or drums
7. Hit by trucks or forklifts passing by in the hazardous waste transportation area
8. Hard wooden pallet corners hit limbs.

Hazard and Risk Identification Results

The following table 4.1 identifies the hazards and risks resulting from observations made at hazardous waste management Infineon Technologies Batam.

Table 4.1 Identification of potential hazards

List of jobs in order of work	Workers on duty	Hazard	Risk
Transporting B3 waste that has been separated from bins in production to TPS B3 using a trolley	Production Operator	Spillage of hazardous waste, Exposure to hazardous waste, Accidental mixing of hazardous waste, Tripping or falling while carrying a waste trolley, Foot or hand being pinched by a hazardous waste box, Hard corner of hazardous waste box hitting a limb	Explosion due to improperly stored segregation of hazardous waste, Eye/skin irritation due to contact with hazardous waste, Bruise/scratch/dislocation, Injury.
Putting B3 waste into each drum according to the description of the type of waste listed.	Production Operator	Spillage of hazardous waste carried, Exposure to hazardous waste, Accidental mixing of hazardous waste, Tripping or falling when carrying waste trolleys, falling hazardous waste drums, Feet or hands pinched by hazardous waste boxes, Hard corners of hazardous waste boxes hitting limbs, Falling or slipping when closing hazardous waste drums.	Explosion due to improper segregation of stored hazardous waste, Eye/skin irritation due to contact with hazardous waste, Leg injury due to accidentally being hit by a hazardous waste drum, Bruise/scratch/dislocation, Injury
Loading and unloading B3 waste ensures that it is in accordance with its type and is not mixed with other waste.	Waste Operator	Spillage of hazardous waste carried, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste boxes, Hard corners of hazardous waste boxes hitting limbs, Feet or hands caught in hazardous waste drums, Falling or slipping when closing hazardous waste drums.	Explosion due to improper segregation of hazardous waste stored, Eye/skin irritation due to contact with hazardous waste, Leg injury due to accidentally hit by hazardous waste drum, Bruise/scratch/dislocation, Injury
Organize hazardous waste from all departments by waste type.	Waste Operator	Spillage of hazardous waste carried, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste boxes, Hard corners of hazardous waste boxes hitting limbs, Feet or hands caught in hazardous waste drums, Falling or slipping when closing hazardous waste drums.	Explosion due to improper segregation of hazardous waste stored, Eye/skin irritation due to contact with hazardous waste, Leg injury due to accidentally hit by hazardous waste drum, Bruise/scratch/dislocation, Injury
Transferring full and tidied waste drums to wooden	Waste Operator	Spillage of hazardous waste carried, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste boxes,	Explosion due to improper segregation of hazardous waste stored, Eye/skin irritation due to contact with hazardous waste, Leg

List of jobs in order of work	Workers on duty	Hazard	Risk
pallets for transportation.		Hard corners of hazardous waste boxes on limbs, Feet or hands caught in hazardous waste drums, Falling or slipping when closing hazardous waste drums, Hard corners of wooden pallets on limbs	injury due to accidentally hit by hazardous waste drum, Bruise/scratch/dislocation, Injury
Wrapping the full waste transferred to wooden pallets with plastic wrap so that the waste does not fall after transportation.	Waste Operator	Spillage of hazardous waste carried, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste boxes, Hard corners of hazardous waste boxes on limbs, Feet or hands caught in hazardous waste drums, Falling or slipping when closing hazardous waste drums, Hard corners of wooden pallets on limbs	Explosion due to improper segregation of hazardous waste stored, Eye/skin irritation due to contact with hazardous waste, Leg injury due to accidentally hit by hazardous waste drum, Bruise/scratch/dislocation, Injury
Ensure there are no hazardous waste spills outside the hazardous area	Waste Operator	Spillage of hazardous waste carried, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste boxes, Hard corners of hazardous waste boxes on limbs, Feet or hands caught in hazardous waste drums, Falling or slipping when closing hazardous waste drums, Hard corners of wooden pallets on limbs	Explosion due to improper segregation of hazardous waste stored, Eye/skin irritation due to contact with hazardous waste, Leg injury due to accidentally hit by hazardous waste drum, Bruise/scratch/dislocation, Injury
Cleaning hazardous waste bins	Waste Operator	Spillage of hazardous waste, Exposure to hazardous waste, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste drums, Falling or slipping when cleaning up hazardous waste spills, Hard corners of wooden pallets hitting the limbs.	Eye/skin irritation due to contact with hazardous waste, Leg injured due to accidental hit by hazardous waste carboys
Housekeeping the entire hazardous waste storage area and ensuring the cleanliness of the area	Waste Operator	Spillage of hazardous waste, Exposure to hazardous waste, Accidental mixing of hazardous waste, falling hazardous waste drums, Feet or hands caught in hazardous waste drums, Falling or slipping when cleaning up hazardous waste spills, Hard corners of wooden pallets hitting the limbs.	Leg injury due to accidental hit by hazardous waste carboy, Eye/skin irritation due to contact with hazardous waste
Supervise the transportation of waste carried out in and check B3 waste that will be disposed of in TPS B3.	ESH Specialist/ Engineer	Hit by trucks or forklifts passing by in the hazardous waste transportation area, Legs or hands pinched by hazardous waste drums while checking the waste to be transported, Hard corners of wooden pallets hitting limbs, Exposure to hazardous waste while checking the waste to be transported	Injury to limbs, Eye/skin irritation due to contact with hazardous waste, Bruises/scratches/injuries
Transporting waste to the waste transportation truck.	Warehouse operator	Hit by hazardous waste transported by forklift , Brake system malfunction during forklift operation, Fall while driving a forklift	Limb injury, Eye/skin irritation due to contact with hazardous waste, Bruise/scratch/injury, Bone fracture

List of jobs in order of work	Workers on duty	Hazard	Risk
Manage the entry and exit permits of waste transportation vendors and coordinate with the security team.	ESH Specialist/ Engineer	Being hit by trucks or forklifts passing by in the work area	Limb injuries, Bruises/scratches/injuries, Fractures

Risk Assessment Discussion

Risk assessment is carried out to identify the value of potential risks and hazards of accidents in the workplace. Determination of the risk value can be based on the likelihood of occurrence and severity that occurs. The risk assessment table is obtained through the ESH department based on the company's risk assessment matrix. The company's risk assessment matrix is based on IMPRES (Infineon Integrated Management Program for Environment, Energy, Safety and Health) and Government Regulation of the Republic of Indonesia Number 50 of 2012 concerning the implementation of occupational safety and health management systems. The assessment parameters can be seen in tables 3, 4, 5, and 6 below.

Table 4.2 Likelihood Parameters Category

Assigned Value	Level	Definition
6	Very High	Incident / Failure has inevitably occurred, likely to occur within 1 month.
5	High	Incident / Failure has frequently occurred, tends to occur within 3 months.
4	Moderate	Incident/Failure has repeatedly occurred, could happen within 6 months.
3	Low	Incident/Failure has occasionally occurred, may occur within one year.
2	Very Low	Incident/Failure has occurred, may occur after several years.
1	Remote	Incident/Failure has ever happened.

Table 4.3 Severity Parameters Category

ASSIGNED VALUE	LEVEL	DEFINITION INJURY
6	DISASTROUS	Fatality
5	CRITICAL	Many Parts of bodily injury & or Permanent/Irreversible loss of bodily functions
4	SERIOUS	Several Parts of bodily injury & or injur 5 or more Man Day Lost
3	SIGNIFICANT	Part of bodily injury & or Injury cause Man Day Lost less than 5 days
2	MINOR	Little bodily injury & or First Aid Treatment & Time off within the day is given & permitted
1	NEGLIGIBLE	No bodily Injury & or Incidental / mishap / near miss

Table 4.4 Risk Level Category

Calculated Value	Result	Recommended Precautionary Action
101 ~ 144	Risk relevant to the health	Improve safety standards (technical, organizational), provide proof of effectiveness
37 ~ 100	Normal risk without relevance to the health	Establish possible minimization potential - intensify control cycles
1 ~ 36	No Risk	Maintaining of safety standards

Table 4.5 Risk Assement Matrix

Likelihoood	Severity					
	6	5	4	3	2	1
6	36	30	24	18	12	6
5	30	25	20	15	10	5
4	24	20	16	12	8	4
3	18	15	12	9	6	3
2	12	10	8	6	4	2
1	6	5	4	3	2	1

Risk Assessment Result

The following table 7 shows the results of risk assessment on hazardous waste disposal of Infineon Technologies Batam.

Table 4.6 Risk Assessment of Hazardous Waste Disposal

List of jobs in order of work	L	S	Risk Level
Transporting B3 waste that has been separated from the production waste site to TPS B3 using a trolley	**2**	**3**	**6**
Putting B3 waste into each drum according to the description of the type of waste listed.	**2**	**3**	**6**
Loading and unloading of B3 waste is ensured according to its type and not mixed with other waste.	**2**	**3**	**6**
Organize hazardous waste from all departments by waste type.	**2**	**3**	**6**
Transferring the filled and trimmed waste drums to wooden pallets for transportation.	**2**	**3**	**6**
Wrapping all waste transferred to wooden pallets with plastic wrap to prevent the waste from falling out after transportation.	**2**	**3**	**6**
Ensure there are no hazardous waste spills outside the hazardous area	**2**	**3**	**6**
Cleaning hazardous waste bins	**2**	**2**	**4**
Revamping the entire hazardous waste storage area and ensuring the cleanliness of the area.	**2**	**2**	**4**
Supervise the transportation of waste carried out in and inspect B3 waste that will be disposed of in the B3 TPS.	**2**	**3**	**6**
Transporting waste to the waste transportation truck.	**2**	**3**	**6**
Arrange entry and exit permits for waste transporters and coordinate with the security team.	**2**	**3**	**6**

Based on the results of table 4.6 risk assessment above, it can be seen that hazardous waste management at Infineon Technologies Batam has no priority risk relevant to the health or potentially high risk. All work processes have a low priority value or no risk. However, the potential hazard if there is an error or accident can cause danger or fatal accident. Therefore, all work processes in hazardous waste management have a high level of risk and danger to the environment, company assets and work but risk control has been carried out in accordance with very high safety standards so that workers are aware of potential risks and dangers around.

Risk Control Discussion

Each stage of work has risks and hazards that must be minimized. Risk control can be determined using the control hierarchy. The control hierarchy is the basic stage in controlling risks and reducing the impact that can be caused by workers or stages of work. There are 5 hierarchies of control, namely elimination, substitution, engineering control, administrative control and PPE (use of personal protective equipment).

There is an effectiveness assessment matrix of risk control as in table 4.7 same as the risk assessment matrix table 4.5, the risk control matrix is also obtained from the ESH department which is made based on IMPRES and legal references to government regulations. The risk control matrix is made to see how effective the risk controls that have been determined are.

Table 4.7 Risk Control Effectiveness Matrix

Assigned Value	Level	Definition
4	**Least Effective**	Provision of approved personal protective equipment.
		Adoption of safe work systems and practices that eliminate or minimise the risk to health.
3	**Low Effective**	Application of engineering control equipment.
		Modification of the process parameters.
2	**High Effective**	Isolation of the work to control the emission of chemicals hazardous to health.
		Total enclosure of the process and handling systems.
1	**Very High Effective**	Substitution of less hazardous chemicals for chemicals hazardous to health.
		Elimination by equipment

Assigned Value	Level	Definition
		design through interlocking system, auto power cutoff.
		Elimination of chemicals hazardous to health from the place of work.

Risk Control Results

The following is table 4.8 of risk control determined from the research results.

Table 4.8 Risk Control Result

Work list by work order	Control measures required to eliminate/reduce risk	Effectiveness Level
Transporting B3 waste that has been separated from production waste bins to B3 TPS using a trolley	**Engineering:** Compatible segregation chambers for hazardous waste, Automatic sprinkler system, Lightning rod installation, 1 hour rating firewall, Hazardous waste temporary storage floor designed with 1% ramp to second shelter, Second shelter provided to contain hazardous waste spills. **Administrative Control:** Label and mark indications for segregation based on respective MSDSs **PPE:** PPE provision, Emergency spill kit, Emergency eyewash shower in case of accidental contact.	**3**
Putting B3 waste into each drum in accordance with the description of the type of waste listed	**Engineering:** Compatible segregation chambers for hazardous waste, Automatic sprinkler system, Lightning rod installation, 1 hour rating firewall, Hazardous waste temporary storage floor designed with 1% ramp to second shelter, Second shelter provided to contain hazardous waste spills. **Administrative Controls:** Labeling and marking of segregation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when necessary. **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash shower in case of accidental contact, Wearing safety shoes	**3**
Loading and unloading of B3 waste is ensured according to its type and is not mixed with other waste.	**Engineering**: Compatible segregation chambers for hazardous waste, Automatic sprinkler system, Lightning rod installation, 1 hour rating firewall, Hazardous waste temporary storage floor designed with 1% ramp to second containment, Second containment provided to contain hazardous waste spill. **Administrative Controls:** Labeling and marking of segregation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when necessary. **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash shower in case of accidental contact, Wearing safety shoes	**3**
Organize hazardous waste from all departments by waste type	**Engineering:** Compatible segregation chambers for hazardous waste, Automatic sprinkler system, Lightning rod installation, 1 hour rating firewall, Hazardous waste temporary storage floor designed with 1% ramp to second shelter, Second shelter provided to contain hazardous waste spills. **Administrative Control:** Label and mark indications for segregation based on respective MSDSs **PPE:** PPE provision, Emergency spill kit, Emergency eyewash shower in case of accidental contact.	**3**
Transferring filled and trimmed waste drums to wooden pallets for transportation	**Engineering:** Compatible segregation chambers for hazardous waste, Automatic sprinkler system, Lightning rod installation, 1 hour rating firewall, Hazardous waste temporary storage floor designed with 1% ramp to second shelter, Second shelter provided to contain hazardous waste spills. **Administrative Controls:** Labeling and marking of segregation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when necessary. **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash	**3**

Work list by work order	Control measures required to eliminate/reduce risk	Effectiveness Level
	shower in case of accidental contact, Wearing safety shoes	
Wrapping all waste transferred to wooden pallets with plastic wrap so that the waste does not fall after transportation	**Engineering: The** hazardous waste temporary storage floor is designed with a 1% ramp to the second storage**, The** second storage is provided to contain hazardous waste spills. **Administrative Control:** Labeling and marking of separation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash shower in case of accidental contact, Wearing safety shoes	**3**
Ensure there are no hazardous waste spills outside the hazardous area	**Engineering: The** hazardous waste temporary storage floor is designed with a 1% ramp to the second storage**, The** second storage is provided to contain hazardous waste spills. **Administrative Control:** Labeling and marking of separation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash shower in case of accidental contact, Wearing safety shoes	**3**
Cleaning hazardous waste bins	**Engineering: The** hazardous waste temporary storage floor is designed with a 1% ramp to the second storage**, The** second storage is provided to contain hazardous waste spills. **Administrative Control:** Labeling and marking of separation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash shower in case of accidental contact, Wearing safety shoes	**3**
Revamping the entire hazardous waste storage area and ensuring the cleanliness of the area.	**Engineering: The** hazardous waste temporary storage floor is designed with a 1% ramp to the second storage**, The** second storage is provided to contain hazardous waste spills. **Administrative Control:** Labeling and marking of separation indications based on respective MSDS**,** Correct manual handling, Use of trolleys and handjacks when **PPE:** Provision of PPE, Emergency spill kit, Emergency eyewash shower in case of accidental contact, Wearing safety shoes	**3**
Supervise the transportation of waste carried out in and inspect B3 waste that will be disposed of in TPS B3.	**Administrative Control:** Pay attention to field conditions**,** correct manual handling **PPE:** Using PPE	**3**
Transporting waste to the garbage truck	**Engineering:** Non-slip surface for footing **Administrative Controls:** Pre-operation brake function test**,** Internal inspection every month, Routine maintenance by the vendor every 3 months**, Maintain all** three contact points when on or off, Maintain the stability of the lifted material, Maintain the height of the stacking material, Ensure that the forks of the forklift are not damaged, Forklift inspection and recertification every year. **PPE:** Using PPE	**3**
Manage the entry and exit permits of waste transporters and coordinate with the security team.	**Administrative Control:** Pay attention to field conditions **PPE:** Using PPE	**3**

Based on the results in table 4.8 risk control, it can be seen that the effectiveness value is 3 with a low effective description because all work uses the hierarchy of engineering control, administrative control and PPE (use of personal protective equipment) not using elimination and substitution.

Elimination is risk control by eliminating existing hazards and risks by eliminating stages of work or eliminating tools and machines that are very unlikely to be carried out. Substitution is risk control by replacing materials, tools/machines or stages of work to those that are less risky and also very unlikely to be done because everything is set according to company standards and SOP.

5. Conclusion and Suggestion

Based on the research that has been conducted and the discussion that has been described related to hazards and risks in hazardous waste disposal at Infineon Technologies Batam, the conclusion is :

1. Potential hazards that can cause injuries and work accidents in hazardous waste disposal are mostly related to chemical spillage and manual handling.
2. Risk assessment of hazardous waste disposal at Infineon Technologies Batam is 10 jobs have a risk value of 6 and 2 jobs have a risk value of 4. Both have a low risk value description, which means they are well controlled and
3. Risk control in hazardous waste disposal at Infineon Technologies Batam is using the hierarchy of control that are engineering control, administrative control and PPE (use of personal protective equipment).

Based on the above conclusions, suggestions related to the research that by providing displays related to K3 signs. And also workers can use Personal Protective Equipment (PPE) which can maintain the safety of workers from potential hazards that can cause Occupational Diseases (PAK) and death to workers. As in Lestari, D. A., Rizalmi, S. R. ., & Setiowati, N. O. . (2023) that providing personal protective equipment is one of the steps that able to maintain worker safety from potential hazards and occupational diseases (PAK).

References

Abituta, M. H., & Yuamita, F. (2023). Analisis Risiko Kesehatan Dan Keselamatan (K3) Dengan Metode Job Safety Analysis Pada Kegiatan Penimbunan (Disposal) PTX. *Cosmic Jurnal Teknik, 1*(2), 16-24. Diakses dari https://journal.aira.or.id/index.php/cosmic/article/view/648/180

AS/NZS. (2004). Risk Management Guidelines Companion to AS/NZS 4360:2004. Sydney: Standard New Zealand Database.

Faiq, A. G., & Apsari, A. E. (2024). *Analisis risiko keselamatan kerja pada bagian produksi dengan metode Job Safety Analysis dan Hazard and Operability Study*. *Jurnal Ilmiah Nusantara (JINU), 1*(4). Kampus Akademik Publishing. https://ejurnal.kampusakademik.co.id/index.php/jinu/article/view/1943/1762

Ghasemi, F., Doosti-Irani, A., & Aghaei, H. (2023). *Applications, shortcomings, and new advances of Job Safety Analysis (JSA): Findings from a systematic review*. *Safety and Health at Work, 14*(2), 153-162. https://www.sciencedirect.com/science/article/pii/S2093791123000227

Ilyas Hamdani, Muhammad. (2024). Analisis Potensi Bahaya Menggunakan Metode JSA dan HIRARC untuk Mengurangi Angka Kecelakaan Kerja pada Area Workshop Fabrikasi PT. ABC.

ISO. (2007). Occupational Health and Safety Management System Requirement.

Lestari, D. A., Rizalmi, S. R. ., & Setiowati, N. O. . (2023). Identifikasi Risiko Kecelakaan Kerja Menggunakan Metode Job Safety Analysis (JSA) pada Rumah Produksi Tahu . *G-Tech: Jurnal Teknologi Terapan, 7*(4), 1335–1344. https://doi.org/10.33379/gtech.v7i4.3074

NOSA. (1999). Risk Management Guidelines

Nurmayanti, D., Annisa, P. J., Hermiyanti, P., & Winarko. (2023). *Assessment of potential hazards with job safety analysis on workers at cotton and gauze industry*. In *Proceedings of the 6th International Conference of Health Polytechnic Surabaya (ICoHPS 2023)*. Atlantis Press. https://www.atlantis-press.com/proceedings/icohps-23/125995913.

S. Umaindra, M. A, Saptadi (2018). Identifikasi dan Analisis Risiko Kecelakaan Kerja dengan Metode

JSA (Job Safety Analysis) Di Departemen Smoothmill PT Ebako Nusantara. Ind. Eng. J.

Sulistyo, A. B., Putra, N. P., Wijaya, H., & Hidayanti, N. (2024). *Improving the implementation of occupational health and safety of construction companies using the Job Safety Analysis (JSA) method (study case at PT Arto Moro Sentosa)*. *Jurnal Optimasi Sistem Industri, 17*(1). https://doi.org/10.24843/JOSI.2024.v17.i01.p01..

WHS. (2015). hazard Identification, Risk assessment and Control Procedure. Sydney : Western Sydney University