

Universally Designed Fitness Equipment

Peter Axelson

Paula Frey

Patti Longmuir

Thomas Robson

Seanna Kringen

Beneficial Designs, Inc.

Minden, Nevada

Sedentary Lifestyles

People with disabilities are less active than peers

Sedentary lifestyles increase the risk of health problems

People with disabilities are unemployed or in sedentary jobs



Equipment Barriers

Equipment is a primary barrier to physical activity participation

Equipment is not available or is not accessible

Specialized equipment is expensive and seldom used



What Some People Do...



ADA Influence

ADA requires fitness and exercise facilities to be accessible

No standards or instructions on what “accessible” means for equipment

ADAAG does not apply to equipment

“Accessibility” is Difficult

Few sources of information

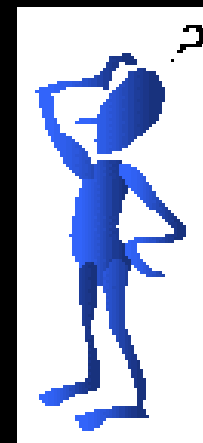
Existing information focuses on:

- Specialized equipment

- Facility assessments

- Disability awareness

Commercial viability not considered



Universal Design

Philosophy/approach to design

Considers all potential users

Design for as many users as possible

Flexible enough to meet the needs of
people with different fitness abilities

Target ADAAG goal of 80% of people
with disabilities

Universal Design Principles

Equitable use

Flexible use

Simple & intuitive use

Perceptible information

Tolerance for error

Low physical effort

Size and space for approach and use

What UD Available Now

Center for Universal Design



Solution

Create guidelines to identify “inclusive equipment”

Ensure that equipment usability is optimized for most people

Enable better designs to enhance accessibility to all users



NIH Research Grant Project Objectives

Universal design guidelines for fitness
equipment (UDFE)

Generate industry-wide knowledge

Support implementation

Educate consumers/providers

NIH Research Grant

National Institute of Child Health and
Human Development (NICHD)

National Institutes of Health (NIH)

Department of Health and Human
Services (DHHS)

Small Business Innovation Research
Grant #NIH-1R43HD49236-01

Phase 1 Project Objectives

Consult with stakeholders

Identify existing guidelines and standards

Develop draft UDFE resources
(guidelines, transition template,
consumer identification system)

Phase 1 Project Objectives

Consult with stakeholders (187):

Manufacturers of fitness equipment

Facility operators

Fitness professionals

Exercise researchers

People with disabilities

Stakeholder Recruitment

Conferences and meetings

Professionals/organizations
who were proposal partners

Contact with disability
organizations

Conferences & Meetings

Obtain initial feedback

Establish project partners

Gather information on existing
equipment

Clarify needs of different users

Conferences & Meetings

International Health & Racquet Sports Association

San Francisco, 2005

Manufacturers

ACSM Annual Scientific Congress

Nashville, May 2005

Exercise researchers

Conferences & Meetings

ACSM Health and Fitness Summit

Las Vegas, April 2005

Exercise professionals

National Strength and Conditioning Conference

Las Vegas, July 2005

Exercise professionals

Conferences & Meetings

Abilities Expo Southern California

Anaheim, June 2005

Disability organizations



Survey Content

Benefits of UDFE

Challenges of UDFE

Issues with existing equipment

Ideas for aerobic equipment

Ideas for strength equipment

Feedback Sources

- 8 Equipment manufacturers
- 3 Exercise facility operators
- 18 Fitness professionals/org's
- 10 Exercise researchers
- 20 People with disabilities/org's

Benefits of UDFE



70% suitable for more clients

63% greater client independence

59% promotion of fitness to wider population

Benefits of UDFE



56% marketing to clients with different abilities

46% attitudes more accepting of differences

43% greater flexibility for programming

Challenges for UDFE



63% more expensive to buy

46% more expensive to manufacture/
re-engineer/re-tool

29% not durable enough

Desired Changes to Current Equipment

Adequate space around equipment

Entry from both sides of equipment

Additional supports for stability/balance

Adjustability of supports for stability/balance



Current Equipment Issues

Adjustability for all body sizes

Variable range of motion

Intuitive and simple adjustments

Smaller initial workloads/speeds

Smaller workload/speed increments

Ideas for UDFE

Seat or bench that is adjustable and removable

Stable railings and handholds

Tactile labels



Phase 1 Project Objectives

Identify existing guidelines and equipment standards:

ASTM

European National

Inclusive Fitness Initiative

ADA Accessibility Guidelines
(ADA/ABAAG)

ASTM Standards

Standard Specification for Fitness Equipment (F2276-05)

Fitness Facility Safety Signage and Labels (F1749-02)

Stationary Exercise Bicycles (F1250-00)

Motorized Treadmills (F2115-05)

Selectorized Strength Equipment (F2216-05)

European National Standards

General Safety Requirements & Test Methods (EN 957-1)

Strength Training Benches (EN 957-4)

Rowing machines (EN 957-7)

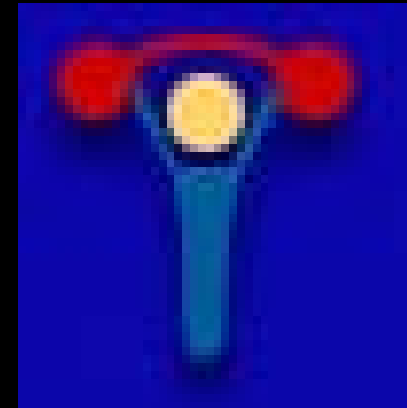
Steppers, stairclimbers, & climbers (EN 957-8)

Elliptical trainers (EN 957-9)

Inclusive Fitness Initiative

Stage 1 draft standards

Stage 2 draft standards



ADA/ABAAG

Operating mechanisms

Ground and floor surfaces

Standards Review

Support principles of universal design

Enable use by 80% of people with and without disabilities

No existing standards

Phase 1 Project Objectives

Develop draft guidelines for home and facility fitness equipment

Develop consumer identification system

Develop transition template

UDFE Draft Guidelines

User Support Surface

Control and Adjustment

Speed and Resistance

Mount/Dismount

Emergency and Safety

User Support Surfaces

Standing, walking or pushing surfaces

Sitting support surfaces

Gripping surfaces

Balance support surfaces

User Support Example



Gripping surfaces distinguished from remainder of machine by:
Definite color contrast
70% or more contrast

Control and Adjustment

Operation of control and adjustment mechanisms

Instructions and directions to users

Control and Adjustment Example

Detachable controls and adjustments should be tethered for easier retrieval



Speed and Resistance

Initial speed and resistance

Increments of speed and resistance

Adjustment of anchors or attachment points (belts or straps)

Resistance Example



Resistance increases:
0.5 lbs up to 10.0 lbs
1.0 lb for 10.0 lbs
to 20.0 lbs
Unrestricted over
20.0 lbs

Mount/Dismount

User support surfaces

Adjacent clear floor space

Height change

Mount/Dismount Example

Clear floor space

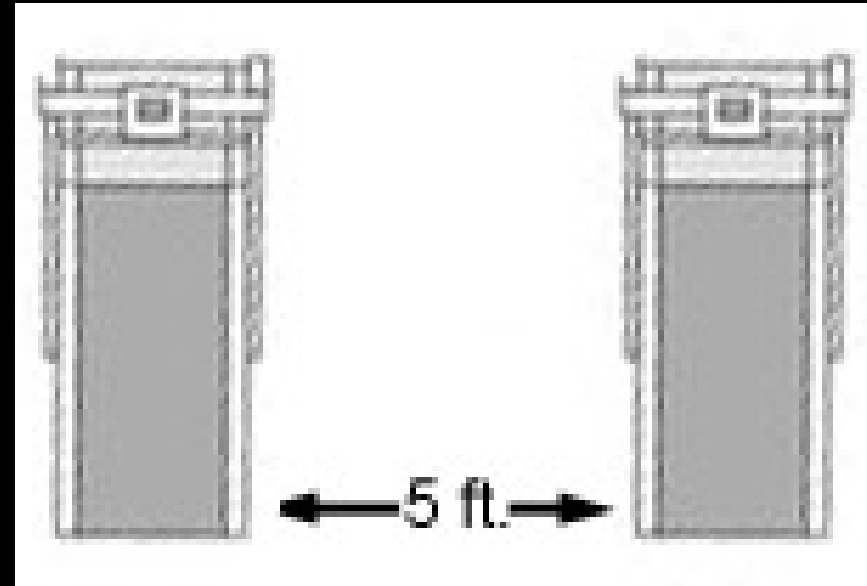
User turning required:

1524 mm (5 ft) length and width

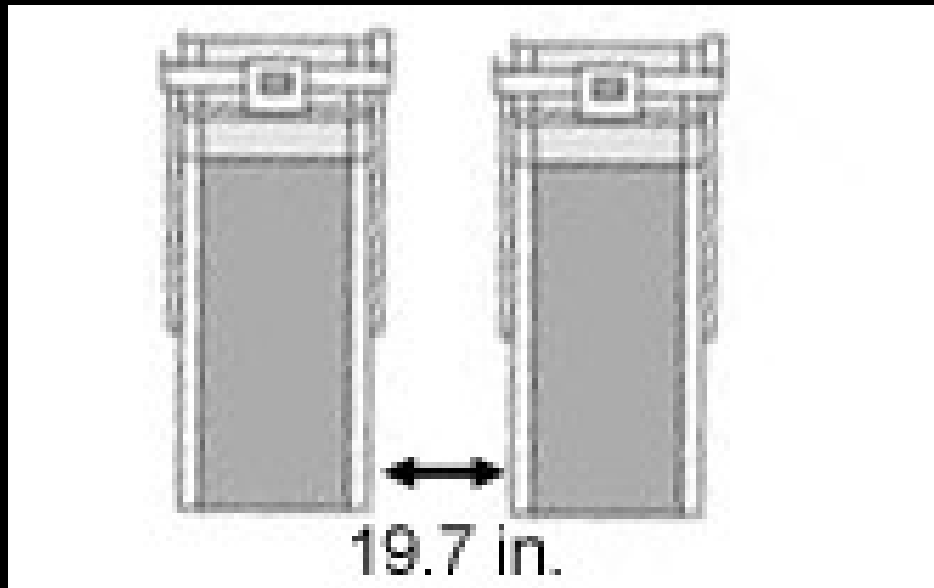
User turning not required:

1524 mm (5 ft) length

914 mm (3 ft) width



Mount/Dismount Example



**Current ASTM
Standard!**

Emergency and Safety

Equipment safety standards

Emergency stop or controls

Safety and warnings

Emergency and Safety Example

Emergency stop or control:

Flexible mounting
system

User control of
position



Identification System

Universal Fitness Equipment		
User Support		
	✓	Sit
	✓	Stand
	?	Grip
	?	Balance
Control/Adjustment		
	✗	Controls
	✓	Information

Speed/Resistance		
	✓	Speed
	✗	Effort
	✗	Anchor
Mount/Dismount		
	✓	Support
	?	Space
Safety		
	✗	Emergency
	?	Equipment
	✓	Information

Next Steps – Phase 1

Complete draft UDFE Guidelines

Review by advisory board and
manufacturers

Develop step-by-step transition
template for existing equipment

Refine UDFE identification system

Next Steps - Phase 2

Research specific design variables

Validate guidelines

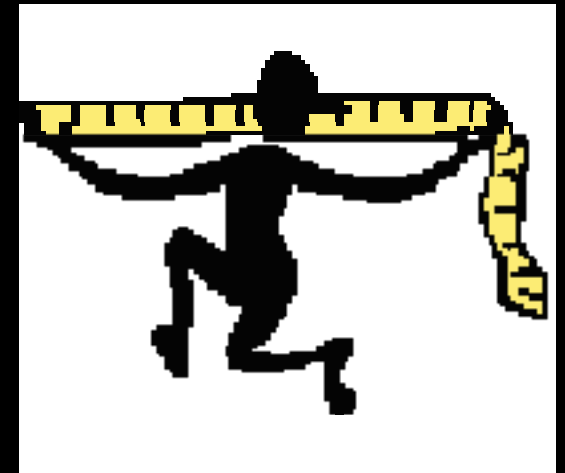
Pilot test:

- Guideline implementation

- Transition template

- Consumer identification system

Research Design Variables



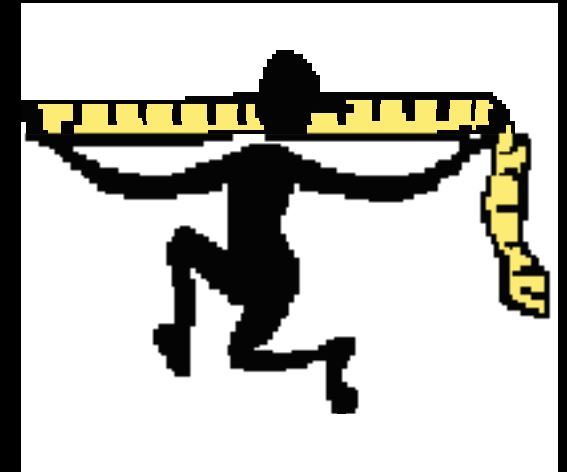
Width, depth & shape of seat

Cushion firmness of seat & grips

Diameter of gripping mechanism on
seat

Diameter of gripping surface

Research Design Variables

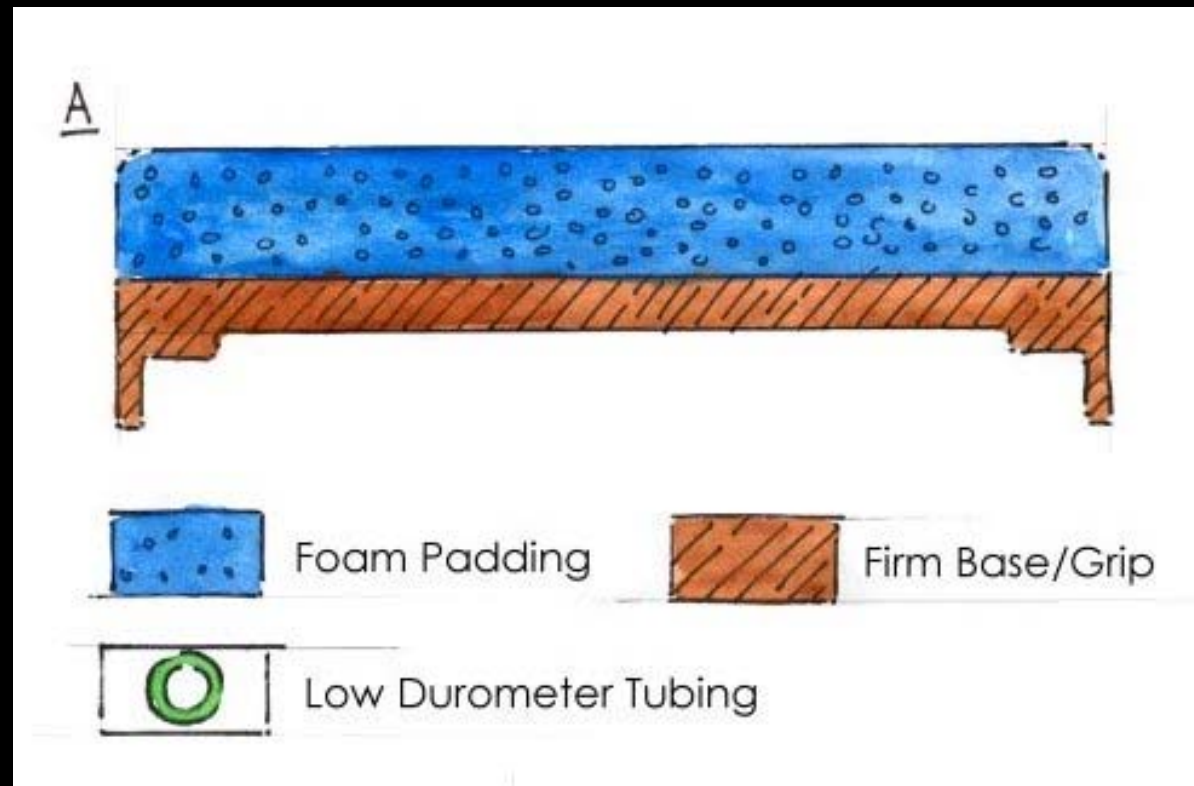


Range of adjustable height
of axle for arms and legs

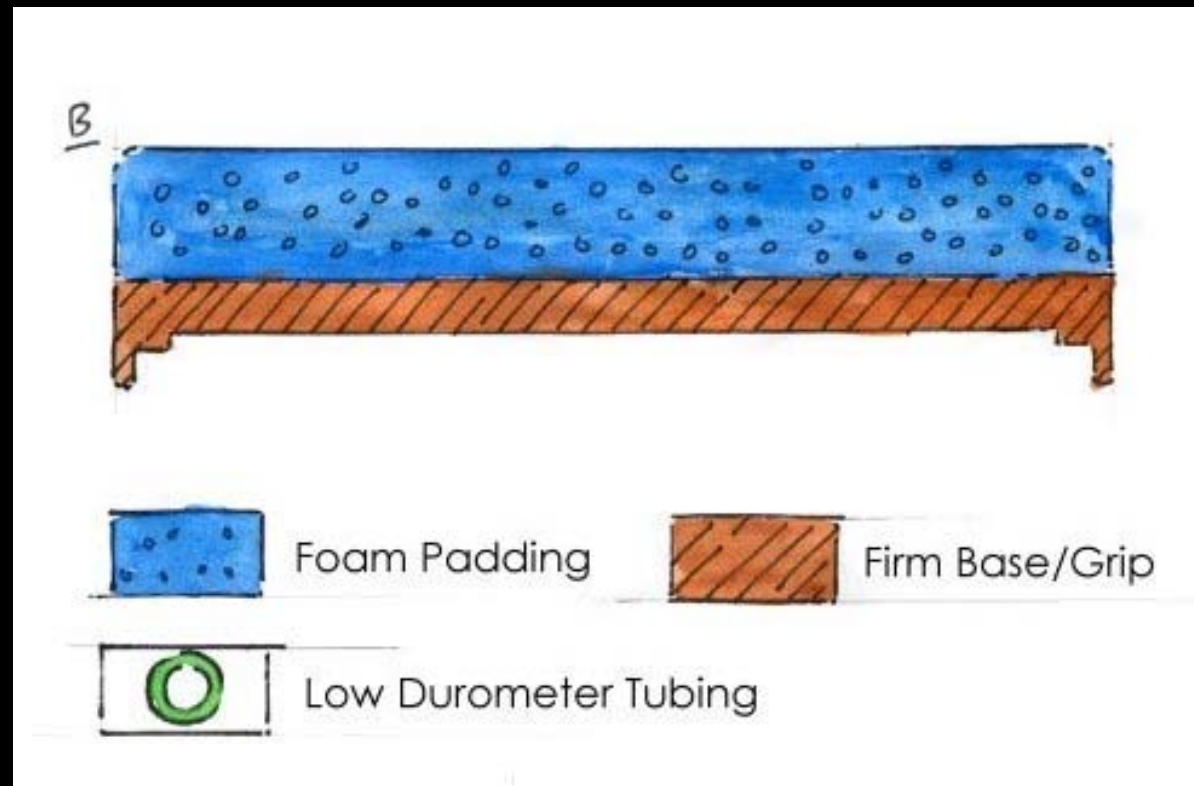
Range of adjustable range of motion
for arms and legs

Range of adjustable height for balance
support grips

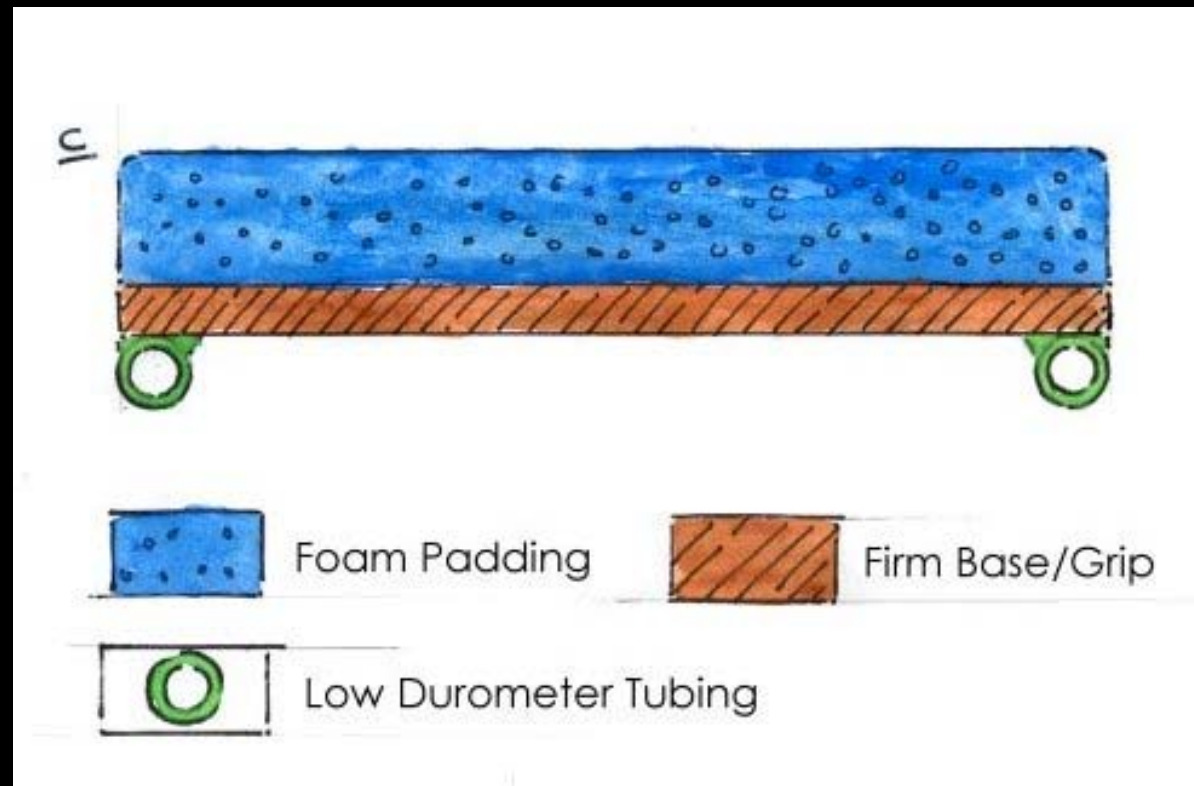
Researching Hand Grip



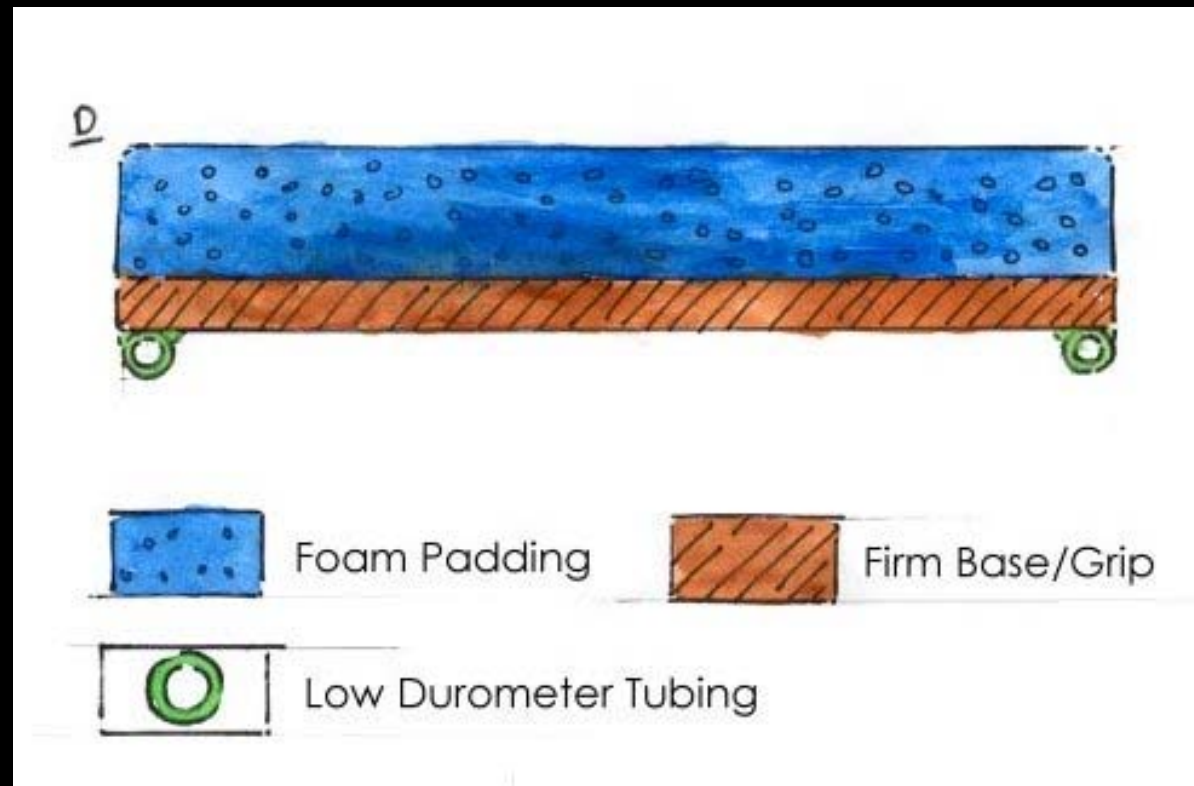
Researching Hand Grip



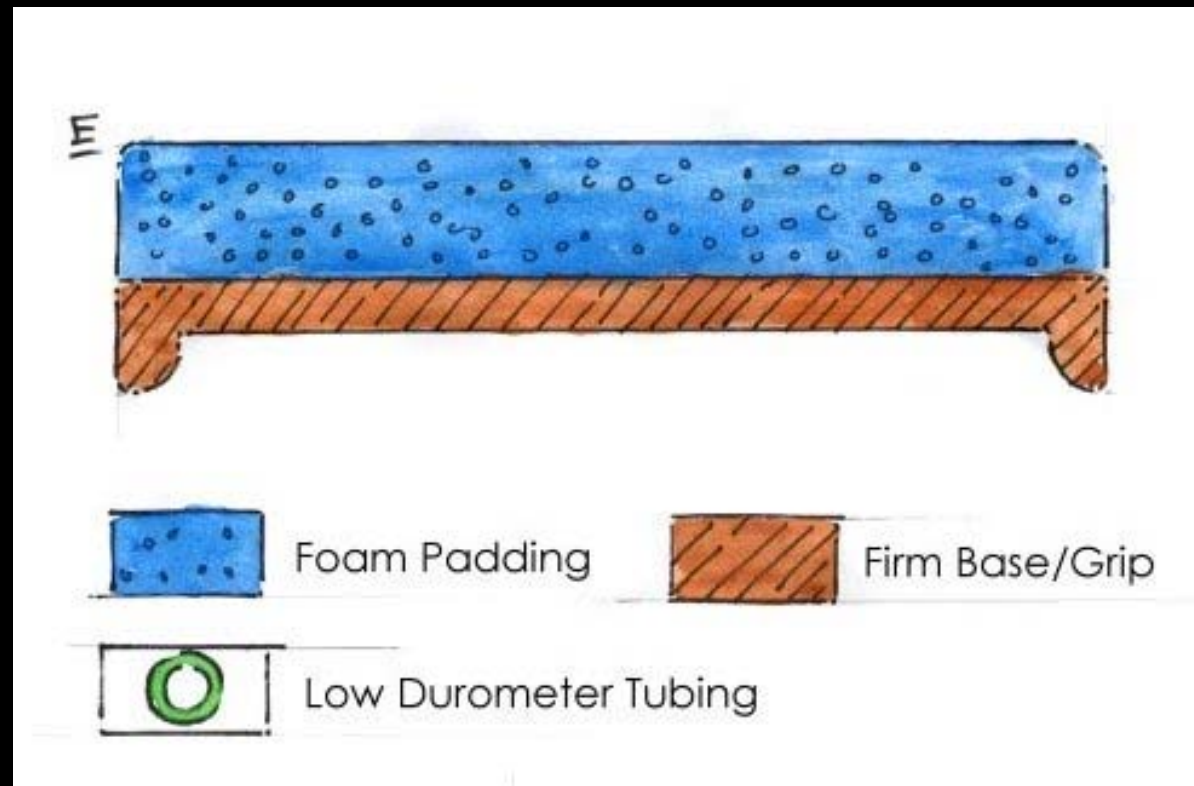
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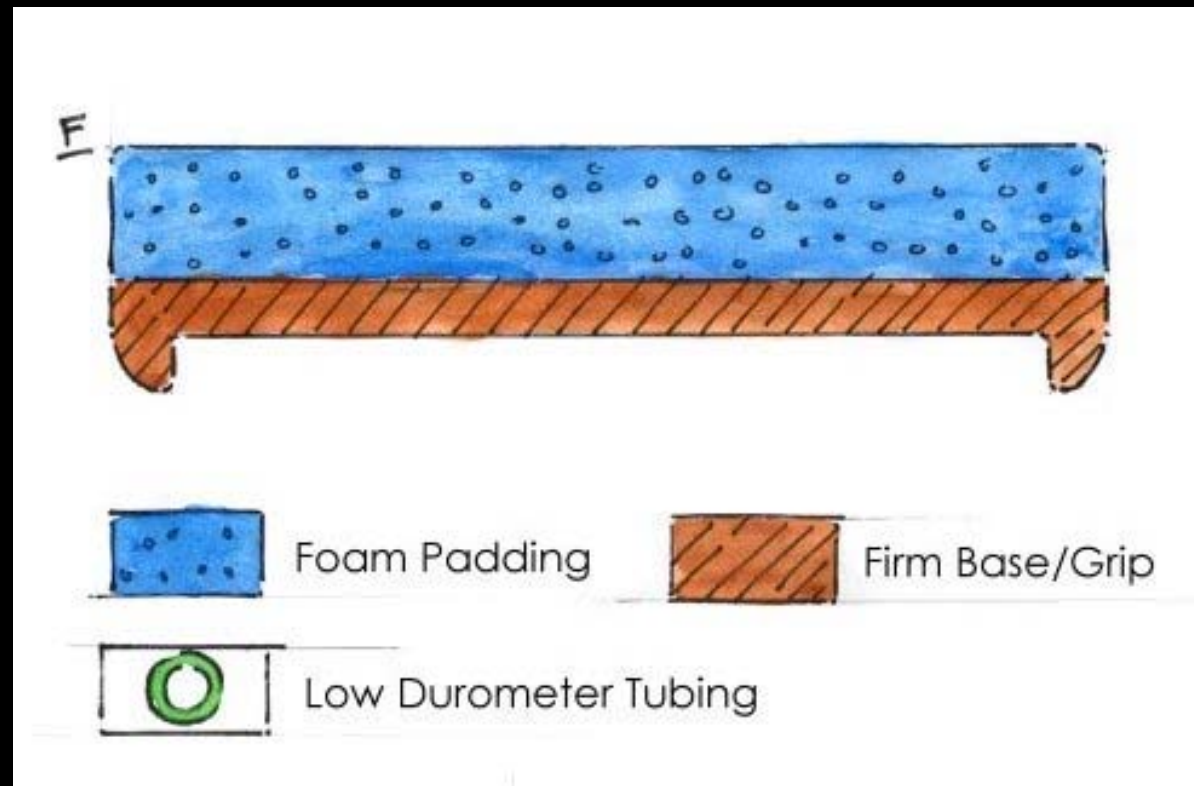
Researching Hand Grip



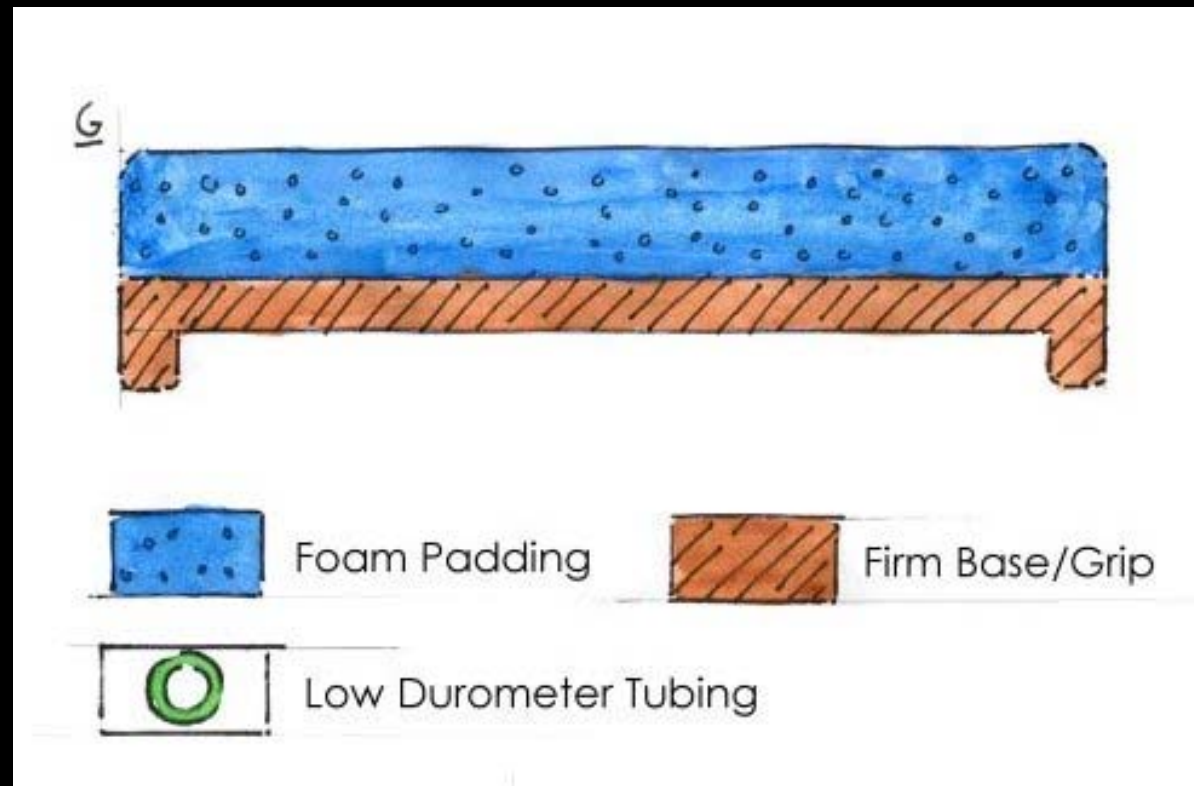
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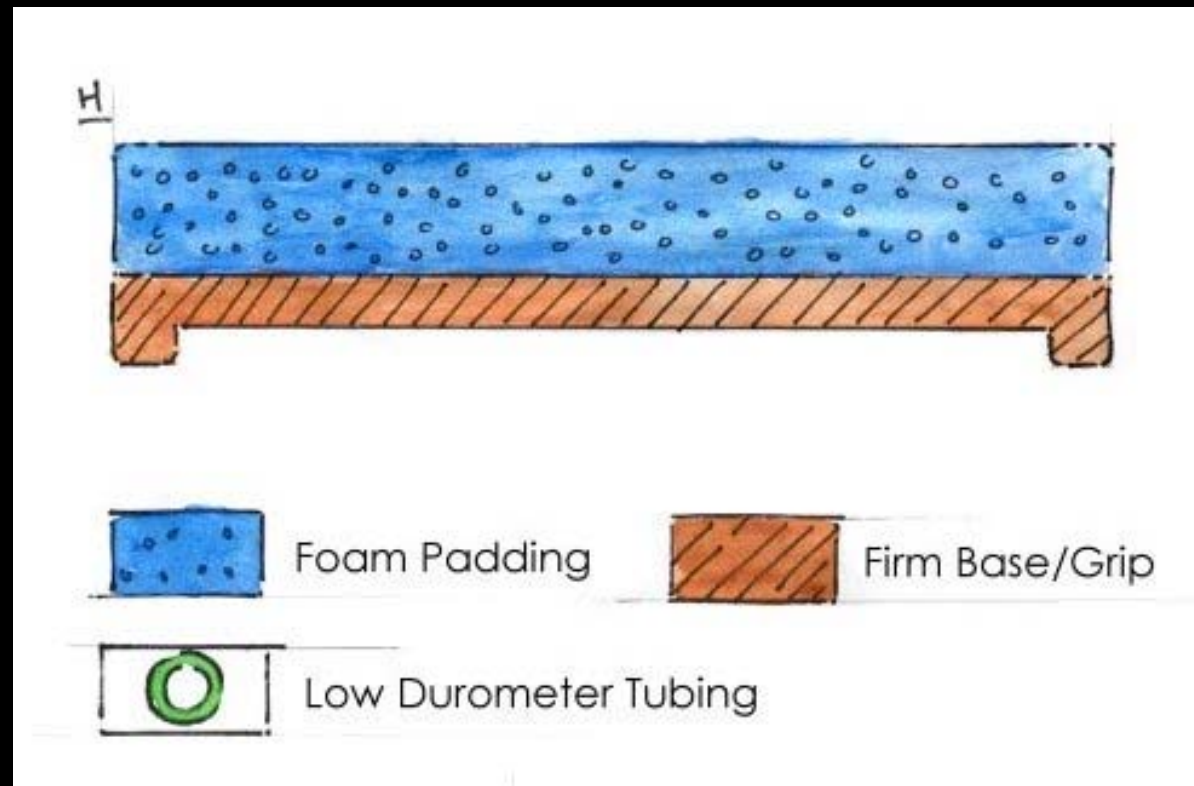
Researching Hand Grip



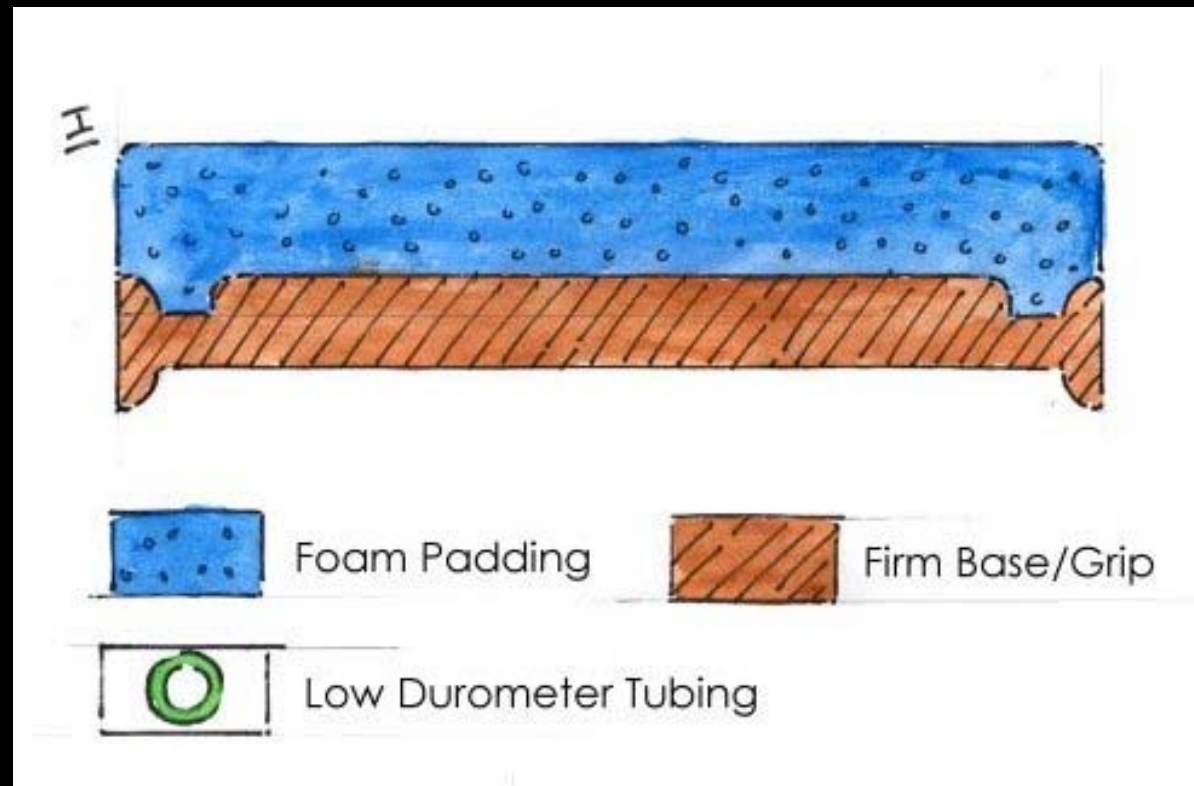
Researching Hand Grip



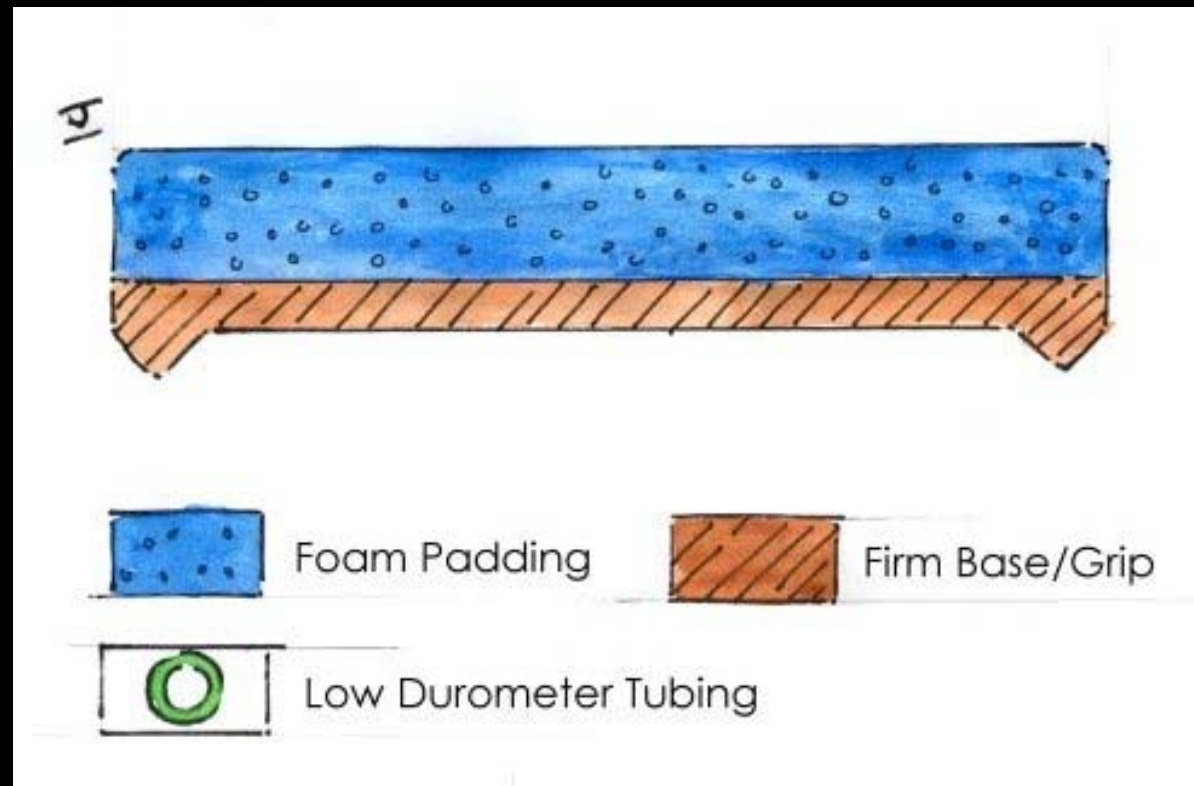
Researching Hand Grip



Researching Hand Grip

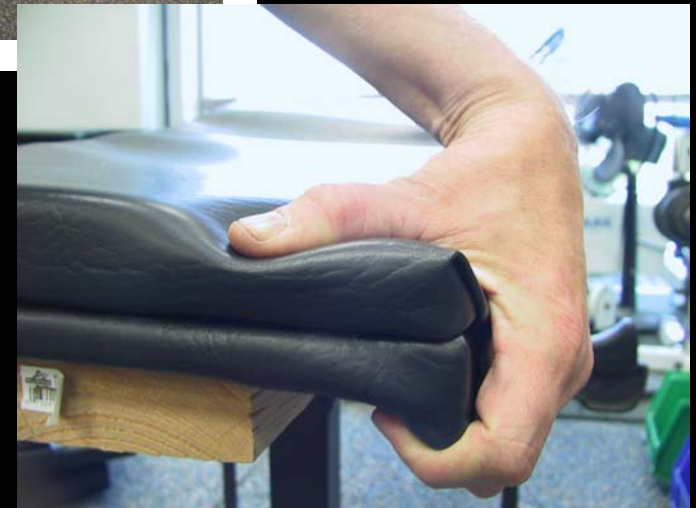
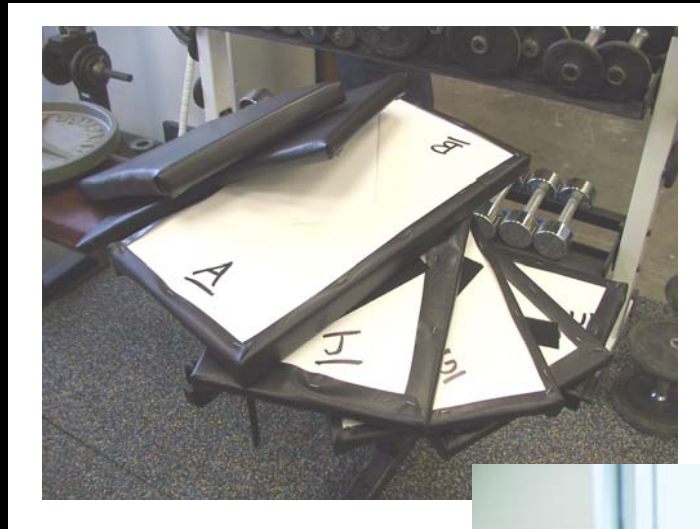


Researching Hand Grip



Hand Grip Research Procedure

Participants
evaluate
different
hand grips
(random order)



Hand Grip Research Procedure

Transfer onto bench
using first handgrip
Survey evaluation of
function and
satisfaction



Hand Grip Research Procedure

Switch handgrip

Repeat with different
handgrip



Researching Hand Grip

Analyze function and satisfaction data

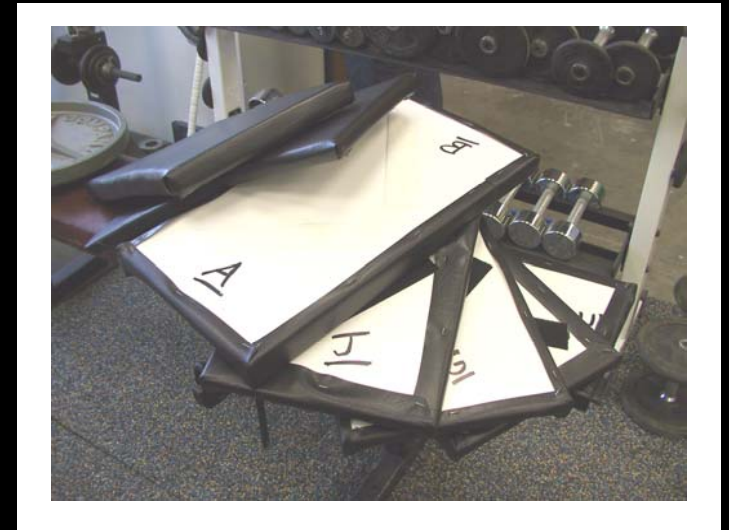
Identify optimal handgrip size and shape

Implement into UDFE guidelines

The grips are here for testing!

Please come and try them out
in the equipment exhibit hall

Give us your feedback



Beneficial Designs, Inc.

Minden, Nevada

www.beneficialdesigns.com

paula@beneficialdesigns.com

775.783.8822 voice

775.783.8823 fax

*Working toward universal access
through research, design & education*