

## JEDDAH RISK PREVENTION AND EDUCATIONAL COMPLEX

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### Abstract

The idea of The Civil Defence Awareness Educational Center (Prevention Disaster) will be a place that people get the awareness and the proper training protection and education. The center promotes a safety life though combining both physical training activity and awareness on how to maintain a safety life as well as how to react through any common kind of disaster such as flood and fires. This study used the concepts based on the case study to develop the project. This project will focus on the 3 major hazards that affect the population namely natural and man-made disasters, motor vehicle hazard and diving hazard. The zone of simulation for motor vehicle was outlined. The Zone of the proposed complex consists of administration zone, cultural & simulation zone (natural & man-made disaster category), museum zone (diving category), diving awareness zone, motor vehicle simulation zone, driving safety test zone, library zone, medical zone and commercial zone. The selected site for the complex is located at Salman bay based on several criteria analysis. This professional complex believes to create the awareness among people towards hazards and risk management.

**Keywords** -- Awareness, Risk prevention, Educational complex, Disaster, Hazards

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### INTRODUCTION

Weather and climate affect every sector of society. Climate change affects economic prosperity, human and environmental health, and national security [1]. Citizens, communities, businesses, governments and international organizations are all demanding climate information and products to respond to and adapt to climate change. A disaster can devastate a community and affects drought, famine and disease [2]. Therefore, education on the disaster is important to mitigate the impact of disaster.

The World Health Organization found Saudi Arabia to have the world's highest number of deaths from road accidents, which now make up the country's principal cause of death in adult males aged 16 to 36 [3]. Simulators help students retain more knowledge and sharpen skills.

Drivers are trained to respond instinctively to danger and get complete, consistent, objective feedback on their performance [4]. Using a reality theatre, trainees are immersed into an animated scenario where they assess actions of the characters to understand how a chain of events can combine to create catastrophic failures. This is a better-trained and safer driver workforce.

The top three common root causes leading to diver fatalities are pre-existing disease or pathology in the diver, poor buoyancy control and rapid ascent or violent water movement [5]. But, all the three root causes are completely avoidable. In fact, if a diver respects the safe diving practices taught during scuba diver training, none of these factors should be a problem. Research conducted by Paul Bert and John Scott Haldane helps explain the effect of water pressure on the human body, and thus determines the limit of compressed air diving [6, 7].

Technological advances in pumps and other equipment have allowed people to stay underwater longer. Therefore, this study propose a Risk Prevention and Educational Complex focus on the 3 major hazards that affect the population namely natural and man-made disasters, motor vehicle hazard and diving hazard in order to create the awareness among the resident in Jeddah Saudi Arabia.

### CASE STUDY

There are two concept proposals of disaster prevention and education center, one weather and climate prediction center, one concept proposals of environmental conference center and the world's first full scale test facility are chosen for the case studies. The constructive concept of the building are sensitive designed to suit their functionality and objectives. The case study topics are:

- Disaster Prevention and Education Center, Istanbul, Turkey by OODA
- Istanbul Disaster Prevention and Education Centre, Istanbul, Turkey by Collective Architectures
- PNOAA Center for Weather and Climate Prediction center
- L-U-D Studio
- AstaZero Active Safety test area

### Disaster Prevention and Education Center, Istanbul, Turkey By Ooda

The Disaster Prevention and Education Center in Istanbul, Turkey was designed and proposed by OODA (Figure 1). This building designed for both local residents and tourists, this iconic building has become a new landmark for cities on two continents.

Conceptually, the building is a celebration of the successful integration of the principle of "resilient cities" in the organization of the old city [8]. The center is equipped with appropriate technology and facilities to prepare for disasters and to raise public awareness of disasters, especially earthquakes.

The center tried to combine the most effective plan clarity with a strong concept to propose an overall theme related to the Istanbul context. The main program component requires a specific connectivity overlap, which will directly generate the intersection axis of the stacked related spaces. OODA's proposal calls for a large 3D cross building with 6 programmatic areas situated off the central lobby are planetarium, library, training, simulation, conference area and administration [8]

**Istanbul Disaster Prevention and Education Centre, Istanbul, Turkey by Collective Architectures**

The architectural design is expressed based on four natural elements: earth, fire, air and water (Figure 2). Being influenced by European, Asian and African cultures, Istanbul has evolved into a unique combination of all these cultures [9]. The entire building is about 9,100 square meters and is divided into three parts: conference, education and infrastructure. Visitors' adventures in the disaster prevention center begin in the lobby. People can go to the conference room (3 conference rooms and a conference hall), reach the ticketing area that contains all the facilities related to the disaster, visit the gift shop or sit in the cafe to relax. In the atrium, visitors can browse an overview of the themes dedicated to the area. A shelter that can accommodate 150 people is divided into two parts, including sleeping, sitting, toilets and places to prepare meals

The central square or courtyard is a place that requires some effort to enter. It symbolizes the aether, and the fifth element in nature is also called Latin "quintaessentia", which represents the combination of the other four elements. It is a natural order, a safe place in the land and the entire Turkish city, with a crucible characteristic of culture and nature.

**PNOAA center for weather and climate prediction center**

The NOAA Center for Weather and Climate Prediction in College Park, Maryland is a laboratory of scientists dedicated to providing the United States with professional weather, water and climate predictions that are closely related to everyone's life (Figure 3) [10]. The center opened in August 2012 and provides a seamless environmental analysis suite. The building will provide scientific and environmental predictions to the United States and the international community.

It works with partners and customers to provide reliable, timely and accurate analysis, guidance, predictions and warnings to protect lives and property and promote the national economy [10]. The materials used are recyclable local raw materials and high-efficiency glass. Sunshades were added to the design on the south side of the building to optimize energy performance. Two-thirds of the roof surface is covered with "green roofs" of slow-growing plants to provide better insulation and protection. Furthermore, the rainwater biological retention area and rainwater storage tank collect irrigation water, and the four-layer rainwater waterfall effectively drains the non-green part of the roof [10].

**L-U-D Studio**

L-U-D Studio designed by Rui Liu for UN Environmental Conference Center for Latin America (Figure 4) [11]. In the words of the architect, it highlights the negative consequences of rapid urbanization in a fast-growing country (such as Brazil, India, or China)-unlike the comprehensive design of how humans use water [11]. Liu took a step back to re-investigate the needs of the built environment to adapt to local scale water management requirements [11].

The design is part of the final paper of the Bartlett School of Architecture. The purpose is to provide a coordinated mechanical design for daily grey water management and urban flood integration in the local land system, while actually providing a systematic organization of paths as an animated building tool.

The complex forms of buildings and basic functional organization are controlled by a series of water flow simulation water management systems. The recommendation is the alternative flow control and water filtration. Due to its naturally biodegradable lifespan, inevitable and continuous changes in the landscape are used as the starting point and driving force for the design [11].



**Figure 1.** The perspective view of Disaster Prevention and Education Center, Istanbul, Turkey by OODA [8].



**Figure 2.** The perspective view of Istanbul Disaster Prevention and Education Centre, Istanbul, Turkey by Collective Architectures [9].



**Figure 3.** The perspective view of PNOAA Center for Weather and Climate Prediction center [10].



**Figure 4.** The perspective view of L-U-D Studio [11].

**AstaZero Active Safety test area**

AstaZero's open environment means anyone is welcome to test different environments, solutions and functions on the test bench. It can quickly adjust the test position according to changing customer needs [12, 13]. In addition to testing and R & D opportunities, AstaZero also hosts demonstrations and assists in product launches, conferences, and company events. It provides a simulation of the entire site, which can be run in a virtual environment before starting the actual test. The simulation system is developed by Swedish National Highway and Transportation Institute (VTI) [12]. The traffic control center at the test site has an accurate understanding of the location of different test vehicles around the site and can stop the test if necessary. AstaZero's proving ground center is composed of multiple elements, including a guarded reception area, a visitor center, meeting room, traffic control, and a separate visitor work area. The office space provides for long-term lease and short-term lease. The research area of the building can be used for a longer or shorter period of time, and these areas can be adapted to the needs of each client, whether it is an open project or a closed project. Last but not least, the security and privacy are top priorities.

**METHODOLOGY**

The project considers as an entertainment educational project, that will increase the awareness of the citizens, each case study has been analysed based on the details and components. Some of the analysed data will clarify the concept of simulation equipment. The division of the zoning of the project will be based on three project categories namely natural and man-made disaster, motor vehicle and diving hazard also the type of simulation for motor vehicle will be outlined.

**Natural and Man-Made Disaster**

To educate and aware the users of the environmental changes, important of life protection such as having a Climate Prediction Center, environmental modelling center. The need of lecture rooms, exhibition hall, library and sea life museum, basically this zone is a mix between all categories, where the education and entertainment meet in one place.

**Motor vehicle**

There are three types of motor vehicle simulations were considered in this project namely full cab, compact premium and motion system.

**Full cab driving simulator**

Full cab simulators (in-cab & Out-cab) are designed to Provide students with a real driving experience in a precise three-dimensional environment (Figure 5). When a trainer is experiencing the visual accident, an assistant is involved to direct the trainer in the In-cab and control the Out-cab visual environment. This allowing groups of trainees to interact simultaneously with the trainee driver. The simulator can be designed to share audio, video and computer equipment or even to include interchangeable panels and power/brake controllers.

**Compact premium driving simulator**

Sydac- the software company- has provided more than 30 complete cab simulators worldwide to provide users with a solid experience (Figure 6). The user can experience the virtual dashboard, vibration seat and others realistic experience such as light mock-up with actual car components including speedometer, rpm, seat, seat belt, gear box and hand brake.

**Motion System Driving Simulator**

Motion system is the most advance driving simulator (Figure 7). The machine consists of an entire vehicle, with a 360 display screen. The motion base mixes the acceleration caused by the hexapod with the yaw ring and the acceleration of the X-Y

component to produce a sense of acceleration, and also improves the accuracy of the train driver's brake control.



Figure 5. Full cab simulation interior [14]



Figure 6. Compact Premium driving simulator [14]



Figure 7. Motion system simulator [14]

**Diving hazard**

A main component in the diving category is the diving Air-tight chamber that helps treating the decompression illness (Figure 8) [15]. Jeddah city has 2 chambers were located far from the sea which makes it possible to save the patient in the right time. The

main goal of decompression chambers is to manipulate the outside pressure around a person in order to influence their blood chemistry and oxygen intake. A small chamber fit just one person, but larger versions can comfortably accommodate up to 10 individuals. The chamber should be provided for immediate use at the site of the diving project. The diver should be able to drain the water quickly and easily and pressurize it indoors to the appropriate recompression pressure.

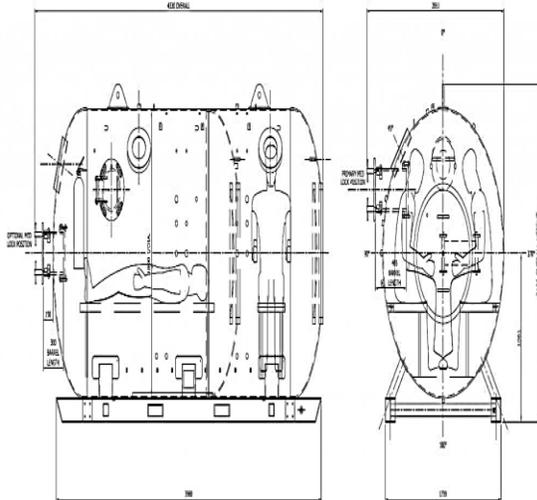


Figure 8. Decompression chamber plan and section [15]

**PROGRAM ASSUMPTIONS**

The building will be divided to 4 main zones namely gross floor area, net area, footprint area and un-built area. The project assumption is tabulate in Table 1. Table 2 and Table 3 demonstrate the total net area with circulation for the project and the complex area analysis respectively.

Table 1. Project assumption

| Zone                   | Area (m <sup>2</sup> ) |
|------------------------|------------------------|
| GFA (Gross Floor Area) | 46 000                 |
| Net Area               | 24 700                 |
| Footprint Area         | 12 400                 |
| Un-built Area          | 15 000                 |
| <b>Total Area</b>      | <b>98100</b>           |

Table 2. Total net area with circulation

| Zone   | Area (m <sup>2</sup> ) |
|--|------------------------|
| Administration zone                                    | 1300                   |
| Cultural Zone (Natural & man-made disaster Category)   | 3300                   |
| Simulation Zone (Natural & Man-made disaster Category) | 1600                   |
| Museum Zone (Diving Category)                          | 2400                   |
| Diving Awareness Zone                                  | 1200                   |
| Motor Vehicle simulation Zone                          | 4600                   |
| Driving Safety test Zone                               | 1300                   |
| Library zone   | 1100                   |
| Medical zone   | 900                    |
| Commercial Zone  | 900                    |
| <b>Total Net Area</b>                                  | <b>18600</b>           |
| <b>Net Area + Circulation</b>                          | <b>24700</b>           |

Table 3. Complex area analysis

| Zone  | Area (m <sup>2</sup> ) |
|---|------------------------|
| Administration zone   | 2200                   |
| Natural disaster & Man-made disaster awareness and educational zone | 6000                   |
| Motor vehicle awareness & Entertainment zone                        | 5900                   |
| Diving Awareness Zone   | 4500                   |
| <b>Total area</b>   | <b>18600</b>           |

**SITE SELECTION**

There are three sites were considered for this project. All the three are located in Jeddah, Saudi Arabia. Figure 9, Figure 10 and Figure 11 show the considered location for this project namely Edge of Obhur, Salman bay and North of Cornish respectively. Site A is located in the middle of Sharm Obhur, also the edge of Obhur Bridge which will be a short cut for linking South Jeddah with its North.

The location of site A is close to Al-Waleed Project which is the Kingdom Tower. Site B is located in Salman bay between Thahban project and Durrat al Arrous. Lots of new residential projects will be implemented during the upcoming years around Site B. Site C is located in North of Cornish Road Close to Fatimah Al-Zahra Mosque.



Figure 9. Site A- Edge of Obhur [16]



Figure 10. Site B- Salman bay [17]



Figure 11. Site C- North of Cornish [18]

It is very important to select an appropriate location for the site to function successful as well as to add value to the location it inhabits. The selections on the location for the project are based on the criteria of accessibility, views, demographic pattern, visibility, surroundings, utilities infrastructure and physiographic elements. This project require quite environment for the driving track which is free from noise such as industries area, also require the sea for the marina area and the diving awareness zone. Thus, Site B is selected for the project.

This site can be accessed from Obhour road as well as from Durrat Al-Arous road. It is located in Salman Bay jeddah. This site is far from the residential areas and the resorts respecting the surrounding. On the western south it has direct accesses to the sea. Since this site near to the kingdom project it will attract the tourist and the citizens to learn more about saving their souls specially the new technology that been used in the interior spaces. Moreover, the site is located after Thahban Park which is an attraction recreational area, also Salman bay is been developed by lots of investors, after few years the area will be rich of residential districts. The total gross area of the site is 200x400square meter.

Figure 12, Figure 13 and Figure 14 illustrate the zones on site, front and top view of site plan respectively. The concept of the complex been establish from the dice how the people take risks in their lives with no responsibilities, the dice concept translate the idea of irresponsible user and the circles on the surface translate the number of the unknown deaths and missing during disasters.

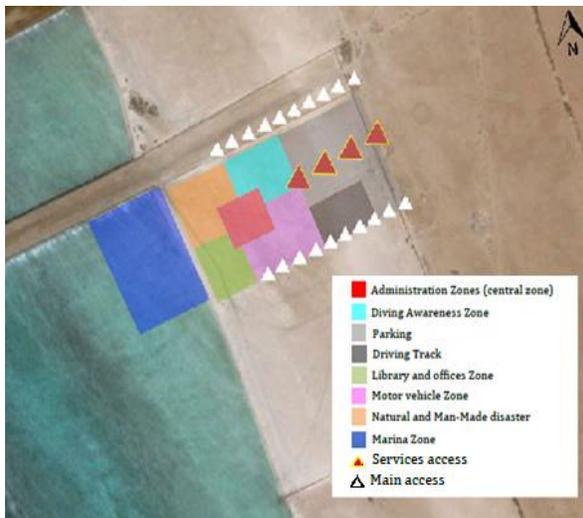


Figure 12. Site B and the zones on site



Figure 13. Front view of site plan



Figure 14. Top view of site plan

### CONCLUSION

This project play a leading major role in Saudi Arabia in providing a complex that offers and specialized in providing an innovation type of awareness and education to the main risks. This project develops a professional complex which opens the eyes toward risks and gives the ability to develop human reactions toward risks. The site selection for this project in at Salman bay, where the proposed complex included the zone of information center, natural and man-made disasters, motor vehicle awareness zone, diving awareness zone, conference zone, library and offices, museum and restaurant.

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