fashion factory of tomorrow

creating healthy and comfortable working conditions for factory workers of the fashion industry

graduation plan
inside garment factory PT Perdana Firsta in Bandung
[picture by Mo Smit, April 2017]

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01. motivation studio choice

I’ve always liked the technical approach of Architecture. When I design a building I want to make decisions based on technical knowledge, not just ‘because it is beautiful’. I like to design beautiful buildings that are smart and well-thought in a technical way. To be able to do this, I need to gain knowledge on technical aspects. Therefore the studio Architectural Engineering is for me the perfect fit.

02. problem statement

“Textiles and clothing production is among the industries that contribute most negatively to environmental and social aspects of sustainability” (Laitala, Boks, & Klepp, 2015). Besides the problem of environmental pollution is one of the main problems in the fashion industry that most of the garment factories have a very poor indoor environment with regards to the thermal conditions, lighting, air quality and acoustics. As a result, the indoor conditions are harmful for the physical and mental wellbeing of the garment workers. (Better Factories Cambodia, 2013)

The majority of today’s garment factories are located in less-developed countries with warm (and humid) climates. The buildings are often simple ‘boxes’ with hardly any measures or provisions to adjust the building to their local climate. Instead of designing/building the factories in a way that they protect themselves against the negative climatic influences and take the opportunity to use the outdoor climate to their advantage, these factory buildings become victims of the challenging outdoor weather conditions. Furthermore is the quality of the indoor environment also negatively influenced by the high worker density, the noisy and polluting production activities, and the absence of good electrical and mechanical installations.

The city Bandung, located on the island Java, is known as Indonesia’s textile and fashion hub. Many inhabitants (mostly women) spend their days in unhealthy and uncomfortable indoor environments of textile or garment factories. But the first positive signs for change are there: Bandung has the ambition to become “the most sustainable and competitive urban region for fashion production in the world” (Smit, Loen, Toledo, Yanindraputri, & Ingen-Housz, 2016). To reach this goal it is vital that factory buildings are sustainable and offer good indoor working conditions. For this a new approach towards the design of factory buildings is needed.
03. Objective

My objective is to design a sustainable medium-size vertically integrated garment factory in Bandung, by making optimal use of passive building design strategies to create a healthy and comfortable indoor environment for the garment workers.

In my research and design, the main focus will be on the quality of the indoor environment. The factory must have a healthy and comfortable indoor work environment for the garment workers with regards to the thermal conditions, lighting, indoor air quality and acoustic conditions. From both sustainability-perspective and cost-perspective, the main way to achieve this is by making optimal use of passive building design strategies suitable for the local climate of Bandung.

From a sustainability perspective should the factory be build as much as possible out of local materials (wood, bamboo, etc.). Secondly should it be a zero-energy building, meaning that there is as much energy produced on the building site as the building uses. Furthermore must the production-process avoid pollution of the outdoor environment (air, water and soil), which could for example be achieved by integrating a water filtering pond and a production garden for natural dyes on the factory building site.

From an economic point of view should the design be affordable, meaning that the price is not too expensive compared to the current factory building prices. Also should the design be optimal suitable for an efficient production process. The building must support the garment production flow in the best possible way.

04. Overall design question

How can a sustainable profitable medium-size vertically integrated garment factory in Bandung meet the production-demands of today’s fashion industry, but at the same provide a healthy and comfortable indoor environment by using passive building design strategies?
05. thematic research question

What building-related problems with regards to the indoor environment currently exist in garment factories and which passive building design strategies can be established to achieve a healthy and comfortable indoor environment in a garment factory located in the tropical climate of Bandung?

With regards to this main research question, the following sub-questions have been formulated:

1. What are the main characteristics of the outdoor climate of Bandung, and what passive building design strategies fit with this outdoor climate to create a healthy and comfortable indoor environment?

2. The thermal conditions inside garment factories: what are the current problems with regards to the health and comfort of the workers and how can passive design strategies improve these conditions?

3. The lighting conditions inside garment factories: what are the current problems with regards to the health and comfort of the workers and how can passive design strategies improve these conditions?

4. The air quality inside garment factories: what are the current problems with regards to the health and comfort of the workers and how can passive design strategies improve these conditions?

5. The acoustic conditions inside garment factories: what are the current problems with regards to the health and comfort of the workers and how can passive design strategies improve these conditions?
06. methodology

IN DELFT:

Literature & internet research
- study the relation between human wellbeing and comfort and the building physical aspects of the indoor environment (thermal conditions, lighting, indoor air quality and acoustics)
- study the existing problems regarding the indoor environment of garment factory in Bandung and in other tropical countries
- study how factories operate; understanding the factory as an efficient and productive workplace; understand the different steps of the production process
- case studies of inspiring sustainable (garment) factories
- study passive building design strategies for tropical climates

Sketches, Drawings & Models
- make info-graphics to tell my story
- designing by sketching, 2D-drawings and 3D-drawings

IN BANDUNG:

Observations
- map the chosen Kampung area for my project
- make pictures of the chosen area
- visit garment factories and home factories to observe (the problematic aspects in) their indoor environments
- make inventory of local building materials
- make inventory of outdoor climate

Interviews
- interview factory workers and factory managers to gain information about the (health and comfort of the) indoor environment of today’s garment factories

07. relevance

Already for many years there is a struggle going on for better working conditions in the garment industry. (CCC, 2013) But it is a slow process, with steps of very little improvement. A lot of research has been done to address the problems of indoor work environments in factories, but not many solutions have been provided to prevent (most of) these problems from already the earliest phase of the design and construction of the factory buildings. In ancient Asian civilizations there was a consciousness and know-how on how to design buildings in a way that they use the local climate to create comfortable indoor conditions (Emmanuel, 2005), but this knowledge seems to have been either lost or simply neglected in the practice of today’s factory buildings.

(Re-)application of passive building design strategies assures optimal use of the connection between outdoor climate and design, in order to create a more healthy and comfortable indoor environment. The use of passive building design strategies for garment factory buildings is not common today. Also not much effort is spend on trying to create healthy and comfortable indoor work environments of the garment workers. It is the incentive of this project to find out if passive building design strategies are an effective solution to built garment factories with a good indoor quality.


