

DEVELOPMENT OF A LIGHTWEIGHT, PORTABLE, RECYCLABLE EMERGENCY SHELTER UNIT

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Abstract

Each year thousands of Americans are left homeless by natural disasters. In addition, thousands more are permanently homeless, living on our cities streets and parks. When homelessness occurs, emergency agencies like the Federal Emergency Management Agency and the American Red Cross are often tasked with providing emergency shelter for these unfortunate individuals. Unfortunately, the current system of supplying shelter is both complex and costly. Generally, emergency shelter consists of either large tents supplied by the military or through the use of mobile homes. Both systems are expensive and logistically difficult. This project proposes to develop and test a new system of providing emergency shelter. At the core of this system will be the development of a recyclable shelter unit composed of a recyclable corrugated board material. These shelter units will be designed for short-term use, usually up to three months, and can then be totally recycled. The units will be both lightweight and inexpensive and will consist of a set of corrugated board panels, which can be carried and assembled by no more than two persons. Setup and connections will be designed to be easily assembled by unskilled individuals using simple tools. After an emergency, the units can be trucked or air lifted into disaster struck areas to provide almost immediate shelter. In winter climates, these shelters can again be delivered by truck directly to the homeless to provide shelter from the dangerously harsh temperatures. After the initial need, the shelter can be easily de-constructed and the materials re-cycled. In addition to design considerations, this project will consider the economics of both the manufacturing and distribution of the shelters.

Keywords: Natural disasters; homeless; emergency shelter; recyclable; lightweight; inexpensive.

SECTION ONE: BACKGROUND

Disaster Relief

The United States, because of its geographic location and geologic make-up, has historically been prone to a variety of different types of natural disasters. These natural disasters include hurricanes, tornados, floods and earthquakes. For the purposes of this project, a natural disaster will be defined as a weather / geologic event classified by the federal government as qualifying for federal disaster relief.

Table 1: Natural Disasters in the United States

NATURAL DISASTERS IN THE UNITED STATES				
	DISASTER TYPE			
YEAR	HURRICANE	TORNADO	FLOODS	EARTHQUAKE
1990	0	9	5	1
1991	2	1	6	1
1992	2	13	14	2
1993	0	9	11	2
1994	2	4	6	1
1995	4	14	18	1
1996	3	11	19	2
1997	2	14	18	1
1998	4	18	18	1
1999	5	15	8	1
2000	0	9	6	2
2001	0	17	11	1
2002	1	16	17	2
TOTAL	25	150	157	18

According to the emergency management agencies such as American Red Cross, Federal Emergency Management Agency (FEMA), Virginia Department of Emergency Services, World Health Organization (WHO), and climatic data centers such as the California Geological Survey, Dartmouth Flood Observatory, National Hurricane Center, National Environmental Satellite Data and Information Service (NESDIS), National Center for Environmental Prediction (NCEP), National Oceanic and Atmospheric Administration (NOAA) and United States Geological Survey (USGS), there have been over 350 such natural disasters documented since 1990.

These disasters have taken their toll on the population of certain geographic sections of the United States in terms of lives, money and emotion. There have been hundreds of persons killed or injured as a result of natural disasters since 1990. In addition over 481,000 men, women and children were left homeless. It is these homeless men, women and children that will be the focus of this project

Table 2: Homeless left by Natural Disasters in the United States

HOMELESS LEFT BY NATURAL DISASTERS IN THE UNITED STATES				
	DISASTER TYPE			
YEAR	HURRICANE	TORNADO	FLOODS	EARTHQUAKE
1990	-	302	-	-
1991	-	-	-	-
1992	126,167	56+	-	5,046
1993	-	3	27,654	1,000+
1994	-	-	2,550	10,000+
1995	6,100+	475	36,725	-
1996	198,963+	892+	23,000	-
1997	-	4	548	-
1998	1,536+	-	10,116+	-
1999	2,500+	1505+	9,238	-
2000	-	59+	460	-
2001	-	536	11,351	-
2002	250+	100+	4781	-
TOTAL	335,516+	3,932+	126,423+	16,046+

Homeless in the United States

It is estimated that on any given night, there are at least 750,000 people in the United States without a permanent shelter. To put this number in perspective, these homeless outnumber the populations of San Francisco, Boston or Washington DC (General Information about Homelessness). Over the course of a year, between 1.3 million and 2 million people will experience homelessness. While every major city is making an attempt to assist the homeless, a recent survey taken in 27 major U.S. cities found that 37% of all emergency shelter requests went unmet (National