beneficial designs

designing beyond the norm to meet the needs of all people

Stanford University

Peter Axelson

2024-02-27

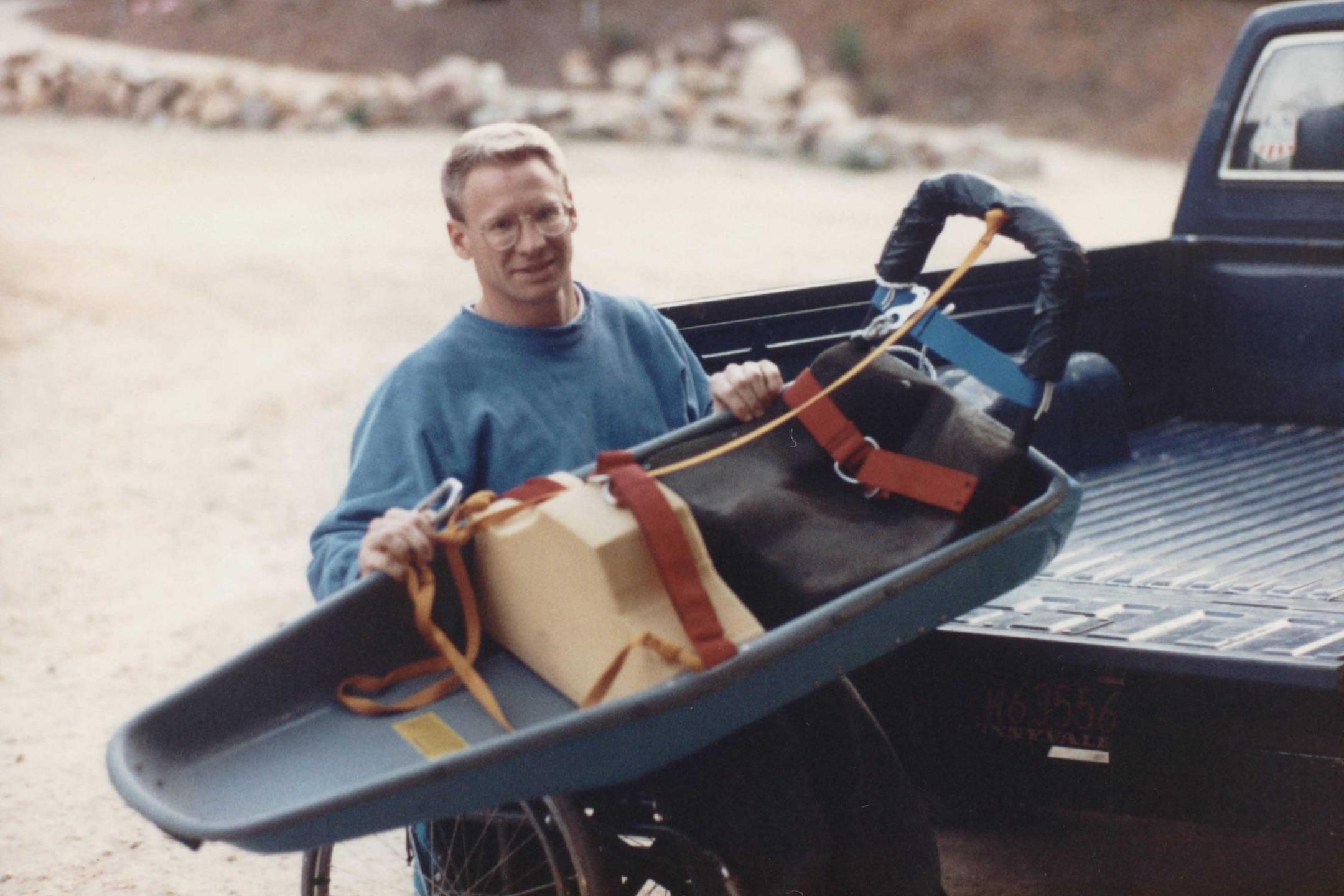

BRING ME MEN
STOP

The need:

To get back out on the snow


2W63556


2W63556
SUNNYVALE



The Mono Ski

Now a Paralympic sport


200
205
AMERICAN EXPRESS
When you

How I got to where I am…

Initial intentions and objectives

Redirected with a new purpose

Found another great place to grow

Personal needs directed my designs

Focused on AT and access for life

beneficial designs

designing beyond the norm to meet the needs of all people

research

design

education

beneficial designs

Mission Statement

Beneficial Designs works towards universal access through research, design, and education. We believe all individuals should have access to the physical, intellectual, and spiritual aspects of life.

We seek to enhance the quality of life for people of all abilities, and work to achieve this aim by developing and marketing technology for daily living, vocational, and leisure activities.

beneficial designs

Mission Statement

Beneficial Designs works towards universal access through research, design, and education. We believe all individuals should have access to the physical, intellectual, and spiritual aspects of life.

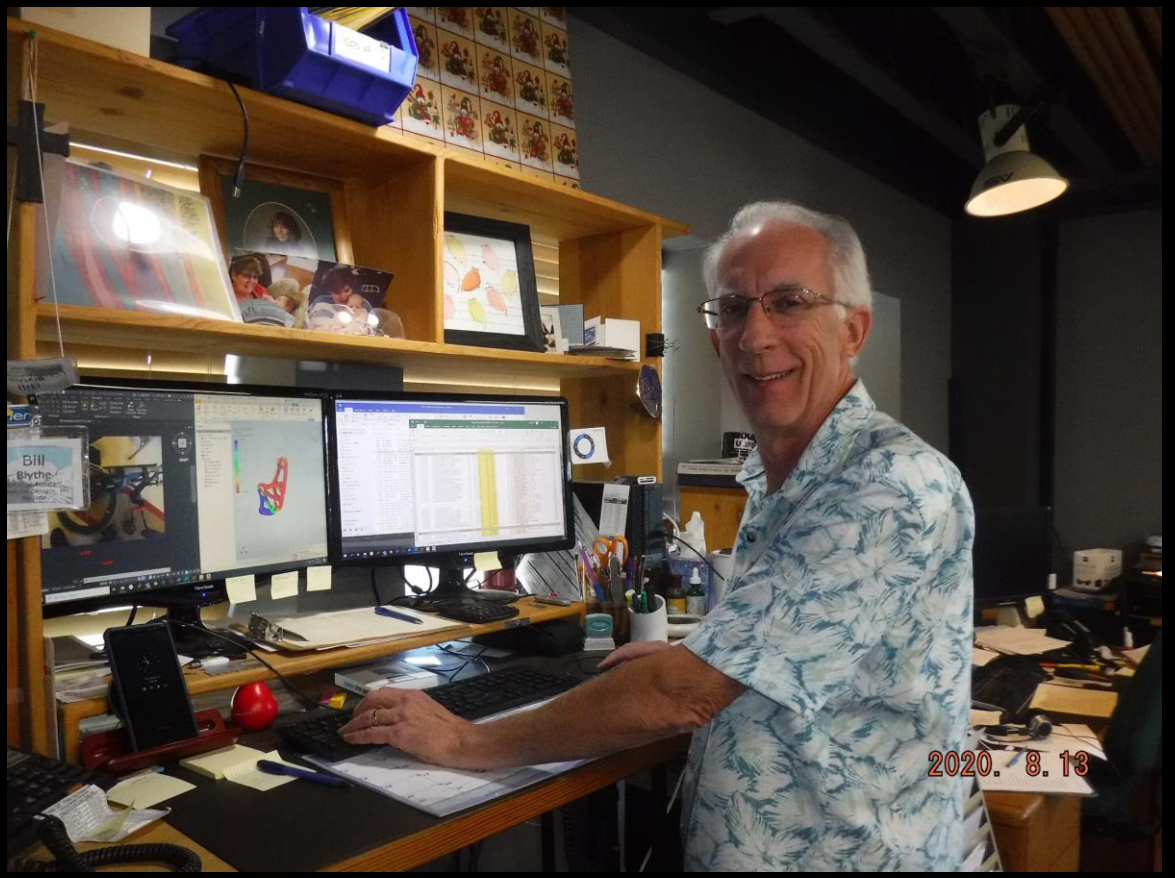
We seek to enhance the quality of life for people of all abilities, and work to achieve this aim by developing and marketing technology for daily living, vocational, and leisure activities.

It takes a team of people…

to design, test and assess

to write, map and build

to plan, support and present



Bill Blythe

IT and facility manager

Stephanie Stephens

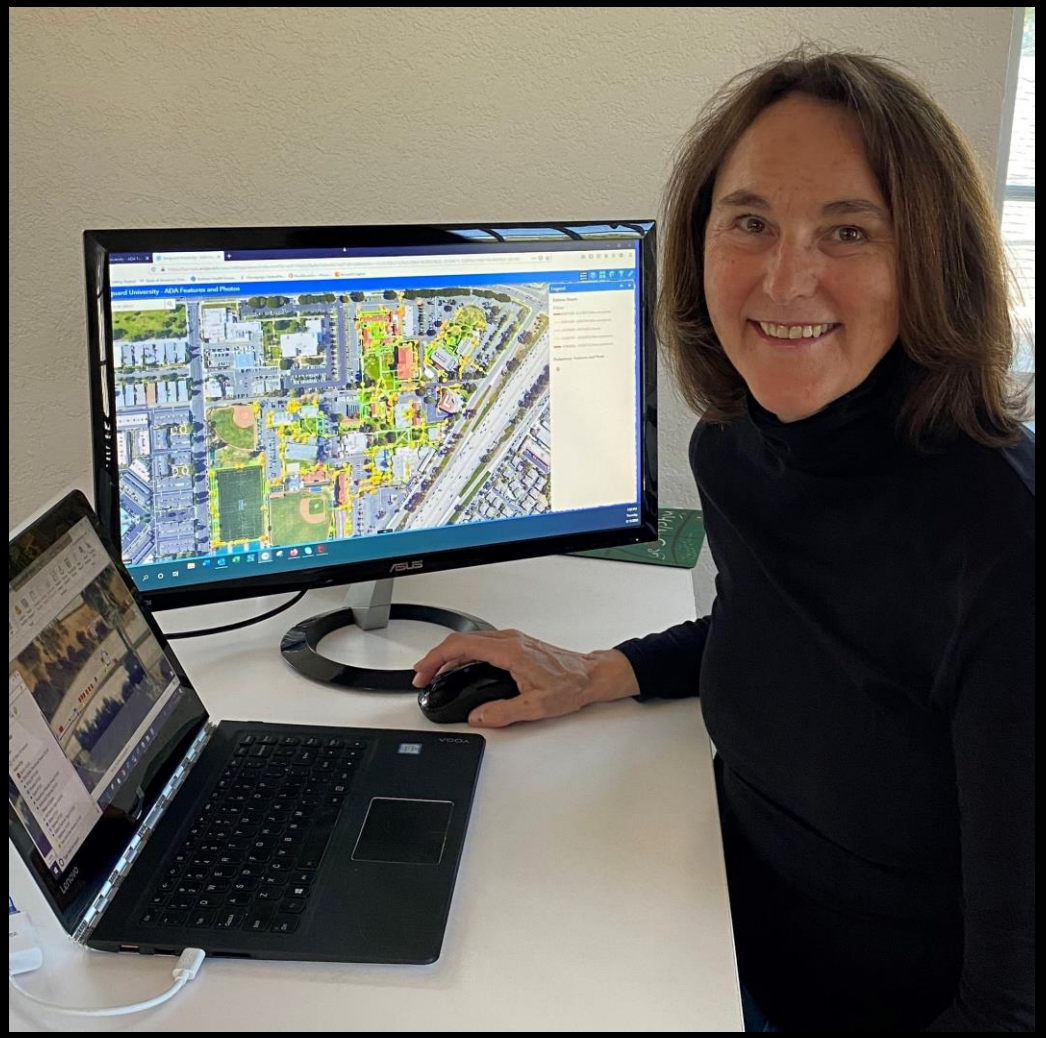
research assistant – remote from India

Stephen Pieters

wheelchair test lab leader

Ben Hubbard

graphic artist GIS map designer



Debbie Hester

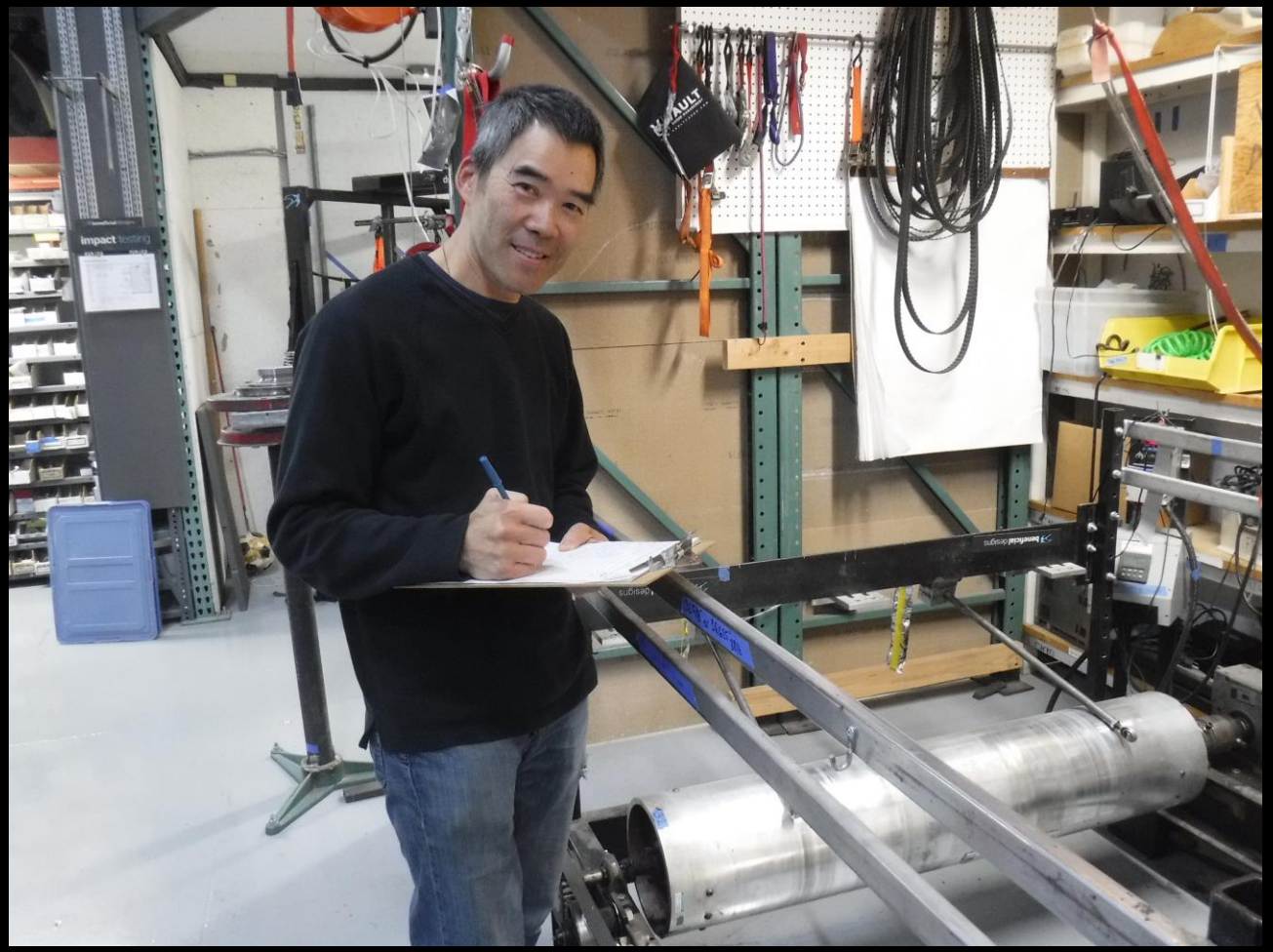
GIS technician

Ria Axelson

office manager and welder

Paul Schnorbus

machinist



Thomas Lee

IT and quality control

Todd Ackerman

sidewalk assessment coordinator

Travis McDonald

assessment technician

Jeremy Kennemur

assessment technician

Abraham Lesiuk

assessment technician

Sam Finley

assessment technician

Wynter Sturtevant

data analyst

Jonathan Miller

technical assistant

Wiu Wiu

test lab assistant

Joshua Wetmore

test lab assistant

Maegan Elkaraki

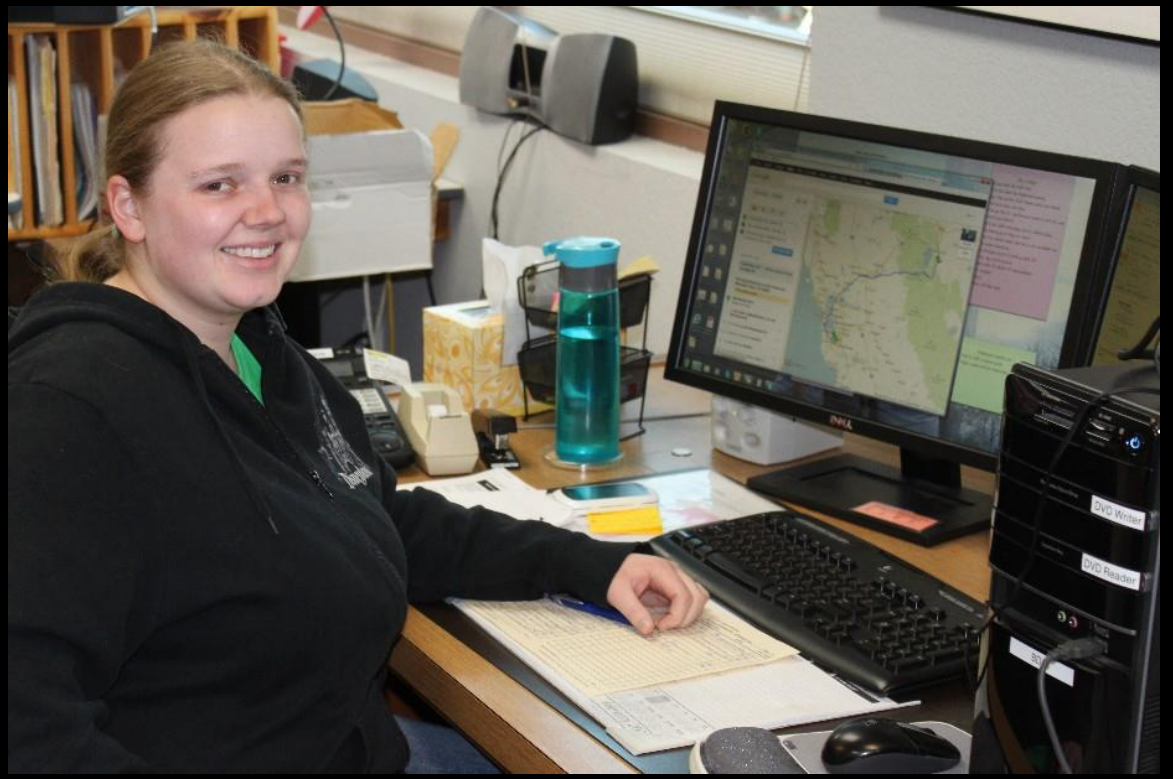
bookkeeping and financial

Annabeth Johnson

administrative assistant

Paola Vazquez

office assistant



Sharon Vazquez

bookkeeping assistant – remote

Julia Woodruff

office assistant

Peter Axelson

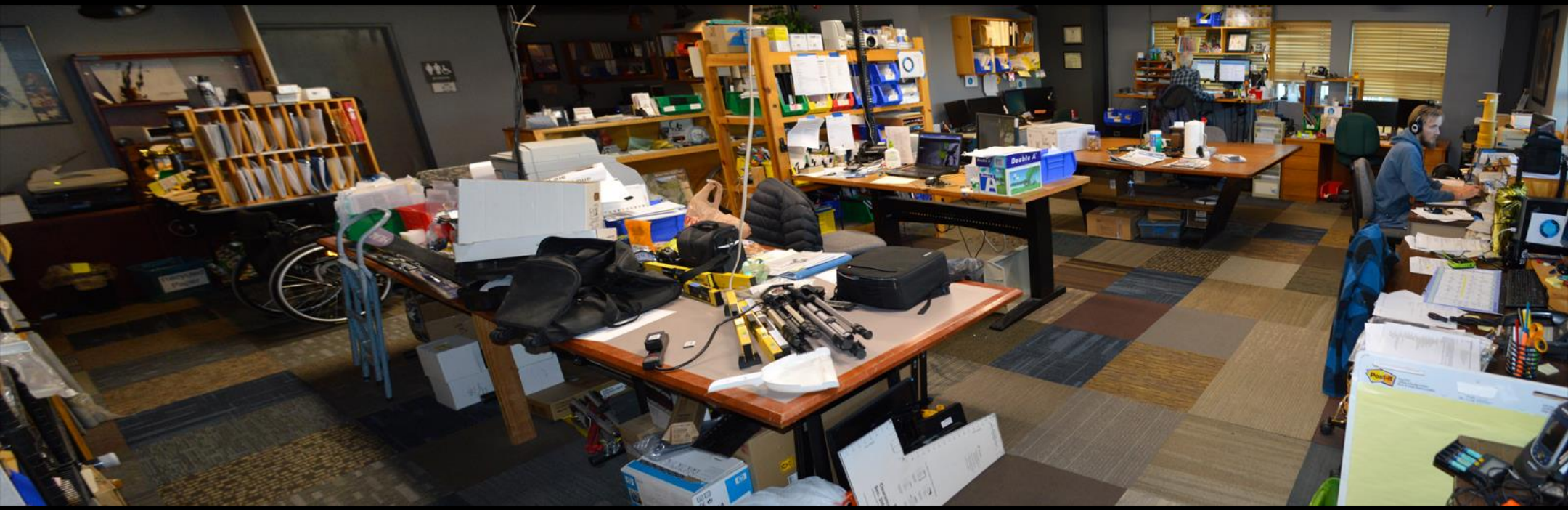
Director of R&D

A working space with tools…

to design and create

to build, test and break

with material and stuff to assemble

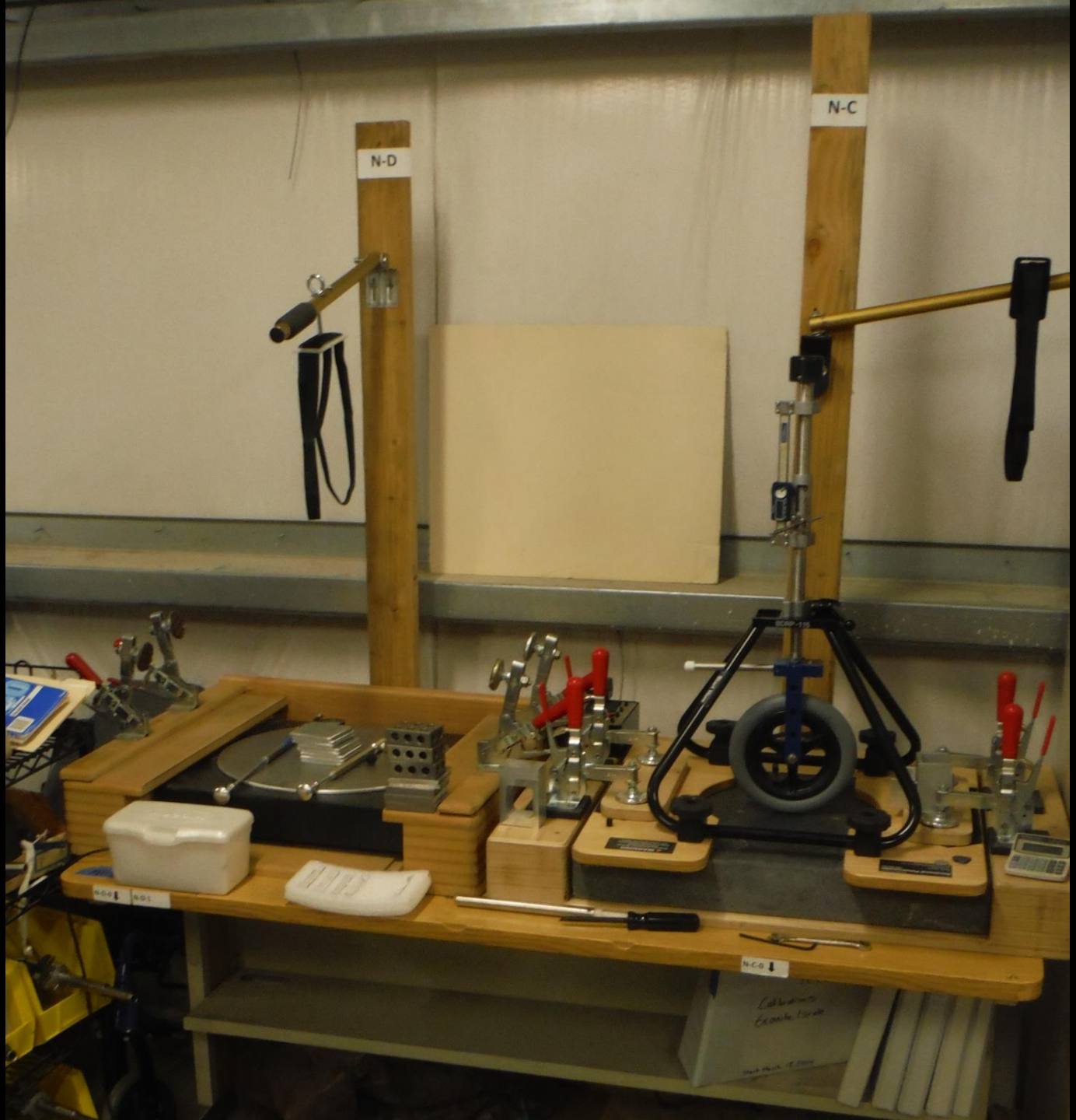

Double A


N20K


Mobil


R2-A
JC Metal Fabrication Inc.
21831 9 Mile Rd.,Reed City, MI 49677
231-832-3551
MADE IN
U S A
FAN
LIGHT


N-C
N-B


N-D
N-C

Testing

- Wheelchairs
- Surfacing
- Adaptive sports equipment
- Forensics

Wheelchair testing

- People get hurt using them
- Design and manufacturing defects
- Making sure the product is safe
- Determine the performance of the product
  - How fast will it go?
  - How far it will go?
  - How high it can climb?

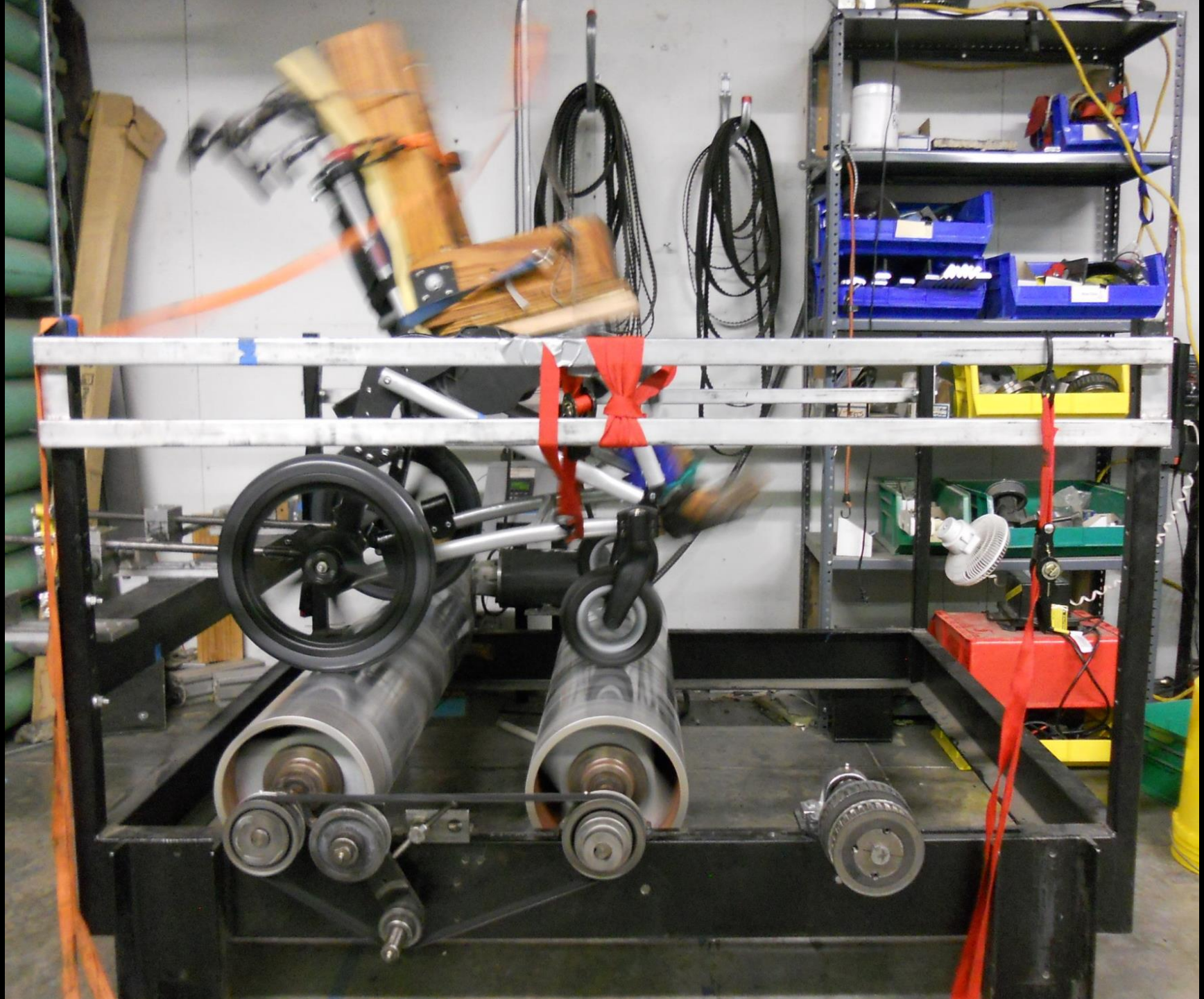
Wheelchair testing

American RESNA Vol. 1 & 2 test procedures

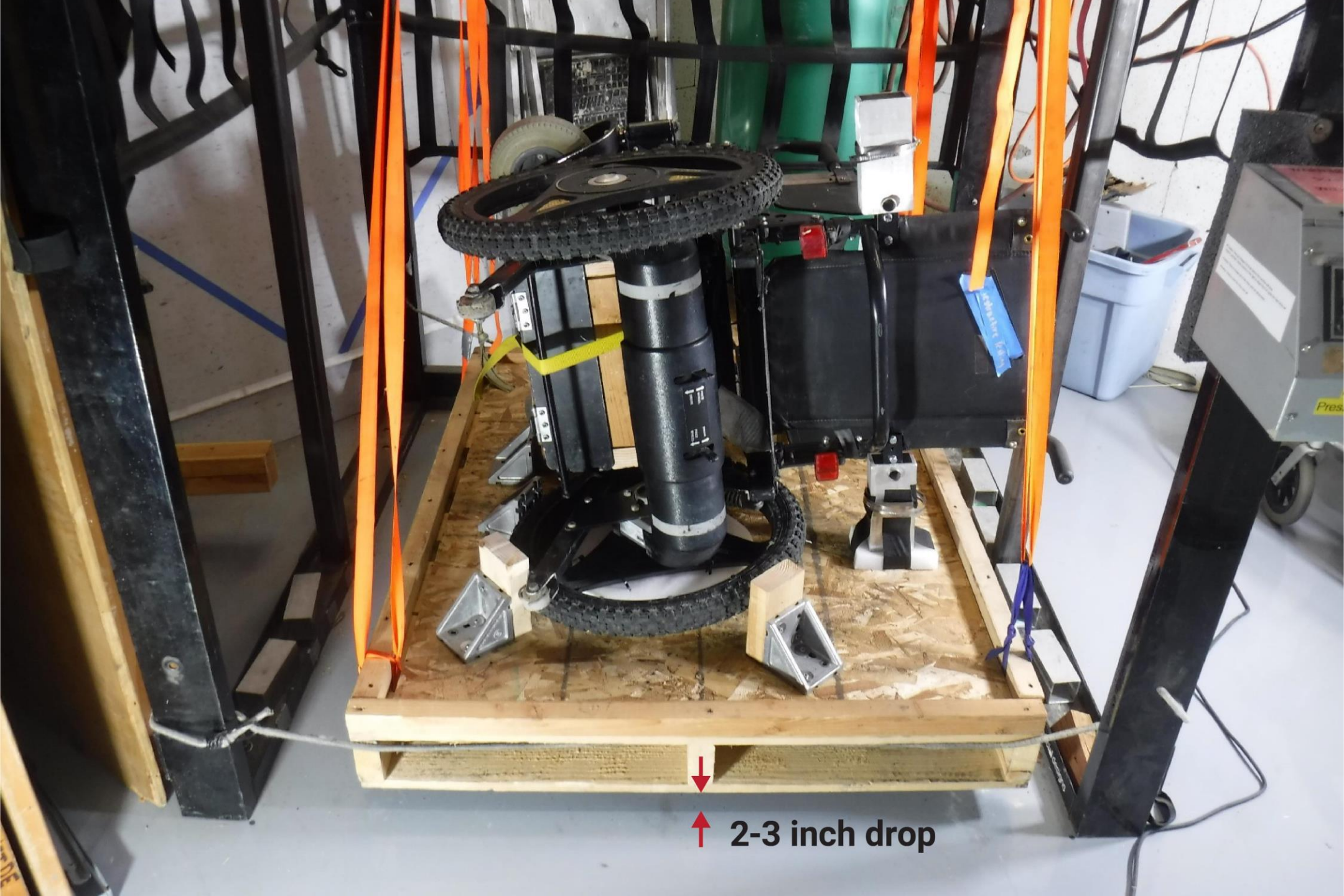
International Standards Organization ISO testing procedures Sections 1 through 30

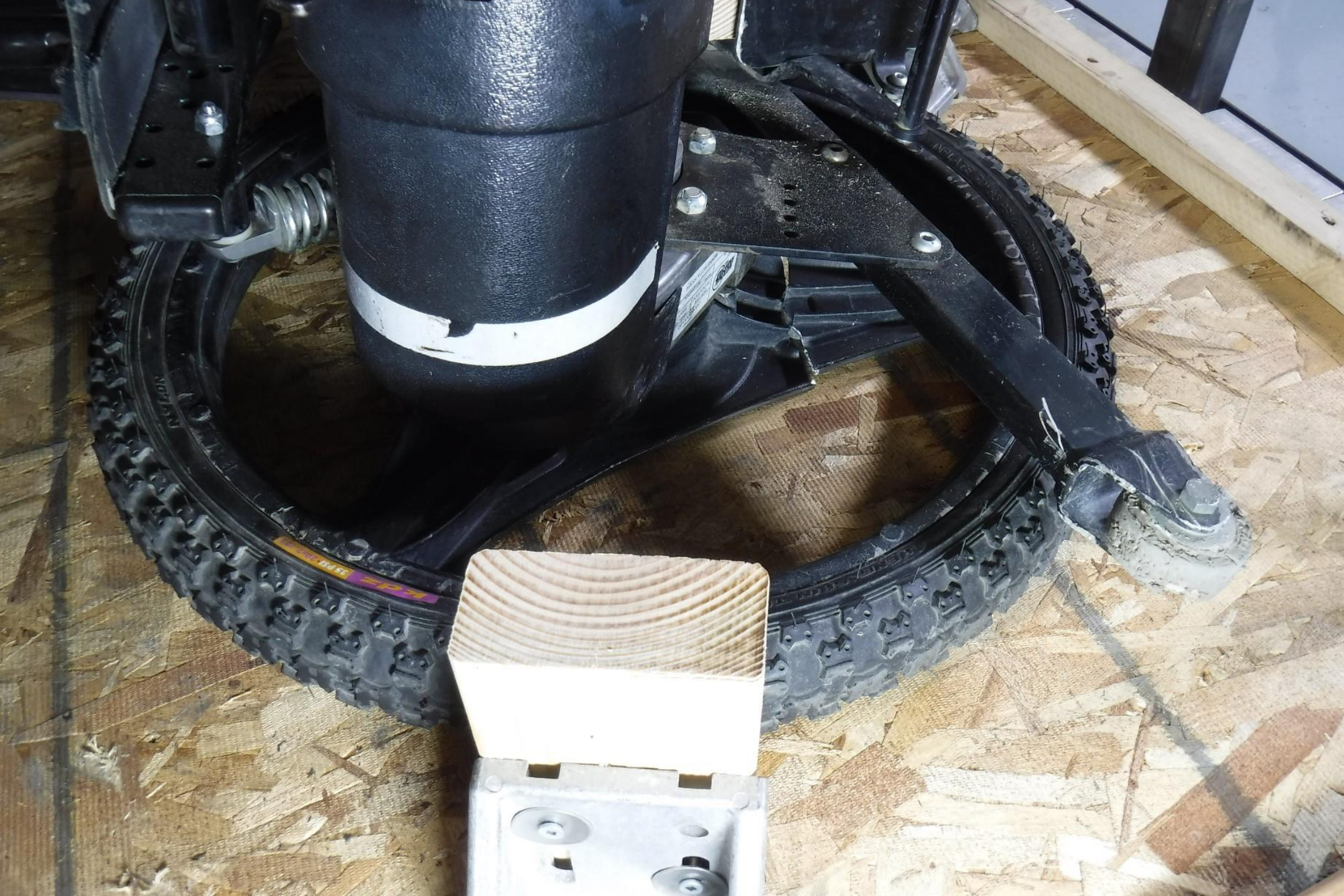
European National EN12183 and 12184 testing requirements and test methods

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION AND TESTING LABORATORY



Damage


2-3 inch drop




10°

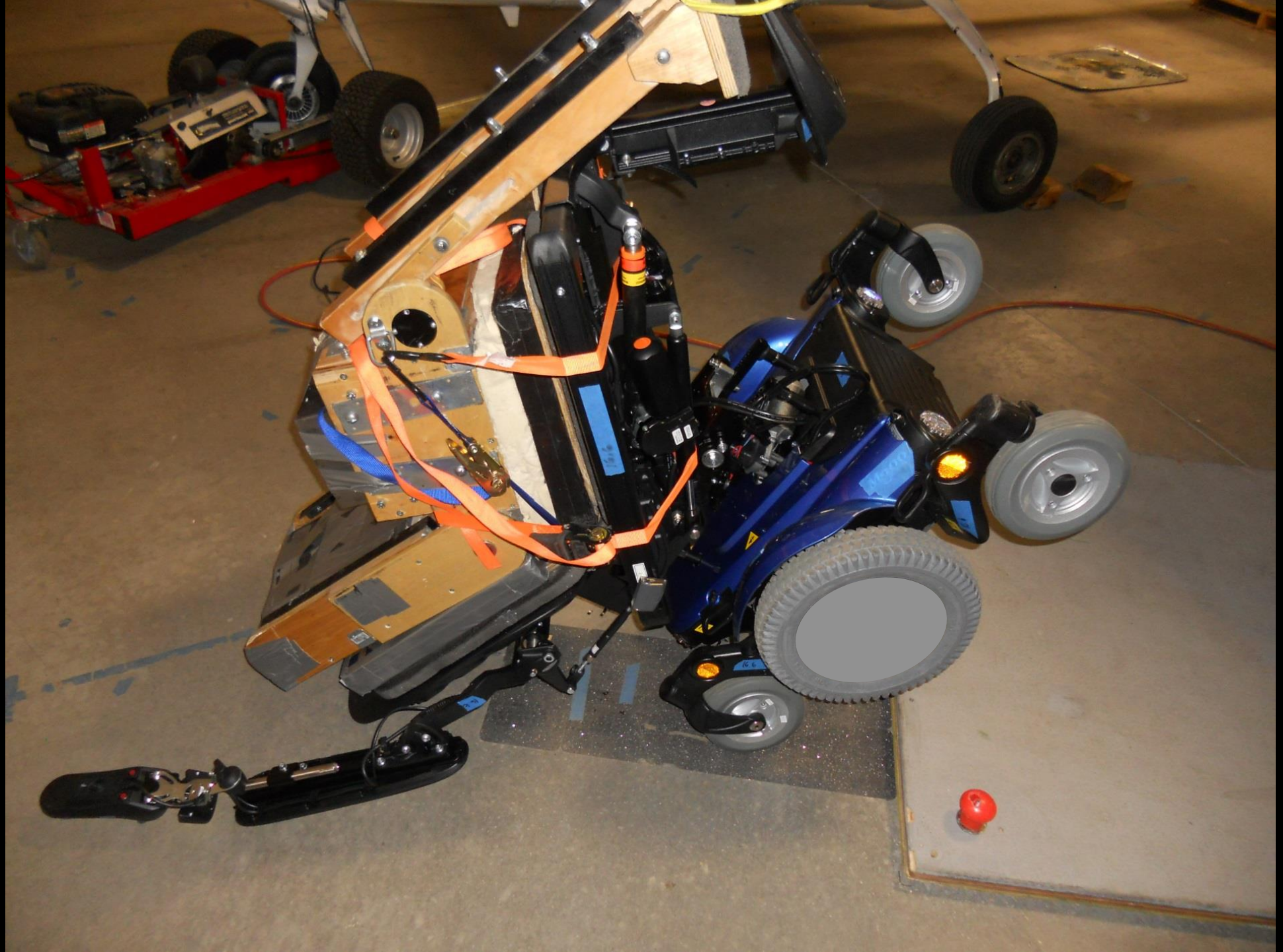

10°


2014-2


N2QK Tools
Action Trackstander


beneficial designs
beneficial designs
beneficial designs
dynamic stability test ramp


7.5°



Surface testing

- People get hurt using playgrounds
- Soft but firm and stable
- Making sure the product is safe
- Making sure I don’t get stuck in them
  - How firm is the surface?
  - How stable is the surface?

Firmness and stability testing

ASTM F1951 Playground testing

Instrumented Surface Indenter ISI

Calibration laboratory for ISI

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION AND TESTING LABORATORY

Rotational Penetrometer

objective surface measurement device


BDRP100


BDRP100
Start Here

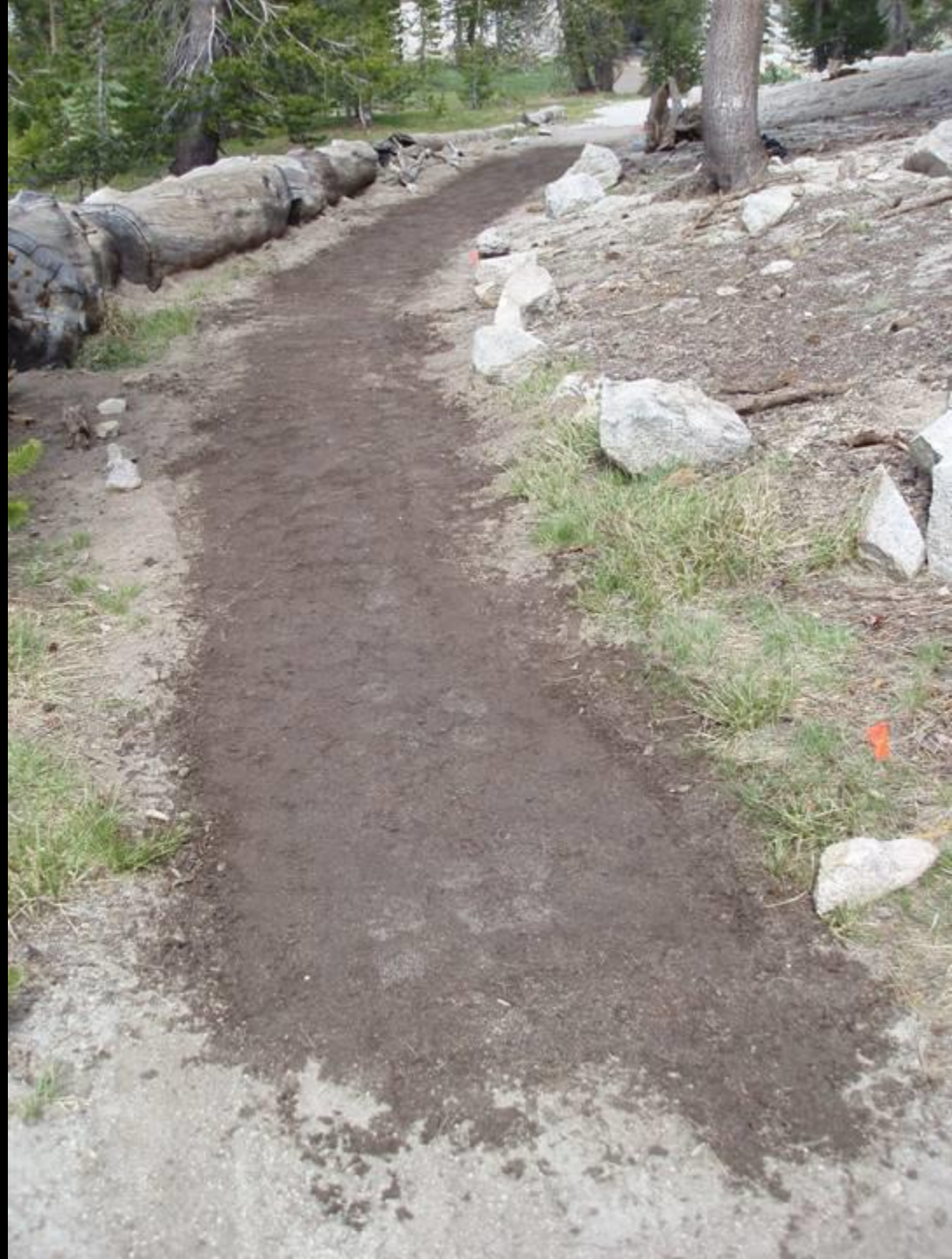
USA
in/mm
ON
ZERO
ABS
UNLOADED

Trail surface

Trail with firm but unstable sandy surface

Trail surface

Trail after installation of surface stabilizer



Rotational Penetrometer readings

Gravelpave 2

Before Application			***After*** Application		
Firmness		Stability	Firmness		Stability
0.18		0.77	0.17		0.37
0.17		0.87	0.17		0.38
0.17		0.77	0.18		0.42
0.18		0.88	0.17		0.35
0.18		0.79	0.18		0.40
0.18	Avg	0.82	0.17	Avg	0.38

Seat cushion testing

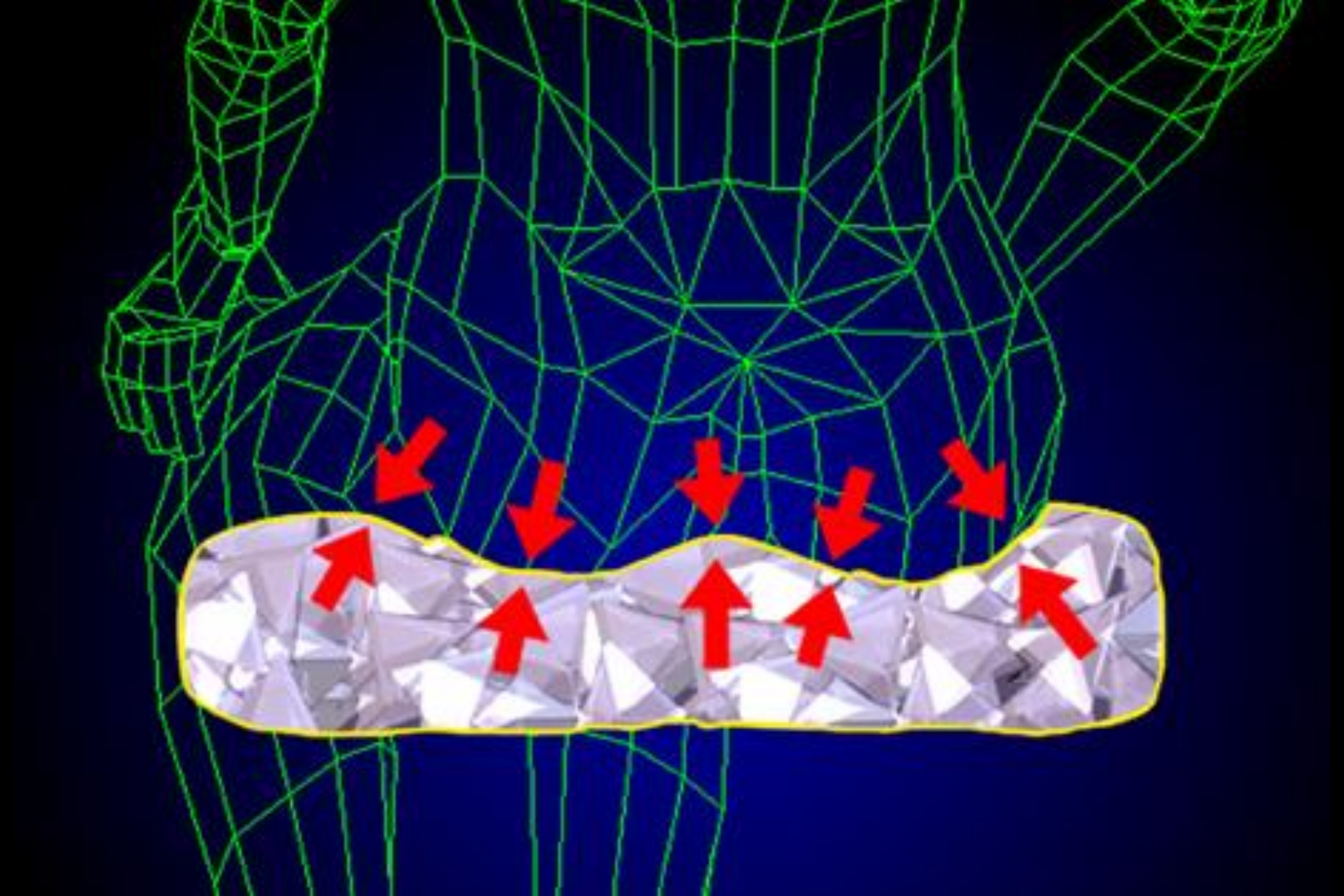
People die from pressure sores

Soft but firm and stable

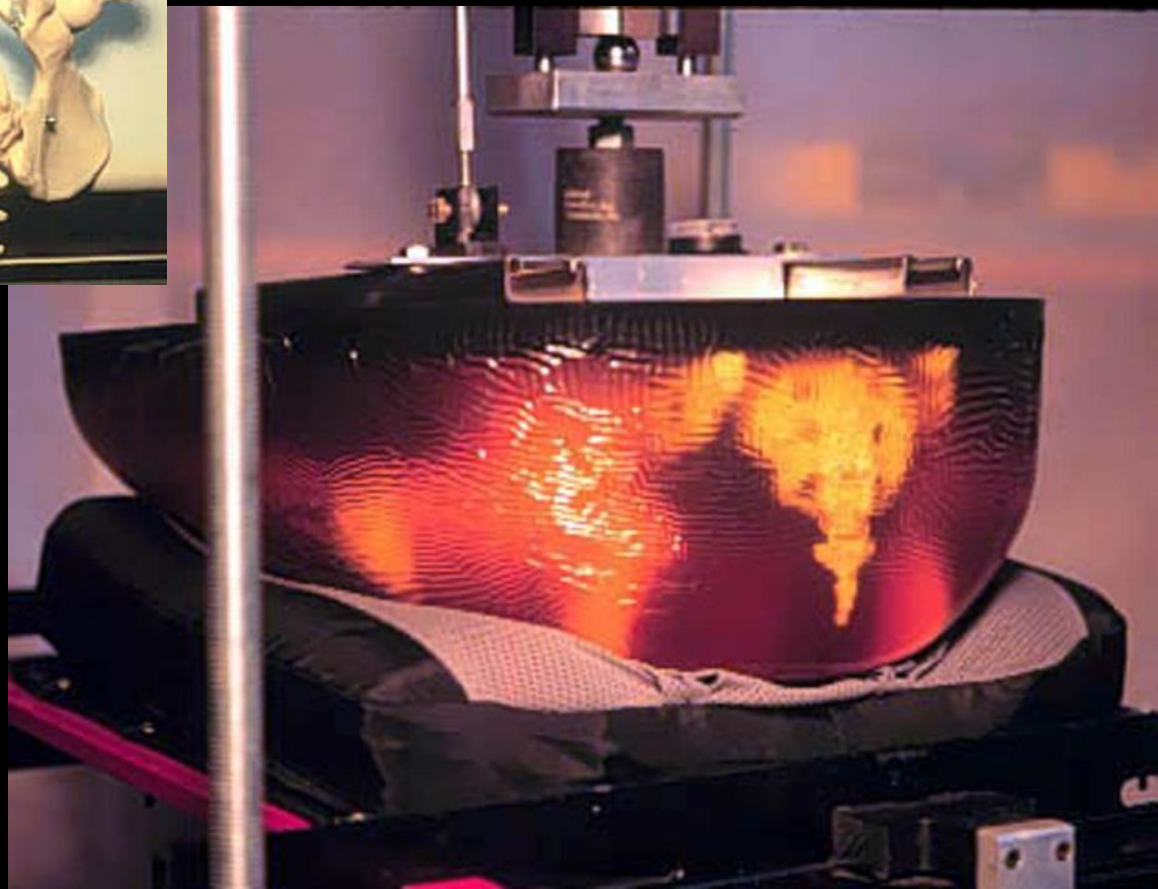
Making sure the product is safe

Making sure I don’t get a pressure sore

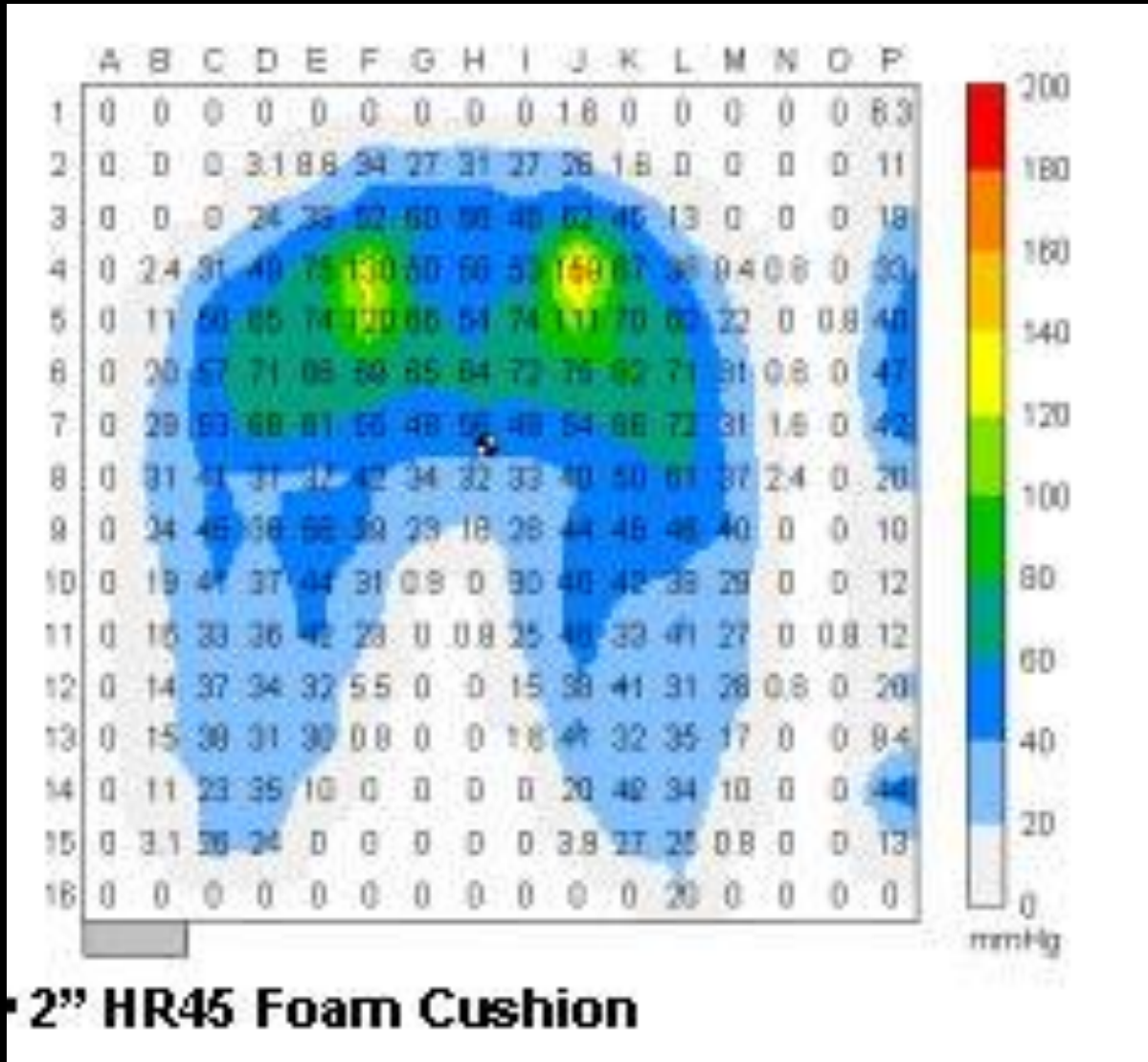
- How high are the sitting pressures?
- How long can I sit on it?



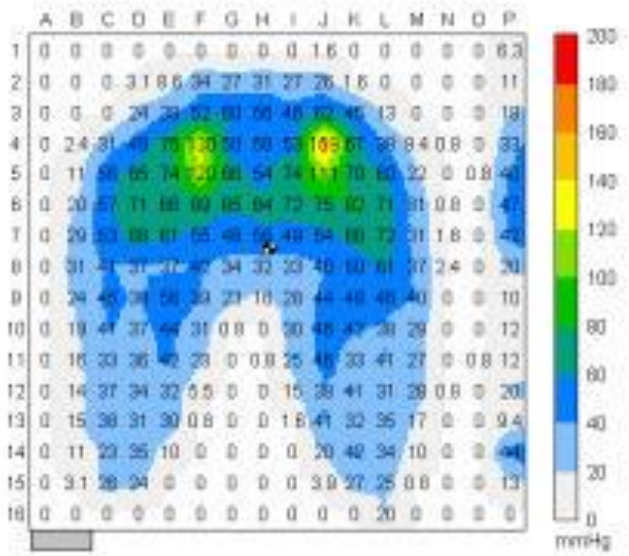
Seat cushion testing



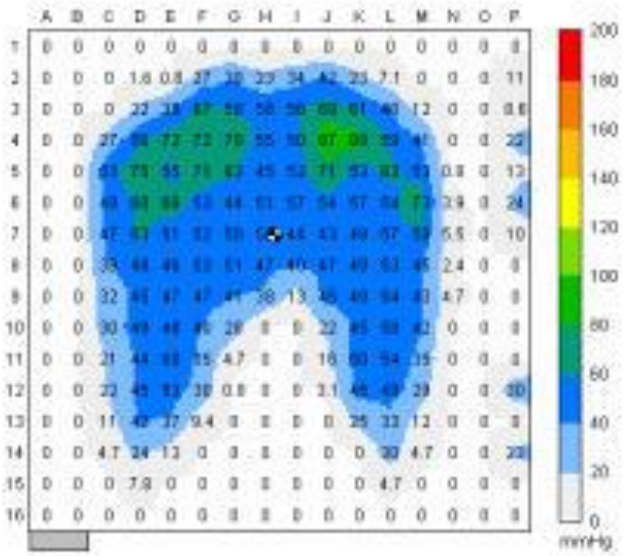
SKELI used on foam



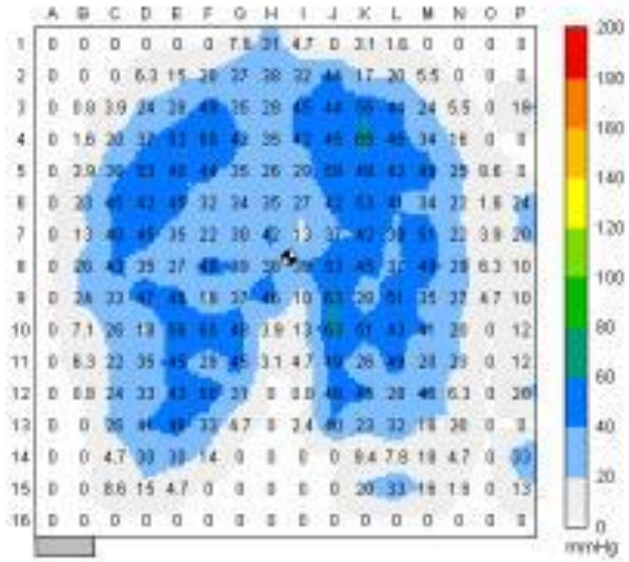
2" HR45 Foam Cushion



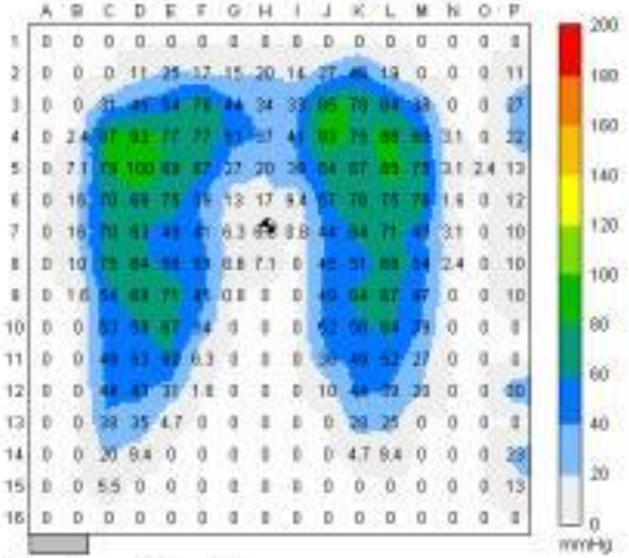
2" HR45 Foam



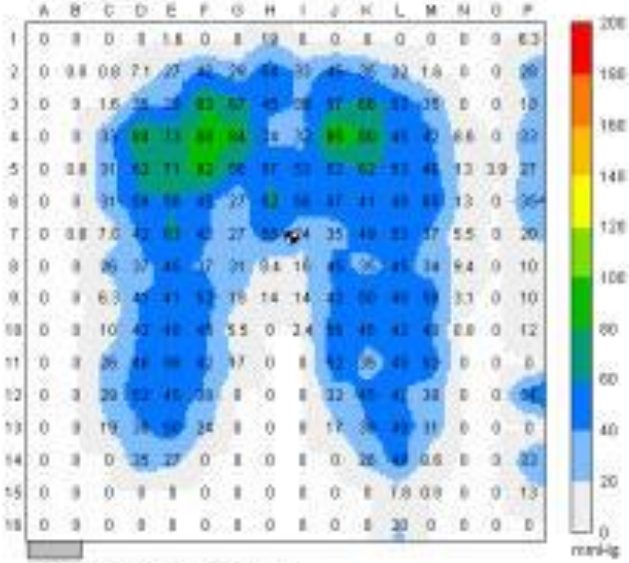
Jay 2 by Sunrise Medical



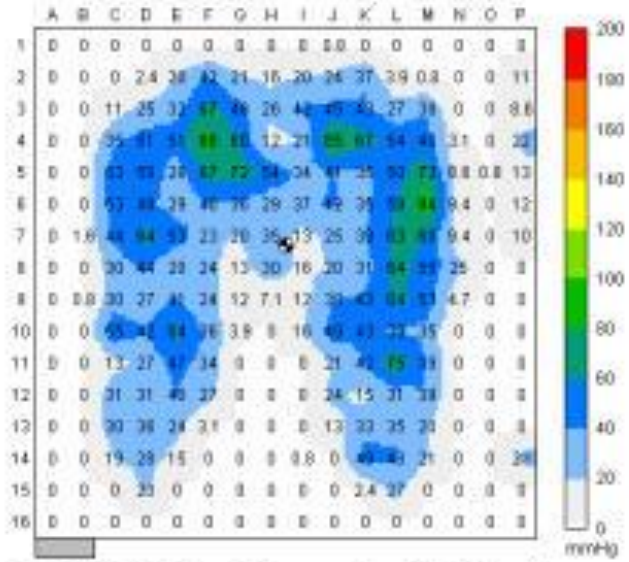
ROHO High Profile by ROHO Inc.



Contoured by Supracor



Model P by Vicair



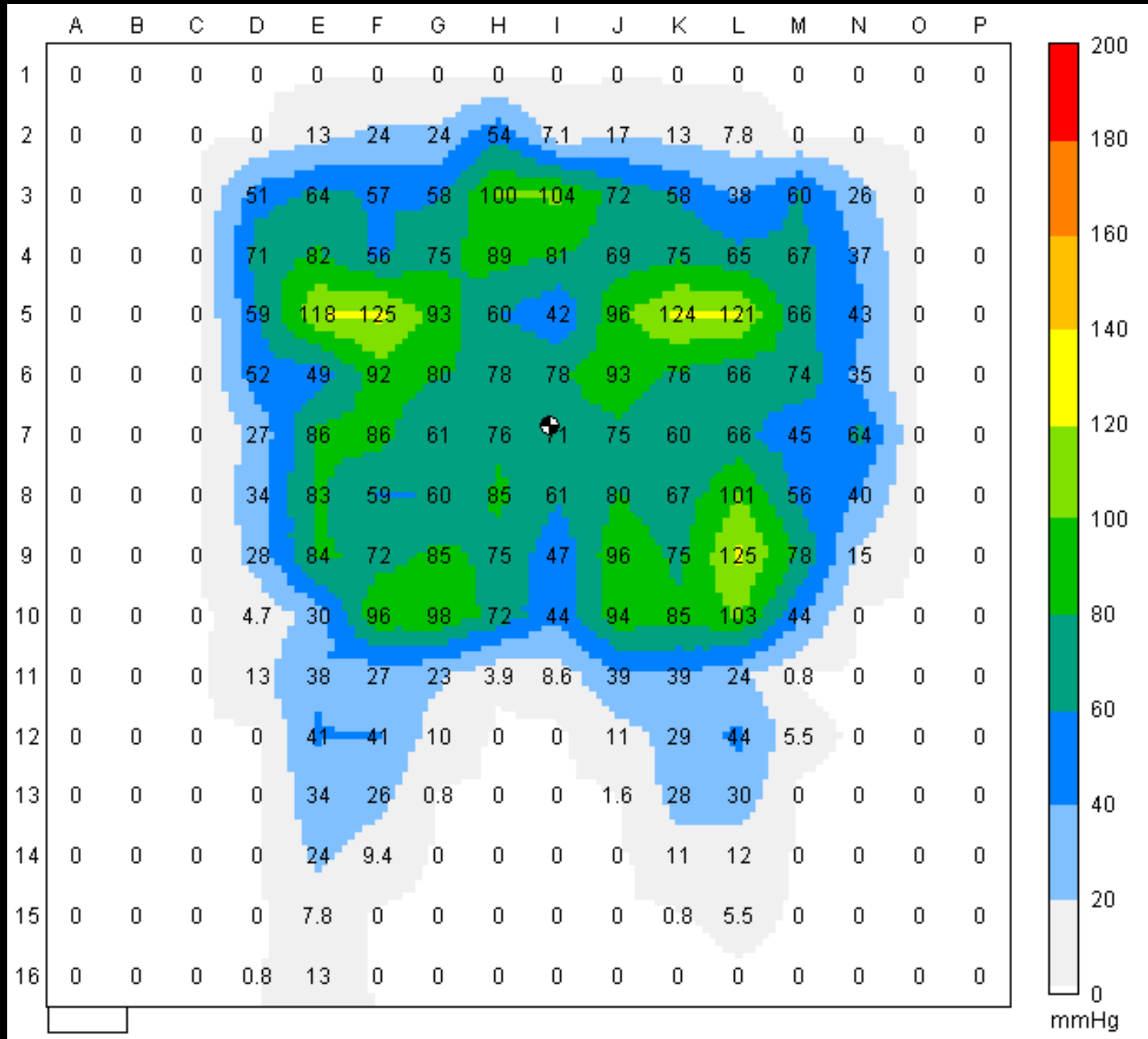
Model P Deep Immersion by Vicair

ASLI prototype

became an ISO shape

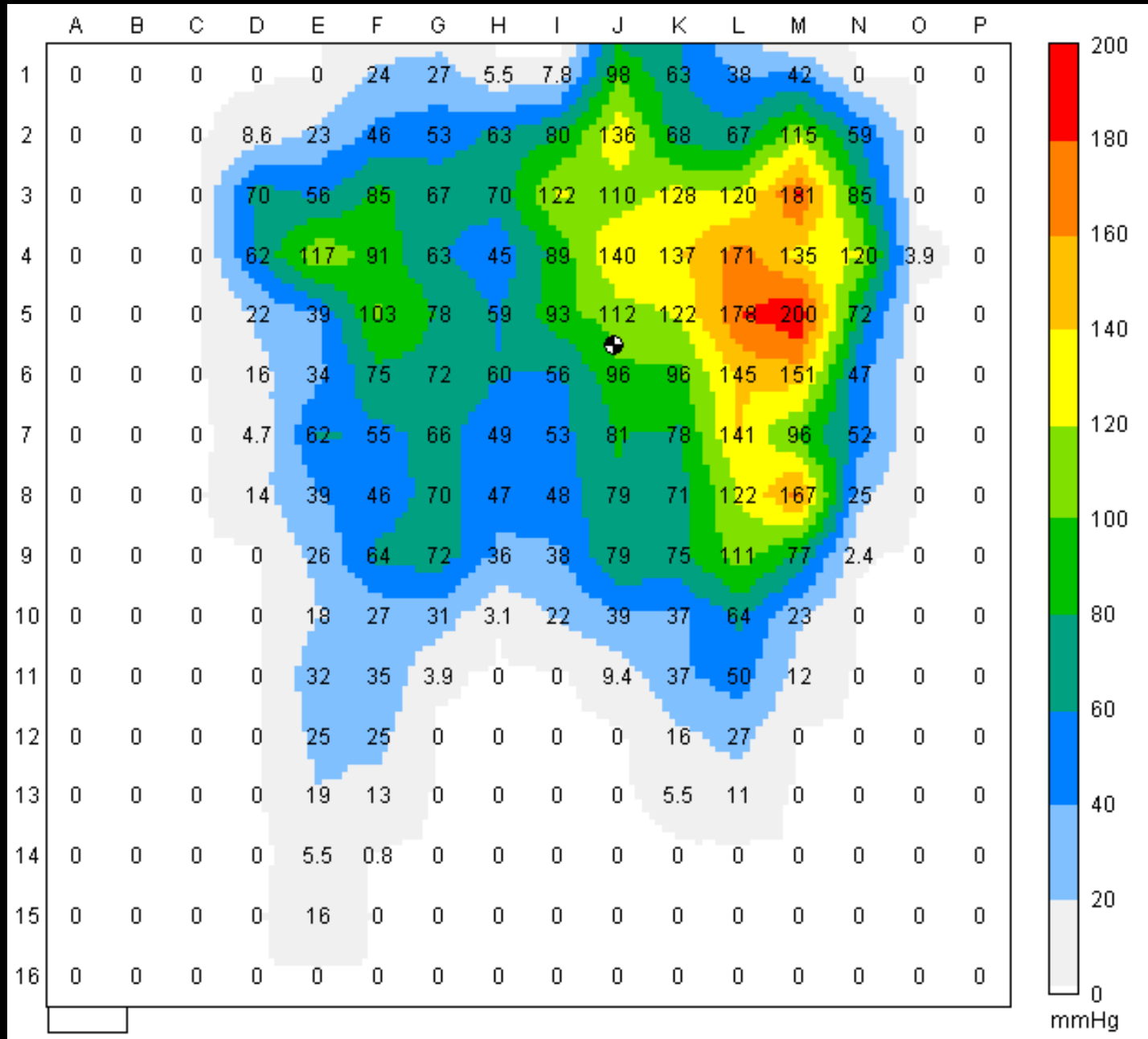
Pressure measurements

symmetric



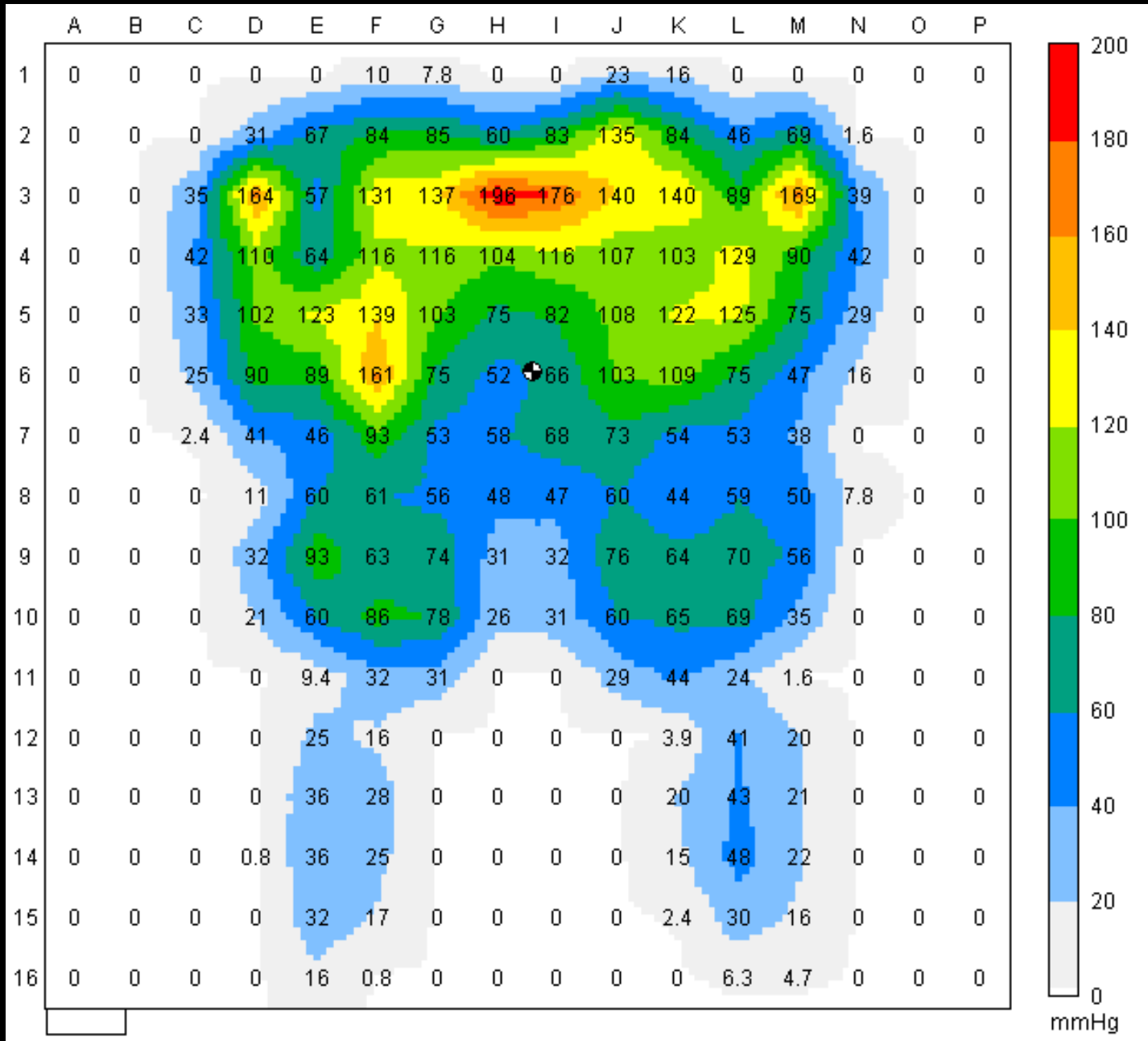
Pressure measurements

10° pelvic obliquity



Pressure measurements

15° posterior pelvic tilt



Personal technologies

Activity-specific technologies

Environmental technologies

Personal technologies

Things that you wear

My personal wheelchair

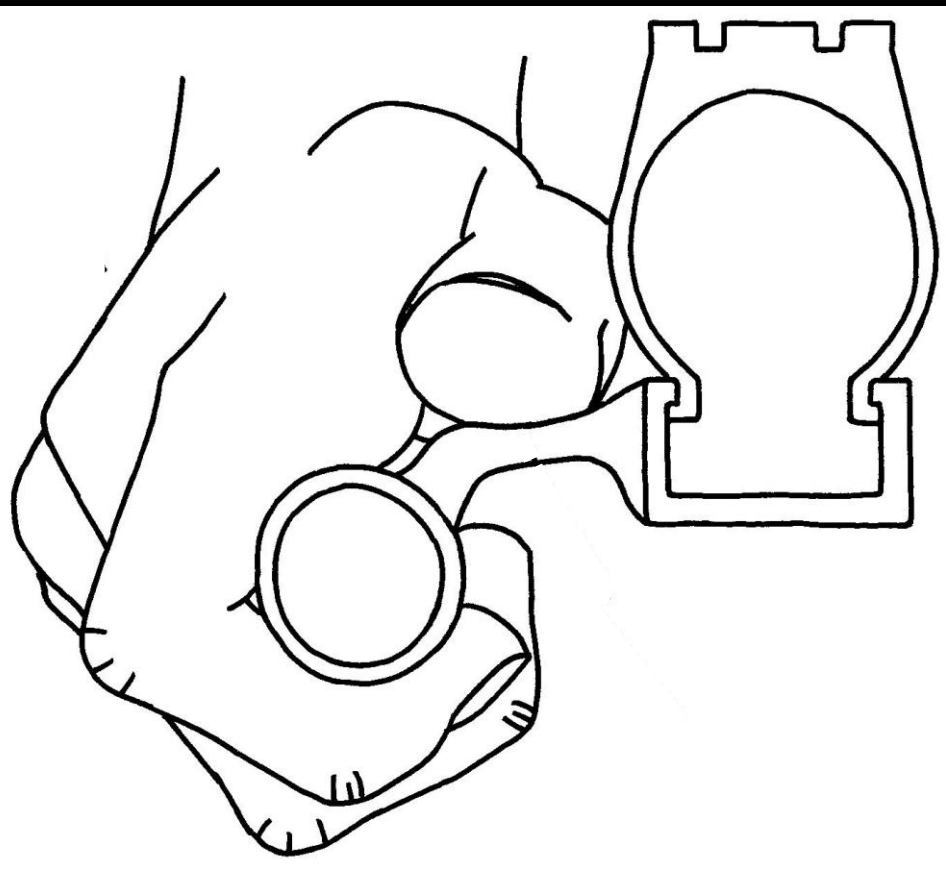
The need:

More comfort sitting

The need:

A better grip

Solution: an ergonomic pushrim

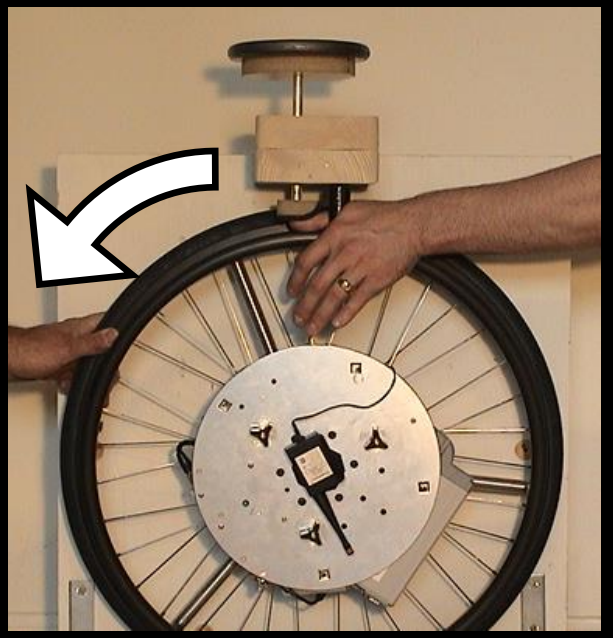


FlexRim

Combining the discrete compliant fasteners into one

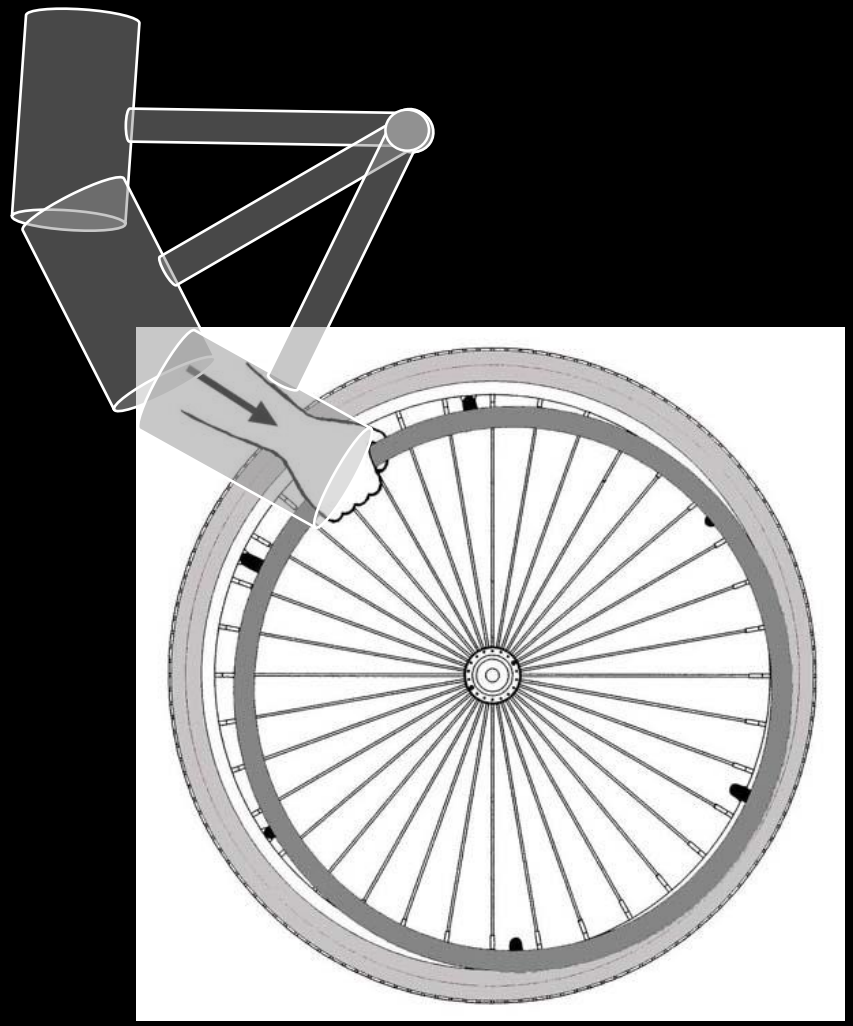
Frictional improvements

To reduce the grip force required to push



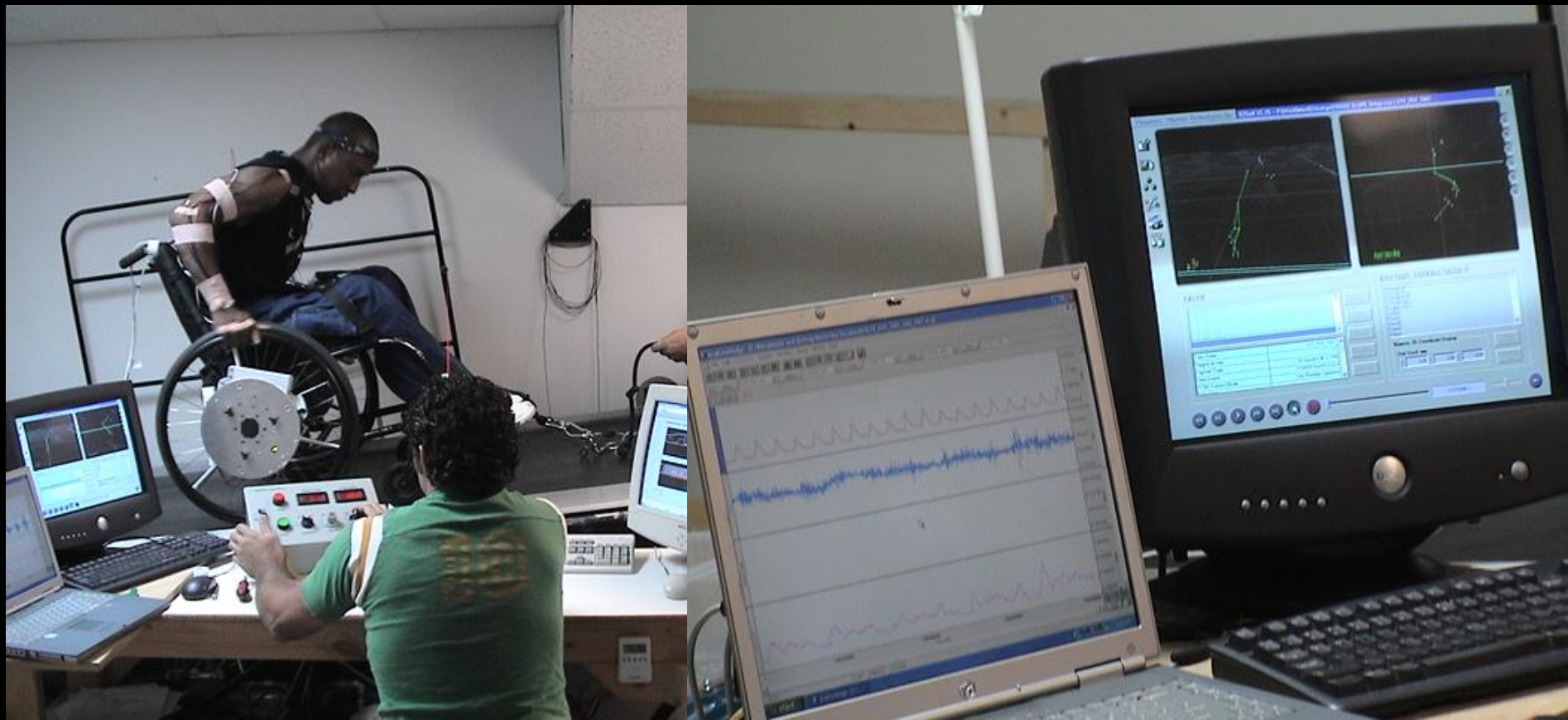
Impact absorbtion

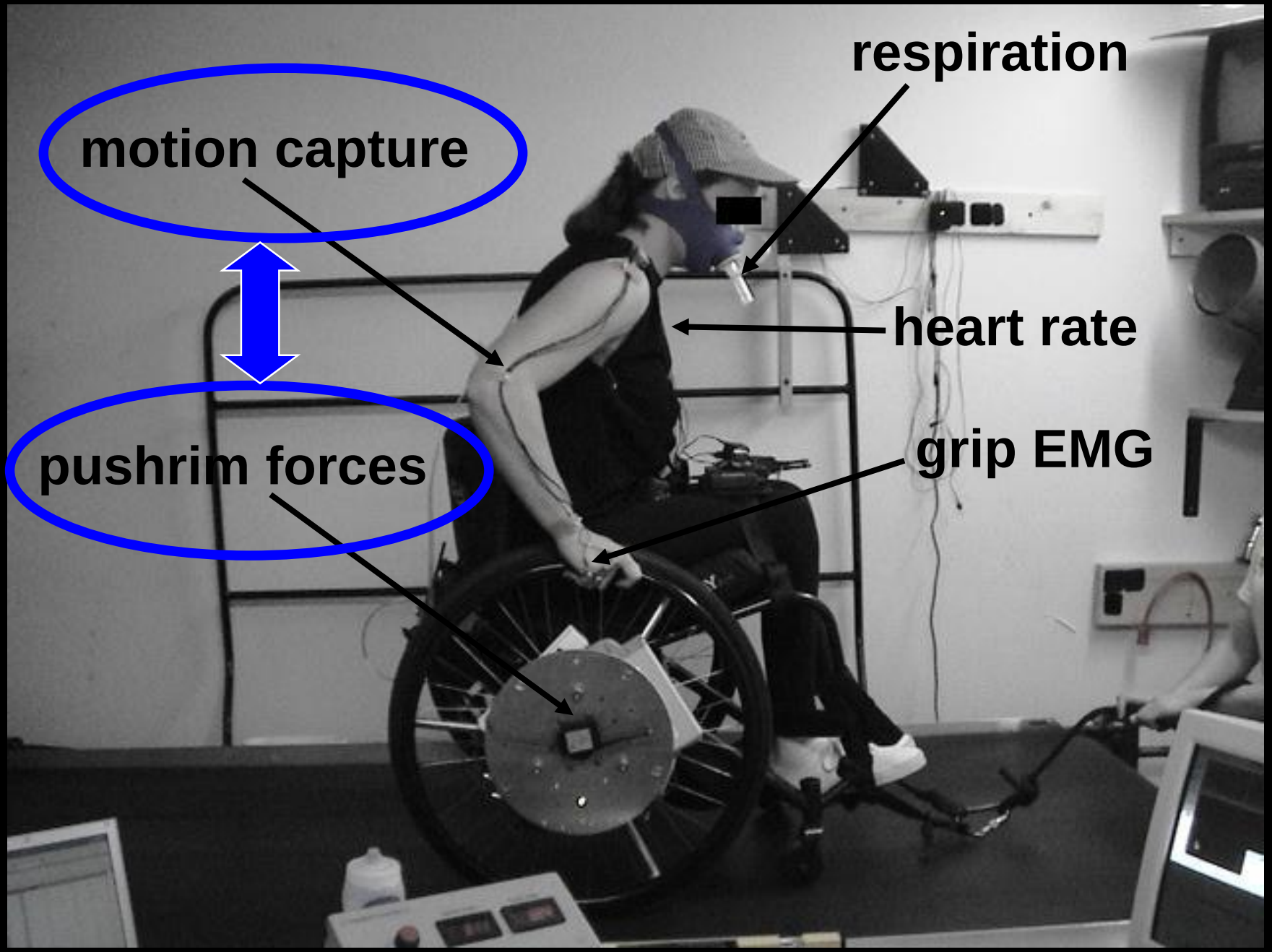
Like running shoes



Subjects are tested

over a wide variety of usage environments




respiration
motion capture
heart rate
grip EMG
pushrim forces

End product – the FlexRim

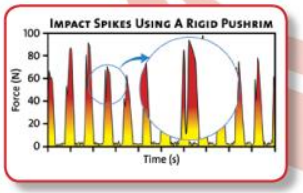
Design

The FlexRim consists of a durable high friction rubber surface that spans between the aluminum pushrim and the wheel. The shape of the rubber is ergonomically designed to conform to your hand when gripped, making it the most comfortable pushrim you will ever use.

Because the rubber is flexible, the pushrim can compress to allow your wheelchair to squeeze through narrow doorways.

Overuse Injuries

Shoulder and wrist problems are very common among wheelchair users. Impact loading is one of the contributing factors. Your hands and arms absorb impact spikes when you first hit the pushrim, illustrated in the graph below.



- Reducing impact is one strategy recommended to help protect you from developing overuse injuries.

Impact Testing

Impact loading of the FlexRim was studied for a wide range of impact intensities.

- The FlexRim was found to consistently ***reduce impact loading by 10%.***

Propulsion Testing

In lab testing, wheelchair users pushed with both a standard pushrim and the FlexRim on a research treadmill. Grip muscle activity, oxygen demand and power generated were all measured during propulsion and compared across pushrims.

Results of the testing were:

- Users required ***12% less grip force*** to push with the FlexRim.
- Overall ***grip exertion was reduced by 15%.***
- On average users required ***12% less oxygen*** to push with the FlexRim than with a standard pushrim.
- Users generated ***13% more power*** when using the FlexRim.

The ergonomic benefits of the FlexRim have been published in numerous scientific journals and in a PhD dissertation at Stanford University.

FLEXRIM BY SPINERGY

Advanced Ergonomics

Activity-specific technologies

And the desire to recreate

seat angle

10 degrees from horizontal

seat angle

19–20 degrees from horizontal

MONIQUE

Dynamic seating spring assist


celebrating
Poker

The desire:

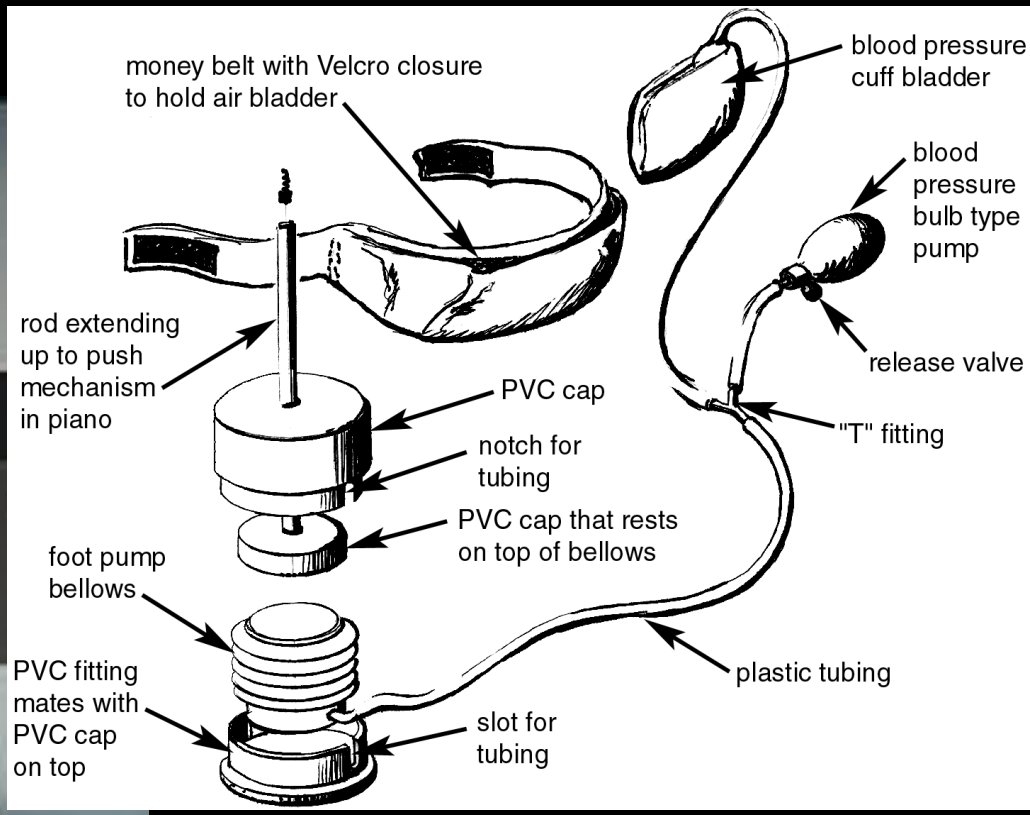
Get back into the backcountry


4 12'98


FOX SHOX
4 12 '98

The need:

Use the pedal again to play the piano



The desire:

Drive a manual shift vehicle

The desire:

Balance and ride a bike again

The desire:

Ride a tandem bike with a friend

The desire:

Paddle a canoe again without the required balance


NIMBUS
KANADIER

lateral balance test

water egress testing

Creating Ability

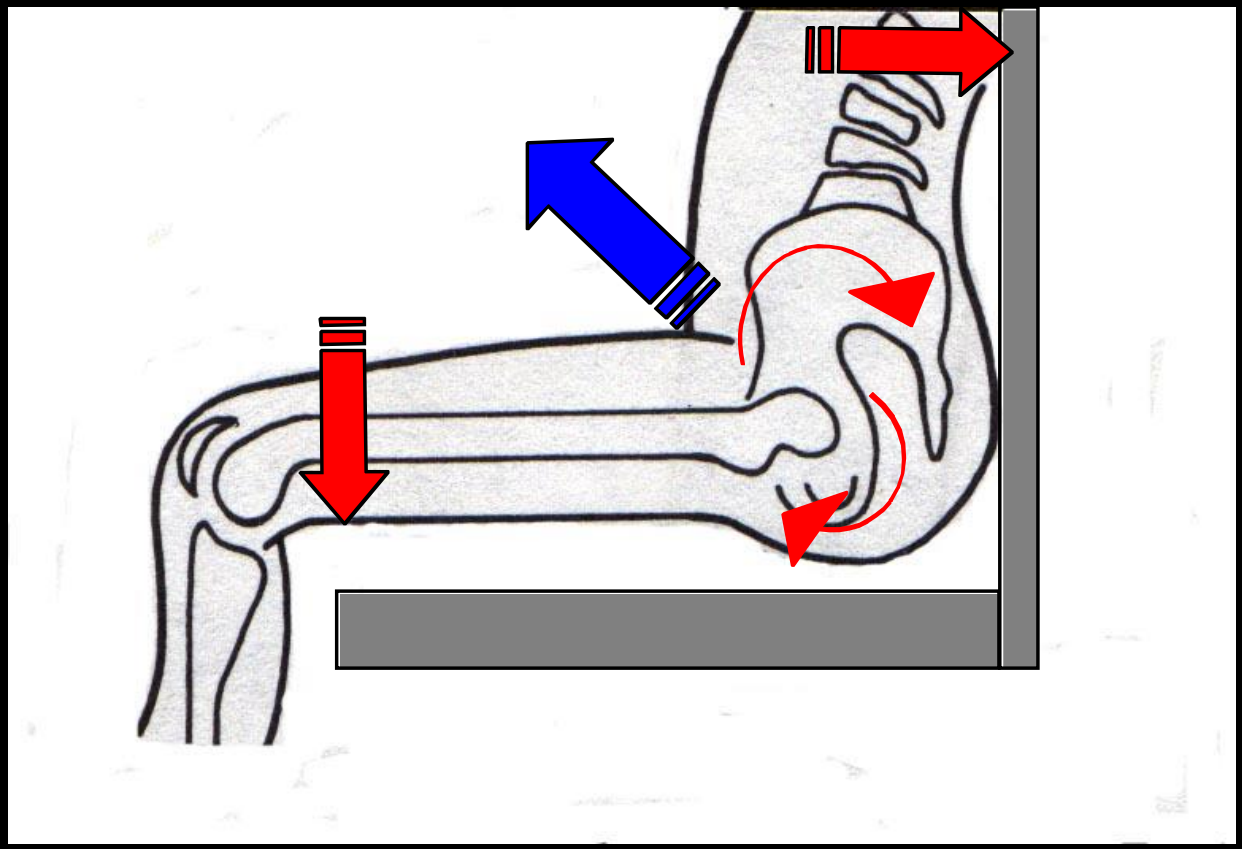
Canoe and Kayak Seating

The desire:

Surf again

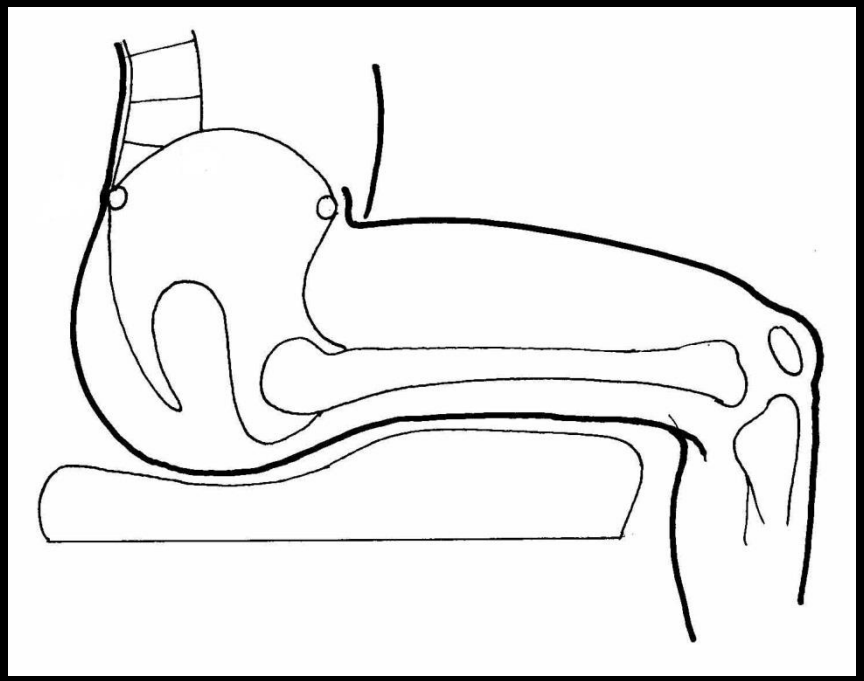
The problem:

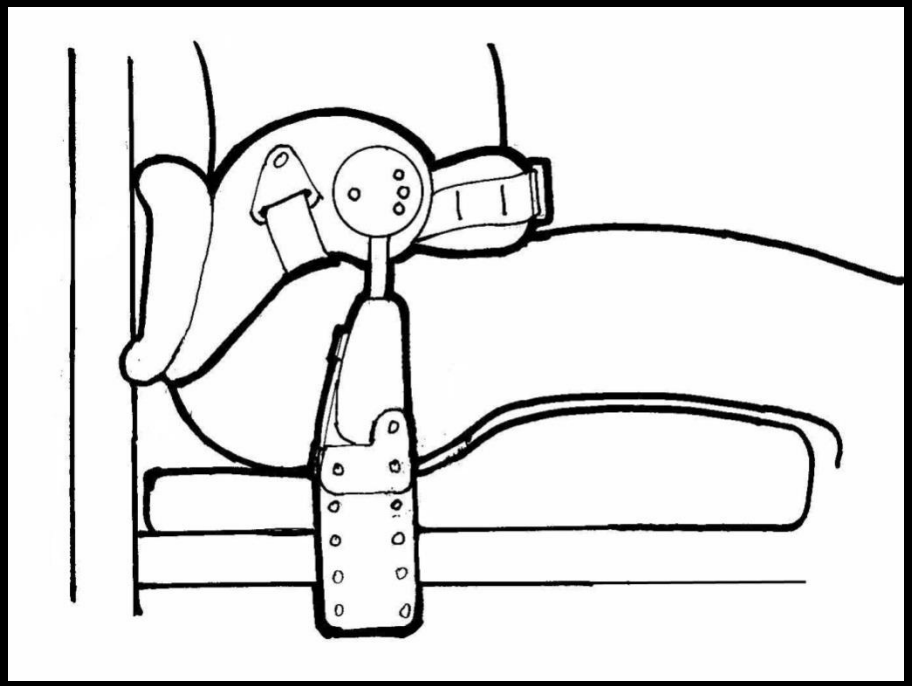
Unwanted pelvic movement due to spasticity



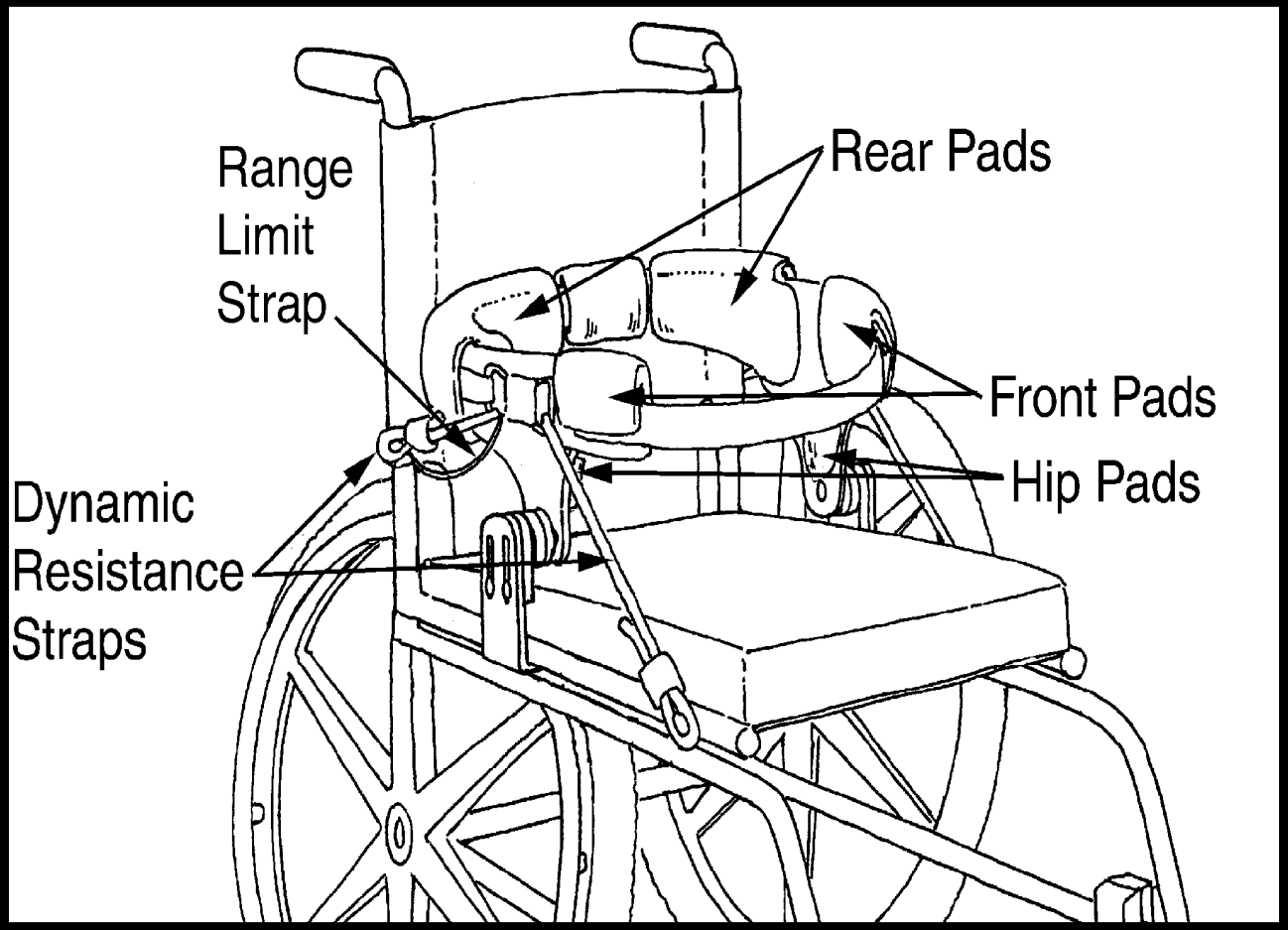
Concepts developed

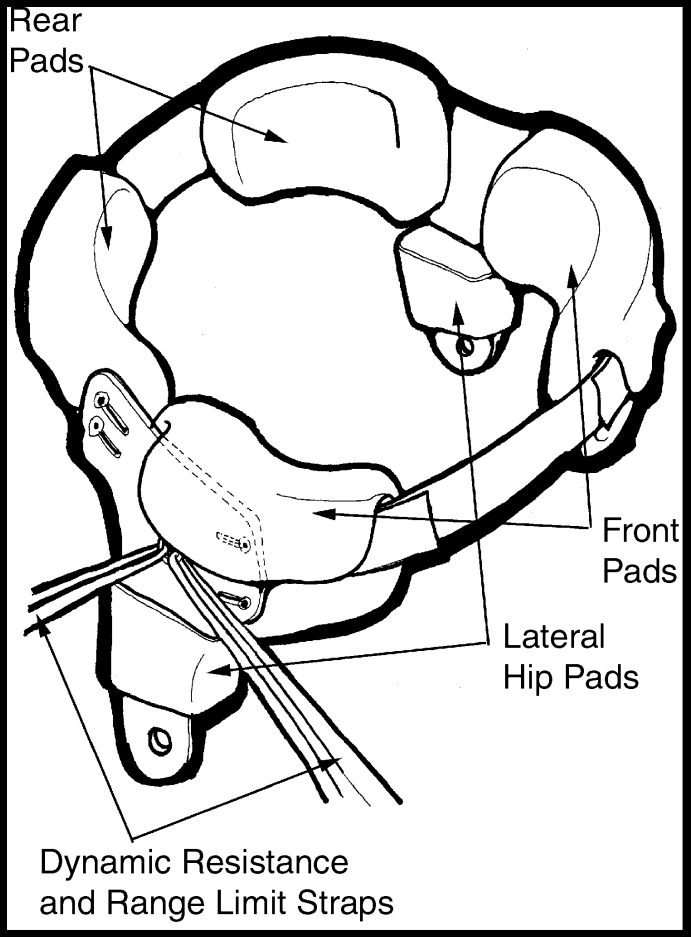
to allow the movement, but return to the desired position





Early prototypes





Fatigue testing of concept

The finished product

Environmental technologies

Things that do not move

ADA recreation trail

grade

> 8.33%	up to 30% of length
5%	for any distance
8.33%	for 200 feet
10%	for 30 feet
12.5%	for 10 feet
14%	for 5 feet in drains if cross slope < 5%

ADA recreation trail

cross slope

5%

10% in drains if width > 42 inches

rest areas

60 inches length, trail width, 5% slope

edge protection

3 inches minimum height when provided

Universal Trail Assessment Process (UTAP)

Key UTAP information

length

grade

width

surface

cross slope

features & facilities

UTAP assessment team


SMARTTOOL

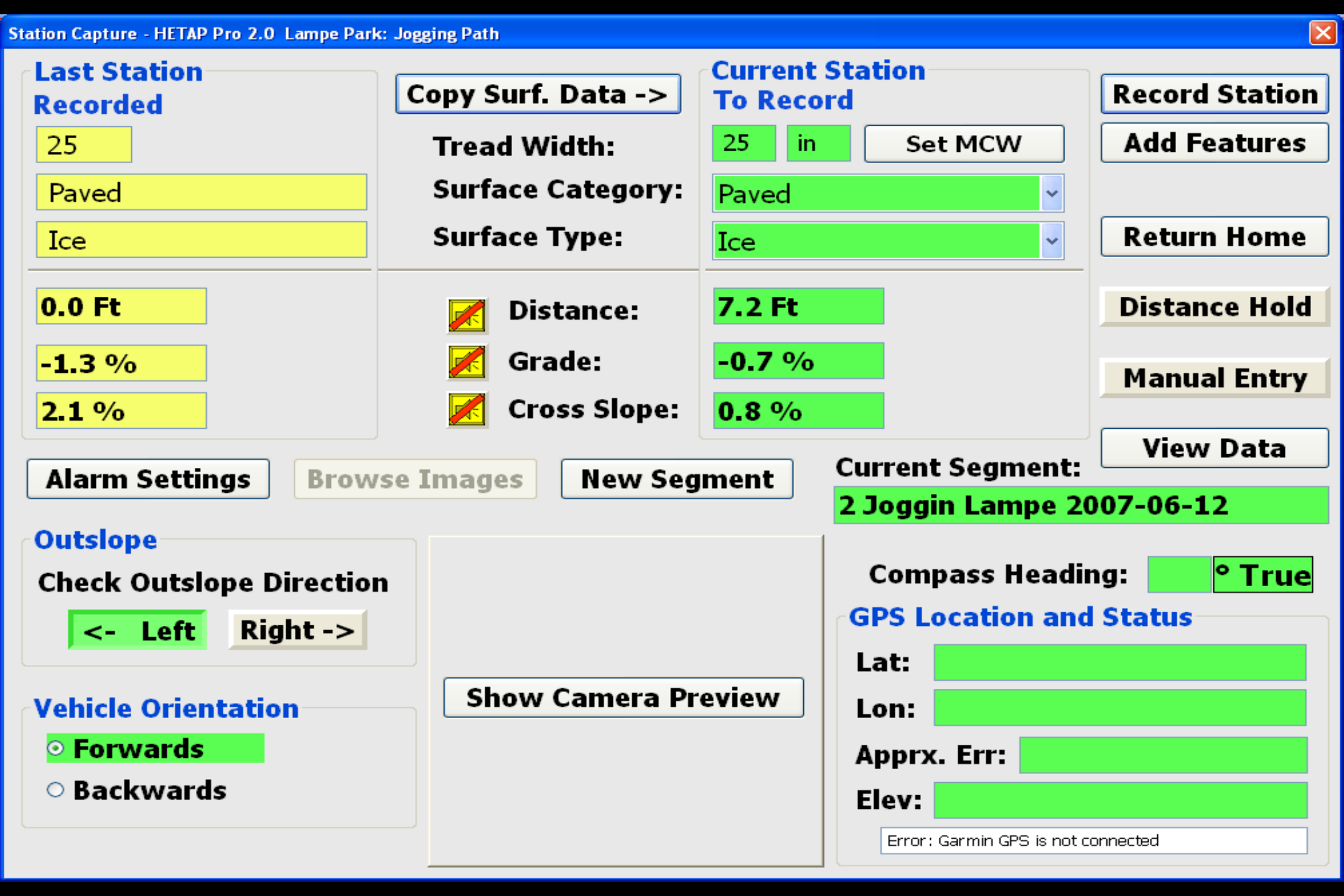
UTAP implementation status

Over 1900 people
trained to lead UTAP assessments

Over 155 trainers
to teach UTAP workshops

High-Efficiency Trail Assessment Process (HETAP)

HETAP wheel


Station Capture - HETAP Pro 2.0 Lampe Park: Jogging Path
Last Station Recorded
25
Paved
Ice
0.0 Ft
-1.3 %
2.1 %
Copy Surf. Data ->
Tread Width:
Surface Category:
Surface Type:
Current Station To Record
25
in
Set MCW
Paved
Ice
Distance:
Grade:
Cross Slope:
7.2 Ft
-0.7 %
0.8 %
Record Station
Add Features
Return Home
Distance Hold
Manual Entry
View Data
Alarm Settings
Browse Images
New Segment
Current Segment:
2 Joggin Lampe 2007-06-12
Outslope
Check Outslope Direction
<- Left
Right ->
Vehicle Orientation
Forwards
Backwards
Show Camera Preview
Compass Heading:
° True
GPS Location and Status
Lat:
Lon:
Apprx. Err:
Elev:
Error: Garmin GPS is not connected


Red
Road
To Peavine Falls Road
Length 5.5 mi (8.9 km)
Elev Gain 787 ft (240 m)
Elev Loss 420 ft (128 m)
Hikers
Bikes
Dogs on Leash
No Motorized Vehicles
No Equestrians

Trail Access Information

TAI for Users

Grade

Cross Slope

Tread Width

Surface

Obstructions

ACCESS INFORMATION

Tahoe Rim Trail

Tahoe Meadows to **Spooner Summit**

Length	**21.8 mi** (35.0 km)
Elevation Gain	**2894 ft** (882 m)
Elevation Loss	**5528 ft** (1685 m)

TRAIL USE

Hikers

Bikes

No Bikes: Spooner Summit to North Canyon Hobart Rd

Dogs

Equestrians

No Motor Vehicles

GRADE

Typical Grade	**7.3%**
27% of trail is	**10%** to **20%**
1829 ft (557 m) is	**20%** to **29%**
Standard Ramp Grade	8.3%

CROSS SLOPE

Typical Cross Slope	**3.2%**
18% of trail is	**5%** to **10%**
2433 ft (741 m) is	**10%** to **20%**

TREAD WIDTH

Typical Width	**28 in** (71 cm)
Minimum Width	**18 in** (45 cm)

TAHOE RIM TRAIL

TREAD WIDTH

Typical Width	**28 in** (71 cm)
Minimum Width	**18 in** (45 cm)

SURFACE

Surface Type	**Soil**
Typical Firmness	**0.17 in** (F)

Minimum Firmness	**0.40 in** (MF)
1% of trail is	**Moderately Firm**
Typical Stability	**0.51 in** (MS)

Minimum Stability	**0.73 in** (MS)
25% of trail is	**Moderately Stable**

OBSTRUCTIONS

Multiple Rocks	**18 in** (46 cm)

VIEW MAP

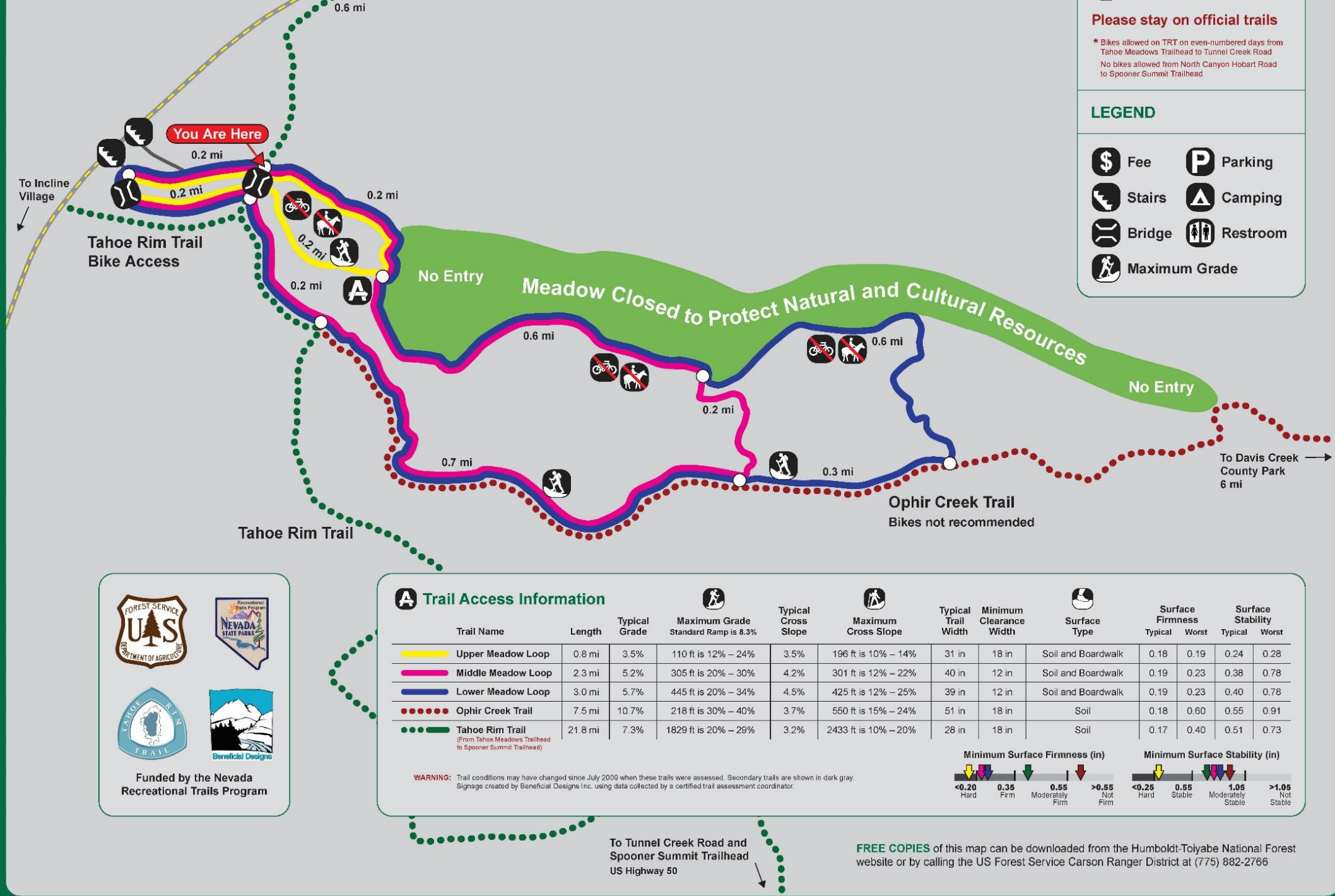
Scan QR code to view **Tahoe Meadows to Spooner Summit Map**

www.tahoerimtrail.org

WARNING: Trail conditions may have changed since December 2008 when this trail last was assessed. Temporary obstructions were not recorded. Firmness values ≤ 0.30 inch and Stability values ≤ 1.00 inch correlate to surfaces tested per ASTM F1951.

Signage created by **Beneficial Designs Inc.** using data collected by a certified trail assessment coordinator. Funded by the Nevada Recreational Trails Program.

ACCESS INFORMATION



Trail Access Information

Trail Name	Length	Typical Grade	Maximum Grade (Standard Ramp is 8.3%)	Typical Cross Slope	Maximum Cross Slope	Typical Trail Width	Minimum Clearance Width	Surface Type	Surface Firmness Typical	Surface Firmness Worst	Surface Stability Typical	Surface Stability Worst
Upper Meadow Loop	0.8 mi	3.5%	110 ft is 12% – 24%	3.5%	196 ft is 10% – 14%	31 in	18 in	Soil and Boardwalk	0.18	0.19	0.24	0.28
Middle Meadow Loop	2.3 mi	5.2%	305 ft is 20% – 30%	4.2%	301 ft is 12% – 22%	40 in	12 in	Soil and Boardwalk	0.19	0.23	0.38	0.78
Lower Meadow Loop	3.0 mi	5.7%	445 ft is 20% – 34%	4.5%	425 ft is 12% – 25%	39 in	12 in	Soil and Boardwalk	0.19	0.23	0.40	0.78
Ophir Creek Trail	7.5 mi	10.7%	218 ft is 30% – 40%	3.7%	550 ft is 15% – 24%	51 in	18 in	Soil	0.18	0.60	0.55	0.91
Tahoe Rim Trail (From Tahoe Meadows Trailhead to Spooner Summit Trailhead)	21.8 mi	7.3%	1829 ft is 20% – 29%	3.2%	2433 ft is 10% – 20%	28 in	18 in	Soil	0.17	0.40	0.51	0.73

WARNING: Trail conditions may have changed since July 2009 when these trails were assessed. Secondary trails are shown in dark gray. Signage created by Beneficial Designs Inc. using data collected by a certified trail assessment coordinator.

Minimum Surface Firmness (in)

<0.20	0.35	0.55	>0.55
Hard	Firm	Moderately Firm	Not Firm

Minimum Surface Stability (in)

<0.25	0.55	1.05	>1.05
Hard	Stable	Moderately Stable	Not Stable

Funded by the Nevada Recreational Trails Program

To Tunnel Creek Road and Spooner Summit Trailhead
US Highway 50

FREE COPIES of this map can be downloaded from the Humboldt-Toiyabe National Forest website or by calling the US Forest Service Carson Ranger District at (775) 882-2766

Trail Access Information

Trail Name	Length	Typical Grade	Maximum Grade Standard Ramp is 8.3%	Typical Cross Slope	Maximum Cross Slope	Typical Trail Width	Minimum Clearance Width	Surface Type	Surface Firmness Typical	Surface Firmness Wo
Upper Meadow Loop	0.8 mi	3.5%	110 ft is 12% – 24%	3.5%	196 ft is 10% – 14%	31 in	18 in	Soil and Boardwalk	0.18	0.
Middle Meadow Loop	2.3 mi	5.2%	305 ft is 20% – 30%	4.2%	301 ft is 12% – 22%	40 in	12 in	Soil and Boardwalk	0.19	0.
Lower Meadow Loop	3.0 mi	5.7%	445 ft is 20% – 34%	4.5%	425 ft is 12% – 25%	39 in	12 in	Soil and Boardwalk	0.19	0.
Ophir Creek Trail	7.5 mi	10.7%	218 ft is 30% – 40%	3.7%	550 ft is 15% – 24%	51 in	18 in	Soil	0.18	0.
Tahoe Rim Trail (From Tahoe Meadows Trailhead to Spooner Summit Trailhead)	21.8 mi	7.3%	1829 ft is 20% – 29%	3.2%	2433 ft is 10% – 20%	28 in	18 in	Soil	0.17	0.

WARNING: Trail conditions may have changed since July 2009 when these trails were assessed. Secondary trails are shown in dark gray. Signage created by Beneficial Designs Inc. using data collected by a certified trail assessment coordinator.

Minimum Surface Firmness (in)

<0.20 Hard | 0.35 Firm | 0.55 Moderately Firm | >0.55 Not Firm

Minimum S

<0.25 Hard | 0.55 Stable

To Tunnel Creek Road and Spooner Summit Trailhead
US Highway 50

FREE COPIES of this map can be downloaded from the Humboldt-To website or by calling the US Forest Service Carson Ranger District at


Developed
Outdoor
Recreation
Assessment
Process

Outdoor constructed features

- bench
- camp shelter
- cooking surface/grill
- fire ring, wood stove/fireplace
- outdoor rinsing shower
- parking area
- picnic table
- pit toilet
- tent pad/platform
- toilet building
- trash/recycling receptacle
- utility/sewage connection
- viewing area at overlooks
- viewing scope
- water spout

Table

ABA/FSORAG

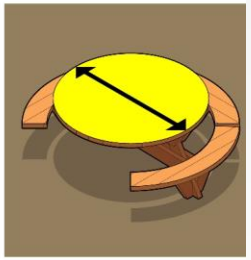
What type of assessment?

ABA FSO

REQUIRED SPACES

Is the table Circular?

Table Diameter



Measure the height from the
to the table top

Table

Table

Measure the height from the gro
to the table top

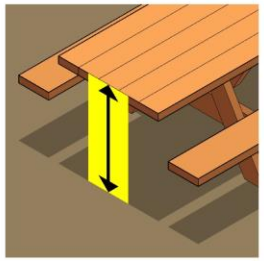


Table surface height (min 28 in
- max 34 in)

Compliant

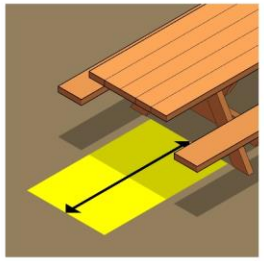
CLEAR SPACE

Does one full unobstructed side
clear ground space around the t
adjoin or overlap an ORAR trail

Table

WHEELCHAIR CLEAR SPACE

Measure the Wheelchair clear s
length. The length may extend a
maximum of 25 inches beneath
the table.



WC Clear space length (min 48 i

Not compliant

Measure the Wheelchair clear

Table

Table

Suggested maintenance

Notes

Optional photos

MANUFACTURER INFO

Manufacturer and Model

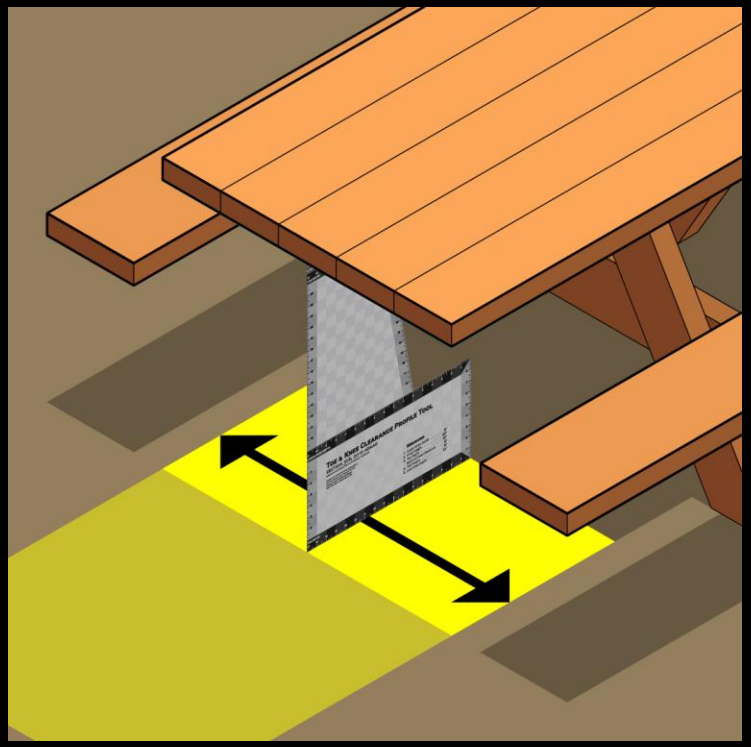
If available, enter the model and manufacturer of the feature.

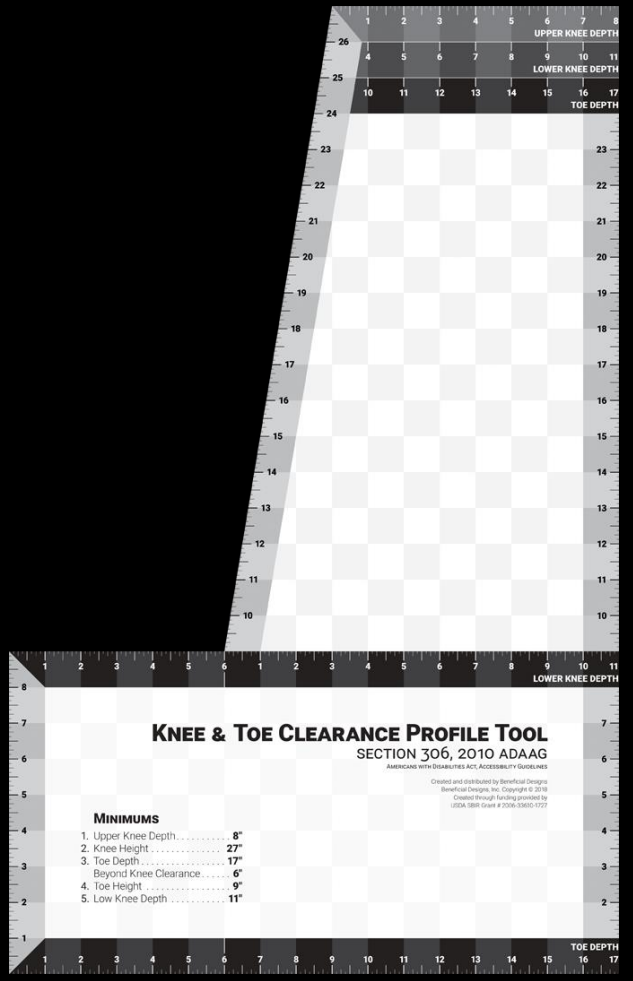
Manufacturer

Model

Knee & Toe Clearance Profile Tool

unobstructed knee & toe space





Adjustable height cooking grill

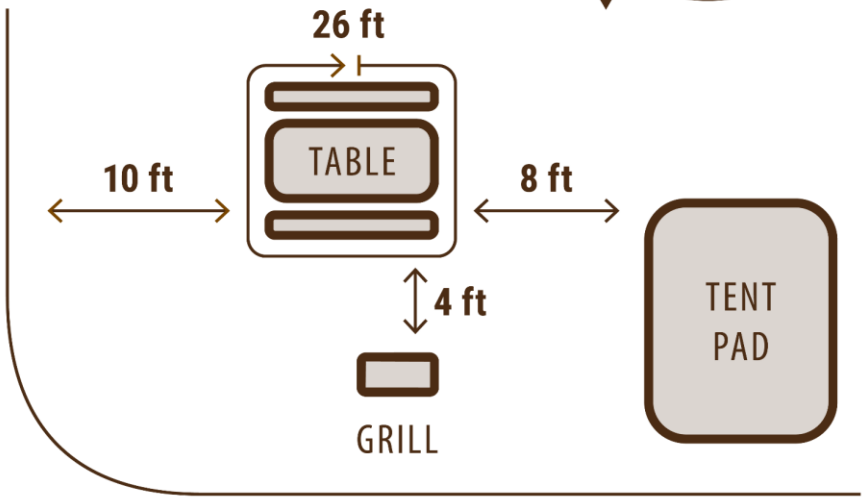
Water pump

Actuation force

Campsite

Access Information

RESET
BEFORE YOU GO



Please return elements so that this campsite remains **accessible**

If you do not require access and mobility features, please do not use this site between **11AM and 6PM**

Develop standards for

Trail and sidewalk design

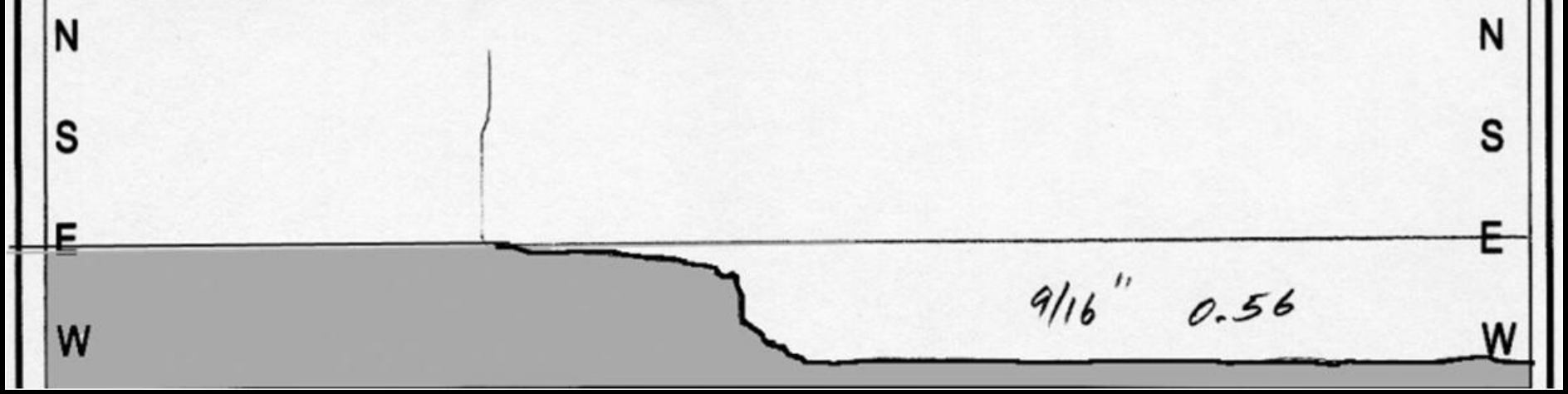
Architectural Barriers Act (ABA)
Outdoor Recreation Access Guidelines

Public Rights of Way Access Guidelines (PROWAG)

HEIGHT TRANSITIONS Project #: 216-2 Date: 4/27/09

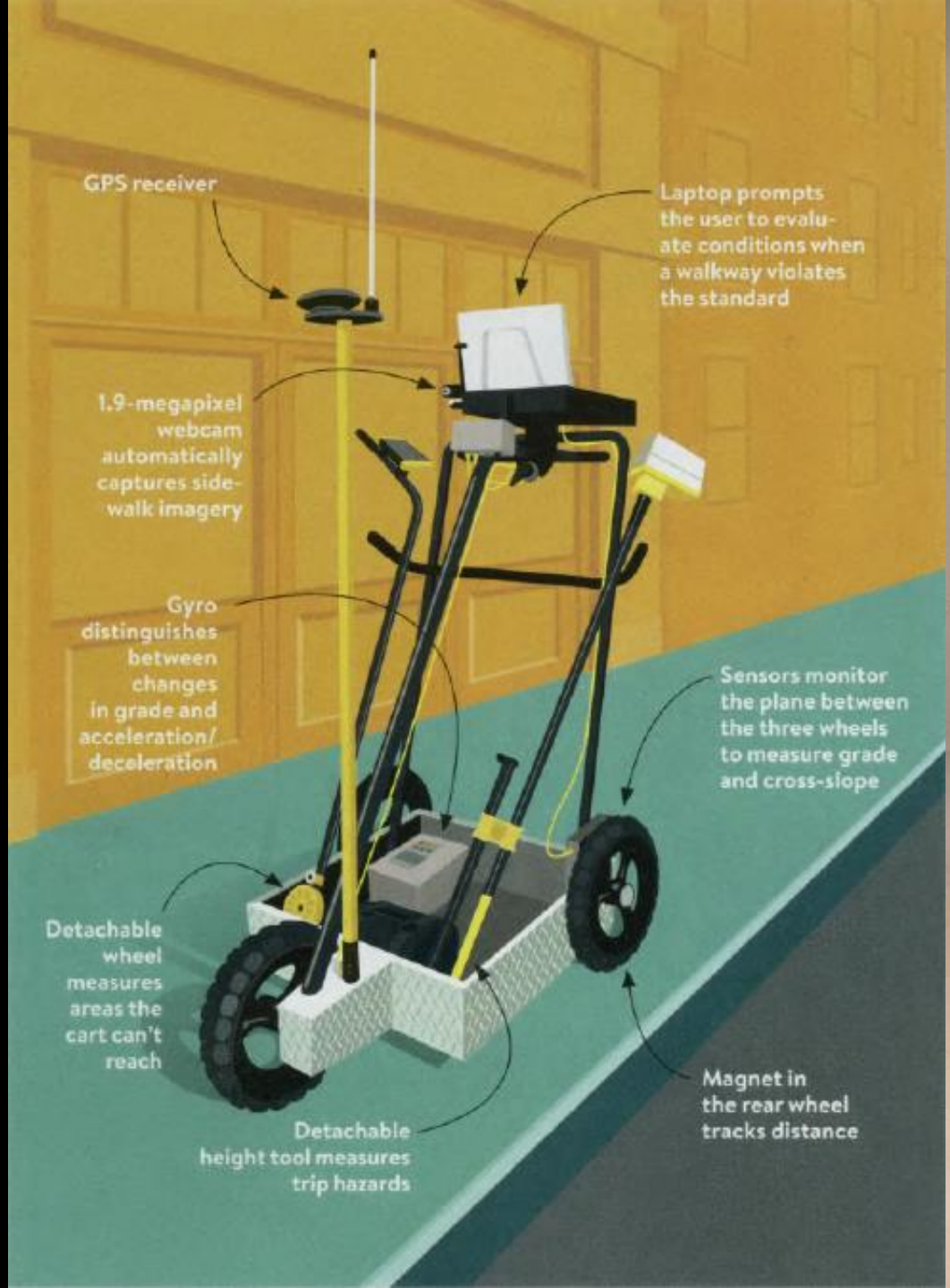
Street Name: OLIVA WEST Segment Name: * Distance: 233'9"

*N COUNTY ROAD TO MACKLAND



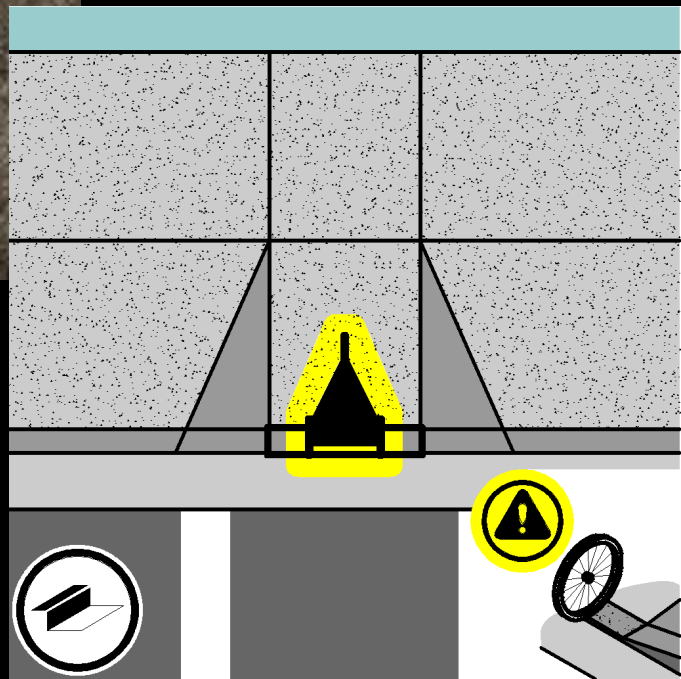
Sidewalk assessment

Public Rights-of-Way Assessment Process (PROWAP)

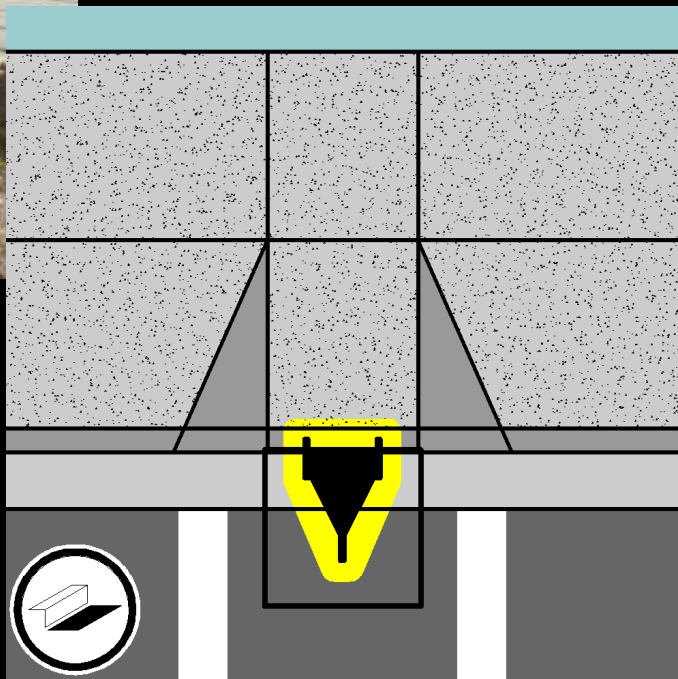

GPS receiver
Laptop prompts the user to evaluate conditions when a walkway violates the standard
1.9-megapixel webcam automatically captures sidewalk imagery
Gyro distinguishes between changes in grade and acceleration/deceleration
Sensors monitor the plane between the three wheels to measure grade and cross-slope
Detachable wheel measures areas the cart can't reach
Magnet in the rear wheel tracks distance
Detachable height tool measures trip hazards

Digital Measuring Wheel (DMS)

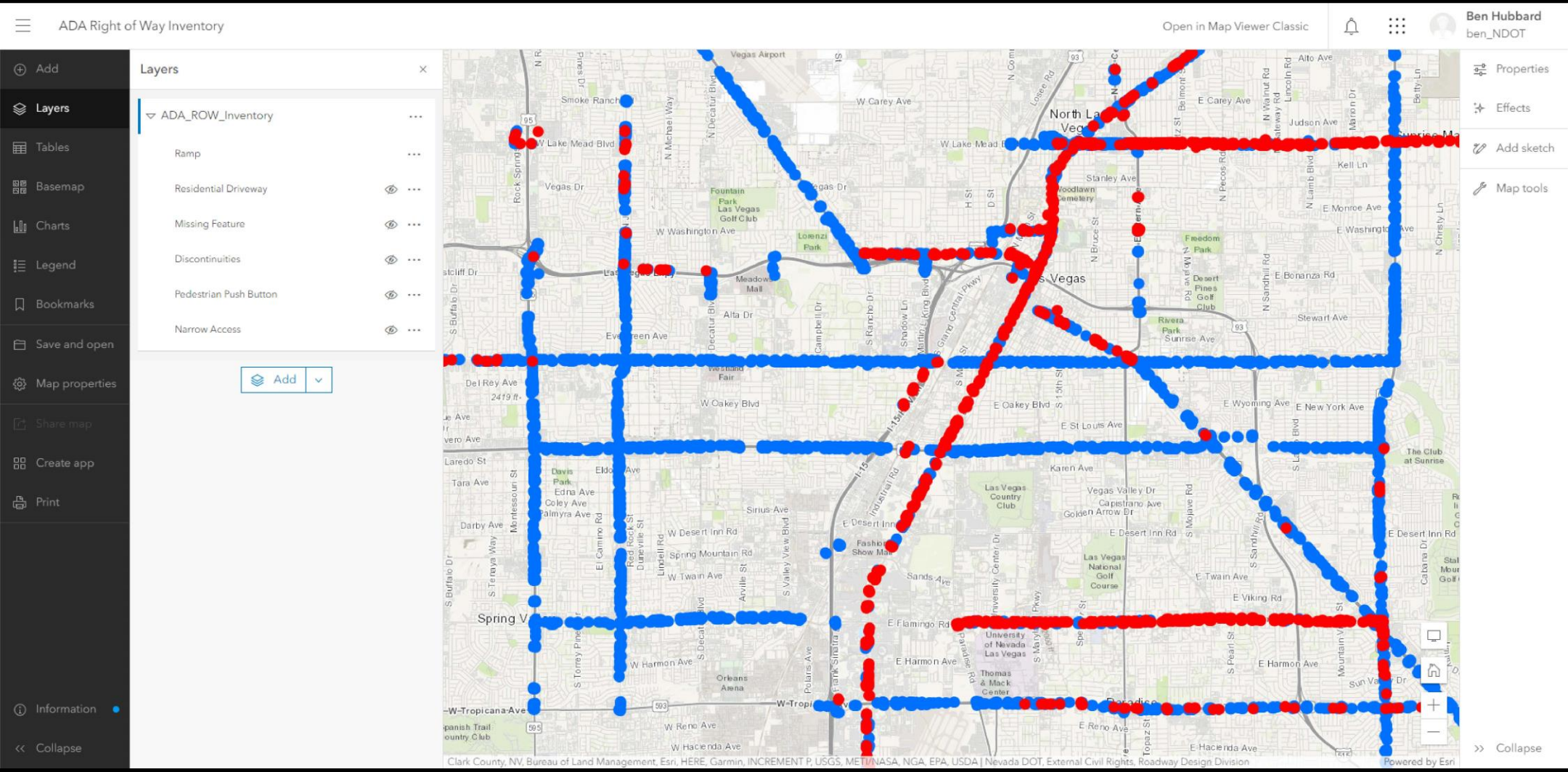
Digital Height Measuring Device

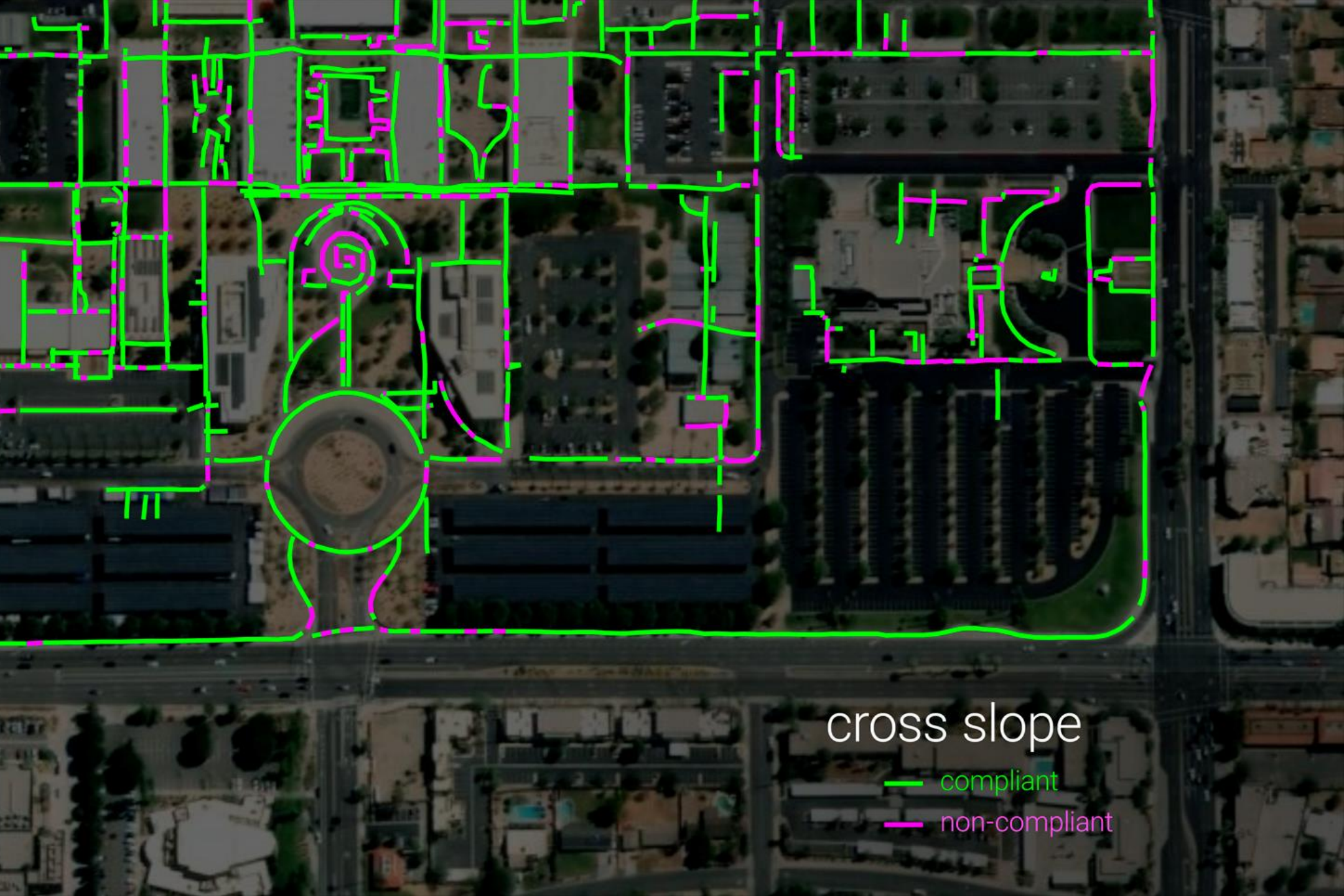


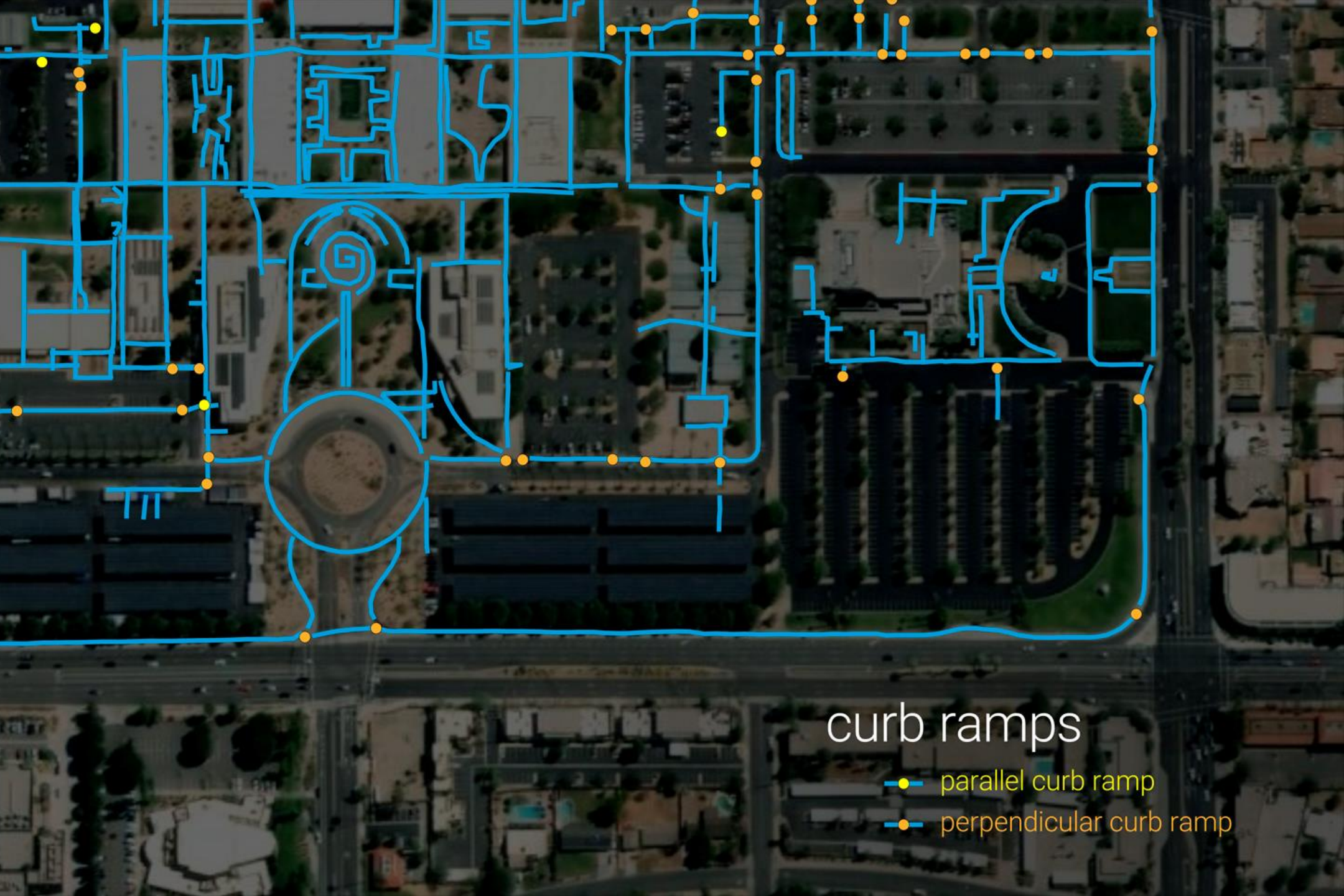

ONE STOP
AUTO REPAIR



NDOT Curb Ramps

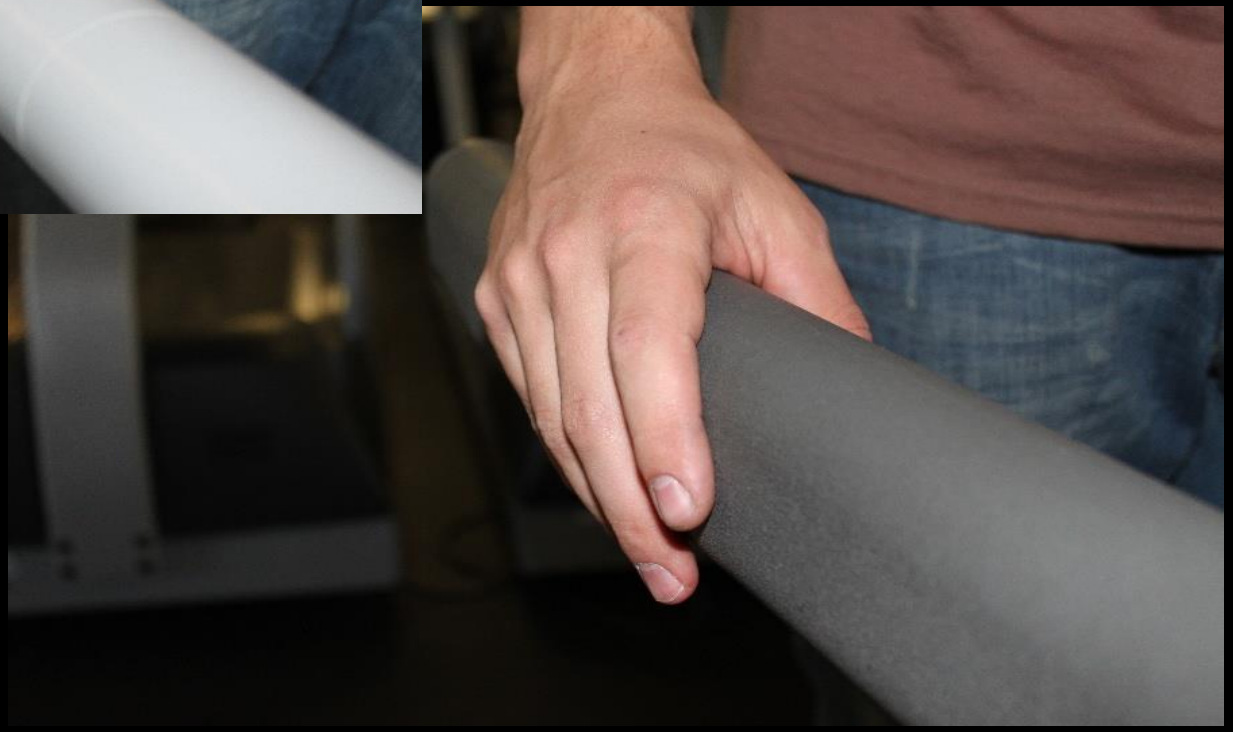



cross slope
compliant
non-compliant


curb ramps
parallel curb ramp
perpendicular curb ramp

Universal Design of Fitness Equipment (UDFE) Standards

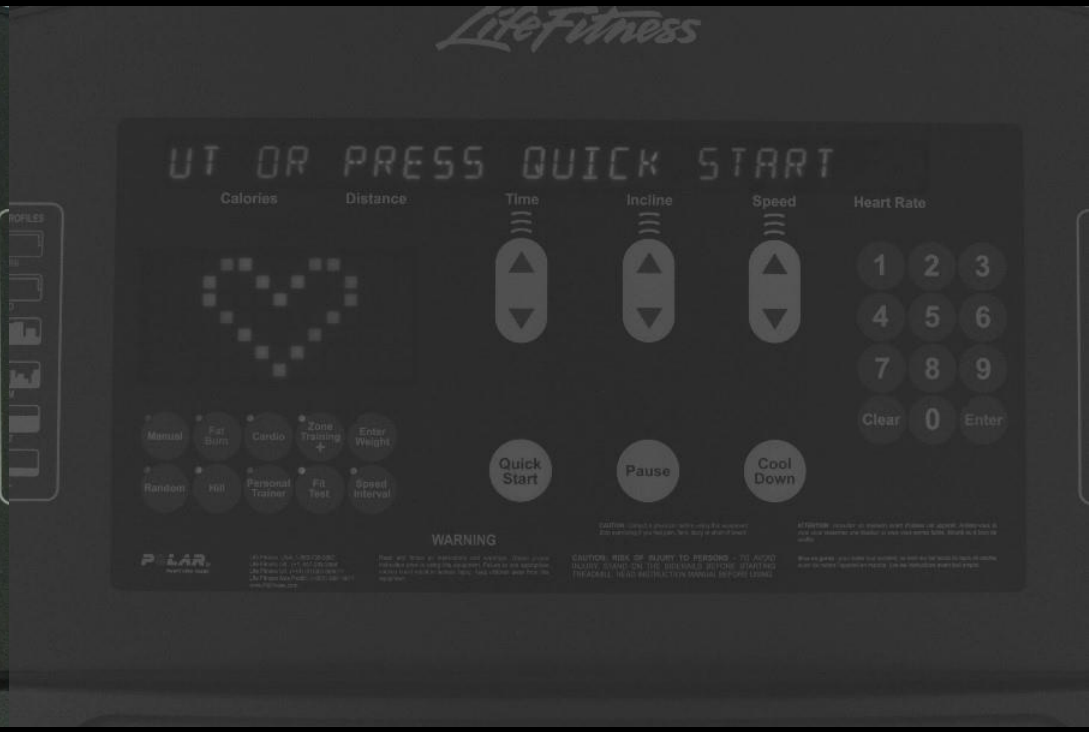
Low step-up height design



Finding the

Weight Adjustment Pin

color contrast



value contrast

color contrast

value contrast


MAURER SÖHNE


2013. 12. 23 13:18

2013. 12. 23


2013. 12. 23 13:19


2013. 12. 23 13:43


214
6°

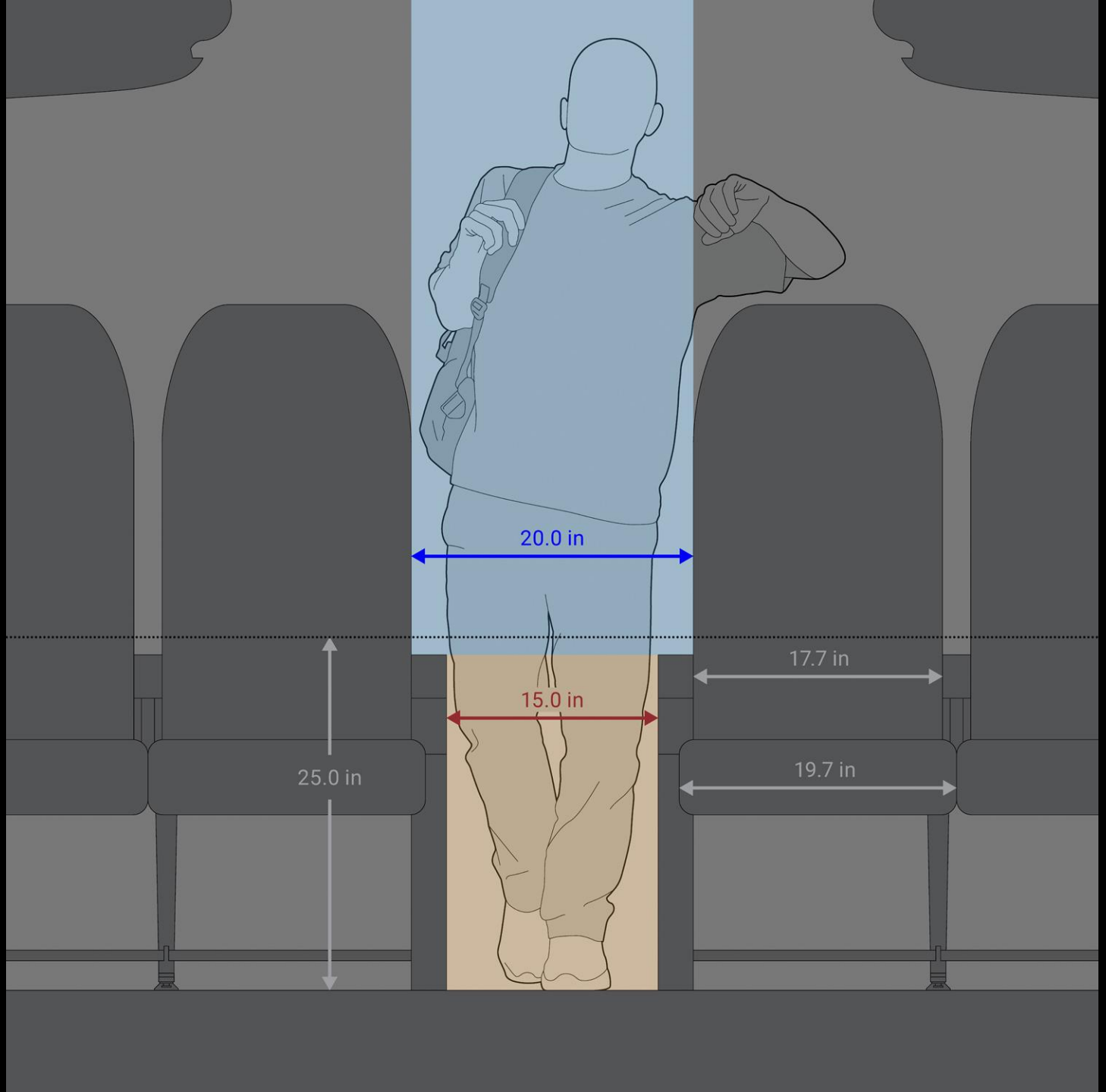

29
SabadellCAM
6°

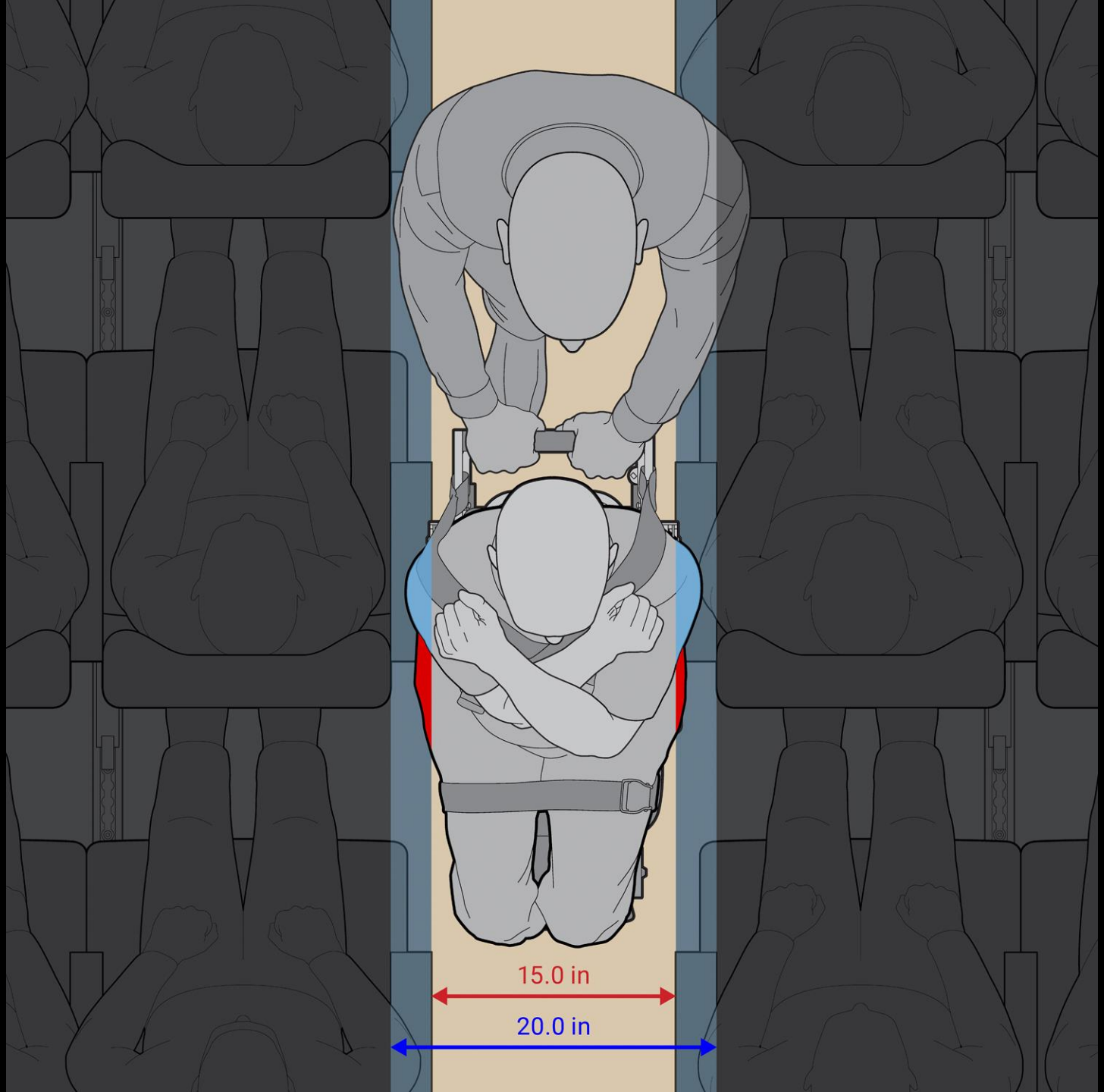
Boarding devices

Assessment of

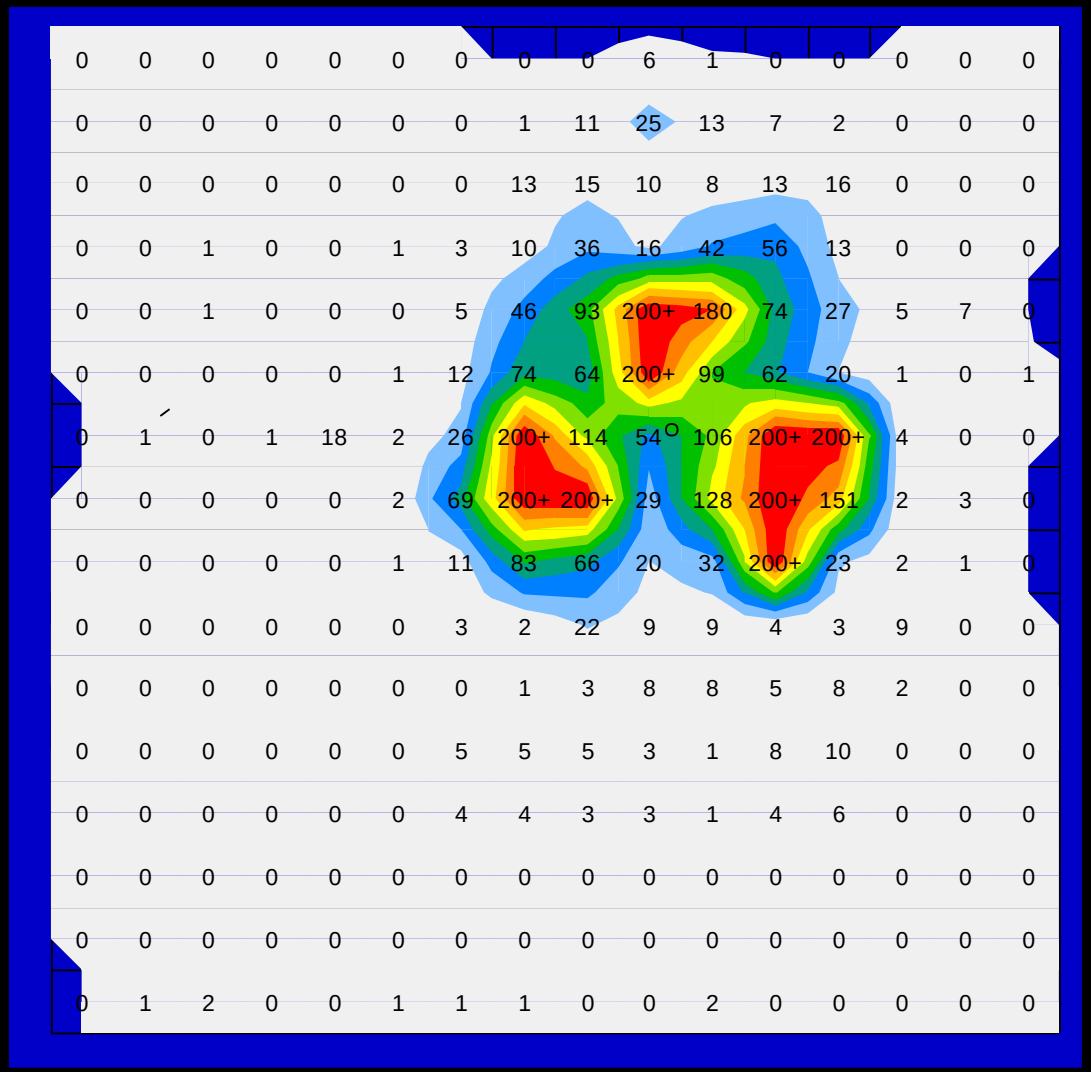
Traditional aircraft boarding devices

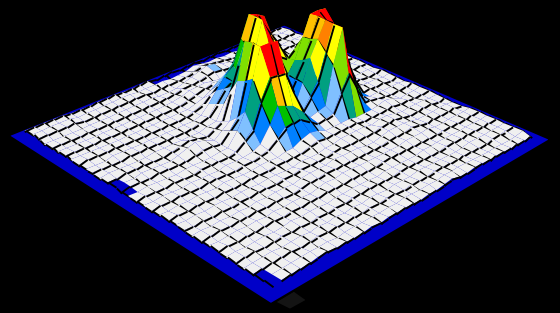
Stability


20.0 in
15.0 in
25.0 in
17.7 in
19.7 in

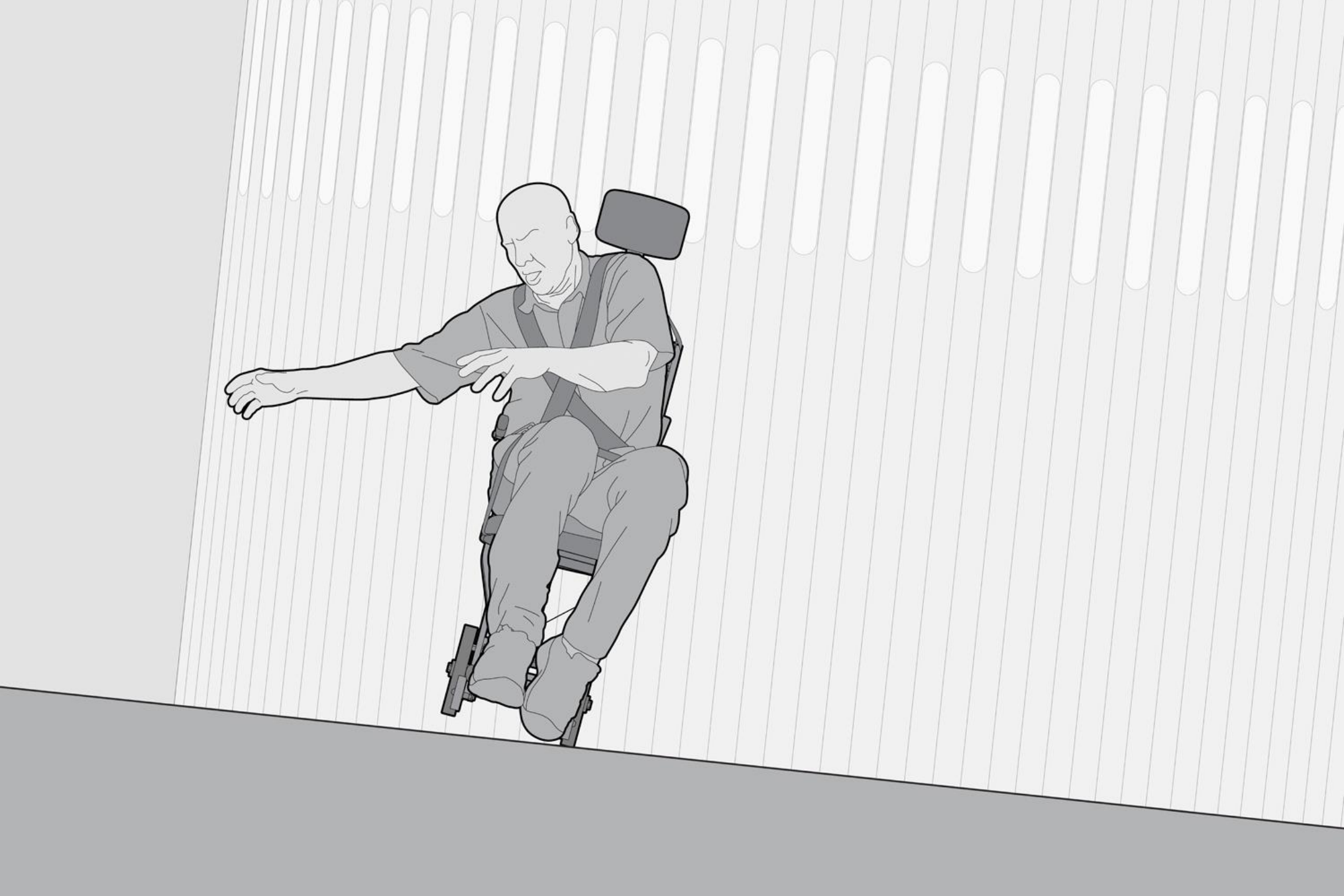

15.0 in
20.0 in

Boarding device seating pressures





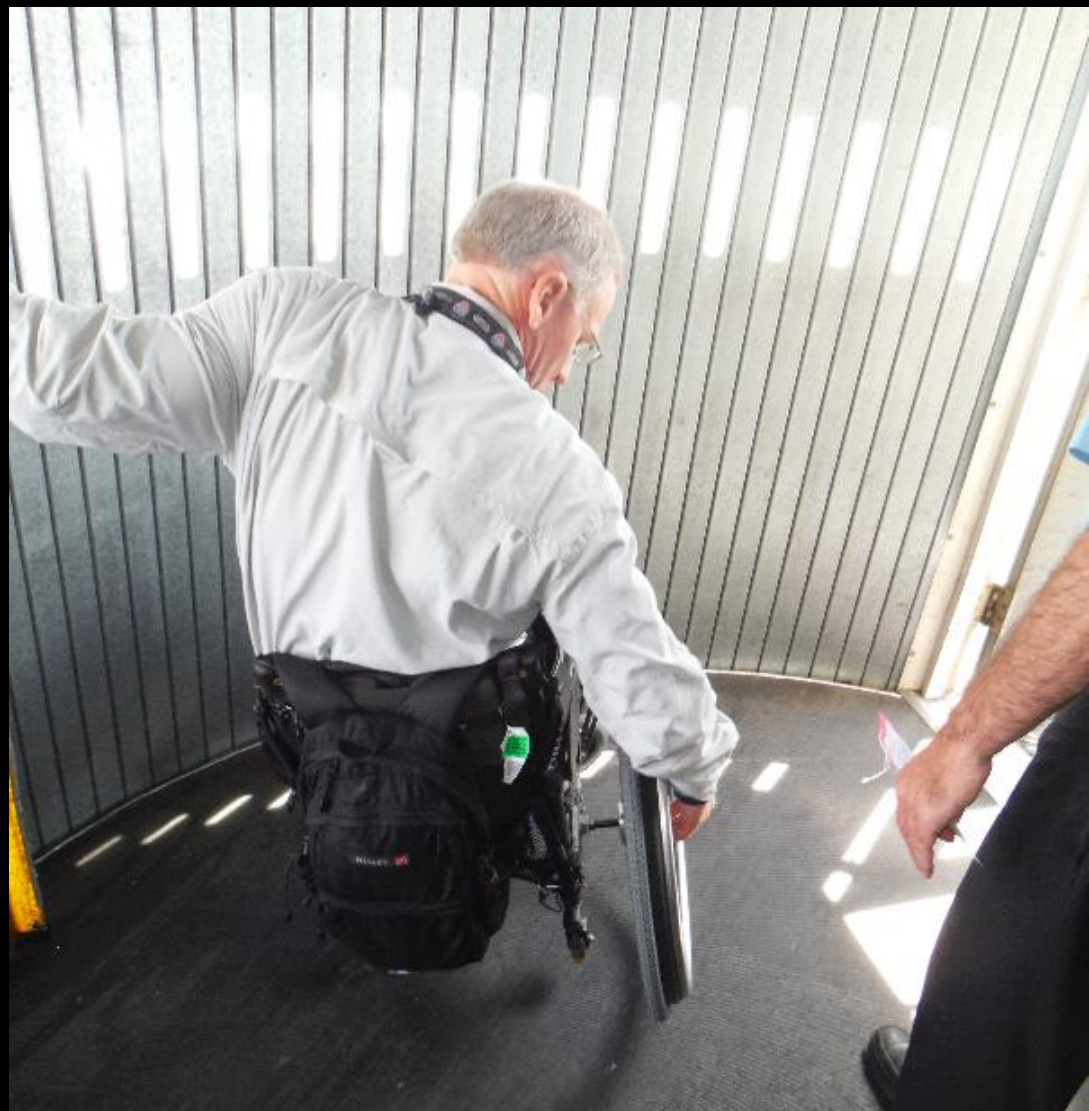
Minimum (mmHg)	0.00
Maximum (mmHg)	200.00
Average (mmHg)	15.64
Variance (mmHg²)	1823.88
Standard deviation (mmHg)	42.71
Coefficient of variation (%)	272.99
Horizontal center (in)	10.47
Vertical center (in)	10.20
Sensing area (in²)	289.27
Regional distribution (%)	100.00



Aircraft boarding using a wheelchair with

Narrow accessory wheels

- Fewer transfers



Aircraft-compatible wheelchair


EXIT
DEWALT


QUICK-GRIP

Aircraft seating with

Pressure relief cushion from wheelchair

- Legs hanging
- Shoulders forward
- Neck extended
- Arm not supported

Aircraft seating with

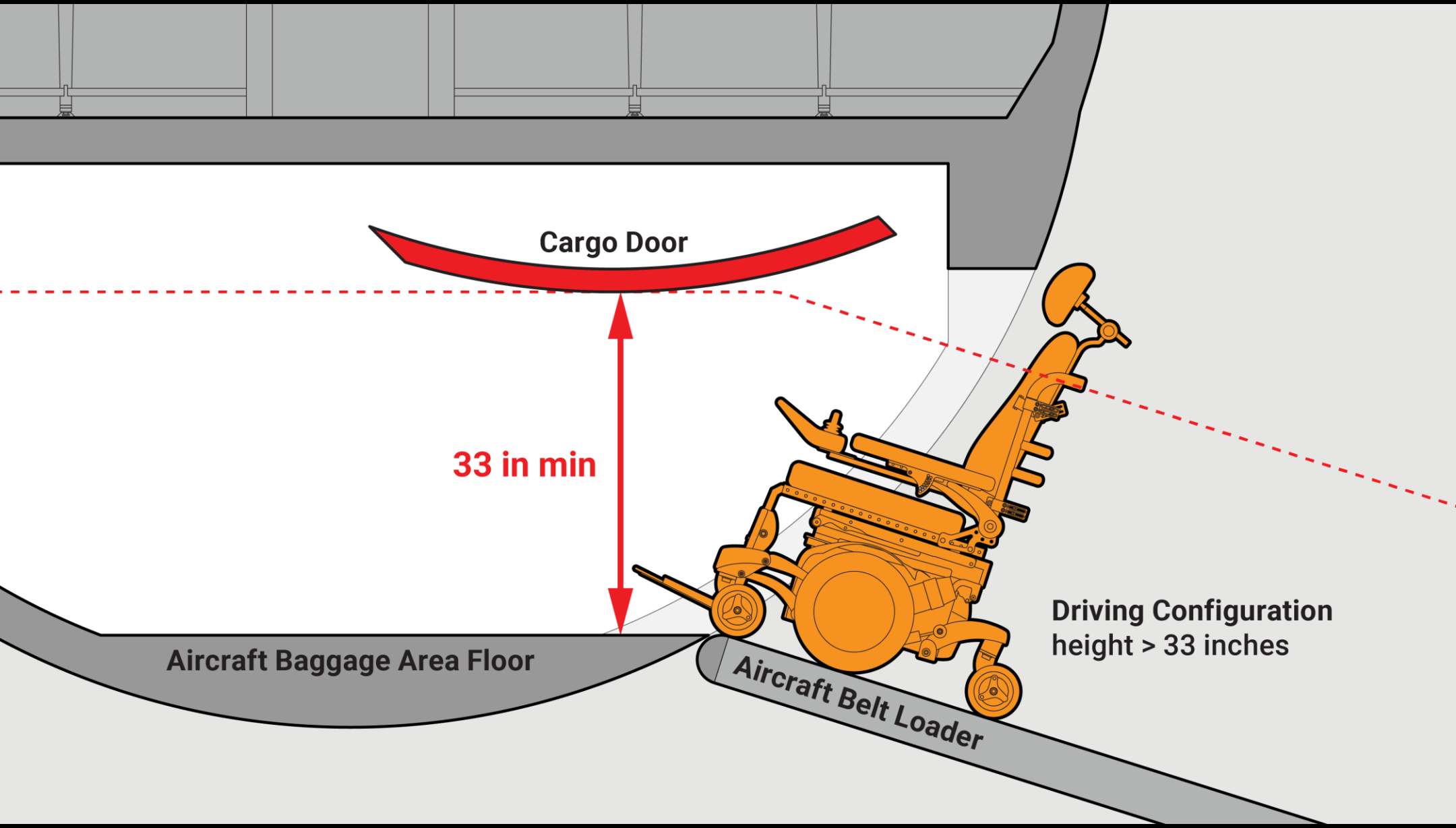
Pressure relief cushion and “accessories”

- Foot support
- Lumbar and spine support
- Neck/head support
- Arm Support

Aircraft seating with

Pressure relief cushion and “accessories”

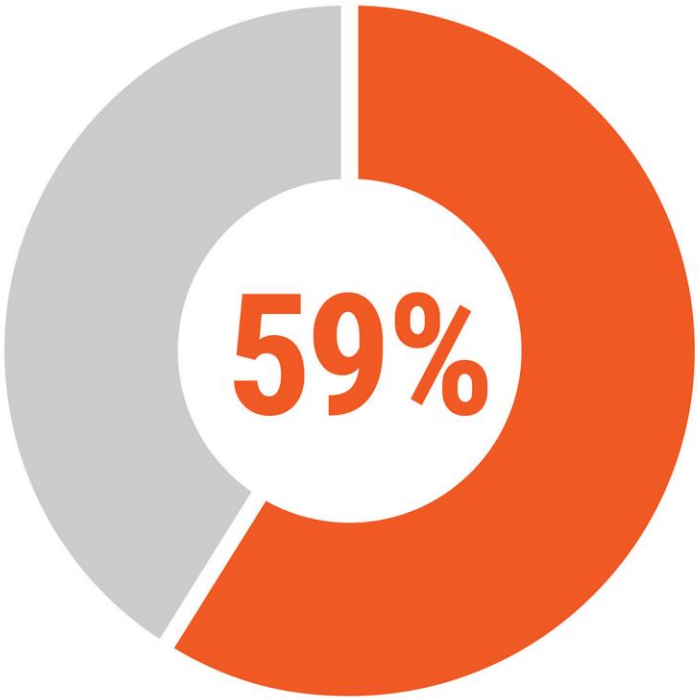
- Feet supported lumbar and
- Spine supported
- Neck/head support
- Arm supported


Cargo Door
33 in min
Aircraft Baggage Area Floor
Aircraft Belt Loader
Driving Configuration
height > 33 inches


PWC tilted on side to fit through door

Damage

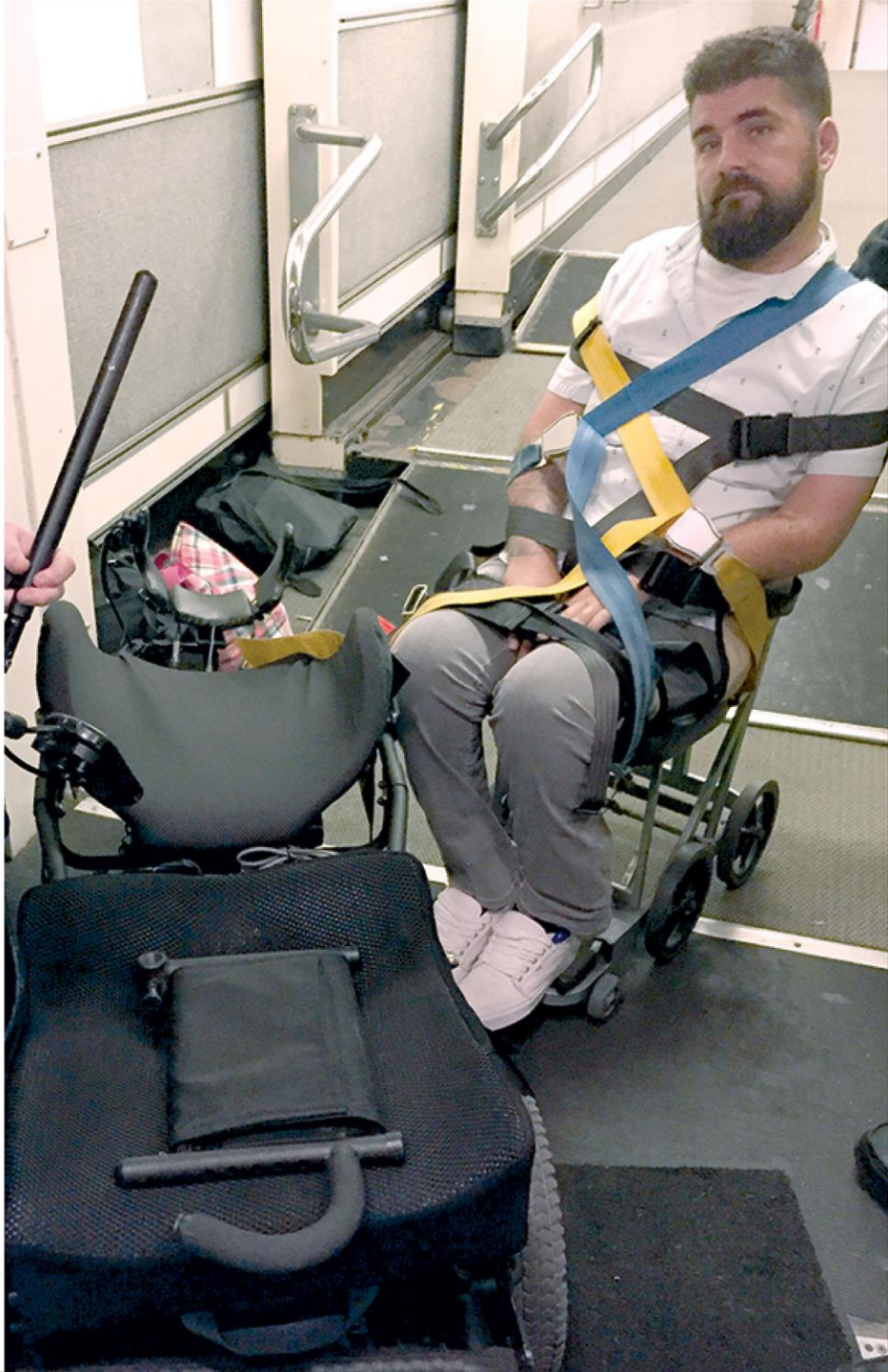
Damage to drive wheel that came off powered wheelchair



responded that their...

mobility devices were damaged after air travel

and over 50% still experience device damage when proper procedures are followed by carrier agents.



RESNA AT-1 Section 4 Standard

American National Standard

RESNA AT-1:2021

for Assistive Technology for Air Travel–

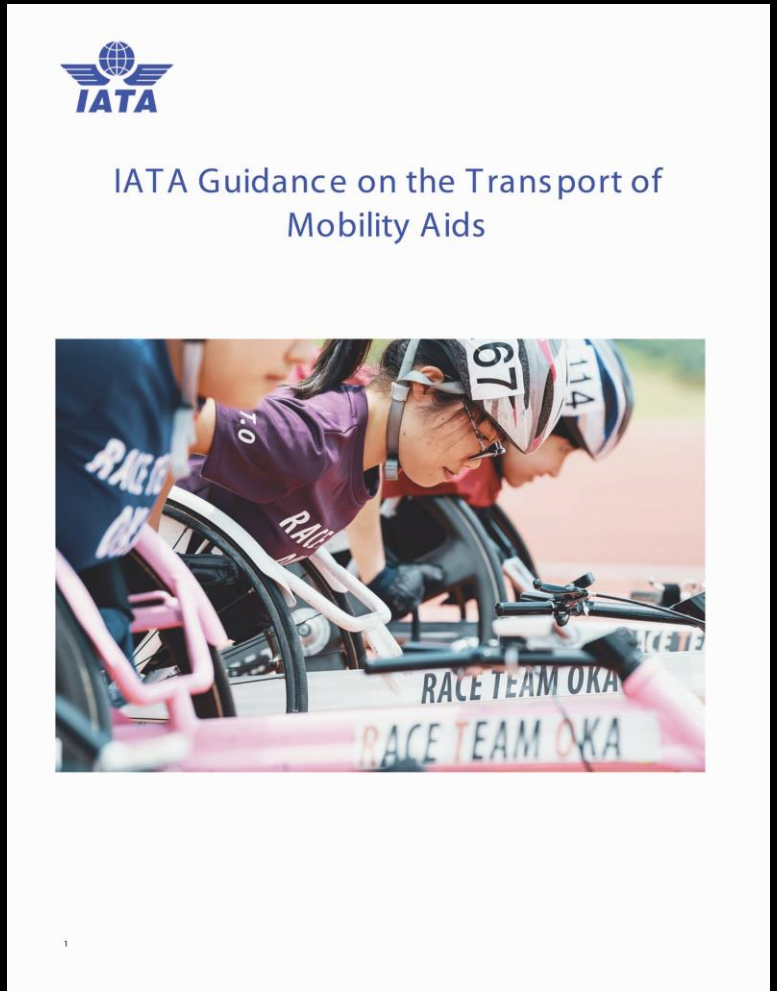
Volume 1: Requirements and Test Methods Related to Mobility Devices

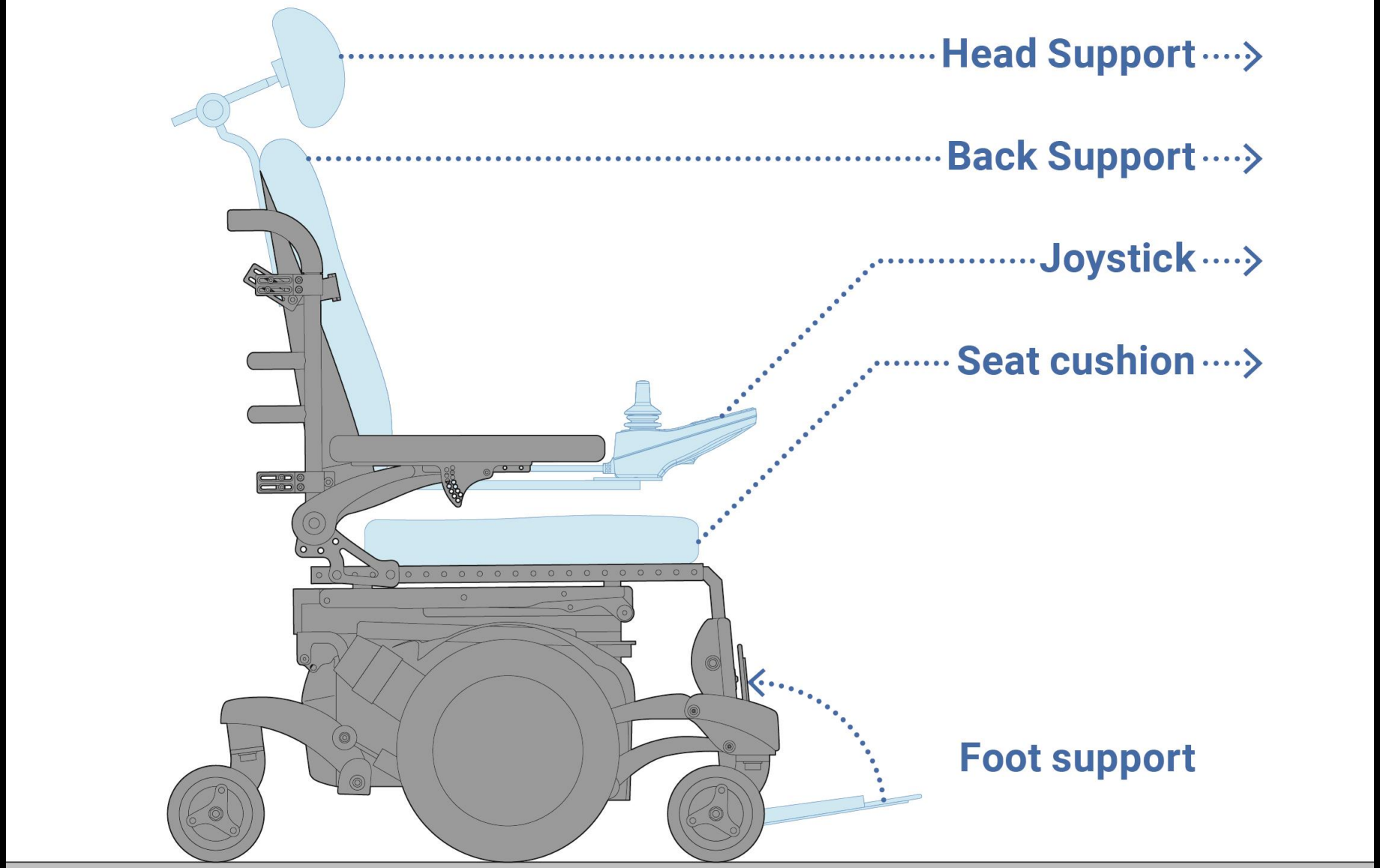
RESNA

Rehabilitation Engineering and Assistive Technology Society of North America

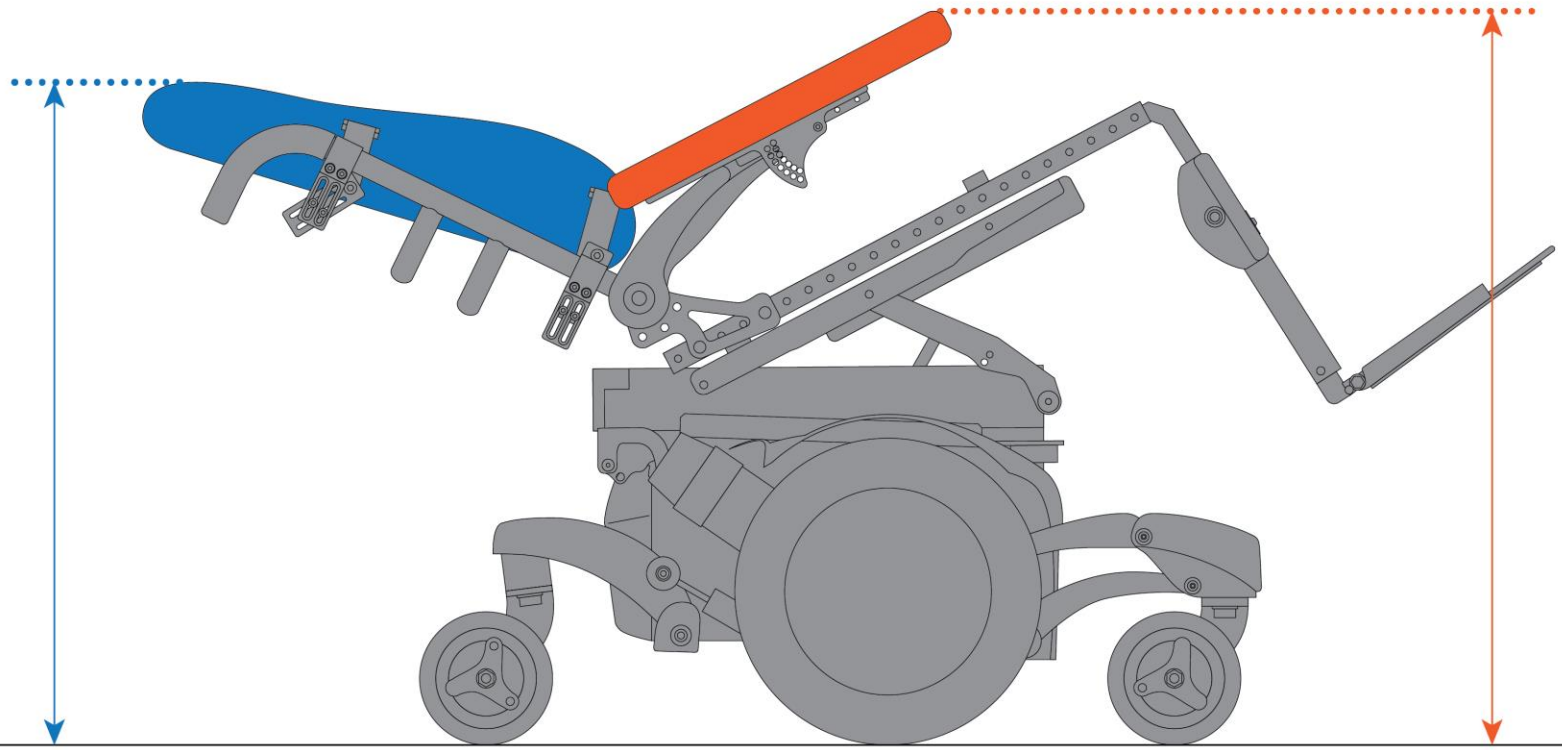
International Air Transport Association (IATA)

IATA Guidance on the Transport of Mobility Aids



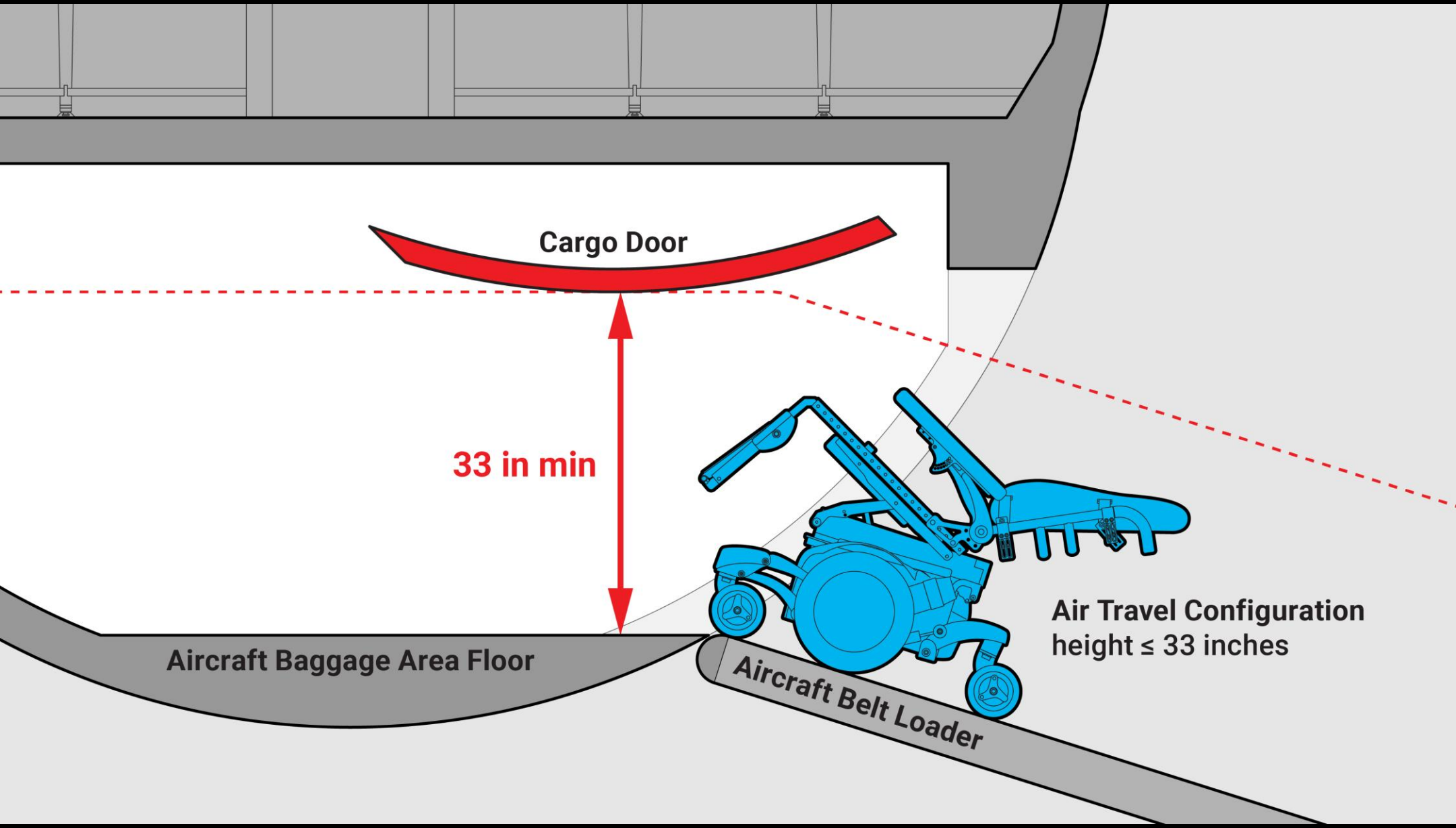

Head Support
Back Support
Joystick
Seat cushion
Foot support

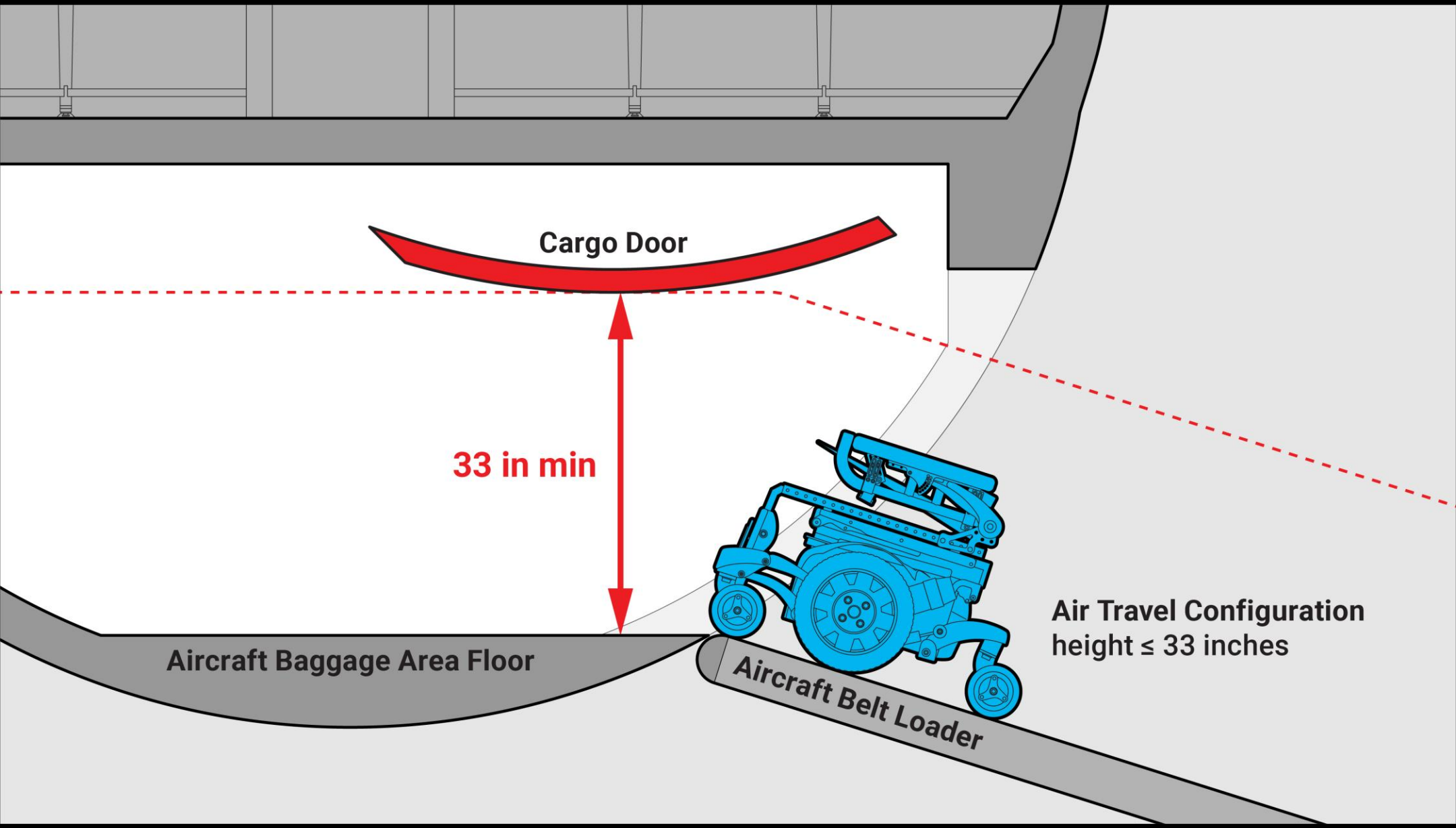
33" max



Travel
Back

Travel
Arm


Cargo Door
33 in min
Aircraft Baggage Area Floor
Aircraft Belt Loader
Air Travel Configuration
height ≤ 33 inches


Cargo Door
33 in min
Aircraft Baggage Area Floor
Aircraft Belt Loader
Air Travel Configuration
height ≤ 33 inches

PMD Labeling Guidelines

Weight

WHEELCHAIR WEIGHT

150 kg

330 lb

https://wheelchairtravel.org/air-travel/reduce-risk-wheelchair-damage/


C400

For existing devices, create an

Air Travel Information Card

air travel *information*

Manufacturer
Model
COMPLIANT with RESNA AT-1

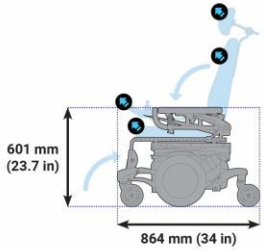
owner: John Doe **phone:** 123 456 7890 **email:** john.doe@email.com **chair serial number:** 7200003

air travel preparation

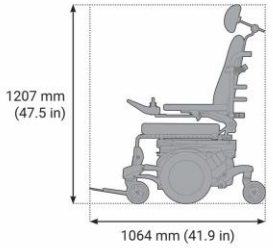
The owner of this device, or a designated assistant, is encouraged to participate in the following process.

1. **remove seat cushion**
   Remove seat cushion; store in aircraft cabin.
2. **remove head support**
   Remove head support; store in aircraft cabin.
3. **lower back support to fit into aircraft**
   Remove back support cushion; store in aircraft cabin. Cushion is fixed in place by means of velcro on the rear. Disconnect quick release pin on back support actuator at the attachment point behind back support. Fold back support forward.
4. **remove joystick**
   Remove electrical connection to joystick. Remove joystick controller; store in aircraft cabin.
5. **raise foot supports**
   Move foot supports to upright position.
6. **isolate battery power**
   Switch breaker to off to fully disconnect power.
7. **disengage drive system**
   Rotate lever on each motor to manually push the mobility device.

air travel configuration



driving configuration

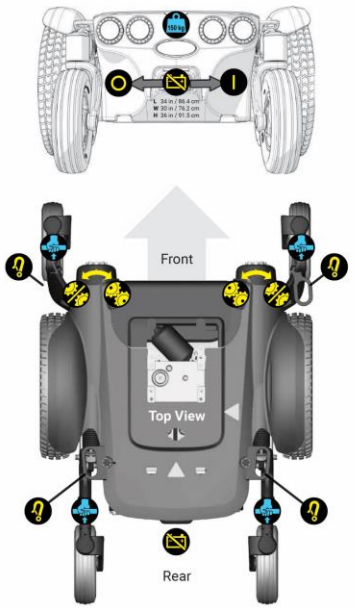


unoccupied product weight
150 kg (330 lb)
WARNING: This product should be lifted using a mechanical lift to avoid injury.

weight of additional components
(if greater than 10 kg)
12 **kg** (26.5 lb)

battery information
WARNING: Only non-spillable lead acid group 34 batteries may be installed on this product.
This wheelchair was manufactured with **2 lead acid sealed gel cell non-spillable batteries** conforming to **DOT 49 CFR 173.159 (d)** and **IATA Provision A67.**

rev: 2022-11-30



isolate battery power SWITCH
Switch breaker to off to disconnect power from the battery.
The circuit breaker is located in the rear beneath the tail lights.

disengage drive system
Move levers outwards to release the brakes.
Disengage drive motors with brake release levers to move product manually. The brake release levers are located at the front of the mobility device.

manual lift points
Manual lift points are located on all four caster arms.
WARNING! This product should be lifted using a mechanical lift to avoid injury. Unoccupied product weight is 150 kg (330 lb).

chair securement
RESNA WC19 securement points can be used to secure the mobility device.
After positioning and securing the mobility device, re-engage the drive system to lock the drive wheels.

user operator manual online
Scan the QR code to visit the RESNA ATAT webpage. Configuration card prototype was created based on the product having a built-in electrical isolation switch to isolate the batteries. Some data was obtained from user operator manuals available online. All values are estimated and may not represent actual product data. The manufacturers of the products on this card have not reviewed or approved this information.

14 CFR §382.129(a) states the following: "As a carrier, you must permit passengers with a disability to provide written directions concerning the disassembly and reassembly of their wheelchairs, other mobility aids, and other assistive devices. ***You must carry out these instructions to the greatest extent feasible...***"

beneficial designs

designing beyond the norm to meet the needs of all people

www.beneficialdesigns.com

peter@beneficialdesigns.com

775.783.8822 voice

775.783.8823 fax