grace under pressure

PART TWO

06 | TYPOLOGY + APPLICATION

Having established the realities of disasters in the local context, this chapter reviews shelter typologies with the emphasis on application. From this, pertinent criteria was derived and formulated towards rendering an effective design proposal.

The investigation points to a highly adaptive solution that can respond to the various phases[1] of recovery.

Deployable (collapsible) structures offer an effective solution to constraints such as the economy of manufacture, storage and transportation.

Shelter for disaster is a vary basic form of portable architecture. Figure 40 illustrates the various shelter typologies and their applications. All portable systems are categorized as either deployed [structures] or prefabricated [elements].

According to Brookes[2]; 'deployment' concerns not the pre-manufacture of **elements** but more or less pre-assembly of an **entire structure** in a factory and the unfurling or deploying of the structure on site."

► The premise of prefabrication is to decrease the need for skilled labour onsite (as well as speed and simplicity of erection often under trying conditions) through the use of factory produced structures. This approach also provides greater economy and better quality control over the final product.

Brookes[3] suggests that there are six main types of deployable structures: tensegrity structures, membrane systems, pantograph, pneumatics; flat packed and pods or capsules.

► Deployable structures are usually based on the principle of collapsibility. The premise of collapsibility[4] is that an object or structure has "one **folded passive state** and one or more **unfolded active states**" with the objective to save space.

This is achieved through the application of one or more principles of collapsibility. A set of 12 principles[5] describes the action by which the structure or object is either collapsed (creasing, nesting, hinging, rolling, folding); expanded (assembling, fanning, stress, inflation, sliding) or in some cases, the structure itself (bellows, concertina).

Collapsibles however exclude self-assembly and knock down furniture as it is argued that self-assembled furniture is not collapsible, it is just not yet completely manufactured.[6]

Although any of these typologies could provide feasible sheltering solutions, some systems are more suitable to the context and constraints than others.

6.1 SELECTION CRITERIA

Two people had a strong influence on the selection criteria for of a structural system:

The first is the sound advice given by a lecturer[7] who was involved in a transitional relief effort run by the Canadian Red Cross. He recommended to make sure that if any new or foreign technology or construction method is used that it is comprehensible to the level of construction skills available. If this is not the case, make sure that the structural integrity of the proposed shelter is easy to inspect afterwards.

This advice is based on his experience in Indonesia were concrete structures designed to withstand earthquakes failed when another earthquake devastated the same area. It was later found that instead of crossing the steel

1 *vide* (4.2.2:20)
2 Brookes (1998:116) [emphasis by author]
3 Brookes (1998:116)
4 Mollerup (2001:24) [emphasis by author]
5 Mollerup (2001:30)
6 Mollerup (2001:22)
7 Adams (2009)

reinforcement of the concrete columns they were overlapped without connecting. The foreign construction technology was not understood by locals and once the concrete was cast it was no longer possible to inspect.

The second was given by Mia Ferrara[8] when she spoke about the temporality of global village shelters. It is impossible to determine how any part of the temporary shelter will eventually be used long after the specified duration of the shelter expires. When a temporary structure naturally degrades such risks are lessened.

The structural elements in tensegrity and membrane systems are designed to withstand a calculated weight for the given design and cannot guarantee other structural loads it might be adapted for.

Another factor to consider is the materials these typologies are likely to require. The use of non-degradable or flammable materials, as in the case of pneumatic structures, and toxicity could have adverse effects on the feasibility of the proposal.

6.2 FLAT PACK

After an evaluation of the various types of deployable structures flat pack solution (employing principles such as folding, creasing, hinging and concertina) offered the most potential in terms of;

- materials and readily available manufacturing processes
- offering the greatest flexibility of supplying interior without adding to the cost [chapter 03] without complex structural implications
- becoming part of a morphogenetic process [chapter 04] that can support the preceding phases using local construction methods [chapter 05]

Because of the family structure in the greater Tshwane region[9] the proposal is leaning towards smaller units that can cluster rather than proposing a larger unit that can subdivide.

The flat pack deployable typology shall be focussed on attentively in the chapters to follow.

8 Fehrenbacher (2006:[1 of 1])
9 *vide* (5.6.3:39)

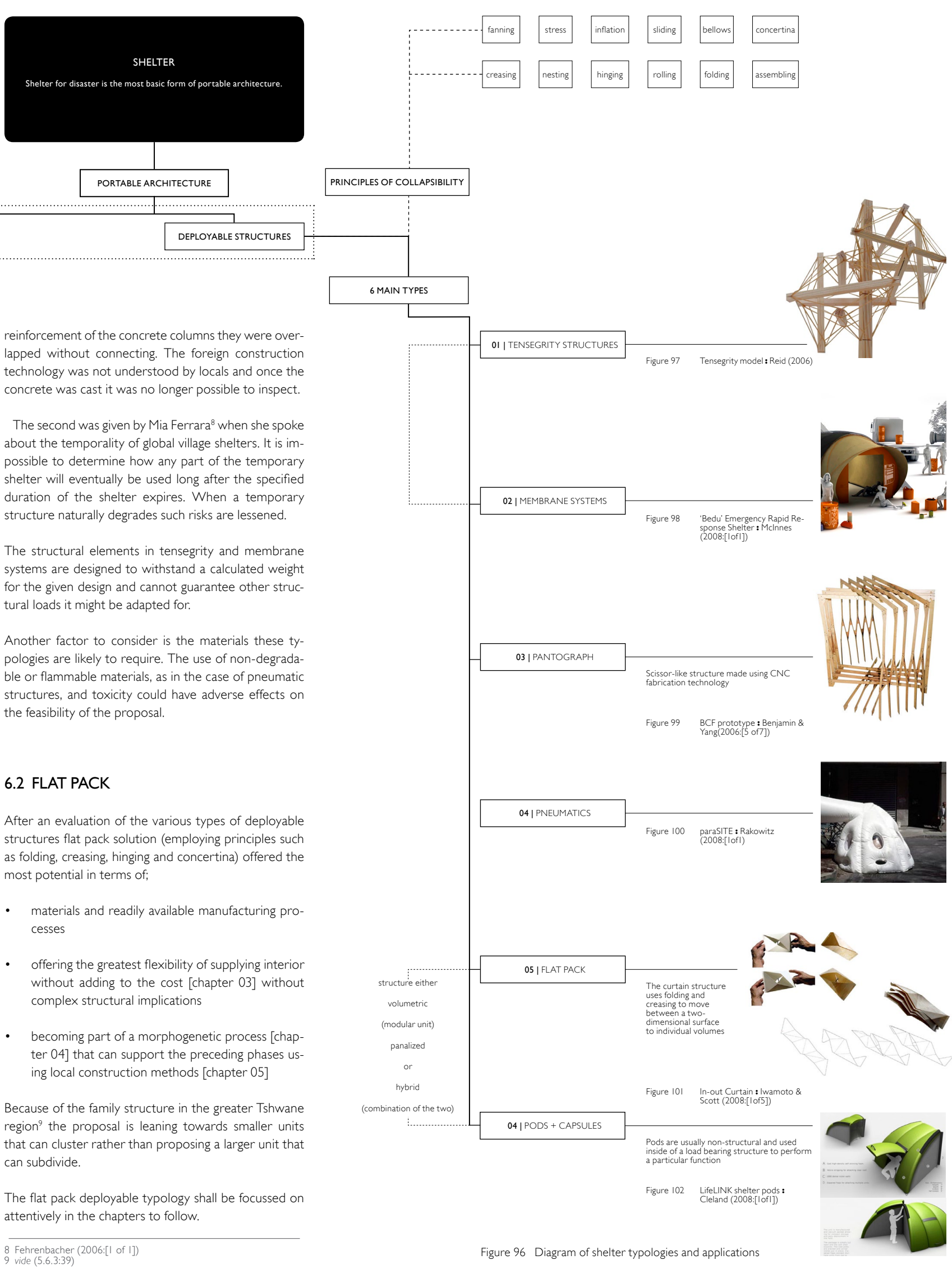

Figure 97 Tensegrity model : Reid (2006)

Figure 98 'Bedu' Emergency Rapid Response Shelter : McInnes (2008:[1of1])

Figure 99 BCF prototype : Benjamin & Yang(2006:[5 of7])

Figure 100 paraSITE : Rakowitz (2008:[1of1)

Figure 101 In-out Curtain : Iwamoto & Scott (2008:[1of5])

Figure 102 LifeLINK shelter pods : Cleland (2008:[1of1])

Figure 96 Diagram of shelter typologies and applications