

“ Always design a thing by considering it in its next larger context - a chair in a room, a room in a house, a house in an environment, an environment in a city plan. ”

• Eliel Saarinen¹

07 | PRECEDENT STUDIES

The focus of this thesis falls within the parameters of rapidly deployable shelter systems. The shelter form will ultimately be determined by the structure type and method of construction.

This chapter is a critical revision of flat-pack deployable structures. Precedent studies were selected accordingly to gain an overall understanding of the diversity of applications that are both temporary and transitional.

Architect and shelter advisor Elizabeth Babister² uses the example of her Transitional Community project in Sri Lanka to describe the difference between temporary and transitional:

These are 'transitional' as opposed to 'temporary'. Emergency shelter is temporary and is intended just to provide shelter for survival. Transitional implies something that is longer-term and gives you space to carry out livelihood activities rather than just surviving.

7.1 OVERVIEW OF PRECEDENT STUDIES

Table 01 shows a wide range of available sheltering options. South Africa currently employs the uses two: the UNHCR light-weight emergency tent and military canvas tents [centre pole and ridge type].

The discussion of precedents ranges from the very general to the specific. This order seemed to be the most logical. The chapter starts by explaining four different concepts derived and explained at the hand of different precedent studies that propose an alternative approach to shelter. These concepts are to be further challenged and explored in the chapters to follow.

It then continues with a critical revision of the main influences that contribute to the synthesis of the proposed solution.



¹ Fletcher (2001)

² Babister was the shelter advisor for the Transitional Community project in Tangalle, Hambantota, Sri Lanka, 2005. Architecture for Humanity (2007:99)

Table II Summary of precedent studies and other sheltering typologies

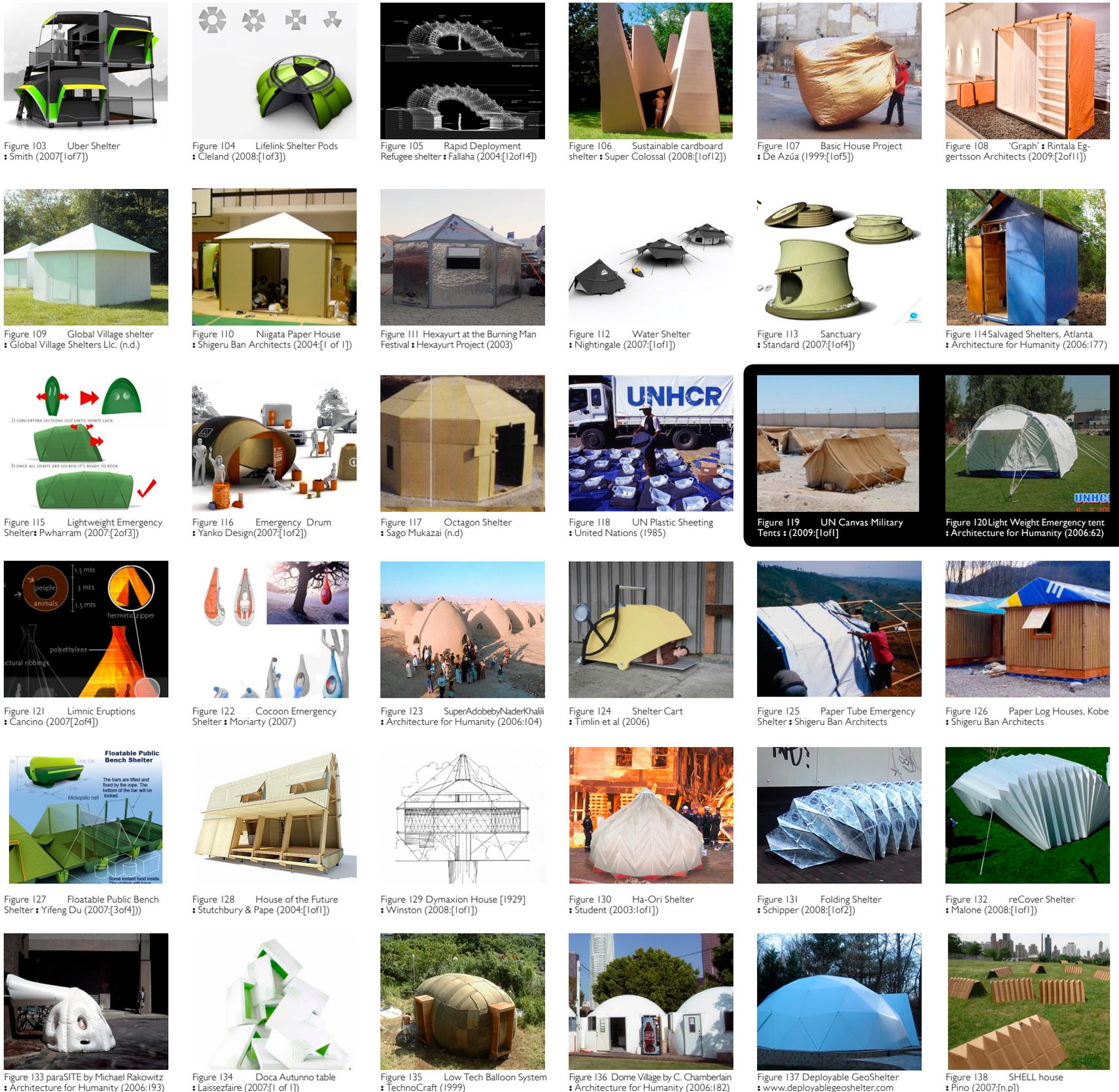


Figure 103 Uber Shelter
• Smith (2007:[1of7])

Figure 104 Lifelink Shelter Pods
• Cleland (2008:[1of3])

Figure 105 Rapid Deployment Refugee shelter
• Fallaha (2004:[12of14])

Figure 106 Sustainable cardboard shelter
• Super Colossal (2008:[1of12])

Figure 107 Basic House Project
• De Azúa (1999:[1of5])

Figure 108 'Graph' • Rintala Eggertsson Architects (2009:[2of11])

Figure 109 Global Village shelter
• Global Village Shelters Llc. (n.d.)

Figure 110 Niigata Paper House
• Shigeru Ban Architects (2004:[1 of 1])

Figure 111 Hexayurt at the Burning Man Festival
• Hexayurt Project (2003)

Figure 112 Water Shelter
• Nightingale (2007:[1of1])

Figure 113 Sanctuary
• Standard (2007:[1of4])

Figure 114 Salvaged Shelters, Atlanta
• Architecture for Humanity (2006:177)

Figure 115 Lightweight Emergency Shelter
• Pwharram (2007:[2of3])

Figure 116 Emergency Drum
• Yanko Design(2007:[1of2])

Figure 117 Octagon Shelter
• Sago Mukazai (n.d)

Figure 118 UN Plastic Sheetting
• United Nations (1985)

Figure 119 UN Canvas Military Tents
• (2009:[1of1])

Figure 120 Light Weight Emergency tent
• Architecture for Humanity (2006:62)

Figure 121 Limnic Eruptions
• Cancino (2007:[2of4])

Figure 122 Cocoon Emergency Shelter
• Moriarty (2007)

Figure 123 SuperAdobey/NaderKhalil
• Architecture for Humanity (2006:104)

Figure 124 Shelter Cart
• Timlin et al (2006)

Figure 125 Paper Tube Emergency Shelter
• Shigeru Ban Architects

Figure 126 Paper Log Houses, Kobe
• Shigeru Ban Architects

Figure 127 Floatable Public Bench Shelter
• Yifeng Du (2007:[3of4])

Figure 128 House of the Future
• Stutchbury & Pape (2004:[1of1])

Figure 129 Dymaxion House [1929]
• Winston (2008:[1of1])

Figure 130 Ha-Ori Shelter
• Student (2003:[1of1])

Figure 131 Folding Shelter
• Schipper (2008:[1of2])

Figure 132 reCover Shelter
• Malone (2008:[1of1])

Figure 133 paraSITE by Michael Rakowitz
• Architecture for Humanity (2006:193)

Figure 134 Doca Autunno table
• Laissezfaire (2007:[1 of 1])

Figure 135 Low Tech Balloon System
• TechnoCraft (1999)

Figure 136 Dome Village by C. Chamberlain
• Architecture for Humanity (2006:182)

Figure 137 Deployable GeoShelter
• www.deployablegeoshelter.com

Figure 138 SHELL house
• Pino (2007:[n.p])



Figure 139 Milan 2009 - House of furniture parts for Droog • Studio Makkink & Bey (2009:[1 of 5])

7.2 CONCEPT PRECEDENTS

The conceptual thinking of the proposed shelter is best explained at the hand of the following precedent studies:

CONCEPTUAL DERIVATIVE 7.2.1

In relation to the thesis topic this concept presents a promising idea that one could either have shelter or one could have furniture. It provides a flexible situation wherein, no matter what, one would always have what one needs most.

CONCEPTUAL DERIVATIVE 7.2.2

Proposes that elements evolve as the time line of recovery increases. This would require more permanent components with flexible applications.

CONCEPTUAL DERIVATIVE 7.2.3

Provision of a partially complete shelter that encourages completion with materials of the user's choice.

CONCEPTUAL DERIVATIVE 7.2.4

The development of cardboard as a viable building material has come a long way. This marks the first ever cardboard building to be built. It met very strict UK building codes and fire regulations and has a life expectancy of 25 years.

7.2.1 ADAPTABILITY

House of Furniture Parts

LOCATION: Via Alserio, Milan

DATE: 2009

DESIGN FIRM: Studio Makkink and Bey

MAJOR FUNDING: As part of the development of Droog Studio's Staircase project for their New York store.

DESCRIPTION:

A fun element used to create a small space within larger office or public spaces. Dezeen Magazine³ describes it as:

Enclosure made of plywood and with walls of stool, bench and table parts that easily come out and assemble, the functionality and character of the house can be changed as more or less furniture is used. A poetic vision for efficient production and material use, House of Furniture Parts transports flat and can be made to suit different functions, produced locally and customized.

The versatility of end uses that the concept can be adapted for are endless. All materials and processes are locally manufactured.

³ Etherington (2009:[1 of 1])



Figure 140 Water Shelter - Sustainable shelter solutions
 • Nightingale (2007:[1 of 1])

7.2.2 EMERGENCE

Water shelter

LOCATION: Zambezi basin in Sub-Saharan Africa
 CLIENT: UNHCR and NGOs in Mozambique and Zambia
 USER: Displaced residents of Dodanduwa, Sri Lanka
 DESIGNER: Robert Nightingale
 MAJOR FUNDING: UNHCR and NGOs in Mozambique and Zambia

DESCRIPTION:

The design meets four basic needs: shelter; drinking water; transportation and product information; promoting healthy behaviour by recycling water through its roof construction. The topic of emergencies is supported by a three phase strategy:⁴

- (a) Transit: temporary tent structure for habitation whilst travelling to safer area.
- (b) Transition: after arriving at the final destination the design allows the incorporation of local materials to increase in size and volume.
- (c) Rebuild: the design becomes a structural template for future construction

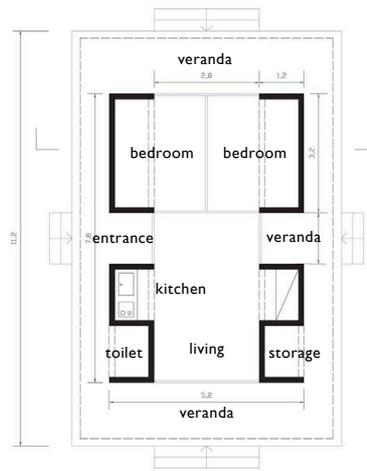


Figure 141 Safe[R] House
 • MIT (2005:[2 of 2])

7.2.3 TRANSITION

Safe[R] House

LOCATION: Sri Lanka
 DATE: 2005
 CLIENT: Prajnopaya Foundation
 USER: Displaced residents of Dodanduwa, Sri Lanka
 DESIGN TEAM: Harvard Graduate School of Design, SENSEable City Laboratory, Massachusetts Institute of Technology [MIT]
 MAJOR FUNDING: Architecture for Humanity, Prajnopaya Foundation
 COST PER UNIT: \$1,500
 AREA: 37 sqm

DESCRIPTION:

The Saferhouse was designed to resist the force of a tsunami. It replaces the core of the house with four C-shaped concrete structures.⁵ These core structures are what was of interest as they allow the occupant to complete their dwelling with their own choice of materials and style.

This slight modification of traditional building techniques helps communities build their homes back safer which is a very important longer term goal.



Figure 142 Exterior and interior school • Buro Happold (2001:[1 of 1])

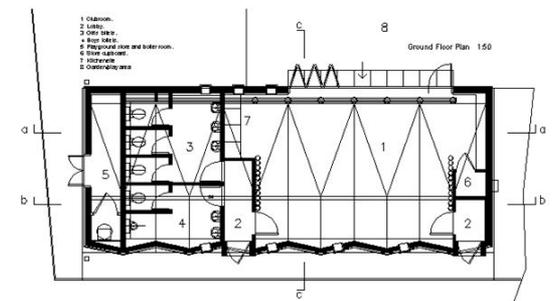


Figure 143 Plan of Westborough Primary School
 • DUBS (2007:1 of 1)

7.2.4 ALTERNATIVE MATERIALS

Westborough Primary School

LOCATION: Westcliff-on-Sea, Essex, UK
 DATE: 1999-2002
 CLIENT: Westborough Primary School
 USER: Displaced residents of Dodanduwa, Sri Lanka
 ARCHITECT: Cottrell & Vermeulen Architects, UK
 ENGINEER: Buro Happold
 QS: Buro Happold
 CONTRACTOR: CG Franklin Building Ltd.
 CONTRACT VALUE: £177,157⁶
 AREA: 91 sqm
 LIFESPAN: 20-25 years

DESCRIPTION:

The project marks a breakthrough for cardboard as a viable building material. The collaborative approach between built environment professionals, the client, manufacturers and other research partners resulted in a building constructed of 90% recycled and recyclable materials.

Inspired by origami the project successfully encapsulated the structural properties inherent to folded paper structures.⁷

⁴ Nightingale (2007:[1 of 1])

⁵ Architecture for Humanity (2006:126)

⁶ Royal Institute of British Architects (2002)
⁷ Fuad-Luke (2002:238)

7.3 FLAT PACK SHELTER

7.3.1 Global Village Shelters

LOCATION: Grenada

DATE: 1995-2005

USER: Displaced residents of Grenada

DISASTER: Hurricane

DESIGN FIRM: Ferarra Design, Inc.

MAJOR FUNDING: Architecture for Humanity; Weyerhaeuser, Inc.; Ed Plant; and other individual donations.

COST PER UNIT: \$400

AREA: estimated 6 sqm

LIFESPAN: 8-12 Months

DESCRIPTION:

More than a 100 different experimental forms were designed before finding the right method for this design.

Made from laminated corrugated cardboard, the hut can be erected in less than an hour by two people using only a set of diagrams and common tools.⁸

The shape relates to the archetype of a typical western house and it remains questionable whether the design is suitable to the context it was designed for.



Figure 144 6sqm Meter Shelter: On site assembly instructions • Global Village Shelters Llc. (n.d.)

⁸ Architecture for Humanity (2006:74)



Figure 145 Niigata Paper House • Shigeru Ban Architects (2004:[1 of 1])

7.3.2 Niigata Paper Shelter

DESIGNER: Shigeru Ban Architects

DESCRIPTION:

Shigeru ban has long been using of cardboard in his designs. The design is made up from square cardboard tubes and was developed after the Niigata earthquake to be an internal shelter allowing privacy in the large spaces used to house those affected by the disaster.



Figure 146 Hexayurt at the Burning Man Festival • Hexayurt Project (2003)

7.3.3 Hexayurt

DESIGNER: Rocky Mountain Institute

DESCRIPTION:

This modern interpretation of the classic Central Asian nomad housing uses modern materials, such as insulation board, to create a shelter that can be easily assembled for disaster relief in developing countries. The design has been worked out so to minimal cutting is required of the materials and the components can be assembled simply with tape.



Figure 147 Octagon Shelter • Sago Mokuza (2009:[2of5])

7.3.4 Octagon

DESIGNER: Sago Mokuza, Japan

DESCRIPTION:

This deployable shelter comprises of a series of precut cardboard panels that slot together to form an octagonal dome. The shelter is transported flat pack in two boxes weighing 40kg each. Once assembled the boxes used for transport can be cut and used as a floor covering. The shelter is kept dry through the use of reflective waterproof membrane and is estimated to last for 6 months.



Figure 148 reCOVER Shelter • Malone (2008:[1of1])

reCOVER Shelter

DESIGNERS: Matthew Malone, Amanda Goldberg, Jennifer Metcalf and Grant Meacham

DESCRIPTION:

The shelter is designed for rapid deployment in disaster relief. It is said the 100% polypropylene structure can be erected in minutes by one person. This seems highly unlikely as it is rather large and made from a single sheet. Structural stability, ventilation, fire retardancy and ground sheeting elements are not addressed. It is however highly adaptable to various environments and its flexibility in transport and configuration has merit. The shelter can be folded into a flat sheet for shipping, or collapsed into a horse shoe shape.



Figure 151 Folding Shelter • Schipper (2008:[2of2])

7.3.7 Schipper

DESIGNER: Daniel Schipper, Netherlands

DESCRIPTION:

Origami inspired folding shelter made from misprinted milk packaging. Tetrapak is very durable compared to raw cardboard and can therefore have a longer life span.



Figure 149 Ha-Ori Shelter • Student (2003[1of1])

7.3.5 Ha-Ori Shelter

DESIGNER: Joerg Student of IDEO

DESCRIPTION:

The Ha-Ori shelter was created by Joerg Student for his masters at Royal college of Art. Developed from nature (hornbeam leaf) the folds and rigid structure of the leaf started to develop ideas of a collapsible shelter. It is made from one sheet of polypropylene which is folded into the designed shape. Roughly 2.4 feet high when folded out and weighs 36 Kg makes it easy to transport.



Figure 152 Extreme Housing • Architecture for Humanity (2006:121)

7.3.8 Extreme Housing

DESIGNER: Deborah Gans, Matt Jelacic, Philadelphia

DESCRIPTION:

Gans and Jelacic have looked into Extreme Housing for people displaced in many forms. Using an array of materials from lightweight structural ceramic foam to bamboo. This scheme, completed for the Transitional Housing competition, describes a reconstituted house using a ruined wall.

The volumetric units / pods

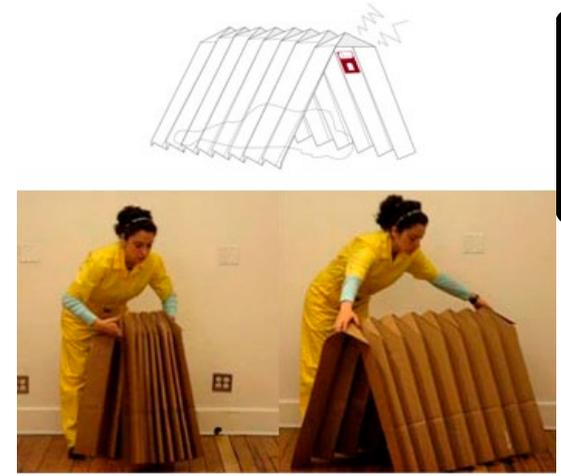


Figure 150 Transmitter diagram and assembly of SHELL HOUSE • Pino (2007)

7.3.6 Shell House [living portable]

DESIGNER: Open Architecture Network

DESCRIPTION:

SHELLHOUSE-[living portable] is a collapsible, recycled cardboard shelter for homeless people. The idea is to provide mobile communications to those who do not otherwise have access to peer contact. Each shelter comes equipped with a radio device providing the occupant with a portable address.

This design displays an innovative use of low tech and temporary elements.



Figure 153 Red + Housing • Redhika db (2009:[8of19])

7.3.9 Red + Housing

DESIGNER: Obra Architects

DESCRIPTION:

Red + Housing incorporates both the advantages of fast-response solutions with that of transitional solutions.

The design adheres to '10 points of architecture on the edge of survival' put forward by the design team: universal application, effective performance, economical, transportable, ease of assembly, renewable materials, digital pre-fabrication, open work, urban/rural application and flexibility of use.

“ *designed objects:*

beauty beyond prettiness

value beyond usefulness

passion beyond

affection ”

: Geometrical Manifesto⁹

7.4 SHELTERING ELEMENTS

Almost immediately after the event of a disaster the sheltering process starts with elements that shelter the body: bandages, blankets, clothes, etc. The process of recovery begins with humble elements that grow to define interior space, even before the exterior shell is inhabited.

Kronenburg¹⁰ explains that “we rearrange objects and possessions because it helps us establish a sense of place.”

This sense of place is one of the many intangible losses experienced by displaced individuals. Seemingly simple objects can become an important step in the recovery process through arrangement, adaptability, flexibility and change.

As is often the case with emergencies, anticipated volume exceeds capacity and thus a product is proposed to mediate between such situations by utilising limited space more effectively and providing the displaced with much needed privacy.

EMOTIONALISM: COGNITIVE PATH OF PRODUCT

In the last section of this chapter precedents are selected to investigate the importance and cultural significance of surface in interior architecture.

Emotionalism is an important part of what drives our consumerist society, it is often emotion that determines whether or not to engage with an object. Designed products connect emotionally with the end user are usually assigned a high value.

⁹ Denzel (2008:[1 of 1])
¹⁰ Kronenburg (2002a:20)



Figure 154 Interior of the De Heredia Winery • Etherington (2007:[1 of 1])

7.4.1 R. Lopez de Heredia winery

DESIGNER: Zaha Hadid

DESCRIPTION:

An elegant example of how structural elements come to define the interior atmosphere. The the wall carries through function to become shelving and storage.



Figure 155 Inside the Kid's Republic activity room • Kim (2009:[1 of 1])

7.4.2 Kid's Republic bookstore

DESIGNER: SKSK Architects, Beijing

DESCRIPTION:

Kids Republic is a children's bookstore in Beijing. The innovative use of colour cultivate an atmosphere of curiosity and play.



Figure 156 Inside the Lilja portable chapel • (2006:57)

7.4.3 Lilja Portable wooden chapel

DESIGNER: Vesa Oiva, Finland

DESCRIPTION:

Although not collapsible or deployable the wooden chapel remains under the portable category as it is made up of prefabricated plywood panels, allowing the structure to be dismantled and reassembled at different locations.

The simple yet delicate addition of a plywood tree motif provides the structure with the ephemeral qualities becoming of a meditative space.

interior



Figure 157 Furniture made from a single sheet of plywood • Urbanist (2008:[1 of 1])

7.4.4 desFURNITURE

DESIGNER: desFurniture Group

DESCRIPTION:

desFurniture¹¹ likes their pieces to: *"push the boundaries of efficiency while maintaining craftsmanship."*

Many of their designs originate from a single sheet of plywood using no fasteners, adhesives or tools. Such principles are ideal for emergency situations where tools and assembly skills are limited.



Figure 158 Doca Autunno coffee table • Laissezfaire (2007:[1 of 1])

7.4.5 Doca Autunno coffee table

DESIGNER: Italy

DESCRIPTION:

This flat pack table from cardboard made from two sheet. The table uses the principles of origami to fold together without the need of any tools.



Figure 159 + The Portananos crib • Sabine7 (2008:[1 of 1])

7.4.6 +The Portananos

DESIGNER: Mark Sapetti, Spain

DESCRIPTION:

The Portananos is a lightweight crib for babies up to six months. Made from recycled cardboard the flat pack principle allows for easy transport and assembly.

furniture

¹¹ Urbanist (2008:[1 of 1])

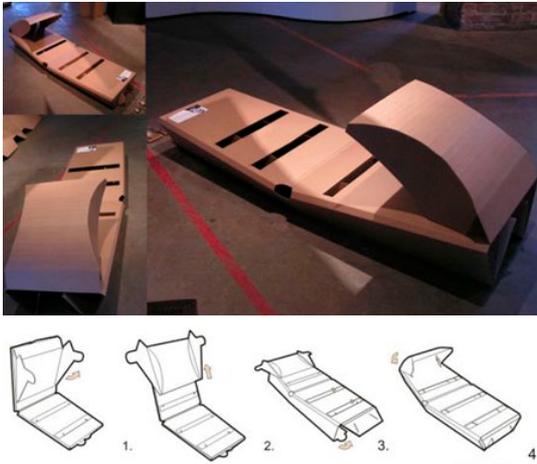


Figure 160 Assembly of disposable cardboard bed
 • DesigneRoof (2008: [1 of 1])

7.4.7 Disposable Cardboard Bed

DESIGNER: Nikolay Suslov, Russia

DESCRIPTION:

A cheap and disposable bed¹² made from corrugated cardboard sheet, and treated with a waterproof substance. It folds up and is easy and light to carry.

When in the reclined position the bed is 20cm high, successfully keeping the user away from the cold floor:

¹² DesigneRoof (2008: [1 of 1])



Figure 163 Chair of textures • Tjep (2006:[1 of 1])

7.4.10 Chair of Textures

DESIGNER: Tjep

DESCRIPTION:

Chair made out of layers of stainless steel, laser-cut and folded to the user's discretion.



Figure 161 Assembly of Itbed • http://www.it-happens.ch/eng/bett_1.html (n.d:[1 of 1])

7.4.8 Itbed

DESIGNER: Design It, Switzerland

DESCRIPTION:

The bed frame consists of foldable triangular sections that can be flat packed for storage and unfolded when needed.

Made from 7mm thick corrugated cardboard it serves as simple application of the basic structural properties of cardboard.



Figure 162 Bett "Dream" Assembled bed illustrating structural components • Stange Design (Art no. 2010)

7.4.9 Das Original Pappbett

DESIGNER: Stange Design, Berlin

DESCRIPTION:

A complete flat packed product that sets up into a bed base from pre-cut and scored elements. Designed in such a way that allows for extra storage space, with the option of purchasing accompanying roll out drawers.

The application of folded elements provided a sturdy and reliable long term solution.



Figure 164 A collection of pillows • Ganszyniec (2008:[1 of 1])

7.4.11 A collection of Pillows

DESIGNER: Maja Ganszyniec, Poland

DESCRIPTION:

A collection of pillows in various shapes and sizes with holes and cut outs. The design was inspired by the unique and different way every individual sleeps.

The design takes a very mundane object and makes it very personal and encourages play.



Figure 165 Red + Housing • Redhika db (2009:[6of19])

7.4.12 Red + Housing chairs

DESIGNER: Obra Architects

DESCRIPTION:

Plywood chairs were designed to join together like puzzle pieces. The fabrication method allows for detailing assembly details directly on chairs.

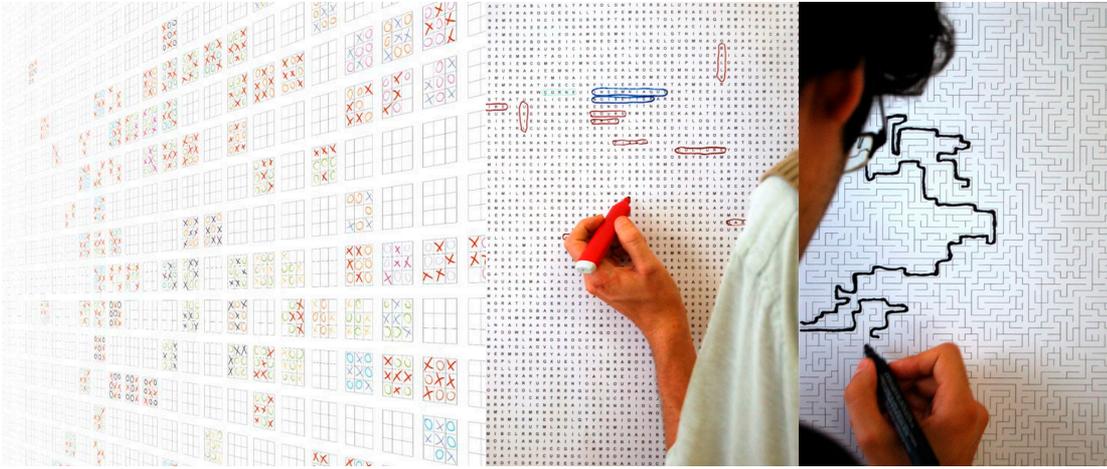


Figure 166 Wallpaper games-Morpion-édition Lutèce-2006
• 5.5 Designers (2006a:[2 of 3])

7.1.1 Wallpaper Games:

DESIGNER: 5.5 designers, France

DESCRIPTION:

Referred to as 'expression surfaces' the wallpaper provides the canvas for spontaneous interaction, encourages play allowing the each space to take on a unique character depending on the colour pens used.

Figure 167 Wallpaper Games-mots mêlés-édition Lutèce-2006
• 5.5 Designers (2006b:[1 of 6])

7.1.2 Wallpaper Games: Maize

DESIGNER: 5.5 designers, France

DESCRIPTION:

Wallpaper maizes.



Figure 168 Do frame tape by for Droog • Guixé (2006:[1 of 4])

7.1.3 Do Frame tape

DESIGNER: Martí Guixé,



Figure 169 Soho tiles • Marazzi USA (2008:[36 of 37])

7.1.1 Soho Tiles

DESIGNER: Marazzi, USA

DESCRIPTION:

Decorative porcelain wall tiles mimicking the texture of over paper overlapping.



Figure 170 Flake curtain • Cullin (2007:[1 of 1])

7.1.2 Flake Curtain

DESIGNER: Mia Cullin, Switzerland

DESCRIPTION:

Flake and flower patterned curtain made from Tyvek that can also act as a partition.



Figure 171 Tableau tablecloth for Droog • Scheltens (2005:[1 of 1])

7.1.3 Tableau tablecloth

DESIGNER: Maurice Scheltens, The Netherlands

DESCRIPTION:

Dutch photographer created a table cloth decorated with the aftermath of a dinner party. Made using a photogram technique.