1. Introduction
Pasar Timbul Barat is a traditional market one of the economic turning points in West Jakarta. Located in the middle of dense settlements and relatively narrow access, this market seems to blend with the surrounding settlements. Market presence is very important. This is because if there is a need that cannot be produced alone, then this need can be obtained in the market. According to Enggartiasto Lukita, former Minister of Trade (2019). There are three problems in the market in general. The slum and smelly physical condition of the market can cause user discomfort, traditional traders often buy goods at higher prices than modern retailers. And finally, the limited capital from the seller is burdening them even more in buying and selling business [1].

Looking at the condition of the Pasar Timbul Barat, One of the three problems above can be said to be quite relevant. One of the three problems that will be examined is the physical condition of the Traditional Market. Lack of management and good market design is the reason this market is starting to be abandoned by visitors. The shopping area that is, stuffy, damp, and shabby is clearly visible in this market. Poor ventilation makes the air trapped in the room. Scientists say the main problems with poor ventilation are humidity levels and high concentrations of carbon dioxide. For this reason, it is necessary to make comprehensive improvements, as an effort to maintain the continuity of market activities in the Traditional Market.
Efforts to fix the market through a systematic approach that can solve physical problems in the Traditional Market is a healthy market approach program which is the goal of creating an adequate market for every market in Indonesia. This provision has been regulated and mandated in the Regulation of the Minister of Health of the Republic of Indonesia Number 17 of 2020. [2] Scientists say the main problems with poor ventilation are humidity levels and high concentrations of carbon dioxide. This triggers the sick building syndrome in this market.[3]

In the building health guidelines, there is a prevention of sick building syndrome, which by applying these 2 items:

1. Physical and environmental factors – include physical conditions such as ventilation, cleaning and maintenance, and workplace design.

2. Occupational factors – such as variety and interest in a particular job and human ability to manage certain aspects of the work environment.

The healthy market program approach has a variety of requirements that must be met. Such as location, ventilation, building structures, and lighting are benchmarks of the market's ability to carry out a healthy market program. The Ministry of Health also provides architectural guidance and for both sellers and buyers to run a healthy market program. [2]. The impact from Air exchange that does not qualify the requirements can cause the growth of microorganisms to flourish, which results in disturbances to human health. According to the governor's regulation no. 38 (2012). The requirement for fresh air change for shops, supermarkets is 6 air exchanges per hour. Or 18 m³/hour/person. This paper will explain the most optimal alternative design in providing optimal air intake in accordance with the standards given at Traditional Market. [4]

The ASHRAE standard, the 2010’s research, shows that the operative temperature in higher indoor temperature is acceptable when the outside temperature is comparatively higher. The acceptable operative temperature could be as high as 31.7 °C when the outdoor mean temperature is 33.5 °C. The average air speed from 0.6 to 1.2 m/s can also reduce the operative temperature from 1.2 - 2.2 °C (ASHRAE, 2013) [5]. In summary, according to the research, the comfort zone of people in the warmer regions is in a higher temperature range than that in the colder regions. However, providing natural wind through indoor activity areas is valuable for the open-air buildings in the tropics.

2. The Methodology
Process of the study is aimed to evaluate the natural ventilation condition in the existing markets and designing a new market which interacts well with wind. The process of enquiry and design are divided into 5 parts as follow:

2.1 Collecting data
First step of the study is to collect the data from the existing markets by making the 3d model of the market and simulate the models using CFD application for finding the result of ventilation flow. The simulation was carried out in two seasons, which is rainy season and the dry season. To see the
2.2 Identifying the problems
The processes of identifying the problems of this markets are done by analyzing the collected data on site and simulating the ventilation flow into the model of building cases by using computer program, Computational Fluid Dynamics (CFD).

For maximum performance, the data used is the highest data in each season. With that, it can be seen how effective the existing building is in responding to the wind and the quality of the intake obtained, so that it can be concluded that the problems need to be solved.

Problems in existing buildings can be concluded as follows:
1) Ventilation is not up to standard in flowing wind, so there is no cross circulation
2) The building is not parallel to the direction of the wind, so the wind is not too big.
3) The building is too fat, with it the wind is difficult to flow smoothly.
4) The room dividers block the incoming wind, so that the wind does not travel throughout the room.
5) In the dry season, the intensity of the wind inside the building is not too big. So we need a new strategy to anticipate the lowest wind speed.

3. Site Data
Pasar Timbul Barat is chosen as the location of study because the two of three main problems are identified. Which they do not have 20% of ventilation openings and crossing ventilation instead. The location of this market is at Jl. Tomang Tinggi, RT.11/RW.7, Tomang, Kecamatan. Grogo Petamburan, Jakarta Barat 11440, The climate is hot-humid and at location it is noted that the wind blows from the west to the northeast.
Wind Rose data at location

**Figure 3. Location**

**Figure 4. Wind Rose data at location**

**Figure 5. Wind Flow Direction**

Explanation:
In wind rose data, it shows the wind comes from each side of the building (8 cardinal directions), while the wind with the greatest frequency comes from the back of the building (southwest). In response to this, a special strategy is needed to respond to winds coming from various directions to optimize the use of natural ventilation. That is by implementing an 8-sided or multi-way wind catcher on the roof of the building.
4. Result and Discussion
To find out which type of wind catcher is the most ideal for the site, the author compares 10 types of wind catcher from each climatic condition, here is a comparison table. [see table 1]

Table 1. Comparison of wind-catchers table

| Climate Zone          | Iran’s arid zone | Persian gulf | Iraq       | Egypt       | Pakistan   | Afganistan  |
|-----------------------|------------------|--------------|------------|-------------|------------|-------------|
| Air direction         | Hot and Dry      | Hot and Humid Dry | Hot and Humid Dry | Hot and Humid Dry | Hot and Humid Dry | Dry and semi hot Dry |
| Shape of cross-section| North-East Breeze | North-East Breeze | North-West | North-West | North-West | North-West |
|                       | Square/rectangle | Square/rectangle | Rectangle  | Rectangle  | Square     | Square     |
|                       | hexagon, Octagon | hexagon, Octagon | Rectangle  | Rectangle  |            |            |
| Average dimension (m) | 0.5 x 0.8        | 1 x 1        | 1.20 x 0.60 | -          | 1 x 1      | 1 x 1      |
| Height (m)            | 3 – 5            | 3 – 5        | 1.80 – 2.10 | One story above roof | 5 And above | 1.5 From roof |
| Direction according to the wind | Diagonal      | Diagonal    | Ordinary   | Ordinary    | Diagonal   | Ordinary   |
| Ceiling of the wind tower | 45° Slope   | 45° Slope  | 45° Slope  | 45° Slope  | 30° Slope  | 30° Slope  |
| Ventilated area       | Dining room and basement | Dinning room and basement | Basement  | Dinning plus one room | All rooms | All rooms |
| Airblow               | Multi-side      | Multi-side  | One, two-side | One-side   | One-side   | One-side   |
| Evaporative Cooling   | Sometimes        | Never       | Sometimes  | Sometimes  | Never      | Never      |

From the comparison of reference wind catchers from various climate types, the most suitable for the conditions on the site are the Pakistani and Persian Gulf types. To use the 2 types, the author tries to create by combining 2 types of wind catchers to become a new component that can be implemented in this market building.

The selected wind catcher types are compared to see the components that affect the performance of each type, then combined into a new form.
4.1 Details of wind-catchers Persian Gulf Type:

![Persian Gulf wind-catcher details](image1)

**Figure 6.** Persian Gulf wind-catcher details

4.2 Details of wind-catchers Pakistan Type:

![Pakistan wind-catcher details](image2)

**Figure 7.** Pakistan wind-catcher details
4.3 Details of combined wind-catchers

**Important Components:**

**Roof / Cover:**
Has a slope of 5 using a light sand spandex.

**Catch panel:**
Positioned 4 sides to catch wind from all directions with ACP material / plywood board.

**Blower:**
As a guide for the flow of air out of the wind wall.

**Wind wall:**
In order to bring the wind into the building through the cavities made of GRC.

**Tower:**
9 meters high from the ground to catch the wind from the top of the surrounding buildings, with full concrete material to the roof structure.

**Figure 8.** Combined wind-catcher details

4.4 Applicating the combined wind-catchers into the main building [see figure 9]

**Figure 9.** Combined wind-catcher implementation
5. Concluding Remarks

Based on the comparison results of each type of wind-catcher in the world, according to the appropriate climate on the site, there are 2 types that are suitable for use. namely the Persian Gulf type and the Pakistan type. and from these two types, the author tries to combine 2 types to get new results that are more optimal to be implemented in this market building. that way optimization in catching wind to increase the use of natural ventilation can run optimally. Then the Design Guidelines that can be concluded based on the results of the author's analysis are as follows:

Building configuration:
1. Orientation facing southwest-northeast (according to the direction of the wind)
2. The most ideal building mass arrangement is O Plan
3. The application of a wind catcher with a combined form of the Pakistani and Persian Gulf types.
References

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