

## Requirements

### Definitions and specifications

#### Multipurpose unit



### MULTIPURPOSE UNIT

The Multipurpose unit is an emergency shelter designed for hosting collective activities and different functions and could be removed or re-used for other purposes later. The Multipurpose unit measures 48 m<sup>2</sup> and is designed to shelter between 10-12 people. The vertical walls facilitate the connections between units, allowing the creation of bigger spaces and camp infrastructures. As a shelter typology, is addressed to vulnerable groups of affected communities like elderly, orphans and handicapped.

The Multipurpose Unit aim is to create a rapid emergency shelter kit that is multipurpose and re-usable in different situations. The general requirements are:

- Easy setting up procedures and connections
- Flexibility of layout and modularity of the system
- Possibility to connect different units for creating bigger spaces and different configurations
- Lightness of the system for the transportation (reduce packaging volume and weight)
- Reducing space between units
- Durability

## Product description

### Connections and useability

#### Design and realization by:

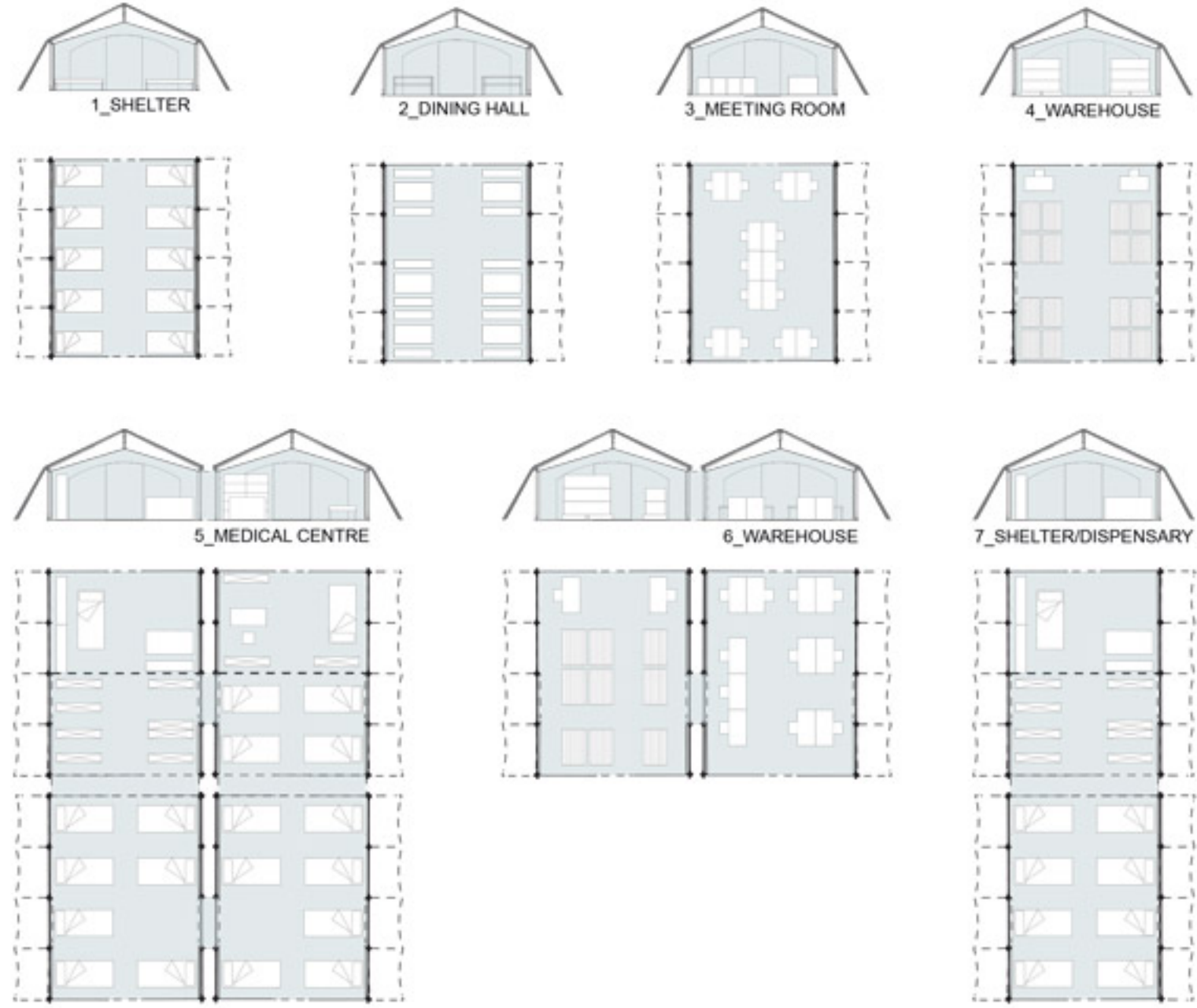


M. Barozzi, A. Zanelli, G. Giabardo



Shelter Research Unit  
an initiative of the European Red Cross Societies

#### With the collaboration of:



## INNOVATIVE ASPECTS

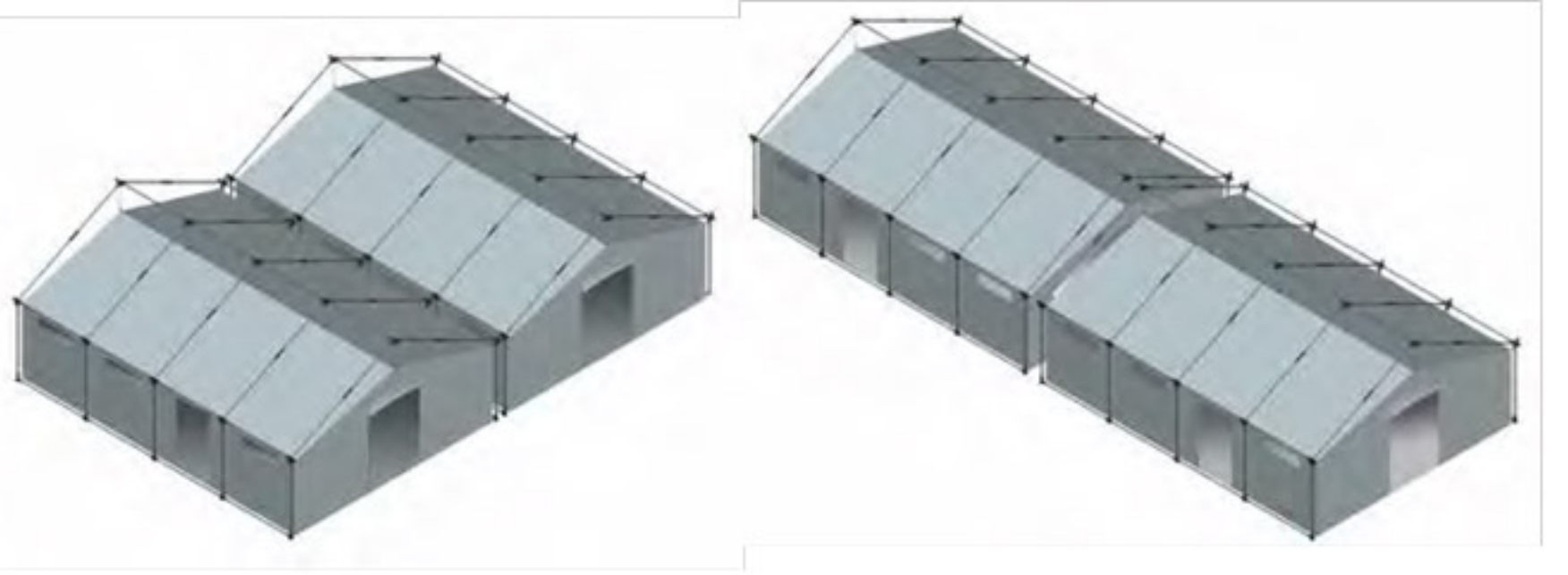
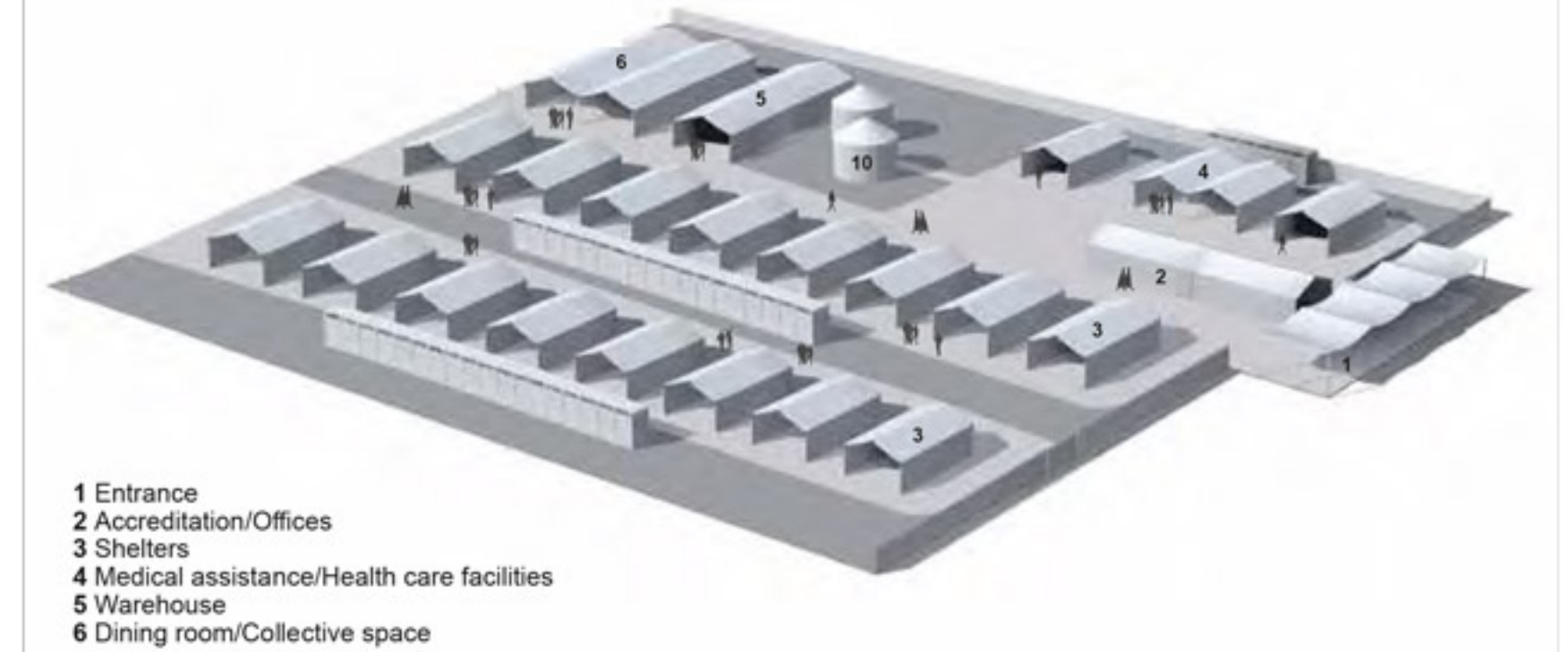
### The vertical solution:

- Allowed a better usability of the inner space of the tent
- Facilitate the connections between units
- Solve the problem of rain effect degradation identified in the sloped tents

All the connectors are the same (5-ways joints) but rotated, in order to facilitate the building procedures. The joints functions also as shade net antennas allowing the elimination of additional framework to support the layer; in this way the shade net can be integrated in the basic kit.

The tent is composed by a breathable material (poly-cotton) for the upper part and a waterproof groundsheet (not separated). The fabric is hung from inside the structure in order to ease the assembling/dismantle operations. The space between the hanging tent and the shade net measures 60-70 cm, a good distance for guarantee air flows passage. The shelter can be used in all climate types. In case of cold climate or winter application an external heating system should be provided or arranged. For what is concerning the application in hot climate, the attention is pointed on good ventilation and shading system. Four small windows on each long side and doors on the front guarantee the inside ventilation.

## CONNECTIONS BETWEEN UNITS



## Structural calculations

### Biaxial test and load test

The research group of POLIMI has tested the resistance to snow load of one prototype. The structure with a dimension of 600x200 cm<sup>2</sup>, the equivalent of a tent span, has been fixed to the ground in order to simulate the conditions of use. The roof of the complete structure has been loaded with topsoil packs simulating a snow load of 30 kg/m<sup>2</sup>. The fabric was torn at the stitching lines. Thanks to the results of the structural test and the test on the fabric samples with the biaxial machine, the fabric for the new prototypes has been improved for reaching the snow load target. The reinforcement lines, stitched beforehand on the external part of the tent, are positioned as a grid inside the canvas. This adaptation increases the structural behaviour of the membrane (successfully test on the field in new configuration).



Concerning the application in hot climate, the attention is focused on good ventilation and a shading system. The Multipurpose Unit contains inside the package a shade net (not included in the currently used products). The shape of the tent and the fact that the fabric is hanging from the frame allows easy mounting of the shade net (no need of an additional frame). Moreover, the gap created between the hip roof poles and the fabric is sufficient to guarantee an air flow below the shade net. The frontal door offers different possibilities (from 150 cm till 450 cm of span), allowing a complete opening in case of high temperature. The Unit should be able to withstand wind speeds up to 75 km/h or 21 m/s.

### BIAXIAL TEST: roof



### LOAD TEST: snow load



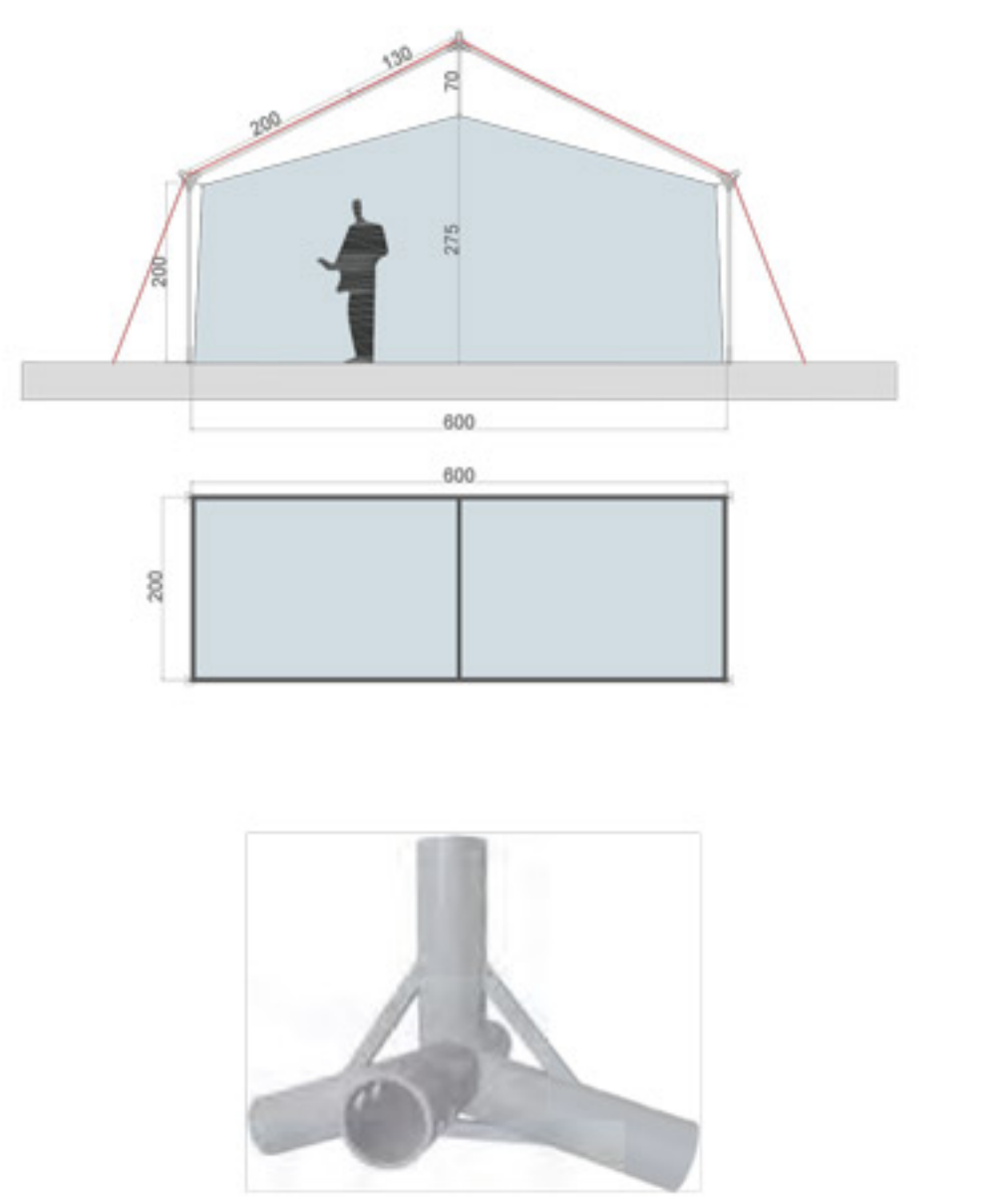
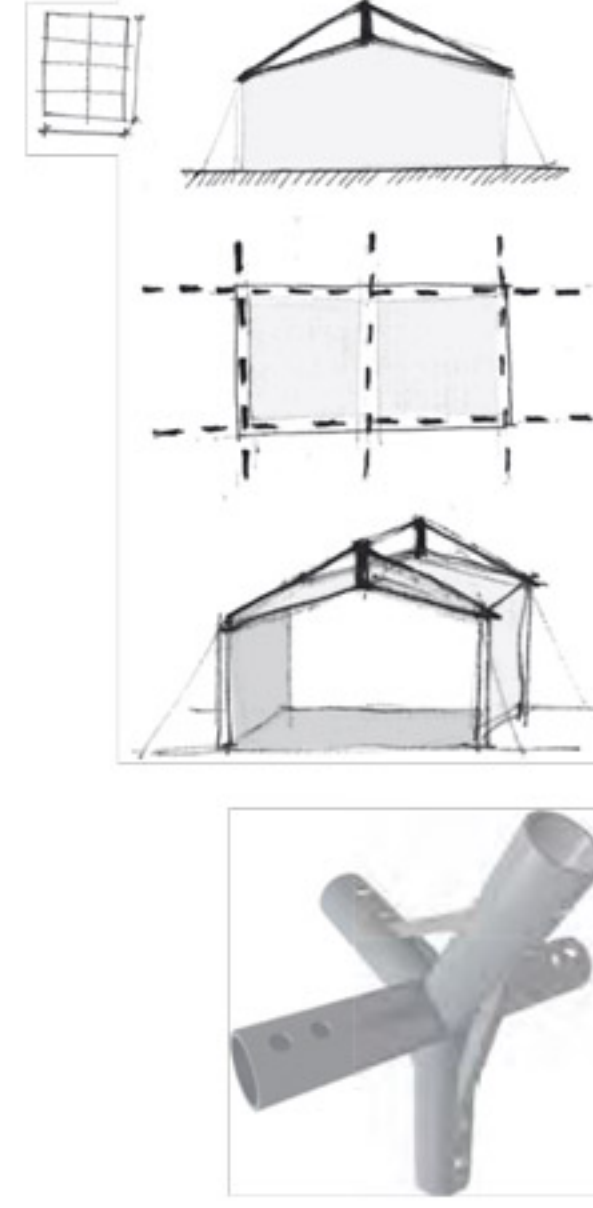
### BIAXIAL TEST: wall



### LOAD TEST: point load



## DETAILS: membrane and joints design



## Field test

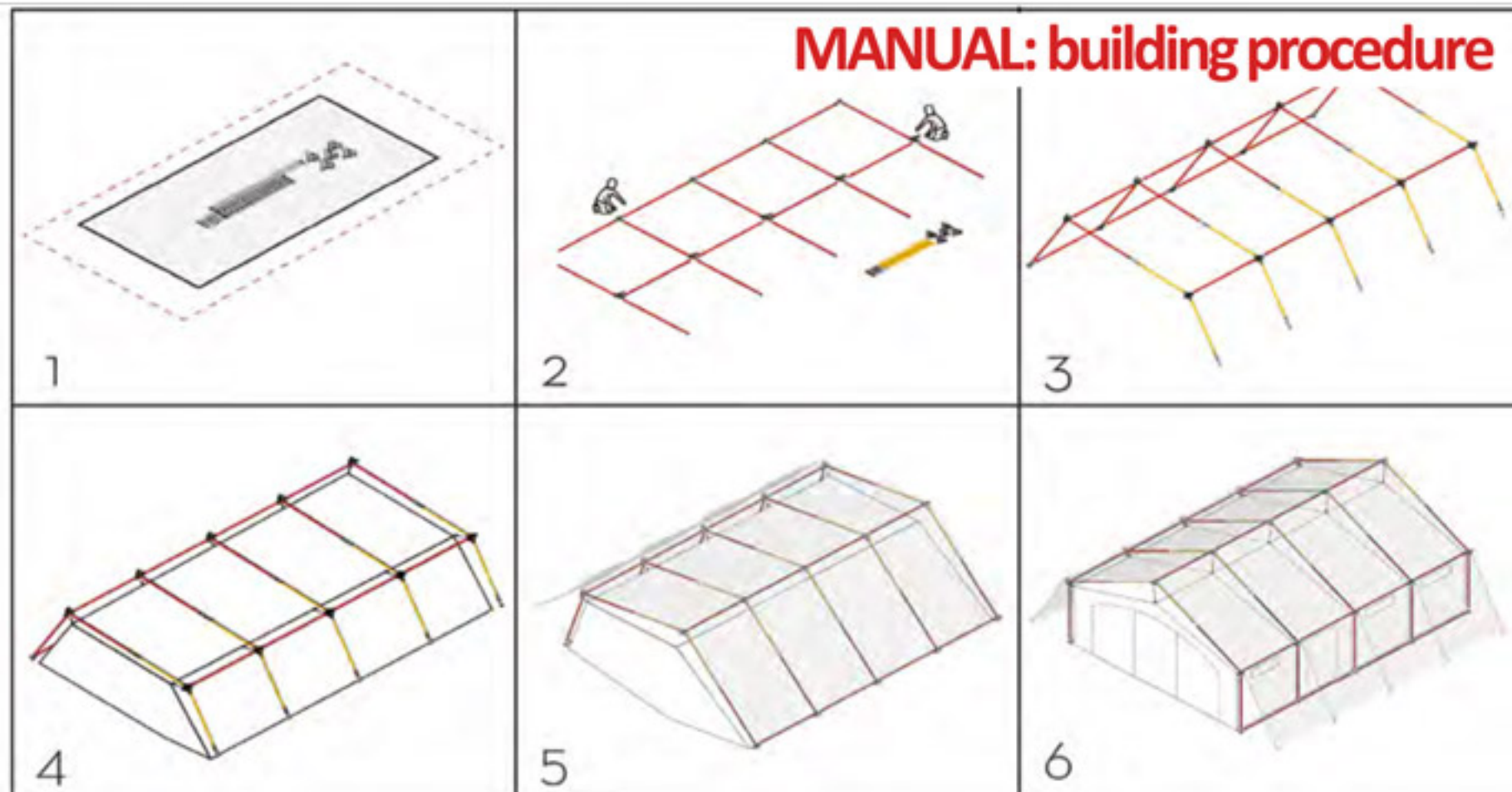
### Instructions manual and packaging

The Multipurpose Unit has been designed to be easily and fast erected. The elements are equal or repeated (all the same joints, 2 sizes of poles). The possibility to hang the tent inside the structure facilitates the installation/removal of the membrane. Moreover, the elimination of an additional framework for the shade net allows it being set up from the beginning, avoiding additional work later. The textile layer is fixed to by means of snap-hooks. The poles are supplied with button spring. The kit have been divided in 6 packaging units compliant with the dimension of the Euro-pallet. The big size packages are arranged with handles.

## PACKAGING: labels



## MANUAL: building procedure



## FIELD TEST: experts feedback



More information:  
<http://www.speedkits.eu>

