

Hazardous And Toxic Waste (B3) Standard Design for Temporary Storage for Oil and Gas

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Abstract

One of the main activities in the oil and gas industry is the maintenance of diesel engines. There is a special process called preventive maintenance with regular oil changes. The process of changing oil is done regularly which results in B3 waste in the form of waste oil. Considering these aspects, the purpose of this research is to identify the temporary storage of petroleum waste for oil and gas based on the literature and the design of the B3 Temporary Waste Storage (TWS). The method used is descriptive qualitative methodology. The data refers to government regulations that have been made in order to create a safe, solicitous and orderly life. The results of these calculations are used as a reference in the design of the TWS, where the maximum waste capacity for the B3 Solid Waste Warehouse is 4.000 tons and for the B3 Liquid Waste Warehouse is 4.000 liters, and the building area of the B3 waste TWS is 108 m². The layout design for new B3 waste is done based on suitability of characteristics B3 waste with a suitable building design (may combined in placing packaging waste).

Keywords: B3; Oil; Waste; Oil and gas; TWS

1. Introduction

In Indonesia, the energy use is still dominated by the use of fossil-based energy, especially petroleum fuels. The demand equation based on fossil fuels has led to rapid development of the oil and gas industry (Al-Badi & AlMubarak, 2019). Oil and gas are natural resources needed by most human activities. The industry of oil and gas is one of the sectors that provide large foreign exchange and the mainstay of the economy in Indonesia. The existence of this industry is having a positive impact on the economy and the welfare of the community (Loe & Kelman, 2016). However, the production activities also have negative impact on the environment if not managed properly (Sigman et al., 2010).

B3 waste (*Bahan Berbahaya dan Beracun*/toxic and hazardous waste) is the remaining substances, energy or other components that pollute and/or damage the environment. As in Government Regulation No.101/2014 concerning management of Toxic and Hazardous Waste (B3), that the waste which originating from the oil and gas industry is categorized as B3 waste because its nature and the concentration can endanger the environment. B3 wastes can be generated from daily activities' waste, such as expired medicines, detergents, empty aerosol cans, and others (Iswanto et al., 2016; Ruslinda & Permadi, 2018)

The B3 waste is a problem that needs attention especially for a company that engaged in oil and natural gas sector. This company carried out natural gas and oil distribution activities, which its wastes are often polluted the environment around. This was in accordance with Ichtiakhiri and Sudarmaji (2016) statement that hazardous waste disposal case and toxic which is discharged into

the environment is a source of pollution and destruction (Ichtiakhiri & Sudarmaji, 2016). The series of natural gas distribution activity is one of the potential activities in producing B3 waste (Taufan & Purwanto, 2018). B3 is a primarily hazardous waste that need to be dumped at the manufacture point or either disposed via incinerators on-site at PHCS (medical facilities) or via registered waste companies (Irawan et al., 2019). One of the dangerous B3 waste is lubricating oil. Based on Government Regulation No. 101 of 2014, lubricating oil waste is classified according to its source, including B3 type 2 waste oil with the waste code of B105d. In addition, according to the characteristics of B3 waste, used lubricating oil is considered toxic because it contains pollutants that are dangerous to humans and the environment. If the pollutants enter the body through breath, skin or mouth, it will cause death or serious disease. The condition of B3 waste due to lubricating oil has not received proper handling (Basuki & Irwanda, 2018). Based on these problems, a method of identifying hazards has emerged, and a temporary storage area for lubricants has been designed to meet the requirements of applicable standards, thereby reducing or minimizing potential hazards is might occur (Rout & Sikdar, 2017).

Article 59 of Law No. 32/2009 on Environmental Protection and Management stipulates that everyone who generates B3 waste has an obligation to manage the waste. In this case, B3 waste management is a series of activities carried out in accordance with Government Regulations 101/2014, involving reduction, storage, collection, transportation, usage, processing and landfilling (Pratama et al., 2015). PT. Perusahaan Gas Negara (Indonesian natural gas transportation and distribution company), for example. This company won the GREEN PROPER achievement in 2019 because it has managed the environment in accordance with the basic principles of the company appraisal program implemented by the Ministry of Environment and Forestry (KLHK). Some hazardous waste are generated by this company including lubricating oil, used batteries, used light bulbs, used cloths and detergents. These variety of wastes can cause explosive, flammable, reactive toxic, and corrosive reaction. As an industry that generates B3 waste, it is obliged to manage B3 waste in accordance with applicable government regulations. Hence, PT. Perusahaan Gas Negara must be treated and controlled the wastes by management and treatment according to characteristics of the waste. B3 waste management itself requires special attention before it is returned to the environment due to prevent any negative impacts to both environment and humans (BulletinSafety, 2011). The work of B3 waste management aimed to achieve a commitment to sustainable and environmentally friendly development.

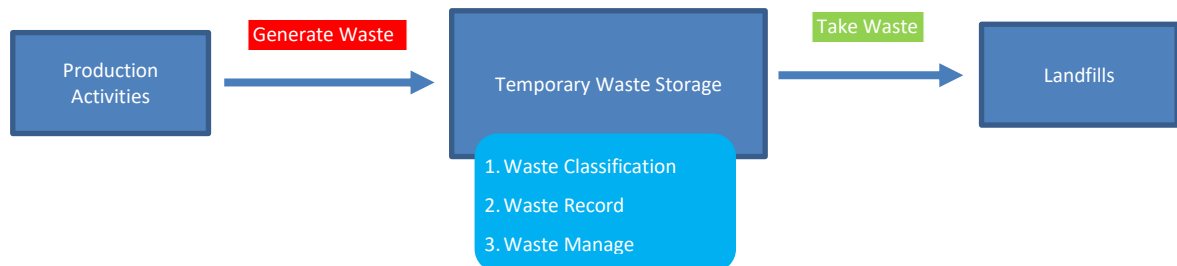
Based on the explanation above, this study tried to identify the temporary storage of petroleum waste for oil and gas based on the literature and the design of the B3 Temporary Waste Storage (TWS).

2. Methodology

The method used in this study is descriptive qualitative methodology. Descriptive qualitative methodology is a research method that aims to describe current or past phenomena (Sugiyono, 2016). The data is collected through government regulations due to create a safe, solicitous, and orderly life. Requirements for waste storage buildings of B3 waste materials is carried out in accordance with the requirements of the Bapedal Number Head Act. 01/1995 on the procedures and technical requirements for the storage and collection of hazardous and toxic wastes (Risnandar, 2014).

The characteristics, symbols, and labels of wastes are used to characterize B3 wastes (Wuryanti, 2016). The manufacturing method of hazardous waste symbols and labels refers to the 2013 Government Regulation No. 14 concerning on the symbols and labels for hazardous and toxic substances. The label of B3 waste includes the B3 identification label, which is used to mark the label of empty packaging and label the bottle cap. It is suitable for all materials to be imported, which have been accumulated and become output within a certain period of time (Murdi, 2007). Temporary storage (TWS) of building area requirements can be determined in a variety of ways

based on pallet size, packaging size, and considering the margin of a forklift as a means of transportation. In addition, in the building, the attention must be paid to other facilities, such as the need for ventilation, lighting and also the need for APAR (*Alat Pemadam Api Ringan*/Fire Extinguisher).



3. Result and Discussion

3.1 Hazardous Waste Identification

Identifying B3 waste is an important and fundamental thing in providing information prior to submission to the waste manager. In waste identification, it is required an identification on hazardous waste procedure which involving the environment workers, users and HSSE leader. The environmental workers and users can identify the type of B3 waste by adjusting the type, code and category of the B3 waste listed in the identification table generated by PT. Perusahaan Gas Negara. If no results are found in the table, then B3 waste is identified using toxicological test based on the sources and/or the dangerous level on category 1 and 2 written on the regulations, material safety data sheet (MSDS) and risk assessment (AMDAL, UKL-UPL, Risk Register) should be implemented. However, if the waste is still not listed in types of B3 waste, the determination of the B3 waste category is carried out using the procedure written in the Government Regulation No. 101/2014.

After identifying the hazardous waste then environment workers give reports on the type, source and category of B3 waste to the HSSE leadership for review. Then the HSSE leadership together with the user conduct management planning on B3 waste. HSSE leaders have the obligation to review the type, source and category of B3 waste with minimum once a year or if there is an operational changes causing in environmental impacts.

According to Government Regulation No.101/2014 B3 waste can be identified based on source, characteristic test, and toxicity test. B3 waste can be distinguished into two sources; (1) unspecific source or the waste which does not come from the main process and (2) specific source or B3 waste originating from its main activities and chemicals. Based on Government Regulation No.101/2014, the determination of B3 waste consists of category 1 and 2, where category 1 is B3 waste which is acute in the sense and has a direct impact on humans and the environment, whereas category 2 has a delayed effect and has no direct impact on humans and the environment. If the identification is not included in the list of B3 waste types can be done through a characteristic and toxicological test using a determination procedure.

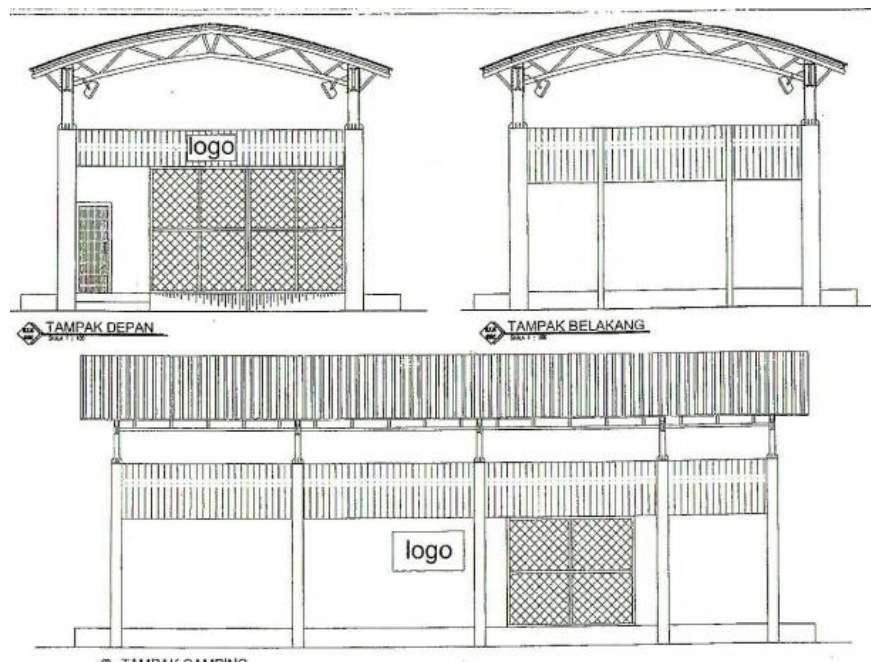


Figure 1. Standard Design B3 Waste From front, back, side

The packaging of B3 waste in Indonesia is regulated in Kep01/Bapedal/09/1995. The shape, size and material of B3 waste packaging are adjusted to the characteristics of the B3 waste by considering the safety and ease of handling, such as the effect of expansion, gas formation and pressure rise during storage.

3.2. List of Building Design Parameters/Benchmarks

- a. Land area including for storage buildings and other facilities at least 1 (one) hectare (Kepka Bapedal No.1/1995).
- b. The locations must be quite far from public facilities and certain ecosystems. The closest distance allowed is:
 - 1). 150 meters from the main road or toll road; 50 meters from the other road,
 - 2). 300 meters from public facilities such as; residential areas, commerce, hospitals, services health or social activities, hotels, restaurants, facilities religion, educational facilities, etc (Kepka Bapedal No.1/1995).
- c. Equipped with a container for anti-spilled / spilled waste designed in such a way as to make it easier to be lifted up (Kepka Bapedal No.1/1995).
- d. The B3 waste collection building is designed for storing 1 (one) waste characteristic based on Kepka Bapedal No.1/1995.
- e. If the building is adjacent to another warehouse building, then a separation wall or fireproof wall partition should be made with requirements as; (1) Reinforced concrete walls with a minimum thickness of 15 cm, and (2) Red brick wall with a minimum thickness of 23 cm, Block (solid) boneless with a thickness of min 30 cm (Kepka Bapedal No.1/1995)
- f. For structural stability in the fire retaining wall it is recommended used reinforced concrete poles that are not penetrated by cables electricity and or sparks (Kepka Bapedal No.1/1995).
- g. Protected from the ingress of rainwater either directly or indirect (Kepka Bapedal No.1/1995).
- h. The roof support frame is made of non-combustible material and is made without ceiling and has an adequate air ventilation system (Kepka Bapedal No.1/1995).
- i. Applying gauze or other material to prevent birds from entering or other small animals into the storage room (Kepka Bapedal No.1/1995).

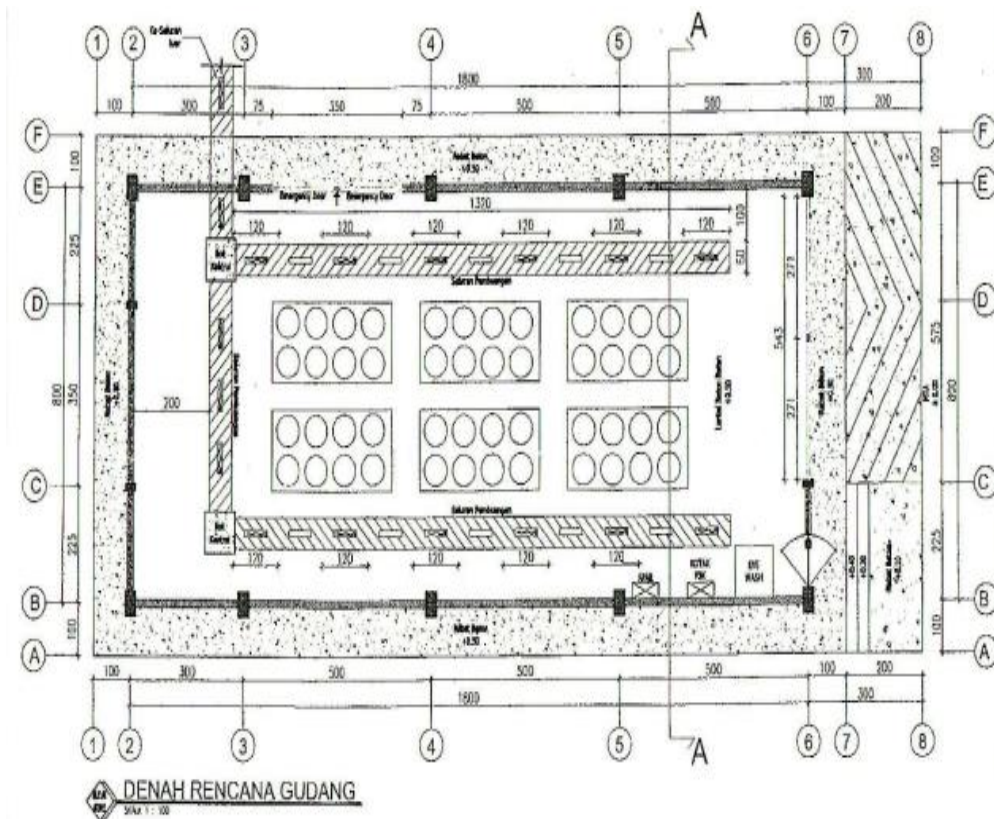


Figure 2. B3 Waste Storage Place Top View

3.3. List of Building Design Parameters/Benchmarks

- 1). Location for storing hazardous waste
- 2). Hazardous waste storage facilities that is suitable for: (a) Amount of hazardous waste, (b) Characteristics of hazardous waste, (c) Equipped with efforts to control environmental pollution, (d) Emergency response equipment

3.4. List of Building Design Parameters/Benchmarks

- 1). Flood free and not prone to natural disasters
- 2). If the hazardous waste storage location is not flood-free and prone to natural disasters, the hazardous waste storage location must be engineered with technology for environmental protection and management
- 3). The location for the hazardous waste storage must be under the control of every person who generates the waste.
- 4). Building a hazardous waste storing with minimum storage facility requirements, such as the design and construction are able to protect B3 waste from rain and sunlight, having lighting and ventilation, and having a drainage channels and reservoirs.

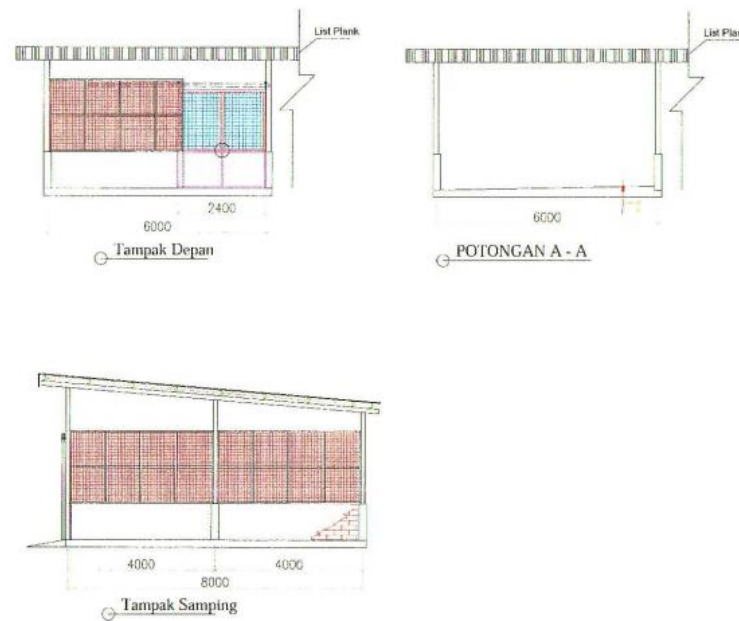


Figure 3. Side Front View Pieces.

Based on the government regulation No. 101/2014, lubricating oil waste is included in the hazard category 2 since the toxicological test result had value of LD 50 greater than 50 mg / kg of body weight of the tested animal and smaller than 5000mg / kg of body weight of the tested animal. The presence of used lubricating oil has impact on health, such as respiratory tract irritation, skin irritation and allergies, and even eye irritation. The used lubricating oil had maximum saving time for 365 days since the waste is generated, while its maximum production as much as 50 Kg / day. In addition, a mass scale is needed to determine the storage capacity.

3.5. Hazardous Waste by Source

According to Government Regulation No. 85/1999 cited in Yulinah (2001), B3 waste can be identified based on the following conditions;

- Hazardous waste from non-specific sources, such as waste generated from maintenance tools, cleaning, corrosion prevention (corrosion inhibitor), descaling, packaging and other activities.
- B3 waste from a specific source, such as B3 waste from an industrial process or activities that can specifically be determined based on scientific studies.
- B3 waste caused by expired chemicals, used packaging, and waste products that do not meet specifications or cannot be used again, will be included as other B3 wastes that needs to be managed.

3.6. Compatibility / Suitability of Hazardous Waste

When storing B3 waste in a building/warehouse, the storage must match the compatibility list between the characteristics of one type of B3 waste and other B3 waste. The purpose of this grouping is to determine which B3 waste is suitable and not suitable for storage in a warehouse B3 waste

4. Conclusion

New design of the building/warehouse for B3 waste storage PT. Perusahaan Gas Negara is composed of two parts, namely, a solid B3 waste warehouse and a B3 liquid waste warehouse. The building specifications are 18 meters in length, 6 meters in width, and 5 meters in height. The

layout design of the new B3 waste is based on the suitability of the characteristics of the B3 waste and the appropriate building design (which can be used in combination to place packaging waste). The capacity of B3 waste packaging in the architectural design of B3 solid waste warehouse design is 4,000 tons for storage and placement, and 4,000 liters for B3 liquid waste warehouse design. The TPS of B3 waste is also equipped with a fire detection and alarm system to prevent B3 waste TPS from catching fire in the form of fire detectors and smoke detectors. Regarding the corrective actions for B3 TPS, four APARs have been completed. This research is useful for other companies as a reference for building standard Temporary Waste Storage and comply with government regulations.

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