

ANALYSIS OF EPOXY COATING ON THE FLOOR SURFACE OF ARFF VEHICLE GARAGE AT HANG NADIM INTERNATIONAL AIRPORT BATAM

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ABSTRACT

Hang Nadim International Airport Batam is an airport located in Batu Besar Village, Nongsa District, Batam, Kepulauan Riau. Every airport is required to provide and offer Aircraft Rescue and Firefighting (ARFF) services in accordance with the ARFF airport category requirements. To support its operational processes, ARFF has a vehicle garage that serves as the primary storage facility for main and support vehicles, serving as the primary arsenal of the ARFF unit to comply with the vehicle garage requirements outlined in the standardization of PR 30 of 2022. However, the condition of the garage floor surface in Hang Nadim International Airport does not meet the existing standards. Ideally, the floor surface should fulfill the requirements to ensure smooth, safe, and comfortable operational processes, and to enhance the response time of ARFF personnel. The method used to address the issue in this research was qualitative, employing the data analysis technique of gap analysis. In the gap analysis process, the researcher utilized data collection techniques including observation, interviews, and documentation. Throughout various stages, the researcher obtained results and conclusions. This research aims to determine whether the ARFF vehicle garage at Hang Nadim International Airport meets the requirements specified in the regulations. The research findings indicated the need for vehicle garage renovation and the application of epoxy on the floor surface. The selection of the appropriate epoxy type certainly has a significant impact on the condition of the vehicle garage, as this change will affect the achievement of response time, minimize potential hazards, and streamline operational processes in the vehicle garage area. Additionally, this is done to meet the requirements specified in the regulations.

Keywords: *ARFF Unit, ARFF Facilities, Vehicle Housing, Floor Surface, Epoxy.*

1. INTRODUCTION

Every airport is mandated to possess a fire station, a prerequisite of paramount importance for any airport engaged in aviation activities. The ARFF unit, entrusted with responsibilities in the realm of aviation safety and security, bears full accountability for all incidents and accidents occurring at the airport and its vicinity. ARFF Unit stands as an integral airport unit charged with the duty and obligation of preserving human lives and material assets in the event of incidents and accidents within the airport's purview. The ARFF unit is endowed with safeguards encompassing regulations, training initiatives, and requisite facilities, all orchestrated to facilitate the delivery of proficient and dependable ARFF services.

In accordance with PR 30 of the Year 2022, airports categorized as level 8 (and beyond) are obliged to maintain, at the very least, the subsequent facilities: a

manoeuvring area, classroom, watch room, unit head's chamber, operations head's chamber, administrative quarters, a rest area replete with lockers, fitness amenities, lavatories, a pantry, training provisions, storage accommodations, a water supply system, and facilities for housing vehicles. It is unequivocally delineated that the ARFF vehicle parking facility must adhere to specialized specifications commensurate with established standards. Notably, one of the prerequisites for vehicle parking is the stipulation that the flooring surface must exhibit non-slip characteristics, be resistant to oil, grease, and foam concentrate, facile to maintain in a sanitary condition, and, assuredly, free from potential hazards to ARFF personnel and vehicular operations during exigencies.

In accordance with the existing phenomenon, it is evident that the garage floor surface would prove challenging to maintain cleanliness. This, in turn, could potentially lead to the floor becoming slippery. A floor

tainted by the presence of oil or grease is notably troublesome to cleanse. Typically, personnel undergo several steps to clean such flooring, commencing with abrasive scrubbing using sand, followed by mandatory detergent application requiring thorough rinsing. In the case of non-slip epoxy flooring, cleaning merely necessitates wiping with a mop or clean cloth, causing liquids to be swiftly removed from the surface.

The difficulty of cleaning the soiled floor, which results in slipperiness, is not the sole concern; numerous other factors may impede or disrupt the operational processes of ARFF personnel. In this context, researchers endeavour to dissect various factors that may potentially disrupt the operational processes of ARFF personnel, ranging from hazards to personnel to the possible non-achievement of target response times. Consequently, the researcher poses the question: Does the current condition of the surface layer of the vehicle garage floor at the ARFF unit of Hang Nadim Batam International Airport comply with established standards?

This research naturally has its set objectives to be achieved. The primary goal of this research is to determine whether the condition of the surface layer of the vehicle garage floor at the ARFF unit of Hang Nadim Batam International Airport complies with the established standards outlined in the existing regulations.

It is hoped that following this research, several benefits will ensue, including: Firstly, the researcher aspires for this Final Project to serve as motivation and encouragement to produce even better work in the future. Secondly, the findings of this research can contribute to the knowledge and insights of the students at the Palembang Aviation Polytechnic. Lastly, this final project can serve as a reference for the general public to implement the research findings, thereby minimizing potential hazards within vehicle garages.

2. LITERATURE REVIEW

The definition of analysis is the intellectual process of breaking down a whole into its constituent parts in order to recognize the signs of these components, their interrelationships, and their respective functions within a unified whole [1]. Analysis is the process of breaking down or dissecting a unit into its smallest components [2]. According to PR 30 of the Year 2022 on Technical Standards and Operations Regulations for Civil Aviation Safety Part 139 (Manual of Standard Casr Part 139) Volume IV, a fire station is a building located on the airside that serves as the control center and execution hub for ARFF operations, strategically positioned based on response time calculations. Response time is defined as the maximum response time, not exceeding 3 minutes

after the alarm or distress signal is issued [3]. A fire station is a ARFF station that must be strategically located [4]. A vehicle garage is a structure designed and configured for the primary and auxiliary vehicle parking [5]. Epoxy is a type of polymer chemical compound consisting of its constituent molecules [6]. Epoxy is a polymer that can be used as a coating in both liquid and powder forms [7]. The most commonly used coating layer is epoxy resin [8]. Epoxy is typically employed as a strong adhesive or resin that is corrosion-resistant and possesses excellent electrical insulation properties. Resin serves as the base, and the polymer acts as the hardener. In its raw form, epoxy is extremely hard and brittle, but when used, its constituent materials are mixed to optimize its mechanical properties in terms of strength, elasticity, and durability. Epoxy serves as the final coating for floors or walls and is commonly utilized in industries such as car parks, buildings, factories, warehouses, hospitals, and supermarkets. Some advantages of epoxy include increased floor strength, cleanliness, absence of seams, a glossy appearance, and resistance to impacts or exposure to chemical substances [9].

3. METHOD

This research is conducted as a foundation for analyzing a finding related to the selected subject matter. Essentially, this section explains how the research was carried out. Qualitative research is a research process aimed at understanding human or social phenomena by creating a comprehensive and complex depiction that can be presented in words, reporting detailed perspectives obtained from informant sources, and conducted in a natural setting [10]. This research employs a qualitative approach, where this approach was chosen to analyze the surface of the ARFF vehicle garage floor at Hang Nadim Batam International Airport. According to Corbin and Strauss (2015:5), qualitative research is a form of research in which the researcher, in gathering and analyzing data, becomes a participant alongside informants who provide data [11]. Qualitative research designs often use an inductive approach, where theory is developed from the collected data. This qualitative research design can be considered a method in research, as it is comprehensively explained and easy to understand by researchers and academics [12]. The qualitative approach serves the function of exploring, examining, and understanding aspects of social and human issues [13]. Observation is a data collection method used to gather research data through observation and perception [14]. The observation method is carried out by directly observing the location of the object to be studied, allowing for a firsthand understanding of the events occurring in the field [15].

Descriptive analysis serves as a data analysis method by describing and presenting research data accurately without altering or making general conclusions [16]. The selection of research instruments should align with the research objectives, the type of data to be collected, and the characteristics of the research subjects or objects [17]. According to Lexy J. Moleong, an interview is defined as "a conversation with specific objectives" [18]. According to Lerbin, an interview is "a data collection method conducted systematically through one-way questioning, based on research objectives" [19]. The interview process involves reciprocal communication between the interviewer and the interviewee to delve into specific topics [20]. The researcher selected a population of 68 ARFF personnel at Hang Nadim Batam International Airport and chose 5 personnel as interviewees. In this research process, the researcher employed the gap analysis technique, which is used to analyze the condition of the vehicle garage floor to align it with the desired state at Hang Nadim Batam International Airport by identifying gaps between the current condition and the desired condition.

This research utilizes three data collection techniques: observation, interviews, and documentation. These three data collection techniques involve several stages necessary to obtain information and data that support the ongoing research process.

4. RESULT AND DISCUSSION

This research utilizes data analysis technique known as gap analysis. The researcher identified conditions that do not currently align with the expected conditions following changes or adjustments, which could meet the existing standards and requirements.

The researcher found that the current situation does not meet several points outlined in the requirements. These include a lack of anti-slip properties, resistance to oil spills and other liquids, and a rough floor texture that hinders effective cleaning. Additionally, the smooth floor texture poses potential hazards to personnel working in the vicinity of the garage. In light of these disparities, the researcher recommends renovation to apply an epoxy floor coating that can fulfill the lacking requirements.

Epoxy coating can render the floor anti-slip, easy to clean, resistant to liquid exposure, and visually appealing with customizable colors and added markings for positioning of main and support vehicles. By implementing epoxy coating, it is hoped that the condition of the vehicle garage at Hang Nadim Batam International Airport can meet the established requirements and minimize safety risks within the garage area.

4.1. Observation Results

From the observations conducted by the researcher during the on-the-job training at the unit of Hang Nadim Batam International Airport, a gap was identified. The gap observed pertains to the inadequacy of the floor condition in the ARFF vehicle garage. According to PR 30, it is explicitly stated that the ARFF vehicle parking facility must have specific specifications in accordance with established standards. One of the requirements for vehicle parking is that the floor surface must not be slippery, it must be anti-slip, resistant to oil, grease, and foam concentrate, easy to clean, and, of course, free from potential hazards to ARFF personnel and vehicles during emergency situations. However, the current condition does not align with the expected and desired condition to meet the minimum standards outlined in the existing regulations.

4.2. Interview Results

To obtain supporting data for this research, the researcher selected 5 interviewees from the ARFF unit:

Table 1. Interviewees

No.	Nama	Jabatan
1.	Heru Laksana	Maintenance Team Leader
2.	Maizar.S.Kom	Team Leader
3.	Miko Siswanto	Squad Leader
4.	Mahfutzi	Rescue And Fire Fighting Officer
5.	Achmad Fajar Shodiq	Rescue And Fire Fighting Officer

During the interview sessions, the interviewees unanimously agreed that the condition of the ARFF vehicle garage floor surface at Hang Nadim Batam International Airport does not yet meet the requirements outlined in PR 30 of the year 2022. This aligns with the problem discussion in this research. The interviewees explained that several points within the requirements still do not align, and it is expected that these aspects will be maximized in the future to meet the existing requirements.

Furthermore, the researcher also found that the interviewees fully support the addition of epoxy to the garage floor surface. This addition aims to reduce safety risks, enhance aesthetics, incorporate various markings on the floor, and, importantly, meet the standards specified in PR 30 of the year 2022.

4.3. Documentation Results

4.3.1. ARFF Vehicle Garage, Hang Nadim Batam International Airport.



Figure 1. ARFF Vehicle Garage, Hang Nadim Batam International Airport.

4.3.2. Floor Surface Exposed to Oil Spills



Figure 2. Floor Surface Exposed to Oil Spills

4.3.3. Cleaning of the ARFF Vehicle Garage Floor

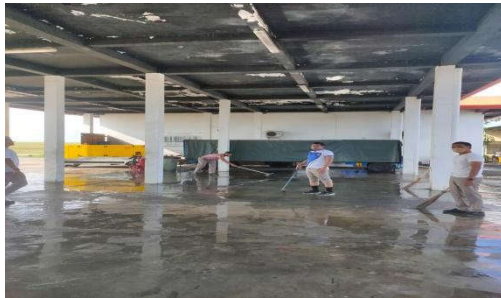


Figure 3. Cleaning of the ARFF Vehicle Garage Floor

4.3.4. Post-Cleaning Floor Condition



Figure 4. Post-Cleaning Floor Condition

4.3.5. Semi-Outdoor Epoxy-Coated Floor



Figure 5. Semi-Outdoor Epoxy-Coated Floor

4.3.6. Vehicle Housing with Epoxy Layer



Figure 6. Vehicle Housing with Epoxy Layer

In the documentation results, the researcher has obtained several findings collected directly from the research site as well as from internet references. The researcher, of course, documented the current condition of the garage floor, which still does not meet the existing requirements. This was done to strengthen the data supporting the research. The researcher also noted that the floor was exposed to liquid, specifically oil and fuel spills from parked vehicles in the garage.

The dirtiness of the garage has led to the accumulation of stains and an unpleasant odor from the oil and fuel spills. Consequently, personnel need to allocate a specific day for floor cleaning, as it is a time-consuming task. All vehicles must be removed from the garage, and this cleaning process requires a considerable amount of manpower. The outcome of this cleaning is a relatively clean floor, although not entirely pristine due to the uneven floor structure, which has allowed stains to penetrate.

In this context, the researcher also included internet reference documentation regarding the application of semi-outdoor epoxy on garage floors. It is evident that this approach results in a cleaner floor, the ability to incorporate color combinations as indicators for personnel during parking, the use of anti-slip materials, and an easier cleaning process. The researcher also documented instances of its successful application in compliance with existing regulations, although it has only been implemented in foreign countries and not yet in Indonesia.

5. CONCLUSIONS AND SUGGESTIONS

5.1. Conclusions

From the discussions and explanations provided in the research results, the researcher has drawn conclusions regarding the existing issues. It is evident that the current surface condition of the ARFF vehicle garage floor at Hang Nadim Batam International Airport does not yet align with the requirements outlined in PR 30 of the year 2022. The data and supporting facts collected through the research methodology substantiate this argument. The present condition remains insufficient to meet the stipulated criteria within the regulations. As mandated, the floor surface should be anti-slip, resistant to oil, grease, and foam concentrate, easy to clean, non-slip, and free from potential hazards to ARFF personnel and disruptions to foam tender operations during emergency situations. Among the various requirements, the condition of the garage floor surface in the ARFF unit at Hang Nadim Batam is still not in compliance.

5.2. Suggestions

Based on the research findings and the available data, the researcher has several recommendations and suggestions for Hang Nadim Batam International Airport, including:

1. It is recommended that the airport promptly align with the requirements outlined in PR 30 of the year 2022.
2. It is advised that the ARFF unit at Hang Nadim Batam International Airport consider renovating by applying semi-outdoor epoxy to the current surface of the vehicle garage floor.
3. Personnel are encouraged to strictly adhere to Standard Operating Procedures (SOP) during garage operations, including wearing appropriate footwear and safety gear, to minimize potential hazards.
4. Swift action is recommended in case of floor exposure to oil or other fluids to ensure a clean, non-slip surface and eliminate the odors associated with these fluids.

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