

## 2ND FLOOR CARPET; ITS EFFECT ON WHEELED OBJECTS

### **Evaluation performed by: Ian Denison, Equipment Specialist**

Initiation: David Metcalf and Michael Wong have asked that I quantify the effect that the carpet on second floor has on clients ability to propel a manual wheelchair.

### **GENERAL**

- Each test is a comparison test and will be performed on the second and fourth floors.
- The floors have an identical layout differing only in the type of floor covering used.
- The second floor is covered with Moire plus II with System Six, which is a very dense, low pile carpet. Specifications are in the attached literature.
- The fourth floor is covered with waxed linoleum.
  
- To rule out the possibility of uneven floors compromising the test results all tests will be performed in both directions and the total time and or force recorded.

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## TEST 1. DISTANCE ROLLED

### Description:

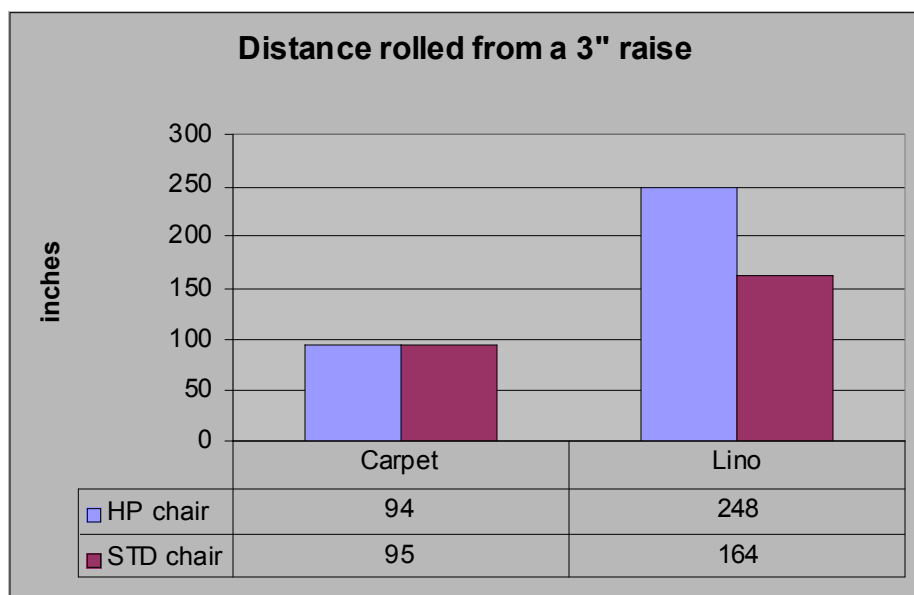
A loaded manual wheelchair is positioned at the top of a four foot long sheet of plywood that is elevated at one end by 3". The chair is released.

### Record:

The distance that the chair rolls.

### Variations:

The HP chair is similar to the setup that might be expected for a marginal wheeler ie: stable configuration, high pressure narrow profile tires and small hard casters on a rigid framed chair. The STD chair is typical of the manual wheelchair an average client might have at GF Strong ie: Pneumatic casters and regular pressure tires on a folding frame lightweight chair.



### Discussion

The effect that the carpet has on the distance rolled by the both chairs is equivalent to reducing the tire pressures to 10 psi.

(Pressures are normally HP 100 psi, STD 65 psi)

Of particular note is the fact that marginal wheelers are most likely to be in the HP chair, the one that is most significantly affected by the carpet.

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## TEST 2. STRAIGHT LINE

### Description:

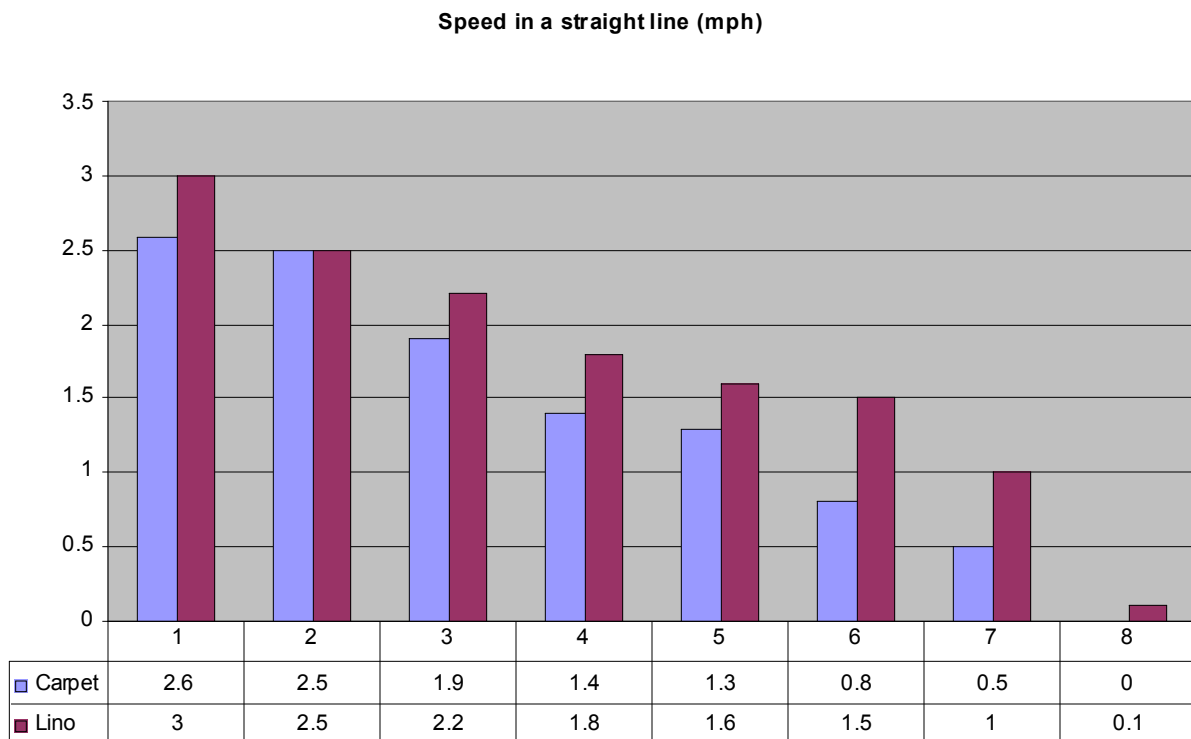
Client wheels the length of the East wing as fast as possible. Repeat test in reverse direction

### Record:

The time taken to cover the distance.

### Variations:

nil (client uses their own chair in the configuration established).



### Discussion

- The forces that a wheeler have to overcome are basically rolling resistance and air resistance.
- Research indicates that at speeds exceeding 2 metres per second air resistance is the most significant factor.
- Three volunteers were able to wheel at speed in excess of 2 m/s, the effect of the carpet was to reduce speed by an average of 10%.
- Four volunteers who were slower than 2 m/s and able to move on the carpet had their speed reduced by an average of 32%
- A marginal wheeler was unable to move on the carpet
- All volunteers felt that they had to work harder on the carpet

**NOTES**

Volunteers 1,2,3 and 4 were in STD type chairs,  
Volunteers 5 and 7 had STD tires and 5" casters.  
Volunteers 6 and 8 had HP type chairs.

All chairs had the rear axle in the rearmost position.

**TEST 3. MANEUVERING****Description:**

Client wheels out of room and in a slalom fashion around 3 cones placed at regular intervals along the east wing to the elevator call button as fast as possible. Repeat test in reverse direction (client uses their own chair in the configuration established).

**Record:**

The time taken to cover the distance.

**Note:**

Initial results were very similar to those from test 2 and have not been processed.

## TEST 4. ROLLING RESISTANCE

### Description:

Various wheeled devices in regular use on the nursing floor were pushed with a Chatillon dynamometer or pulled with a spring scale. The devices were moved slowly from a standing start with casters placed in the straight ahead position.

### Record:

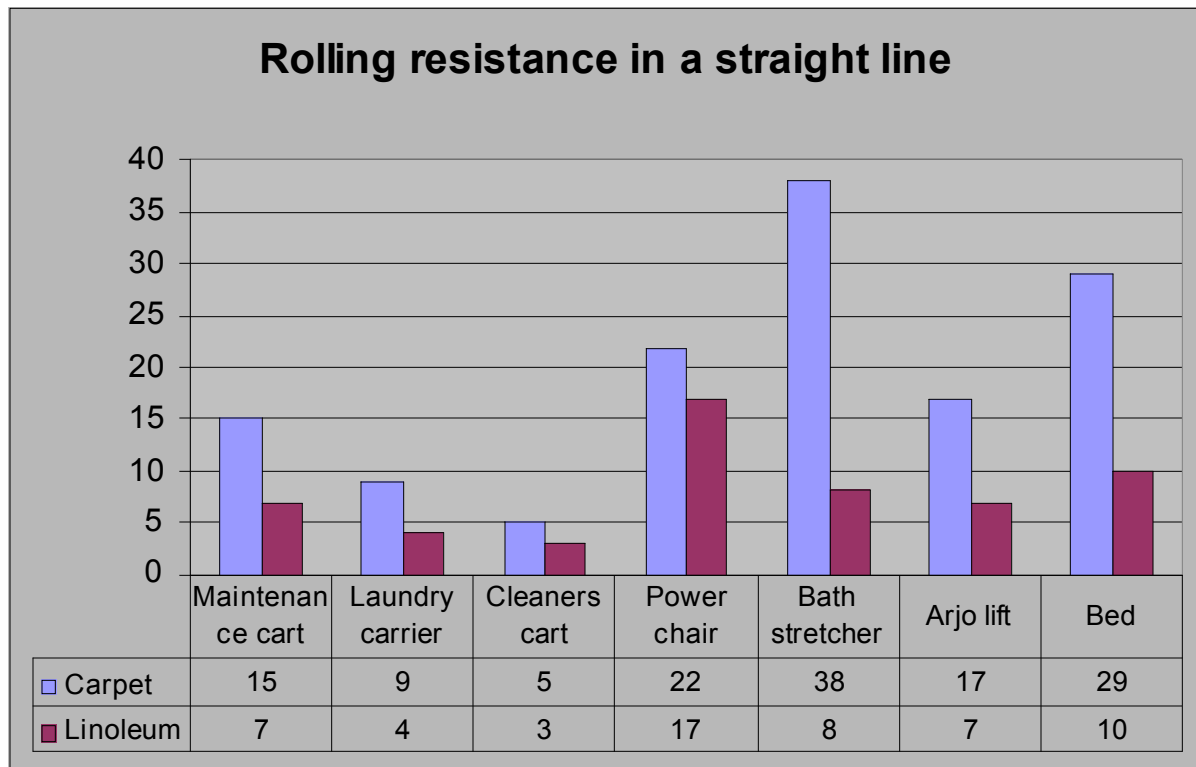
Peak and average values were possible.

### Note:

If the force is less than 16 lb. the Dynamometer did not calculate the mean and peak forces, they had to be estimated instead as did all readings taken using the spring scale.

### Average values

(lbs force required to move)



### Discussion

- The average force needed to move a wheeled object slowly was 55% less on

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linoleum than on carpet.

## ***Force required to turn object through 90 degrees***

### ***Discussion***

- The average force needed to move a wheeled object through 90 degrees was 42% less on linoleum than on carpet.
- The average forces were calculated over a 5 second span therefore high peak forces which were usually experienced during initiation of movement had the effect of increasing the values for the man when compared to the actual force required to roll an object

## ***Peak forces registered throughout test***

### **Discussion**

- The force needed to initiate movement in a wheeled object was 56% less on linoleum than on carpet.
- The force required to initiate movement at right angles to the plane of movement was 35% less on linoleum than on carpet.

## **OTHER POINTS TO CONSIDER**

Ease of cleaning up spills

Effect on ambulation and walking aids

Tendency for wheelbearings to collect dust fluff and hair.

Sound proofing

Contribution to ambiance

Real world scenario

Built in form of exercise

## **FINAL WORD**

There are numerous factors that need to be considered when choosing an appropriate floor covering material. Resistance to rolling is just one of the considerations, it is however the only consideration covered in this report.

It should come as no surprise that under all circumstances anything with wheels is harder to push on a carpeted surface than on one covered by a hard material such as linoleum.

This test was not conducted to validate that fact.

The purpose was to quantify the effect that the carpet has on wheeled objects so that

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decisions regarding appropriate floor coverings for different client groups will weight this factor appropriately.