

S. A. Mojabi,  
Saees Shaikhzadeh Najar<sup>1</sup>,  
S. Hosseini Hashemi<sup>2</sup>,  
A. Rashidi<sup>3</sup>  
S. J. Bassam<sup>4</sup>

Dept. of Carpet,  
Islamic Azad University Najafabad branch,  
Isfahan, IRAN  
E-mail: sa-majabi@iaun.ac.ir

<sup>1</sup> Dept. of Textile Engineering,  
Amirkabir Univ. of Technology  
424 Hafez Ave., Tehran, IRAN  
P.O.Box: 15875-4413  
E-mail: saeed@aut.ac.ir

<sup>2</sup> Dept. of Mechanical Engineering,  
IranUniversity of Science and Technology  
Narmak, TEHRAN, IRAN  
P.O.Box: 16846-1314  
E-mail: shh@iust.ac.ir

<sup>3</sup> Dept. of Textiles, Faculty of Engineering,  
Islamic Azad University  
Science and Research branch,  
TEHRAN, IRAN  
E-mail: rashidi50@yahoo.com

<sup>4</sup> Institute of Technical  
and Vocational Higher Education,  
Ministry of Jihad Agriculture,  
TEHRAN, IRAN  
E-mail: bassam@iranrncarpet.ir

# Investigation of Compressional Creep Behaviour of Persian Hand-woven Carpet During Simulated Storage under Different Environmental Conditions

## Abstract

In this research, an apparatus was designed and constructed in order to simulate the storage behaviour of hand-woven carpet under different environmental conditions. Hand-woven carpet ("Isfahan") with 127×83 cm dimensions and 79×84 knot per 10 cm was selected and then inserted into a designed packing simulator with two different laying configurations: flat and folded. The environmental conditions were adjusted at 3 different climatic conditions:  $25 \pm 5\%$  r.h and  $30 \pm 2$  °C (July-Tehran-Dry),  $65 \pm 5\%$  r.h and  $6 \pm 2$  °C (February-Tehran-humid),  $40 \pm 5\%$  r.h and  $19 \pm 2$  °C (October -Tehran-mild). The carpet sample was compressed under constant loads of 170 and 190 kg for folded and flat configurations, respectively. The variation of carpet thickness with time in different parts of the carpet was continuously measured using a data acquisition system. The result of the experiment shows that carpet thickness suddenly decreases in a short period of time, and then reaches a stable condition. The variation trend of carpet thickness with time is in accordance with a logarithm equation ( $y=a \times \ln(t)-b$ ), which is in complete agreement with the Eyring model proposed in creep theory. Generally, in humid conditions, maximum carpet thickness variation occurred at the folded point of the folded configuration. On the other hand, carpet thickness variations in dry conditions are less than those in humid and mild conditions. In addition, carpet thickness in dry conditions more quickly reaches a stable state condition than those in humid and mild conditions.

**Key words:** persian hand-made carpet, environmental conditions, creep, eyring model, simulation.

## Introduction

### How to store carpets

Hand-woven Iranian carpets are stored and preserved in a variety of ways and methods before export. The most important ones are flat; placing carpets of the same dimension on each other horizontally, and folded using a method in which the carpets are folded and placed on each other lengthwise [1].

In this method the carpets are sorted out in accordance with their origin, mate-

rial, size and weave style. They are then placed on a slatted wooden pallet, which is 20 cm above the ground. The height of the packed carpets in this method is about 110 cm and the approximate force being exerted on the last carpet underneath would be related 190 kg. In the folded method, the general height remains unchanged; the force being applied to the last underneath carpet would be related to 170 kg; and the folds of each carpet would be similar, which therefore reduces the occupied space to one half of the space needed by the flat method [2].

Though economically advantageous from this point of view, the folded method, depending on the environmental conditions and the duration of remaining folded, would change the physical features of the carpets [3].

The duration of storage under such conditions would last 2 - 7 days, and the stores are mostly in bazaars, where there is no control over the rate of moisture and temperature [2]. Figure 1 shows two methods of storage.

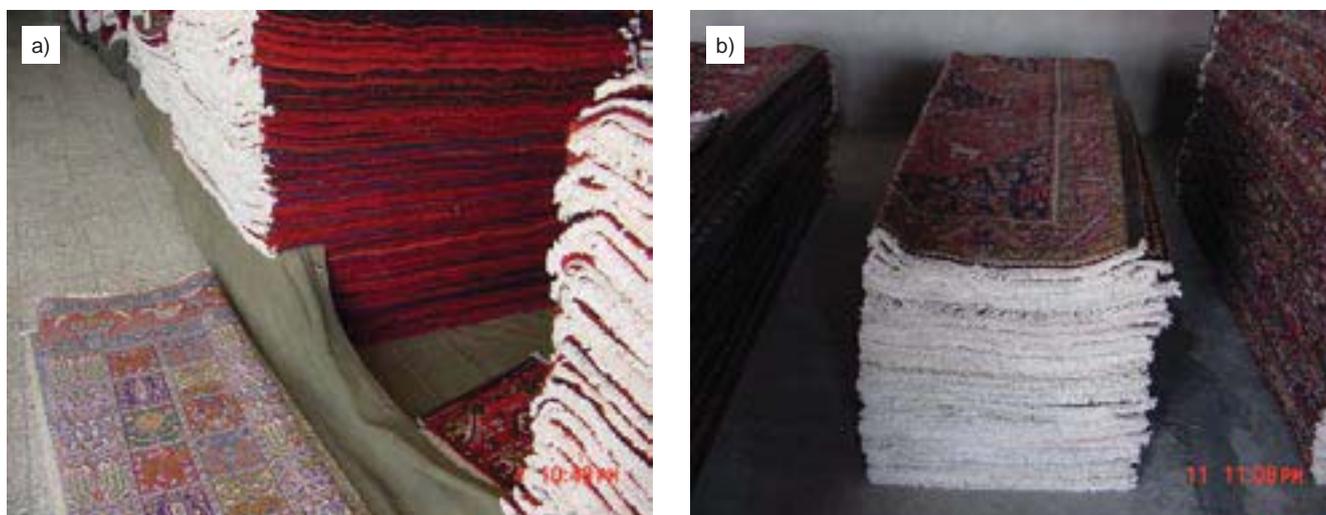


Figure 1. Methods of storage; a) flat, b) folded.