International Journal of Architecture and Urbanism Vol. 07, No. 03 (2023) 465 – 475

International Journal of Architecture and Urbanism

Journal homepage: https://talenta.usu.ac.id/ijau

Car Modification Workshop Design with A High-Tech Architectural Approach in Medan City

***Devin Defriza Harisdani*[1], *Iffat Rais* *[1]**

[1]*Department of Architecture, Universitas Sumatera Utara, 20222, Medan, Indonesia*

*Corresponding Author: iffatraisss@gmail.com

ARTICLE INFO

Article history:
Received 16-10-2023
Revised 20-11-2023
Accepted 28-11-2023
Available online 30-11-2023

E-ISSN: 2622-1640
P-ISSN: 2622-0008

How to cite:
Harisdani D.D, Rais I. Car Modification Workshop Design with A High-Tech Architectural Approach in Medan City. International Journal of Architecture and Urbanism. 2023. 7(3): 465-475.

ABSTRACT

The design of a car modification workshop in Medan is intended for car modification enthusiasts so they can develop their hobbies and are designed using a High-Tech Architectural design. Car users in the city of Medan have reached 42,397, so this figure can affect the number of car modification enthusiasts. In the city of Medan itself, there are not too many car modification workshops that provide multi-functional services with supporting facilities, so it is difficult to find a variety of modification options. The design of a car modification workshop in the city of Medan with high-tech architecture aims to be able to meet the demand for vehicle sales services, engine servicing, modifications, and other facilities on a large scale due to the high market interest. This car modification workshop is specifically designed and has been limited according to the concept of the user, actor, type of activity, space requirements and building analysis. By using the basic High-Tech theme, the concept of structural configuration style is applied in such a way. It turns out that High-Tech Architecture is very much influenced by current scientific advances and innovations so that it has many functions that are useful for many people. This design is expected to be able to overcome the problems of the people in Medan to have the latest innovations and accommodation for technological advances because it has a futuristic impression along with the times and provides its own style to attract the attention of visitors.

Keywords: high tech architecture, modification, workshop

1 Introduction

Medan is the third largest city in Indonesia after Jakarta and Surabaya. Medan in 2020 has a population of 2,983,868 million people. Indonesia is significantly developed in transactions of imported vehicles from abroad, especially in big cities like Medan [1]. Car modification is fun because people can beautify their car with a particular variant. Repairing cars and modifying them is a uniquely rewarding experience where one has almost unlimited creativity. Spending time modifying a car is like a hobby or satisfaction on a large scale because it can change the appearance of a personal car vehicle to be different. Most people probably do it for the sake of all the above combinations, plus an inexplicable interest in the hobby. People's high interest in making modifications also affect the interest in repairing cars to have more sophisticated performance [2].

The car modification is planned with an innovative engineering approach since the cutting-edge design is a methodology that focuses on utility qualities and is named current. This type of design in current times does not rely on the components applied to the structure. However, it has considered the structure's capability to be a variable of its magnificence. Nowadays, Functionalism expresses that the capability of building components like windows, entryways, and many more are considered magnificent. Everything is viewed as something consistent, and excellence shows up in it [3].

High-tech architecture can provide building functions as a factor of beauty and can increase the utility value of a building. Safety is undoubtedly the main thing in driving. Car maintenance regularly can also maximize safety while driving while increasing comfort. Choosing this title is very interesting because the development of automotive, especially vehicles, has expanded its creations in the Indonesian market. So, this design is expected to build a building as a place to help progress in the car sector, especially modifications and workshops in Medan [4].

2 Methodology

2.1 Modification

Modification is a change in an object or goods. The point is to change something from being more attractive without losing the object's function or the item itself and showing the form of a modifier's imagination.

2.2 Workshop

An auto repair shop is where a repairman runs his business to provide vehicle repair and maintenance services. A general workshop for motorized vehicles is a general workshop that can repair and maintain an automated vehicle so that it meets special requirements and is roadworthy.

2.3 Car

A *car* is a four-wheeled vehicle operated by motor power that utilizes gas or diesel fuel with a particular shape. A car is a means of transportation widely used by the surrounding community because by using a car, one can quickly go to a place and avoid unpleasant weather conditions such as rain or hot sun [5].

2.4 High-Tech Architecture

High Tech architecture is a style of building design that, in its application, creates innovative refinements and further uses the main components that are very prominent with manufacturing materials on the inside, outside, essential components, and utilities of the building. High Tech buildings represent and address technology instead of involving innovation.

The High-Tech Architecture theme has a crucial rule, precisely the adaptability of space. It means that spaces can adapt to changes that occur either perceptually or entirely independently of actual changes within the building, but not by changing the layers of the structure. The interior relief space arrangement formed without a walled area within the building structure [6]. An example of a high-tech architectural style can be seen in Figures 1 and 2.

Figure 1 Centre Pompidou-Metz

The Pompidou Center is a metropolitan structure with a complex capacity. The capacity of this super-sophisticated design building as a historical center and a show or exhibition of cutting-edge craftsmanship. The Pompidou Center also requires elements of general media and musical and acoustic exploration [7].

Figure 2 LeMay Museum

The LeMay Museum uses the Gable Frame structure, supported using the primary material in the structure, and a bent roof frame that is collected using materials such as bolts combined with dividing plates and the help of handlebar links as elasticity to help construction rigidity. Whereas the cladding system uses a stunning silver tone, it has strength, thunder dampening, and roof covering against temperature advances [8].

To analyze a High-Tech theme in a building, we must pay attention to several criteria, for instance, the inside-out, celebration of process, transparent, evenly bright color, a lightweight filigree of tensile members, and optimistic confidence in a scientific culture [6].

The location selection method was carried out by conducting direct surveys of several sites used as the planning locations for the Car Modification Workshop. Based on the description of the function and the nature of its activities, the right area is in the service sub-focus area of Medan Sunggal city, which is suitable as a project area [9]. The technique used is descriptive, a critical thinking system that describes the subject's condition or article in design research.

The writers sorted the gathered information to obtain the data needed to achieve the research design objectives. The writers then collected information disaggregation by collecting crucial information divided into perceptions, encounters, and documentation of additional information sets isolated into comparative research and writing studies. The writers also obtained the information retrieval by observing directly to see the state of the field and the planned structure to get a decent picture of the current reality and problems that arise directly in the field [10].

3 Result and Discussion

3.1 Design Location

The search for the right location aims to design a multifunctional building as a Car Modification Workshop in Medan. The location of this design is on Gagak Hitam Street, Medan Sunggal with a land area of 10,000 m2 and a flat contour. This design area has boundaries in the east, west, north, and south with a large road, making it easier for visitors to access the location that will be the site of this project.

Figure 3 shows the building around this location in most areas functioned as a residence as housing, hotels, offices, trade, and others. So this supports the development of the Car Modification Workshop design considering the large population or activity around this location.

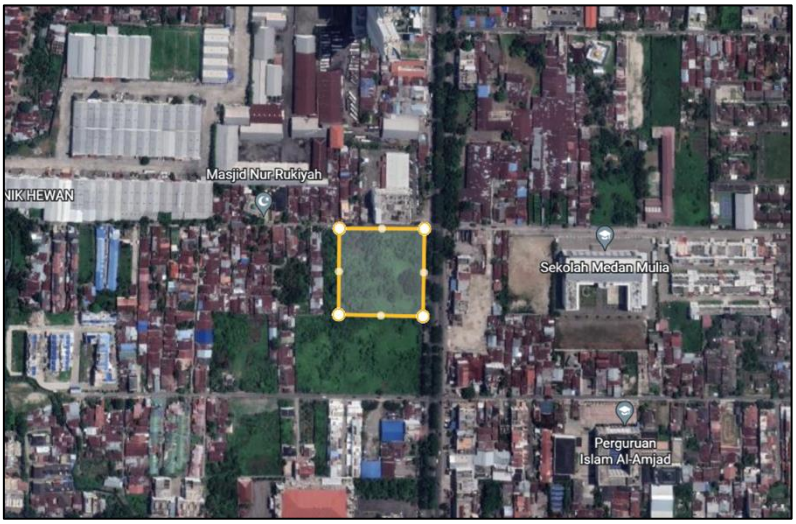

Figure 3 Design Location

The results of personal data related to land use maps show that most of the area is a residential function. However, Gagak Hitam Street is more dominated by commercial and office facilities. This design area has a KDB of 60% of the total site area and a GSB of half of the road area, with a maximum KLB of 6 for office buildings. The regional development model to anticipate the decline in vitality and density is a revitalization model by utilizing a potential attraction processing method modeled as a semi-circle that connects one element to another, one node to another, or one district to another.

The accentuation is on handling development frameworks and foundations in open space designs. The way can be an organization of streets, passerby ways, open spaces, and many more. The current organization can be as streets, a person on footways, direct open spaces, or structures genuinely interconnected between urban communities/locales. In the plan of organization hypothesis, this is valuable as a source of perspective in directing the development framework [11].

Figure 4 shows the results of personal data related to the existing land use map (around) indicate that the site is in a commercial area, offices, and densely populated residential areas. With a strategic site, this project can provide a high level of modification for car enthusiasts to come to the location so that the purpose of this building can be carried out properly according to its function.

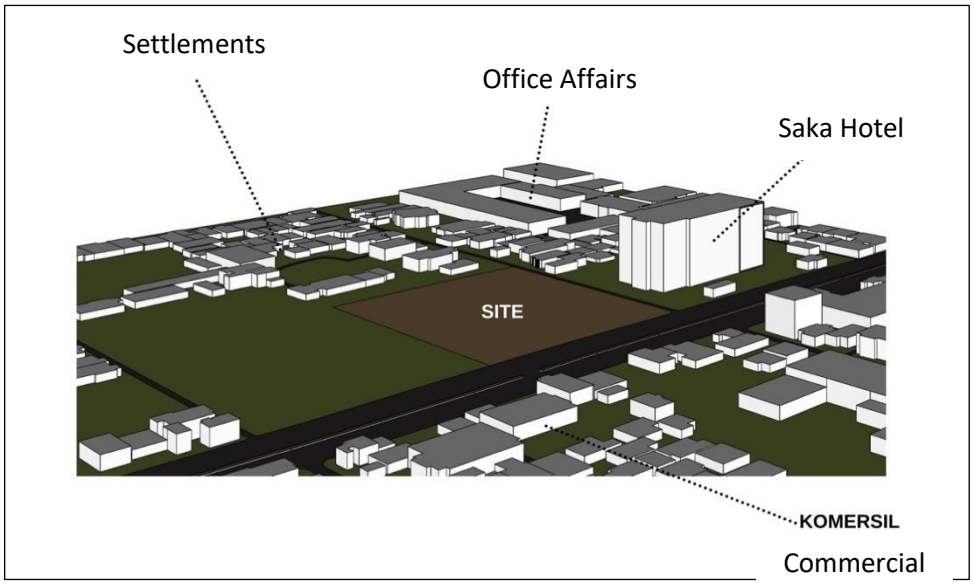

Figure 4 Illustration Of the Existing Conditions Around the Site

3.2 Project Site Zonation

Figure 5 shows the site design is based on the zoning of this building, and it is a combination of Workshop and Car Modification which is public because it provides services to visitors. The main exhibition hall is placed in the site's front area to show the building's primary function and because the exhibition space requires a comprehensive view.

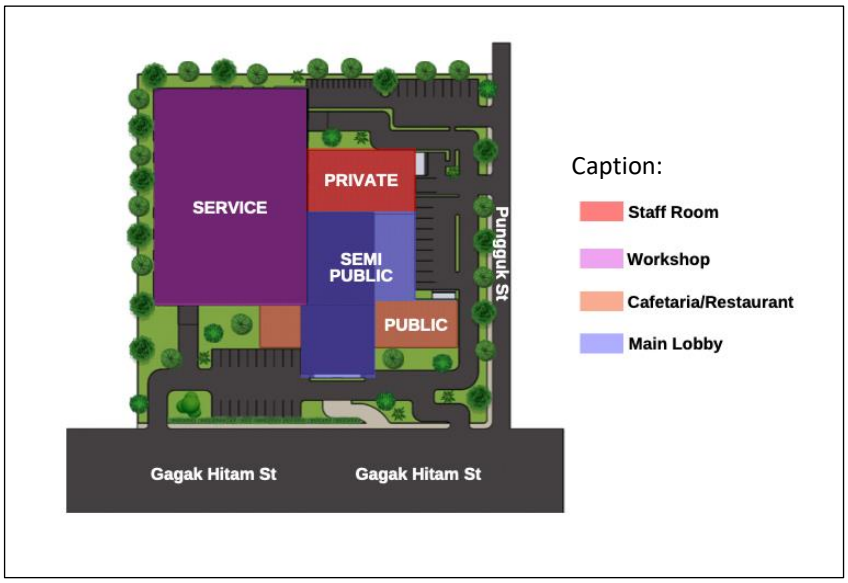

Figure 5 Project Site Zonation

3.3 Outdoor Layout Design

Figure 6 shows the results of the outer space processing design in this building are more directed at forming the impression of the building as one mass unit. In contrast, there are two building masses on the site, namely the Car Modification Workshop.

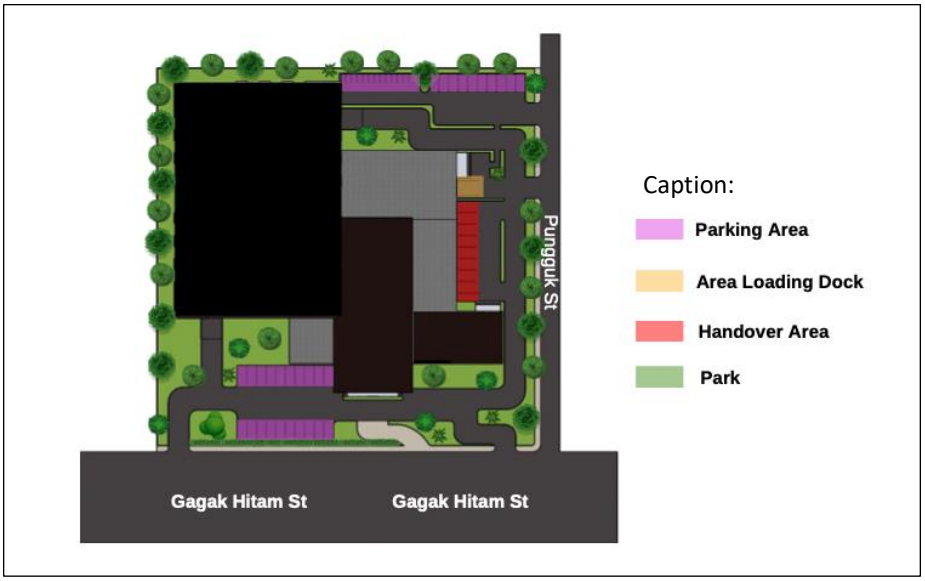

Figure 6 Outdoor Layout Design

3.4 Achievement Planning Design

Figure 7 shows to reach this building site for the service department, we can enter through Pungguk Street. Then visitors who drive to enter the building can go through Gagak Hitam Street, as well as access for pedestrians.

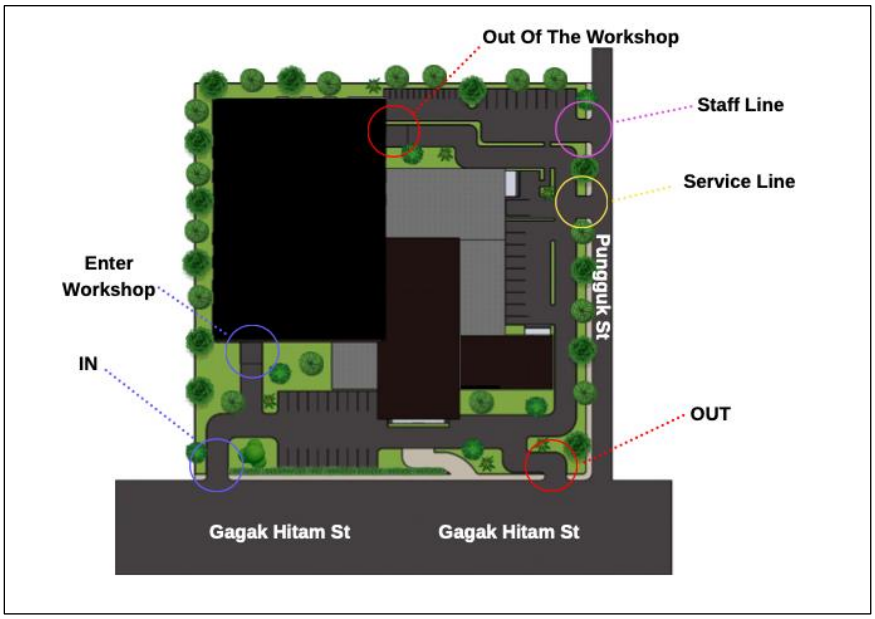

Figure 7 Achievement Planning Design

3.5 Circulation Design

Figure 8 shows the circulation in this building is from one direction. From the main entrance, visitors to the Car Modification Workshop can go directly to the parking lot in front of the main building. Those who want to go to the workshop can go directly to the workshop area, which can be accessed directly from the site's main entrance [12]. The workshop circulation can go back and forth to facilitate the transfer of cars from one division to another, making it easier for visitors to pick up their cars directly near the waiting room.

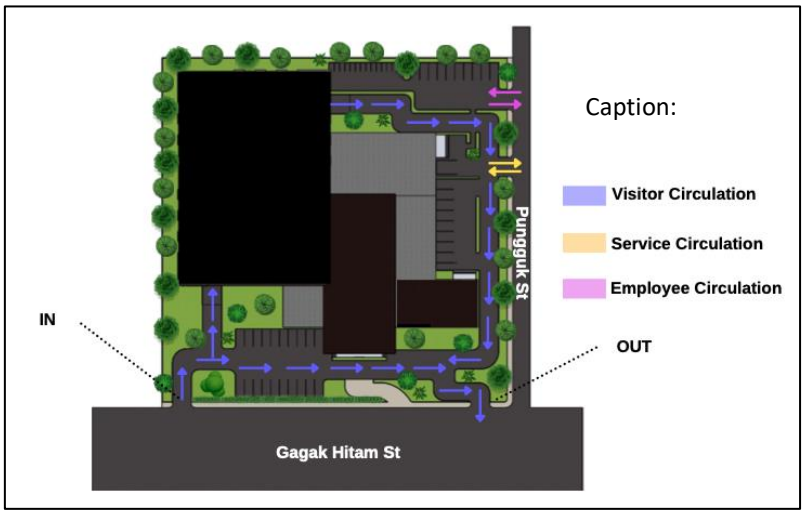

Figure 8 Circulation Design

3.6 Interior Layout Design

Figure 9 and 10 shows the assistance design must be prepared to ensure that the passage and exit spaces are carried out in one direction in case of traffic [13]. Dissemination of the plan is carefully planned to keep it out of traffic between vehicles.

Figure 9 Building Interior

Figure 10 Workshop Interior

3.7 Mass Design and Appearance

Figure 11 shows at the Car Modification Workshop, there is a rectangular shape. It starts from a square shape with a volume—then gives subtractive and additive transformations and details with consideration following the shape of the building site. The writers chose this building form because it responds to parts of the building with a high degree of flexibility and creates a formal and rigid impression. Furthermore, the workshop area is made of a square shape by considering the efficiency of the space for movement.

Figure 11 Mass Design and Appearance

3.8 Structure Concept

Figure 12 shows the structural design for this car workshop use the concept of a mixture of rigid and comprehensive span structures where it uses the composite steel columns exposed at the top. While in the modification area, a wide-span structure system is used with exposed steel. Truss frames with steel ropes and a fastener between the frames are used for the roof structure.

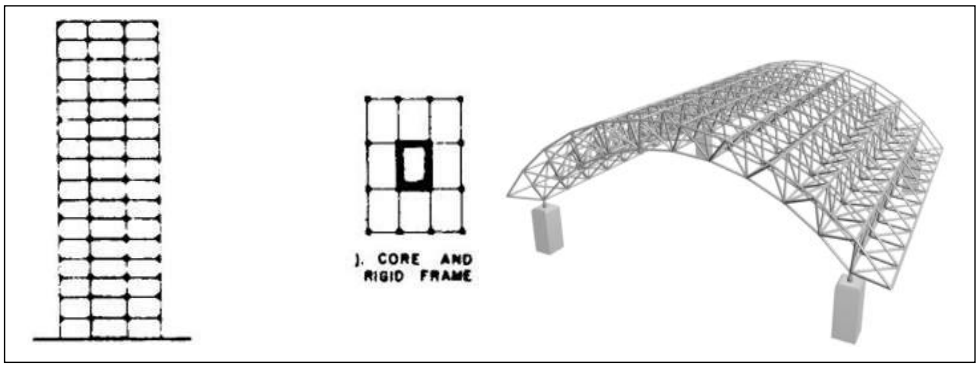

Figure 12 Rigid Frame, Core and Space Frame Roof Structure

The Space Frame is a three-layer primary structure consisting of rotating conjunctures, individual consisting of lines, cones, hexagons, and HT Bolts. The rooftop uses a space outline structure. The spatial arrangement at this workshop considers the arrangement of free-bended calculations, lightweight that is not difficult to deal with in the field, sturdy materials, pre-assembled and modern spare parts, straightforward, safe, and fast development since it is not welded in the field [14].

3.9 Utility Concept

Figure 13 shows the Car Modification Workshop plan has the perfect water supply framework idea. The idea of the wastewater treatment framework is that the effluent generated from the building must be treated before being discharged into the municipal sewer. Clean springs come from drilled wells and PDAM, which must then be supplied to the top and circulated to unlucky rooms. This perfect water structure is used to construct firefighting facilities such as hydrants and sprinklers.

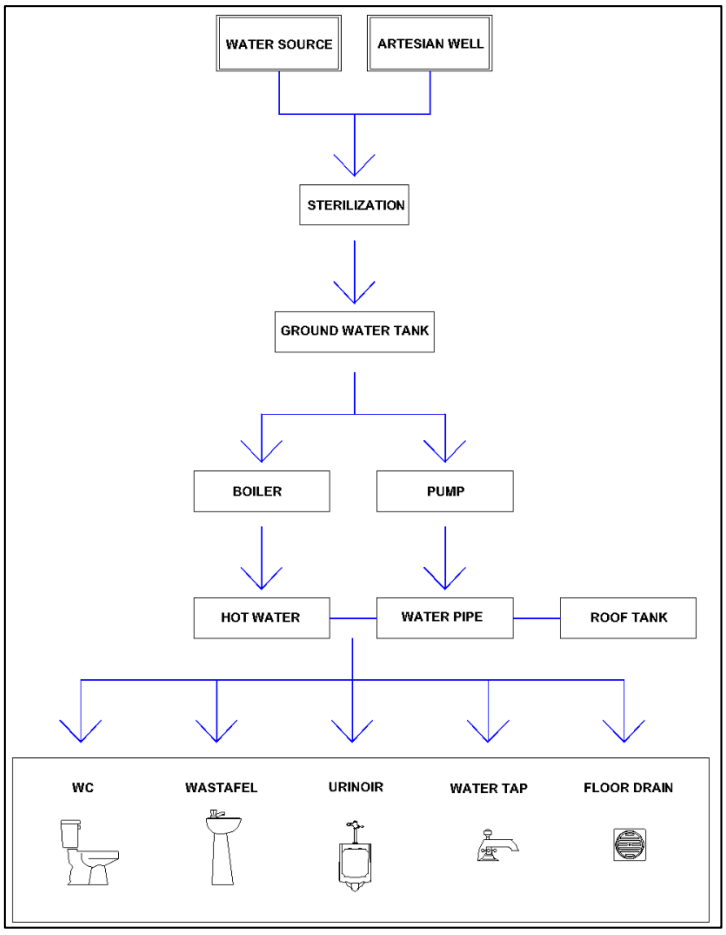

Figure 13 Utility Concept of Clean Water

Figure 14 shows the dirty water from the building will later be channeled through a vertical channel implanted in the bulkhead, directed to the lower drainpipe, and continued into the city canal. Dirty water is not below 10m aims to prevent it from contaminating the clean water. Disposing of dirty water does not pollute the climate and does not reduce the advantage of the climate and the separation from clean water sources.

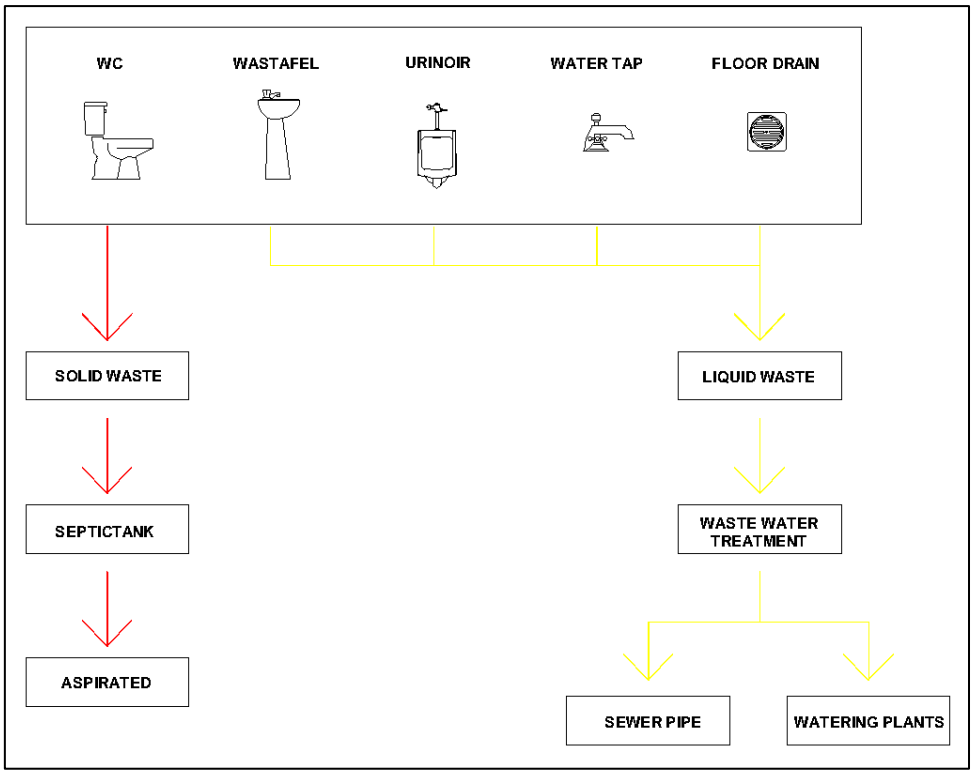

Figure 14 Utility Concept of Dirty Water

Figure 15 shows the design of the fire prevention system, the Car Modification Workshop has passive protection in the form of fire stairs, emergency lighting, and fire curtain while active protection in the form of hydrants, sprinklers, fire alarms, and fire poisons (portable). Fires can occur due to human carelessness or intentional fires that are not controlled, aiming to take lives and property.

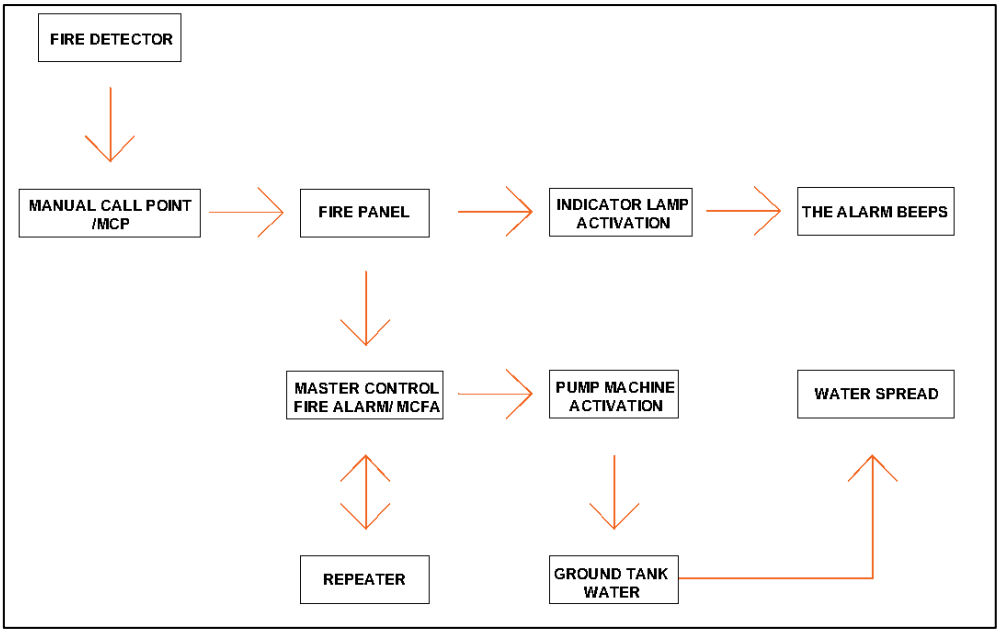

Figure 15 Utility Concept of Fire Extinguisher

Figure 16 shows the electrical framework is the development of electrical power supply hardware to solve the problem of low-voltage electric power. Electrical installations must be ready in the structure as they will assist all current exercises. The fundamental electric springs come from PLN. Generators are the solution to provide electricity needs in times of crisis [15].

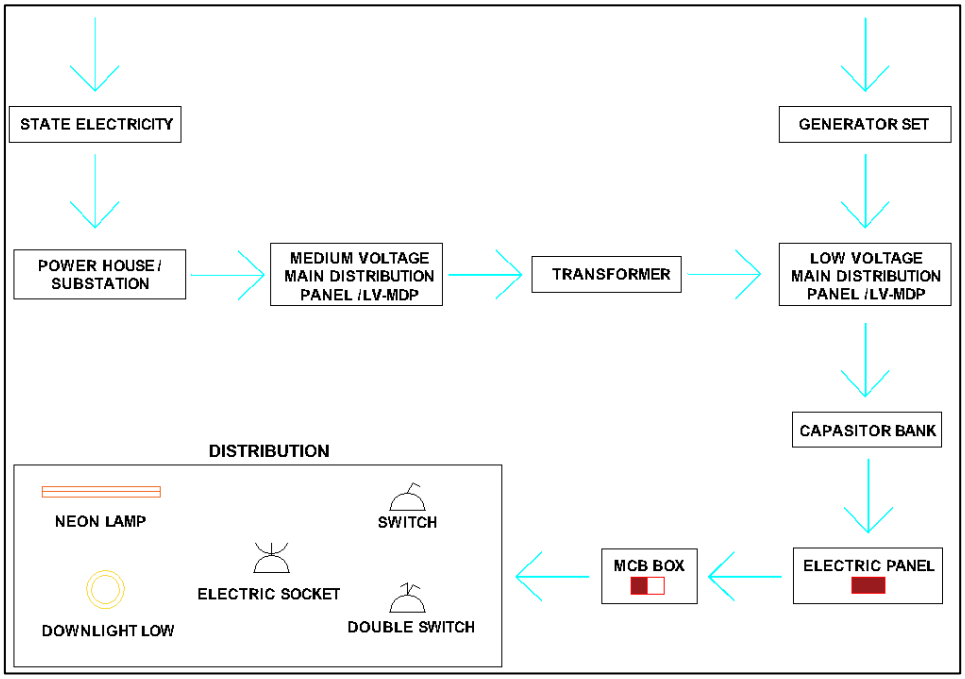

Figure 16 Utility Concept of Electrical

Figure 17 shows the concept of air conditioning is to transfer heat from one place to the next. An air conditioner as a cooler exchanges heat from inside to outside the room, and an air conditioner as a radiator transfers heat from the heating frame into the room (in polar countries) into two parts.

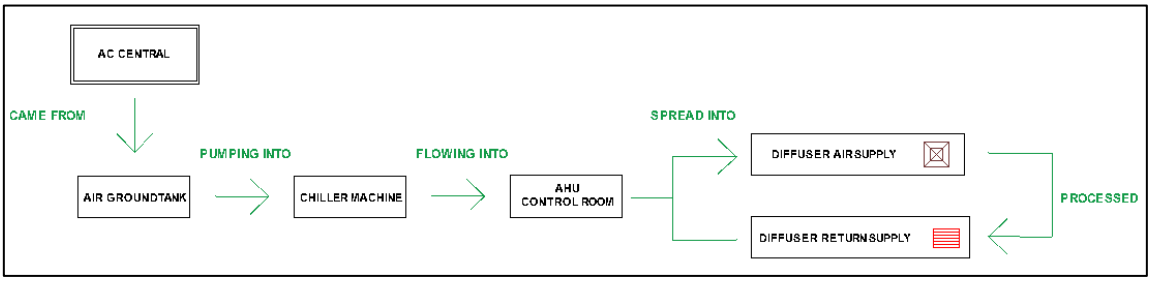

Figure 17 Utility Concept of Air Conditioner

4 Conclusion

This Car Modification Workshop is specially designed and has been limited according to the concept of users, actors, types of activities, space requirements, and building analysis to create relationships between spaces that can provide a pleasant atmosphere for users. It has showrooms, workshops, spare parts, display rooms, modification rooms, cafes, and other supporting facilities. In terms of design, it uses the basic theme of High-Tech Architecture. In this concept, the current structural configuration style has particular guidelines and is arranged in such a way. High-Tech architecture is also greatly influenced by the progress of science and innovation today.

This workshop has many functions that can be useful for many people. It is expected to overcome human problems with the latest innovations and accommodations for technological advances because it has a futuristic impression along with the times. In supporting the structure's vision, the materials used are manufactured, such as metal, glass, and plastic.

5 Acknowledgment

This research is a study on the design of car modification workshops which are expected to become a forum for the community to channel their hobbies and have varied choices with the High-Tech Architecture approach which emphasizes function and innovation with the times. The author also wants to thank the Department of Architecture, Faculty of Engineering, University of North Sumatra, and various parties who have helped launch the design concept for this modification workshop.

6 Conflict of Interest

The authors names are listed below certify that the manuscript do not have conflict of interest.

This statement signed by all the authors to indicate agreement that the above information is true and correct

Author's name (typed)	Author's signature	Date
Iffat Rais		November 2023

References

[1] Admin, "Sejarah Kota Medan," *pemkomedan.co.id*. https://pemkomedan.go.id/hal-sejarah-kota-medan.html (accessed Feb. 15, 2022).
[2] H. Basri, "Medan Modification Center Arsitektur High Tech," University of Sumatera Utara, 2013.
[3] I. Pane, M. Loebis, I. Azhari, N. Ginting, and D. Harisdani, "The Study of The Influence of Functionalism and International Style on Architecture Development in Medan City.," *IOP Conf Ser Mater Sci Eng*, vol. 309, 2018, doi: 10.1088/1757-899X/309/1/012021.
[4] D. Ardi, S. Adi, Susanti, and D. Anityas, "Pusat Otomotif di Semarang Dengan Pendekatan Arsitektur High-Tech," *Unpand: Journal of Architecture*, vol. 6, 2020.
[5] S. Kulkarni, P. Rao, and Y. Patil, "Are the Non-renewable Resource Utilization and Waste Management Practices Employed in Indian Automobile Sector Sustainable?," *Procedia Soc Behav Sci*, vol. 133, 2014.
[6] I. Y. Martha, "Mengenal Arsitektur High-Tech dan Penerapannya Pada Bangunan," *99.co.id*, 2020. https://www.99.co/id/panduan/arsitektur-high-tech (accessed Feb. 15, 2022).
[7] B. Shigeru, "Centre Pompidou-Metz / Shigeru Ban Architects," *archdaily.com*, 2014. https://www.archdaily.com/490141/centre-pompidou-metz-shigeru-banarchitects?ad_source=search&ad_medium=projects_tab (accessed Feb. 15, 2022).
[8] Large, "LeMay Museum / LARGE Architecture," *archdaily.com*, 2013. https://www.archdaily.com/326916/lemay-museum-large-architecture?ad_source= search&ad_ medium=projects_tab (accessed Feb. 15, 2022).
[9] S. Muharreza, "Laporan Perancangan TGA 490 – Studio Tugas Akhir Semester A Tahun Ajaran 2010/2011," University of Sumatera Utara, 2010.
[10] Sugiyono, *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta, 2015.
[11] D. Lindarto, D. Harisdani, and S. Sembiring, "The Modelling of Commercial Zone Management on The Strip Development in Medan," *IOP Conf Ser Earth Environ Sci*, vol. 452, 2020.
[12] B. Alfat, Y. Esti, and M. Sudarwani, "Pusat Otomotif Toyota di Semarang (Toyota Automotive Centre in Semarang) Dengan Pendekatan Desain Arsitektur Modern," *Unpand: Journal of Architecture*, vol. 4, 2017.
[13] S. Georgy, H. Vicky, and V. Johannes, "Mall Otomotif Manado (High Tech Architecture)," *Daseng: Jurnal Arsitektur*, vol. 4, 2015.
[14] B. Aron, "Aquatic Center di Medan dengan Pendekatan Arsitektur High-Tech," University of Sumatera Utara, 2020.
[15] E. Erdianto, "Toyota Car Modification Workshop in Jogjakarta," Indonesian Islamic University Jogjakarta, 2015.