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Insulated membrane kit for emergency shelters: product development and evaluation of three different concepts

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Abstract

The paper deals with the development of a novel winterized textile partition to accommodate refugees during a humanitarian crisis. The research has been developed within S(P)EEDKITS, a four year research project (March 2012 - February 2016) in which research institutes, universities, companies operating in the emergency sector and non-profit organizations have rethought shelters, medical care resources and other facilities provided in case of natural disaster and conflicts.

The S(P)EEDKITS project aimed to scrutinize materials and equipment of the Emergency Response Units (ERUs) that are currently used by humanitarian non-governmental organizations (NGOs), and to develop novel solutions which drastically reduce their deployment time, the volume and weight for transportation. Solutions needed to be clever and durable enough so that the affected population can use them also during the reconstruction phase. This dual approach - speed and seed - was crucial as the recent trend in emergency aid for organizations is not only to stimulate as early as possible the self-repair, but also to support the transitional period and the reconstruction.

Starting from a detailed analysis of the state of the art, the research group of Politecnico di Milano (POLIMI) worked on the design of innovative shelter solutions and their packages, in order to add values in terms of ease of transport and set up. Through the multidisciplinary approach that involved several partners of the collaborative project, a list of metrics scored three diverse shelter concepts; one of them was prototyped in ten units and tested by Senegal and Luxembourg Red Cross delegations.

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Keywords: Emergency; Sheltering; Winterization; Adaptability; Polyester fiber.

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1. Research field and goals

In humanitarian field, shelter products are mainly developed as 'closed' prefab system that work independently to other provided shelters and local materials. Prefabricated designs are developed ad hoc and their parts often require time-consuming assembling. Sometimes prefab products don't include instructions for post-emergency use or disposal. As result, abandoned temporary shelters become common, sad reminders of the easy waste of money and resources. Moreover, the different climatic contexts require from NGOs a huge faculty of adaptation as each situation calls for a precise answer. Recent emergencies draw attention to limits of current standard tent to be adapted in all climates or in places with high daily-temperature ranges [1].

Within the collaborative project S(P)EEDKITS, for overcoming this critical aspect of current shelter kits, the development of novel solutions aimed to offer an effective winterized solution that also well works in warm and hot climates. The idea of a progressive solution was adopted according to local constraints: it wasn't only linked to climate risk, but also dependent by local resources [2]. Adaptability was to ensure both a prompt first-time repair, that can be easily erected, and an effective protection in a medium and long-term period, so configuring the 'core' of a transitional dwelling.

Moreover, a novel shelter system should not only link to climate risks and local resources, but also relate to cultural identity of the affected population. The novel shelter kit has to be inserted in an affected area (urban area, improvised camp, rural region etc.) to reach as quickly as possible an acceptable post-disaster situation towards the rebuilding of economic and social life. By providing shelter kits that are adaptable to users' practices (tribal composition, lifestyle, religious claims etc.), the rescue could be organized with a people-centered approach in which refugees enclose themselves private spaces, even inside damaged buildings. This feature can improve the acceptance level of the entire sheltering process during a disaster [3].

2. State of the art

By analyzing the state of the art (SOTA) of current shelter-materials that are currently used to protect affected persons from extreme climatic conditions in cold and hot environments, it's possible to distinguish two different main types, as shown in Fig. 1. The first one collects all the winterization kits that are conceived for upgrading NGO-standardized tents; they are optimized to be combined with their reference products, and aren't adaptable to other tent-structures. The second category includes all the non-food items (NFIs) that are distributed in rolls to displaced population as winter protections: blankets, mattresses, foam boards, plastic sheeting etc.; in that case, materials - often recovered from local markets - are used for insulating floors, openings of unfinished/damaged buildings and non-winterized shelters [4].

Fig. 1. (a) Winterization kit for UNHCR-IFRC Family Tent (Source: ICRC-IFRC, 2009); (b) Tuareg population uses blankets and plastic tarpaulins to cover tents of the refugee camp of Sagnioniogo (Burkina Faso), located in the sub-Saharan climate with an high daily temperature range (Source: Virgo, De Vilder, Viscuso, Roekens, 2014)