



View of 7th floor elevator lobby

Effect of Innovative Stair Design on Physical Activity

Evaluating Skip-stop Elevators and Stairs in
the Caltrans District 7 Headquarters Building,
Los Angeles, California

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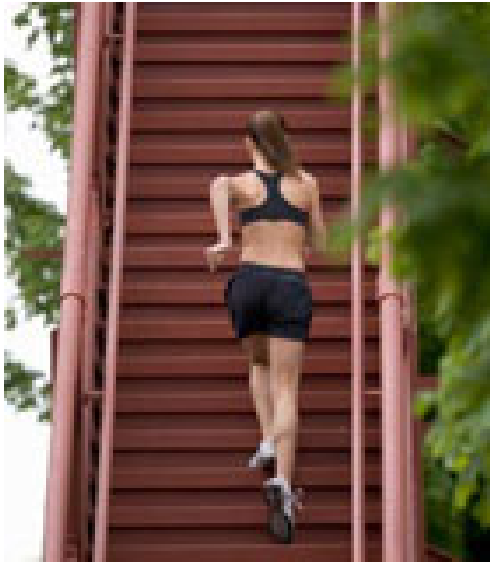
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Stair climbing for exercise alone is largely limited to those capable of athletic training



Increasing the frequency of stair use in the workplace is a great potential to augment the physical activity of most working adults



Stairs have been primarily relegated to the ancillary role of emergency egress.



Strategies for Promoting Physical Activity



Pull strategies

passive informative, motivational or environmental efforts, voluntarily use stairs;



Push strategies

social programming, or environmental interventions designed to mandate new behaviors.



Strategies for Promoting Physical Activity



Pull strategies



Motivational signage

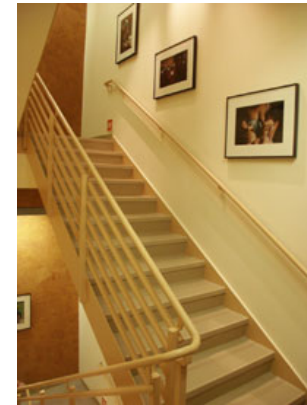
Behavioral Change or Lifestyle Modification

Environmental Enhancement & Restructuring

BEFORE



AFTER



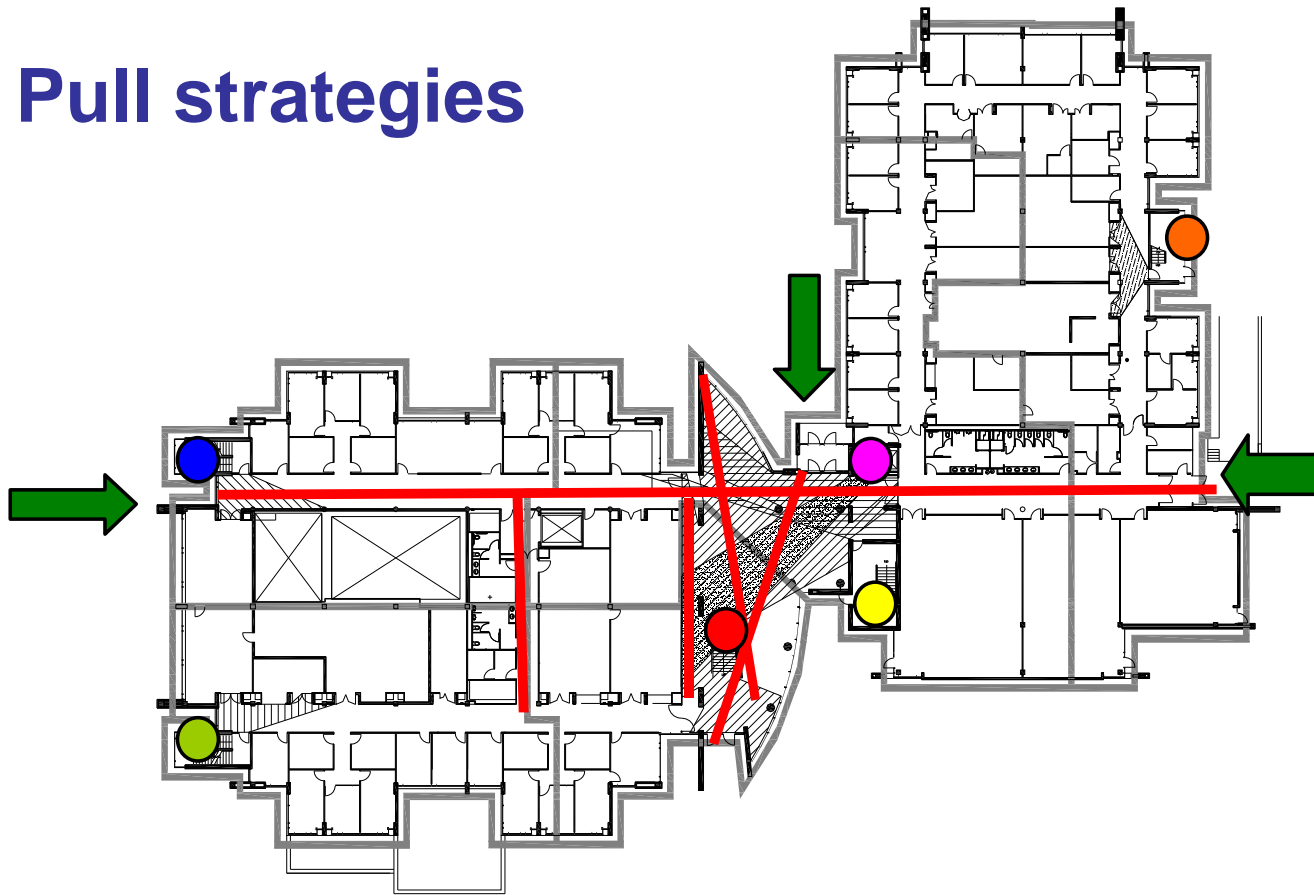
Upgrade interior finishes



Strategies for Promoting Physical Activity



Pull strategies



Locating stairs where people are most likely to use them instead of the elevator



Strategies for Promoting Physical Activity



Push strategies



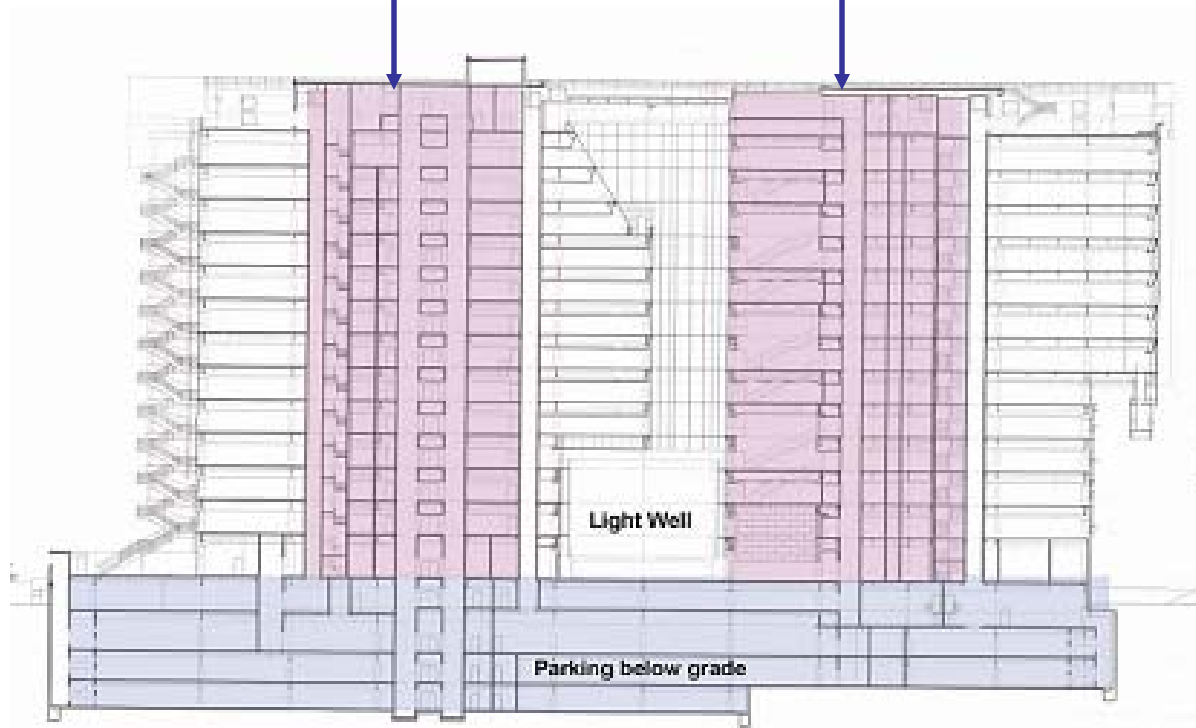
Provision of Skip-stop Elevators and Adjacent Open Staircases at the Caltrans District 7 Headquarters Building, Los Angeles, California



Caltrans District 7 Headquarters Building

Traditional Elevator Core

Skip-stop Elevator Core with adjacent stairs



Skip-stop elevators stop only on floors 1, 4, 7, 10, and 13.

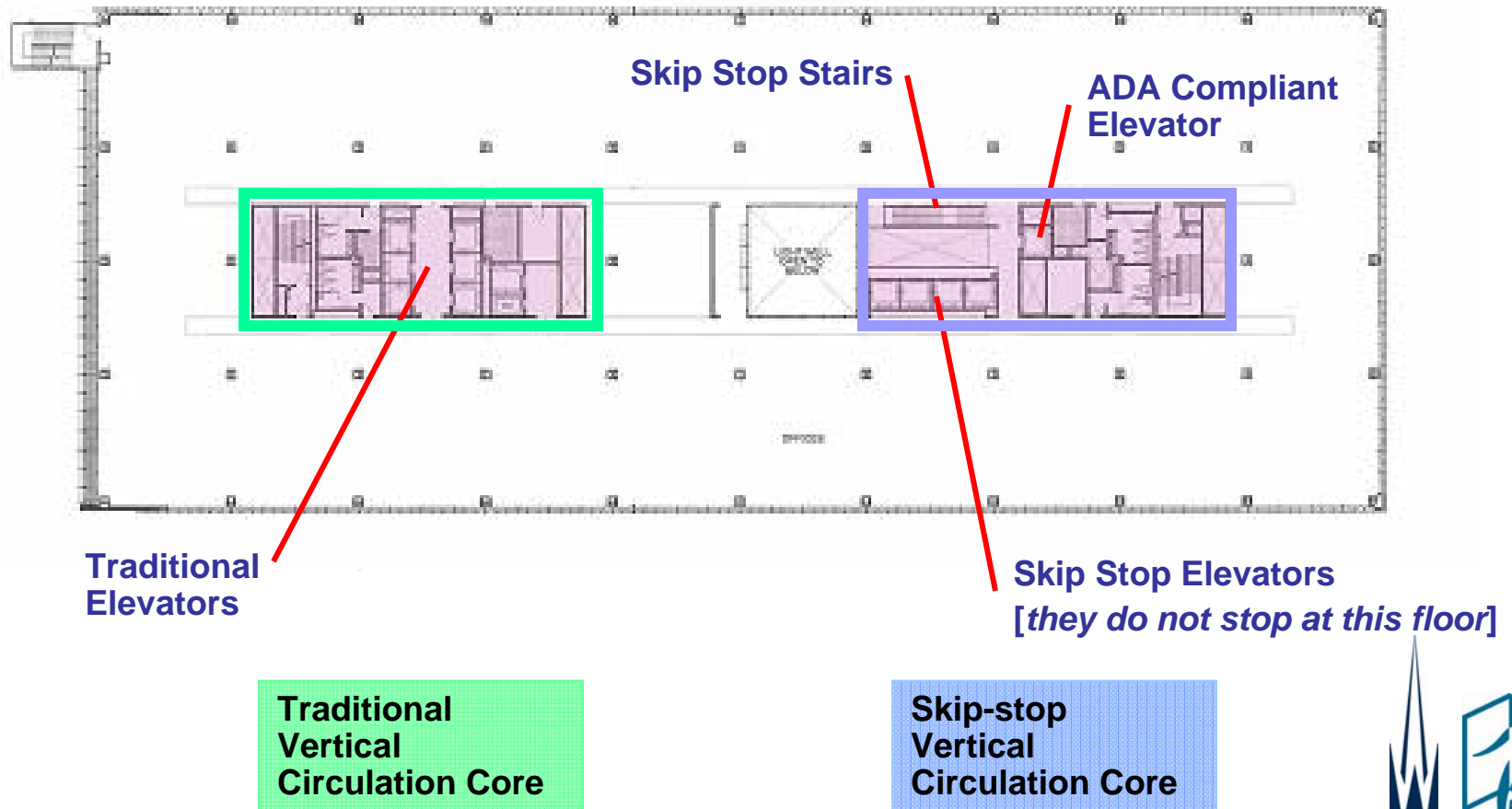
Skip-stop stairs offer access to the floor above and one floor below.

Section through Building



The Caltrans building provides a natural experiment for the investigation of the skip stop elevator/stair arrangement.

5th Floor Plan





Skip-stop staircase in Lobby of Caltrans Building

Design of Objectives for providing the Skip-stop Elevators & Staircase

1. Organize this high-rise building into a more human scale
2. Increase personal interaction and overall office cohesion among Caltrans employees
3. Increase physical activity while decreasing non-productive time spent waiting for elevators.





Interior of skip-stop staircase

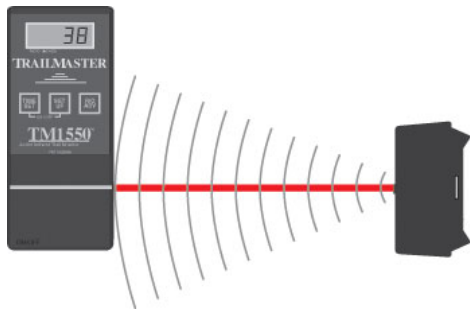
Key Research Questions

1. Is there a difference in stair use patterns between the two vertical circulation cores in the Caltrans District 7 Headquarters Building?
2. How has the provision of this new skip-stop vertical circulation arrangement affected employee attitudes and behaviours towards workplace satisfaction and physical activity?
3. What implementation issues related to the provision of a skip-stop vertical circulation core in the Caltrans District 7 Headquarters Building that should be considered in applying this strategy to other buildings?



Data Collection Method: Stair Use

Record stair use in the two types of vertical circulation cores



Active infrared monitor

Stair use on open staircases adjacent to skip-stop elevators measured with active infrared monitors



Magnetic Card Reader

Stair use on the enclosed fire stairs measured using monitored access card reader system

Measurement period: 24 weeks



Data Collection Method: Employee Behaviour, Attitudes & Perceptions

Online self-report survey



Self-reported measure of change in employee behaviors and attitudes towards physical activity and stair use.

Questions adapted from IPAQ
(International Physical Activity Questionnaire)



Self-reported measure of change in employee's change in attitudes & perceptions towards the new Caltrans Building and the skip-stop elevator/stair arrangement, changes in work patterns and movement in relation to their previous building

Questions adapted from the Occupant Satisfaction Survey
(Huizenga, Zagreus et al. 2003)



Data Collection Method: Skip Stop Elevator Implementation Issues

Interviews with key decision makers on issues related to the implementation of the skip-stop elevators/stairs arrangements in the Caltrans building.

Site Visit & Assessment

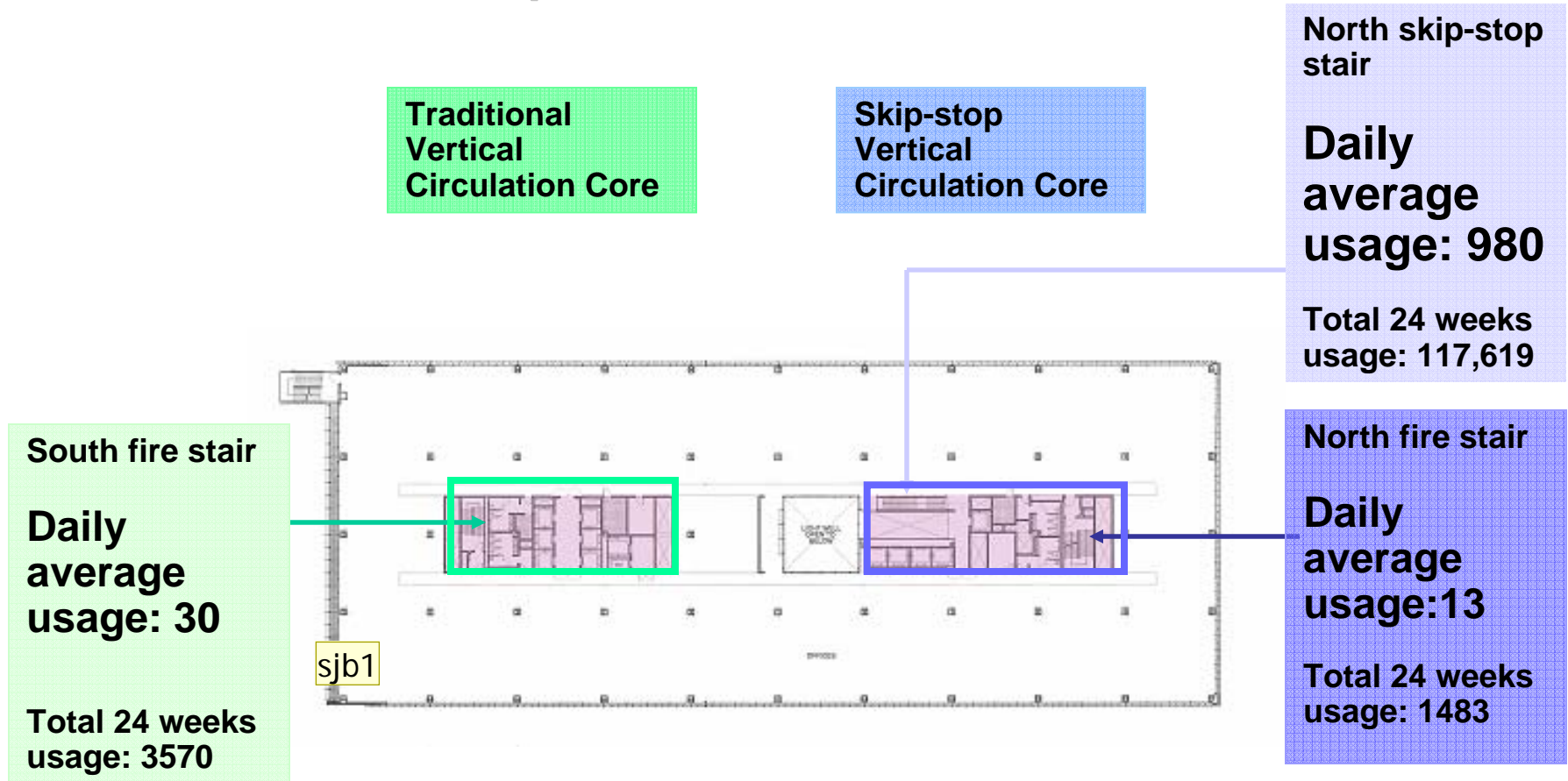
Interviews with

**Client – Chief Administrator
Client- Health & Safety Officer
Project Architect
Cost Consultant
Elevator Technical Advisor**

Building Code Assessment



Results: Comparison of Stair Use



Stair usage during 24 weeks between 4th and 8th floors of Caltrans Building



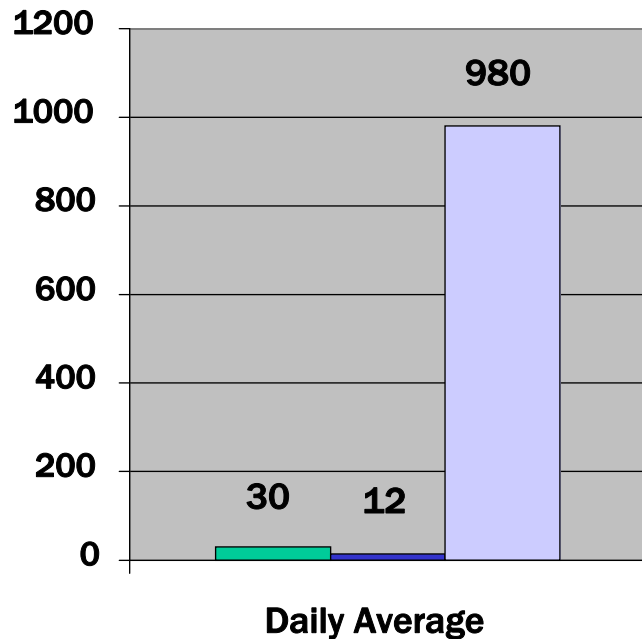
Slide 14

sjb1

Are others averages also? Need to be consistent among these 3

sj90, 7/9/2007

Results: Comparison of Stair Use



Open staircases next to skip stop elevators were used

3300%
more

than enclosed stairs next to traditional elevators



Results: Online self-report survey

17% response rate (299/1718)

Demographics similar to Caltrans population

70% male,
90% bachelor degree or higher
33.6% White, 34.6% Asian
53% between ages 40 & 54



Physical Activity Levels (PA)

27.8% reported that they did not achieve minimum recommended level of PA any day

Only 26.4% reported achieving recommended minimum levels of PA daily



Results: Comparison of Employee Attitudes & Perceptions

72%

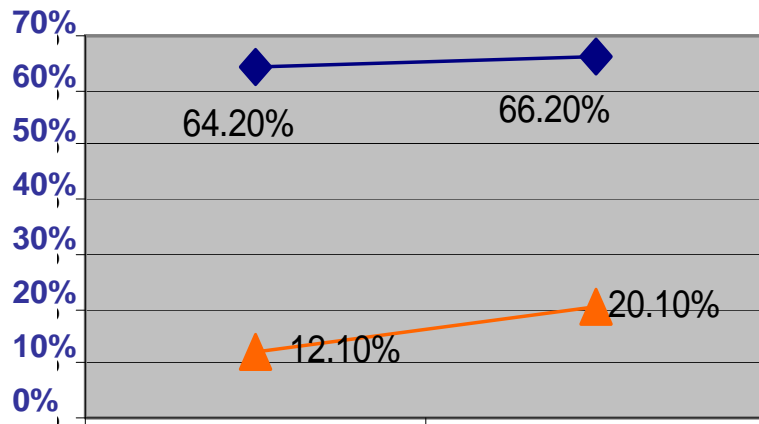
**of Caltrans District 7 Headquarters
Building employees reported daily
use of stairs**

**50% reported 1-6 flights per day
Average stair use 2 flights per day**



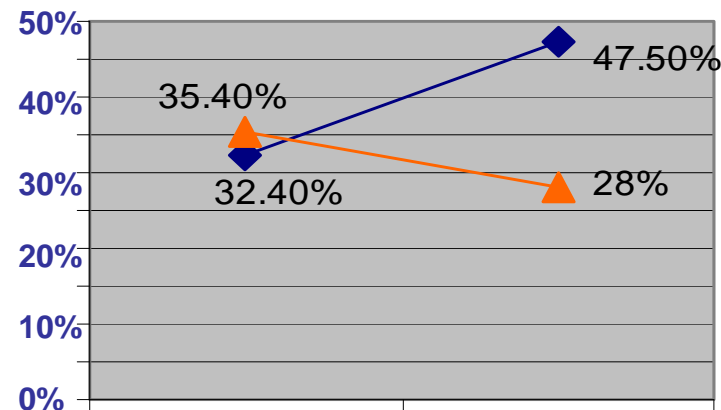
Results: Comparison of Employee Attitudes & Perceptions

The use of the skip-stop elevator/stair can be accepted and even embraced by the majority of employees over time.



Initial
Satisfaction
with Caltrans
Building

Present
Satisfaction
with Caltrans
Building



Initial
Satisfaction
with Caltrans
Building

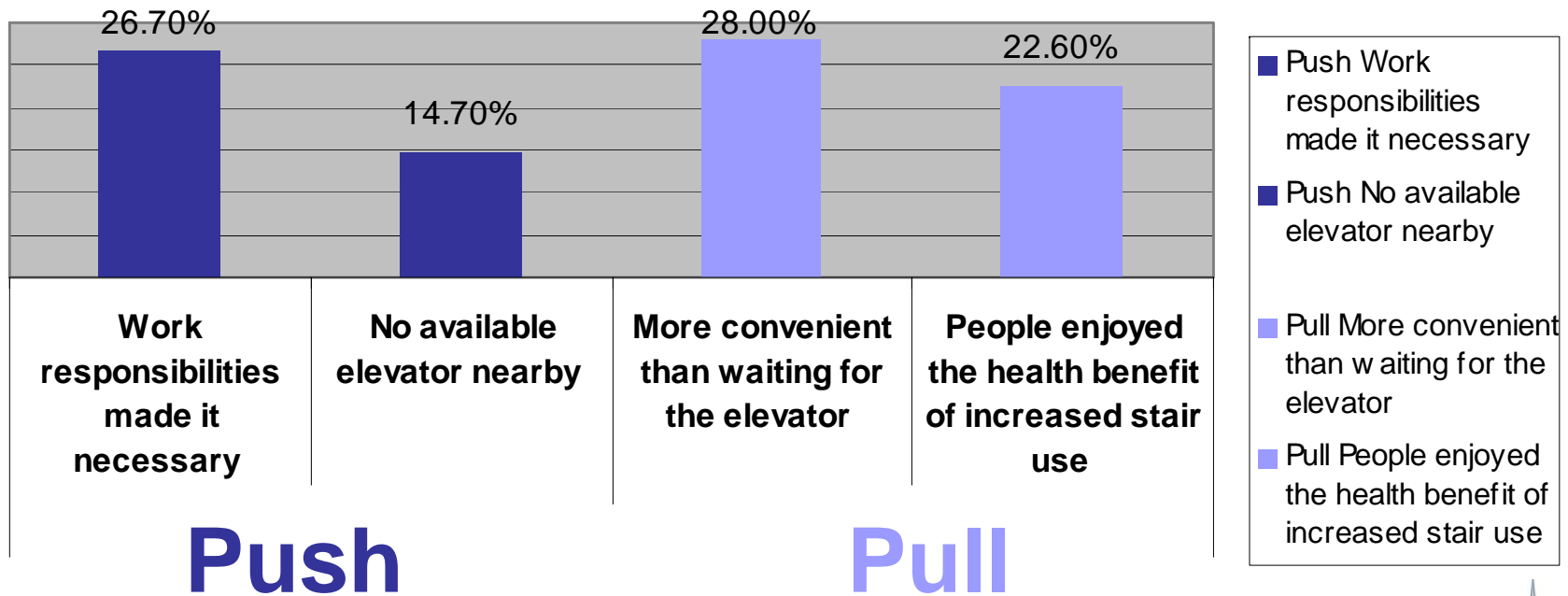
Present
Satisfaction
with Caltrans
Building

◆ —◆ Satisfied
◆ —◆ Dissatisfied



Results: Comparison of Employee Attitudes & Perceptions

Four principal reasons for increases in stair use reflect both Push & Pull strategies



Results: Relationship between Stair Use & Employee Behaviors, Attitudes & Perceptions

Stair Use & Workplace Attitudes

The employee's perception of office cohesion was inversely correlated with the greater number of flights ($R^2=0.061, p=0.0013$).

The satisfaction with the skip-stop arrangement was negatively influenced by the greater number of flights ($R^2=0.0385, p=0.001$).



Results: Relationship between Stair Use & Employee Behaviors, Attitudes & Perceptions

Stair use not related to “Natural Selection” of more physically-minded individuals.

No relationship between amount of stair use &:

location of workstations

demographic variables

physical activity levels

Only minor relationships between stair use &:

Preference to take stairs $R^2=0.03$ ($p=0.002$)

Preference to take lunchtime walks $R^2=0.024$ ($p=0.007$)



Results: Skip Stop Elevator Implementation Issues

1) Compatibility with the Organizational Structure

- The Caltrans building is a single tenant building with multi-departmental organization interaction between departments.

Most office buildings have multiple tenants with limited interaction between building occupants on other floors.

Would users of buildings without multi-level interaction benefit from this design strategy?



Results: Skip Stop Elevator Implementation Issues

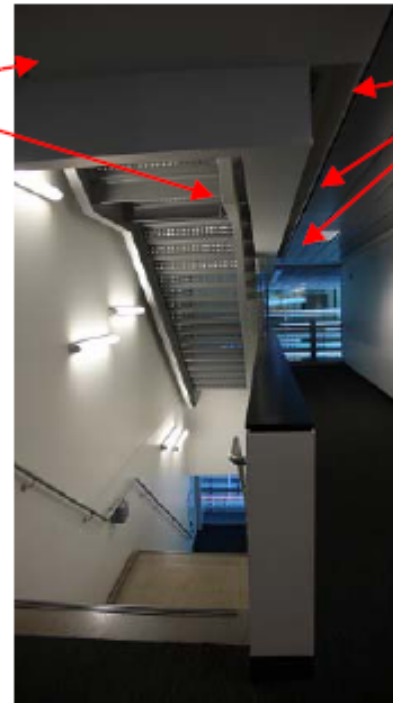
Building Code Issues

Fire stairs are enclosed with a 1-hour fire-rated separation construction assembly;

Open skip stop staircases are not fire exits

Architects received a variance from building officials to use open skip-stop stairs interconnect three-story units by using additional sprinklers to create a wall of water in case of fire.

Location of Sprinkler heads



Location of Sprinkler heads in ceiling recess that creates wall when activated



Results: Skip Stop Elevator Implementation Issues

3) Cost Implications

There may be minimal differences in capital costs between skip-stop stairs/elevators and traditional elevator arrangements.

Cost benefits of 72% employee stair use can not be assessed at this time.



Results: Skip Stop Elevator Implementation Issues

4) Security Issues

The Caltrans building controls public access to the building at the entry lobby where visitors sign in/out.

This security measure may be incompatible with many other government and corporate buildings.



Results: Skip Stop Elevator Implementation Issues

5) Health and Safety Considerations

Although stair use can increase risk of injury from falls, only 1 stair injury had been reported.

There was an initial influx of requests and verifications for designated status allowing the use of the ADA elevator.



Active Living Research is a national program of the Robert Wood Johnson Foundation.

Thank you

