
LAYOUT ANALYSIS OF EQUIPMENT STORAGE AREA TO CREATE SAFE FLOW IN AIRPORT

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Abstract

The flow access road in the airport make-up area still has obstacles from many Grounds Support Equipment (GSE) scattered during operational and non-operational hours that can be a hazard endangering ground handling officers and passengers. This study aims to overview the problems in the make-up area of Jenderal Ahmad Yani Semarang International Airport and provide a solution with a new layout of GSE to make a safe flow in the make-up area. This research used descriptive qualitative methods, data collection by observation, interview, and documentation with analytics design by Miles and Huberman. The solution to the problem in this study is designing a new eastern equipment parking area layout by optimizing the empty land of former containers and providing land for Baggage Carts (BCT) to make it tidier. The conclusion of this study is a layout design of the equipment storage area that can optimize the empty land of the former container into additional land to make equipment area storage more efficient and safe. The researcher also provides land for baggage carts. Hence, their placement is neater to avoid becoming an obstacle and suggests that third parties consider this research, which can also be applied at Jenderal Ahmad Yani Semarang International Airport.

Keywords: *Layout, Equipment Storage Area, Ground Support Equipment*



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Introduction

The development of the Ground Handling Services business in the aviation service industry is a very tight competition in the world of aviation services nationally and internationally (Oya et al., 2022). This condition causes demands on the quality of reliable, quality, and professional land service handling services. Flight services include pre-flight services, in-flight services, and post-flight services. One form of flight services is ground handling services, including handling passengers, baggage, cargo, post, and aircraft (Agusinta et al., 2021; Yuliana, 2017)

Indonesian flights have started operating normally again, so airports in Indonesia also need to improve their services. In the New Normal era of the COVID-19 pandemic, the aviation industry began to rise again, which increased the number of air transportation passengers, such as airplanes (Irawan et al., 2022). With the current limitations, airports must continue innovating in developing their services (Puspitasari, 2022). As we know, the airport is an area of land and water with specific boundaries. It is used as a place for landing and taking off aircraft, taking off passengers, loading and unloading goods, and a place to stay and unload intermodal transportation (Rizki et al., 2020). They were equipped with safety and security devices, aviation security measures, basic facilities, and other supporting equipment.

The place where the luggage of departing passengers is processed before being loaded into the aircraft is called the Make-up area (Rahimudin et al., 2023). An Ideal condition of the make-up area is each type of GSE has a clear perspective so that it is easy to get in and out during operational and non-operational hours so that if the GSE is not in use, it is not scattered and endangers other GSEs that are operating at Jenderal Ahmad Yani Semarang International Airport, the make-up area is located near the Equipment Storage Area (ESA) east. An equipment staging area or clearance area is a designated area where equipment can be staged before the arrival or departure of an aircraft. Defined by a broken white/red/white line, an equipment storage area means A designated area where equipment can be stored. Baggage carts whose placement does

not match the existing signage sometimes hamper flow in the make-up area. So, based on observation conducted in Jenderal Ahmad Yani Airpot Semarang, every Baggage Cart (BCT) needs land to get BCT parking. This disruption of the flow of movement in the Make-up area is continuous/repeated systematically. This BCT deployment violates the applicable standard operating procedure. If this problem continues, it is likely to become dangerous in the future. 64 GSE accidents occurred between 2014 and 2016, with a total loss of \$12.3 million (Bonita et al., 2023).

There is also free land around the eastern EPA where used containers are proposed. The area of this free land is 14x14 M, which can be optimized to increase the Equipment storage area again. This land is also close to GSE's make-up business area, so it could be an opportunity to solve the problems of the make-up area.

Previous research at Lombok International Airport found no GSE parking lot at Lombok airport, so the placement of GSE equipment disrupts the smooth running of vehicles on the service road (Nisa, 2018). Another researcher conducted a study at Sis Al-Jufri Airport Palu, where the study reviewed Ground Handling personnel and GSE equipment, but in the study, it was concluded that ground handling personnel still met the SOPs made; the study also focused on the number and feasibility of GSE available (Yarlina et al., 2020). Based on the background described, it is necessary to make a new layout for the equipment safety area to implement a safe flow of ground support equipment at Jenderal Ahmad Yani Airport. The benefit of this study is designing a new layout of the equipment safety area in the Make-Up Area Jenderal Ahmad Yani Airport.

Methods

This research was designed with descriptive qualitative research. According to Sugiyono, descriptive qualitative research is a research method based on the philosophy of postpositivism, used to research natural object conditions (as opposed to experiments) where the author is the key instrument, data collection techniques are triangulated (combined), data analysis is inductive/qualitative, and

qualitative research results emphasize meaning rather than generalization (Vusvitha, 2023).

The analysis technique used in this research is the research technique used by Miles and Hubermann. Data analysis in qualitative research is carried out during data collection and after the completion of data collection within a certain period (Setiawan, 2021). During the interview, the author analyzed the interviewee's answers. If the interviewee's answer after analyzing the terrace could be better, the author will continue the question until a particular stage is reached, and the data is considered credible. Miles and Huberman suggest that activities in qualitative data analysis are carried out interactively and occur continuously until completion, so the data is saturated—activities in data analysis, namely data reduction, data display, and conclusion drawing or data verification (Latifah et al., 2021).

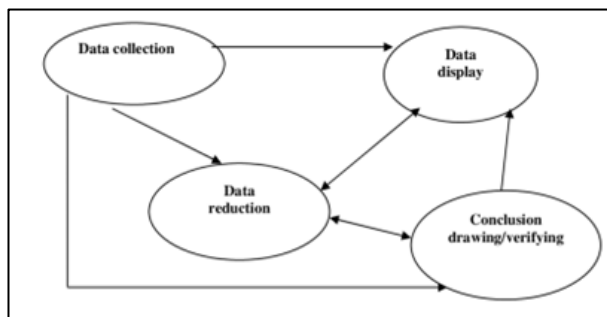


Figure 1. Analysis Model Data by Miles and Huberman

The primary data sources in qualitative research are words and actions; the rest are additional data such as documents and others. In this regard, in this section, the types of data are divided into words and actions, written data sources, photographs or documentation, and statistics (Onwuegbuzie et al., 2016). The words and actions of the people observed or interviewed are the primary data sources. Primary data sources are recorded through written notes, video/audio tapes, photographs, or movies (Knafl et al., 1988). The author took research data on words and actions through interview activities. Interview activities were taken with four ground-handling personnel representing their respective companies. The author conducted interviews via telephone and then recorded and entered the information into the interview transcript.

Regarding data sources, additional material derived from written sources can be divided into sources of books and scientific magazines, sources from archives, personal documents, and official documents (Rijali, 2018). The author takes some data, such as regulations, Ministerial Regulations, Ministerial Decrees, and Standard Operating Procedures for the make-up area at Jenderal Ahmad Yani Semarang International Airport, and several journals and scientific works in this research's Bibliography. The archives from Jenderal Ahmad Yani Semarang International Airport, such as the layout of the eastern Equipment Storage Area and data on the number of GSEs operating, are also needed.

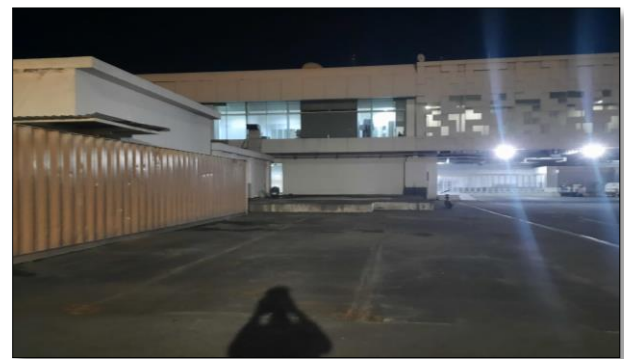


Figure 2. Vacant Land Used Containers

Observation is a method used to collect research data through observation and sensing (Hasanah, 2017). In this case, the author observes the movement of GSEs in the EPA, as well as make-up areas and vacant land in the airside area that can be used as additional land for the EPA. A literature study is a data collection technique that studies books, literature, records, and reports related to the problem being solved. The literature study conducted by the author includes regulations and requirements contained in the discussion of the problem, along with several opinions from experts edited from various sources to solve problems regarding designing an Equipment storage area for land optimization and realizing the safety flow of Ground Support Equipment Movement at Jenderal Ahmad Yani International Airport Semarang.

Figure 3. Overcrowding Conditions



in the Make-Up Area

Documentation is a method used to obtain data and information from books, archives, documents, written figures, and images in the form of reports and information supporting research (Waruwu, 2023). The documentation used is photos of the location of the airside area at Jenderal Ahmad Yani Semarang International Airport, which were taken this year. Interviews are used as a data collection technique if the author wants to conduct a preliminary study to find problems that must be researched, but also if the author wants to know things from respondents that are more in-depth. This data collection technique relies on self-reporting, or at least on personal knowledge and beliefs. The author conducted interviews with Ground Handling personnel working in the Make-up area. The author took four samples of personnel working in the make-up area with equal competence.

Results And Discussions

Based on the research technique used by Miles and Hubermann, there are three steps of analytic data. The first step is the reduction of data. All the data collected from interviews by the four ground handling officers shows that many obstacles were found in the form of GSE irregularities, especially BCTs parked not according to the markings. The BCTs are parked near the make-up area conveyor belt in a pile and do not follow the existing markings, disrupting the flow. The BCT is not arranged, making it difficult for officers who work to transport the following baggage, so they have to wait for the BCT to be arranged so they can return to transporting passenger luggage. According to the interviewee, there are several inefficient layouts with the current layout, such

as towing bars and difficulty laying BCTs due to lack of space. Interviewees said that if the layout were redesigned in the equipment storage area, it would be perfect for efficiency and safety at work. Sometimes, several baggage carts hinder the flow in the make-up area. The baggage carts are sometimes stacked and messy, causing obstacles. After data reduction, three problems can be discussed and improved through this research. The author found problems in the make-up and equipment storage areas close to each other. Some of these problems include (1) The problem of laying BCTs that are not neat and out of the markings. BCTs are placed out of the markings and can interfere with the safety flow on the service road in the make-up area. (2) The problem of laying towing bars, which, according to the author, is not right so that counter-flow often occurs when ground handling officers will take the towing bar for reasons of efficiency but pay less attention in terms of safety. (3) Frequent placement of GSE that is not following the place determined by AMC officers.

The author found that several problems occurred. These problems include the placement of BCTs that need to be more neat and cross the markings. Then, there is the location of the towbar placement, which is considered by ground handling personnel to be less precise, making towbar retrieval ineffective. This towbar retrieval sometimes causes contra flow, so the ground handling wants to move the towbar placement. The second step is data display based on Miles and Hubermann's method. In this research, data from all observations, documentation, and interviews is displayed in Table 1.

Table 1. Display Data

No.	Current Condition	Expected Condition
1.	Access Road conditions are not always smooth in the make-up area.	Access road conditions are always smooth and there are no obstacles in the make-up area.
2.	The placement of GSE that is not always	Neat placement of GSEs in the east

	neatly parked in the equipment storage area east.	equipment storage area.
3.	Make-up area conditions that can always be neat during operational and non-operational hours.	Make-up area conditions that can always be neat during operational and non-operational hours.

solution by redesigning the existing layout to be safer and optimized again. According to the author, the empty land next to the eastern equipment storage area, previously the place to place the container, can be used as additional land for the eastern equipment storage area. The author redesigns some GSE placement in the east equipment storage area. The author also provides a place for BCTs to be pulled by a baggage towing tractor to facilitate the preparation process and help smooth the access road in the make-up area. The following is an example of a layout that the author has made:

The last step is conclusion drawing. Taken from this problem, the author found a

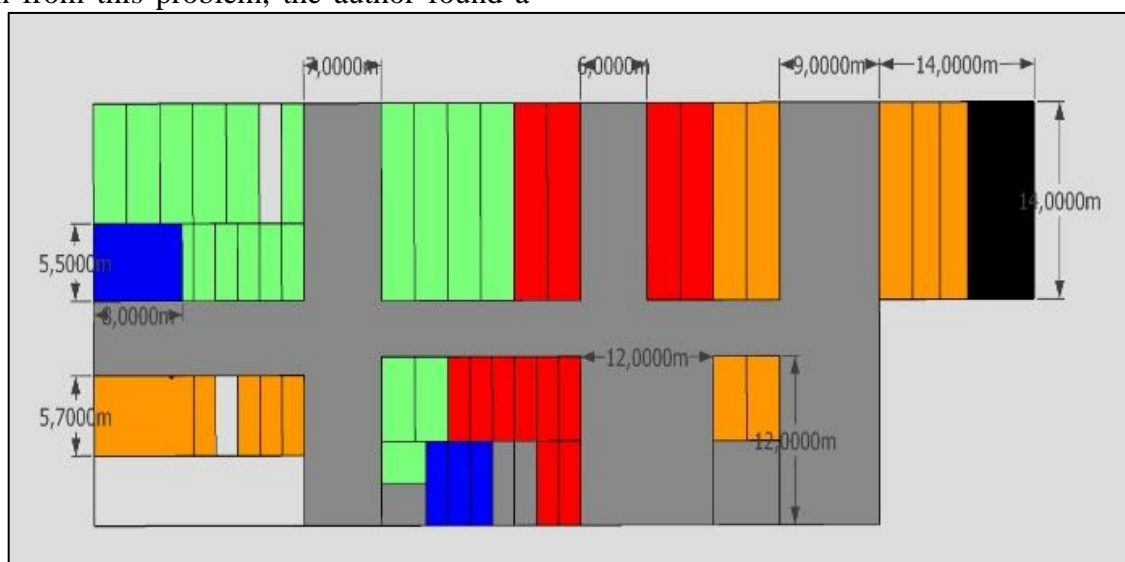


Figure 4. New Layout of Equipment Storage Area

In this layout picture, the author made several changes from the previous layout, such as making access roads for BCT withdrawal easier. The author also utilizes the former container land to increase the land that can be used for GSE storage. Because the author made several changes, he had to make markings again. The author’s mark-making guidelines are from the Ministry of Transportation, 2019 (Pratiningsih et al. 2020). The Perdirjen KP 326 in 2019 has standards for making equipment storage area markings. The standards for making equipment storage area markings include making markings in the form of an unbroken red line with a width of 0.1 meters; the word storage area must be red with a height of 0.3 meters and a distance of 0.15 meters from the marking line. The word

“EQUIPMENT STORAGE” should be painted red on the side where the equipment is placed and can be read from every side. This mark should be repeated at intervals not exceeding 50 m along the boundary line (Khoirun Nisa, 2018).

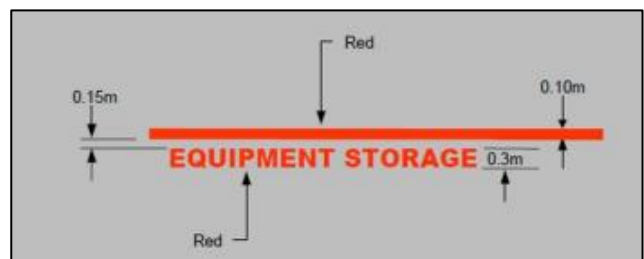


Figure 5. Equipment Storage Area and Marking

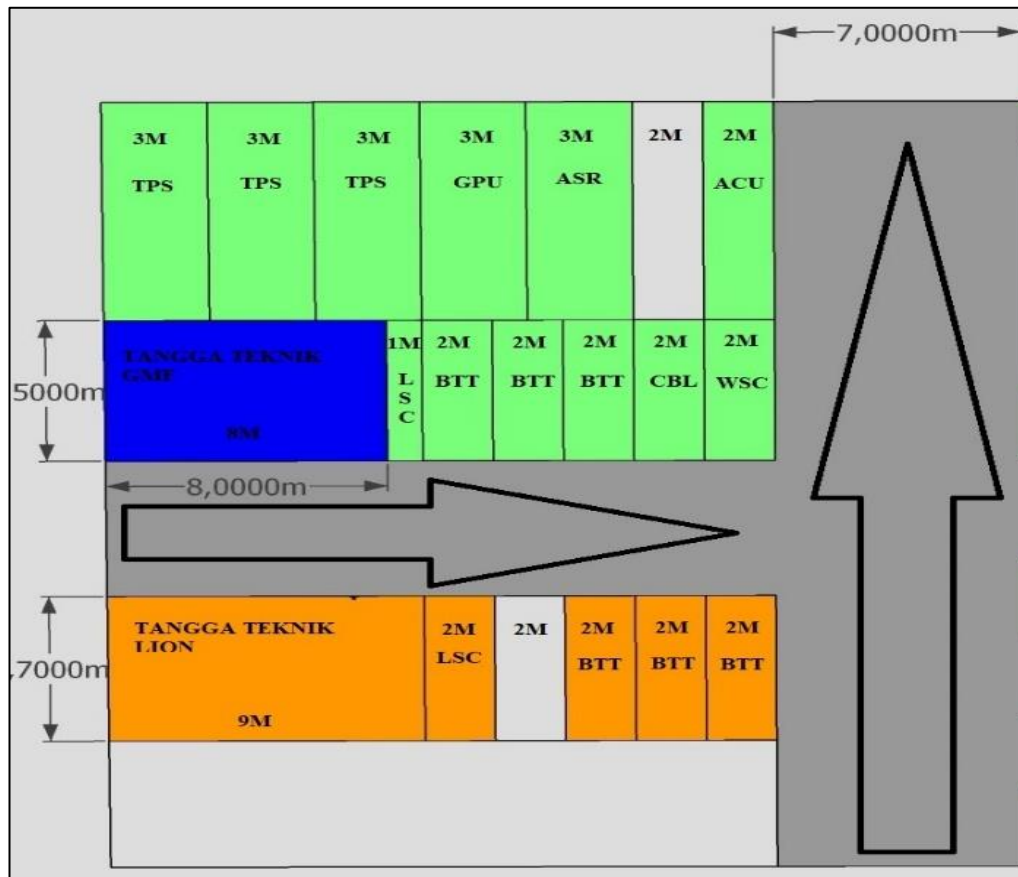


Figure 6. GSE Layout Division 1

The figure shows the division of the GSE placement area in the first part of the east equipment storage area. The author divides the

east equipment storage area into two parts to make the size and division of the GSE location more visible.

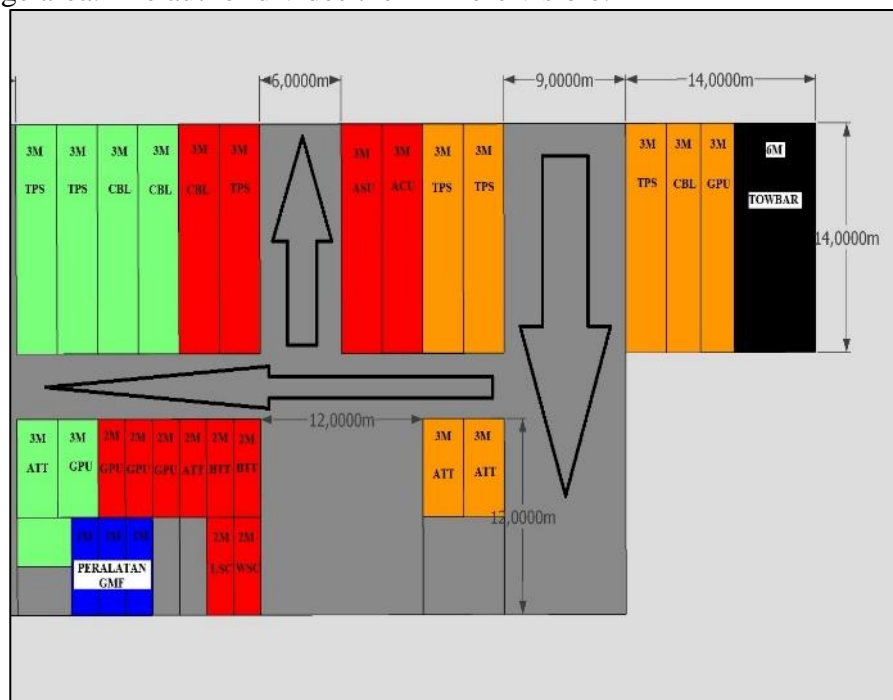


Figure 7. GSE Layout Division 2

The figures above shows the flow in and out and the placement of GSE in the second

part of the layout. The picture also shows the utilization of the empty land of the former

container with more detail on the placement of the GSE. Green declares storage land for the Gapura company. Red declares storage land for the Natra company. Orange declares storage land for the Kokapura company. Black declares storage land for the entire ground handling company. Blue declares storage land for GMF companies. Grey specifies that the land is not where the GSE is stored. White specifies land previously used for storage but not currently in use. The success of this ground-handling task is related to many things, including the quantity and quality of human resources, equipment, and standard operating procedures used. The International Air Transport Association has regulated ground handling service standards abbreviated as IATA in the Aircraft Handling Manual (AHM) 810 2013 regarding ground handling agreement standards where every activity and every vehicle must be performed by AHM 810 2013 (Annisa et al., 2018). So, suppose a new layout has been created. In that case, it is necessary to socialize ground handling personnel and make new Standard Operational Procedures (SOP) related to the operation of GSE in the new layout of the make-up area. In handling loading and unloading, ramp services should have the equipment used following the wants and needs. The activities must be meticulous, including how goods are laid. Sometimes, there is still a misplacement of goods carried out by operator staff who are not careful and in a hurry. All activities carried out during the loading and unloading process of goods already have applicable operational standards and must follow these provisions (Arif et al., 2018), so based on the research, there is a close relationship between GSE equipment performance and ground handling operators which need to be reviewed in future research if the latest layout has been applied.

Conclusion

The conclusion is intended to help the author conclude from the research that has been done that the current condition of the make-up area and equipment storage area still has several problems. These problems include irregular baggage carts that cause obstacles and endanger other GSEs. It is also found that there is empty land of former containers that can be

optimized into land for equipment storage areas. The author makes a layout design of the equipment storage area that can solve these problems. The author's layout has optimized the empty land of former containers into additional land for equipment storage areas and provided additional land for BCTs that BTT will pull. The author's suggestion hopes that the airport can consider the layout design. The author also hopes that one day, the layout design that the author has made can be realized or implemented at Jenderal Ahmad Yani Semarang International Airport.

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