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# WOOD-WOOL CEMENT BOARD (WWCB) AS A SUSTAINABLE GREEN INFRASTRUCTURE MATERIAL

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## 7.1 INTRODUCTION

Buildings alone, not including other infrastructures, are accounted for about 40% of total primary energy consumption worldwide. Construction of buildings has contributed to approximately a third of total greenhouse gasses emissions (UNEP, 2009; IEA, 2013). In order to reduce the energy consumption and the emission of greenhouse gases in the construction of buildings, the use of natural lignocellulosic materials as a substitute in cement board is considered as one of the solutions. According to the findings by Eriksson (2003), construction using wood as raw materials or as reinforcement, require less energy than construction using pure concrete and steel alone. It was predicted that with the increase usage of wood (about 35% more) in construction, the greenhouse gases emissions can be reduced to about 1.3% of total annual emissions in Europe. Besides the reduction in green houses gases, buildings constructed with timbers is also more energy efficient in the long run. Comparative study between identical timber and concrete buildings in Las Vegas suggested that timber construction required higher space heating energy but at the same time require much lower energy for space cooling (Zhu *et al.*, 2009).

Timber in various size, shape, geometry and condition can be utilized in the construction of various parts of a building. However, in this chapter, the discussion is mainly focused on hybrid panels produced by the mixture of shredded wood wool (ribbon like particle) and Portland cement which mainly serve as a substitute for asbestos-based cement products. Wood-Wool Cement Board (WWCB) has been manufactured since 1920 and has been used as construction and building material for over 60 years (Moslemi and Hamel, 1989). Some of the applications of the WWCB are as ceiling materials, sound barriers, heat insulator and wall panels. The benefits of using the wood-cement hybrid panels in a building include high fire resistance and high durability. Besides that, the low maintenance nature of the panels also contributes to its increasing popularity in the construction industry (Doudart *et al.*, 2014). Furthermore, the shredded wood wools used are low in density, low in cost, are biodegradable and are easily available in extensive varieties of fibers (Karade, 2010; Tabarsa *et al.*, 2011). The use of wood wool fibre as reinforcement also improve the weakness of cement boards such as having brittle and low tensile strength. Generally, the application of WWCB in building construction is economically and environmentally beneficial as wood wool is a green, sustainable and renewable material which is available at relatively low cost besides its desirable physical and mechanical properties (Onuaguluchi and Banthia, 2016).

## **7.2 MANUFACTURING AND PROPERTIES OF WOOD-WOOL CEMENT BOARD (WWCB)**

Wood wool can be made from timber from various species. The fibre in Wood-Wool Cement Board (WWCB) to some extent can determine the properties of the boards produced. Therefore, it is best to understand the structure of the natural fibre existed in WWCB. The structure of natural fibre of wood from which wood wool is derived is shown in Figure 7.1.