

Tools and Technology for Accessible Trails



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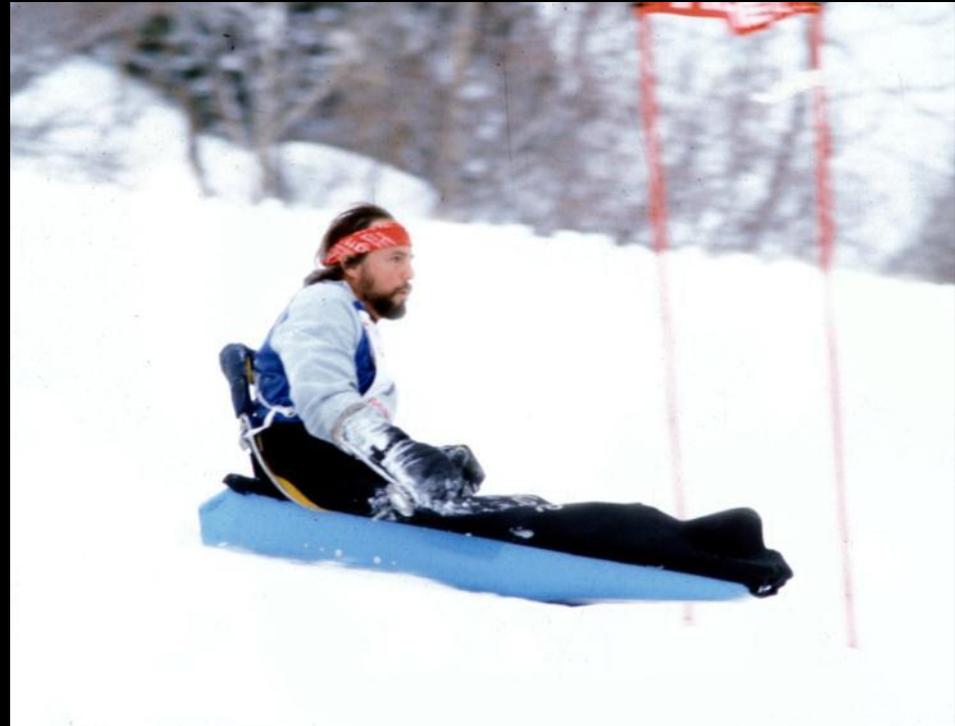
Who is: Beneficial Designs

research/design/education

Designing beyond the norm to meet the needs of all people.

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.





Arroya Sit Ski



Mono Ski

Cross Country Ski





Hand Bike

Adaptive Canoe Seating



Available from
Chosen Valley
Canoe Accessories
www.gear4portaging.com



Beneficial Design's History with Sidewalk Accessibility

ADA Outdoor
Recreation
Committee



Greatest Barrier to Trail Use

Lack of knowledge about actual on-trail conditions

Lack of knowledge about where access is possible

Need for Trail Assessments

All users and land managers need accurate trail data



Objective trail information is very limited, but it enables informed decisions about trail use and conservation

Subjective information is not related to individual abilities

ADA Transition Plan is Required by Law

1968 passage of the ABA required facilities to be accessible

December, 1994, 7 CFR 15e required programs of all USDA Agencies to complete a Transition Plan



Requirements of The Transition Plan

- (i) Identify physical obstacles...
- (ii) Describe in detail the methods...
- (iii) Specify the schedule... to achieve compliance...
- (iv) Indicate the official responsible for implementation

Title II of the ADA [28 CFR Section 35.150 (d)(3)]

Where to begin?

Appoint an ADA Coordinator

Establish ADA Grievance Policy

Generate Public Participation Methods
and Process

Perform a Self Evaluation

Establish the Methods to Remove the Barriers

Prioritize areas to provide access

Identify areas within scheduled
Capital Improvement Projects

Identify areas that may qualify for
grant funding

Hazardous conditions

Applicable Guidelines

US Access Board: Draft Final
Accessibility Guidelines for Outdoor
Developed Areas (AGODA)

Chapter 10: Recreation Facilities



Trails

Grade

Between 1:20 (5%) and 1:12 (8.33%), 200 feet maximum

Between 1:12 (8.33%) and 1:10 (10%), 30 feet maximum

Between 1:10 (10%) and 1:8 (12.5%), 10 feet maximum

Cross Slope

1:20 (5%) maximum unless concrete, asphalt or boards, then 1:48 (2%)

Outdoor Recreation Access Routes

Grade

Between 1:20 (5%) and 1:12 (8.33%), 50 feet maximum

Between 1:12 (8.33%) and 1:10 (10%), 30 feet maximum

Cross Slope

1:33 (3%) maximum
unless concrete, asphalt
or boards, then 1:48 (2%)



Outdoor Recreation Access Routes

Surface

firm and stable

Width

36 inches

exception 32 inches for up to 24 inches

Openings

< 0.5 inch sphere

Obstacles

1 inch maximum unless concrete, asphalt or boards, then 0.5 inches

Beach Access Routes

Grade

Between 1:20 (5%) and 1:12 (8.33%), 50 feet maximum

Between 1:12 (8.33%) and 1:10 (10%), 30 feet maximum

Cross Slope

1:33 (3%) maximum unless concrete, asphalt or boards, then 1:48 (2%)



Conditions for Exceptions



1019.2 Conditions for Exception.

- 1. Compliance is not feasible due to terrain.**
- 2. Compliance cannot be accomplished with the prevailing construction practices.**
- 3. Compliance would fundamentally alter the function or purpose of the facility or the setting.**

Conditions for Exceptions



4. Compliance is precluded by the:

- Endangered Species Act (16 U.S.C. §§ 1531 et seq.);
- National Environmental Policy Act (42 U.S.C. §§ 4321 et seq.);
- National Historic Preservation Act (16 U.S.C. §§ 470 et seq.);
- Wilderness Act (16 U.S.C. §§ 1131 et seq.); or
- Other Federal, State, or local law the purpose of which is to preserve threatened or endangered species; the environment; or archaeological, cultural, historical, or other significant natural features.

Conditions for Exceptions



Advisory 1019.2 Conditions. *Entities should consider all design options before determining whether the conditions in 1019.2 apply. The laws referenced in Condition 4 can limit construction in the outdoor environment. Condition 4 also applies where archaeological, cultural, historical, or other significant natural features are eligible for protection under Federal, State, or local law.*

Universal Design

Philosophy that designs for all potential users to the greatest extent possible

Principles include:

- equitable use
- flexible use
- simple & intuitive use
- perceptible information
- tolerance for error
- low physical effort
- size and space for approach and use

Preventing Access Barriers

**Need to provide access to all
allowed user groups**

**Need to prevent those user groups
not allowed**

A man with glasses, wearing a black puffer vest, dark pants, and winter boots, is seated in a wheelchair. He is leaning against a chain-link fence barrier. He has tan work gloves on his hands, one resting on the top rail of the fence. The setting is an outdoor area with a dirt ground, a green trash bin, and a building in the background under an overcast sky.

Barrier at Riverview Park





Third Inverted Bollard Concept

Motorcycle Testing

Electronic Gate Barrier



Electronic TGB Specifications

Infra-red sensor technology with
fresnel lens

Field of view is approx 2 degrees

At 50 feet the field of view is approx
20 inches

Dynamic detection of hot objects
entering field of view

Electronic TGB Specifications

Custom designed electronic circuit to control infra-red sensor

Custom software algorithm to detect movement of heated object against background

Detect the difference between hikers and count to monitor trail usage

Provided Access, now address the Trail

**Self Evaluation:
Trail Assessment**

Trail Assessment Options

Universal Trail
Assessment
Process (UTAP)



High Efficiency
Trail Assessment
Process (HETAP)



Key Variables for UTAP

Measured many trail factors

Matched objective variables with user expectations and experience

Matched objective variables with trail experts and their knowledge of trail



UTAP & HETAP Generate Objective Information

Access and Use

Construction and Maintenance

Mapping and Interpretation

Environmental Protection and
Management

Compliance with Design Standards

Assessment and Compliance

Inventory existing facilities and infrastructure

Determine compliance with existing ADAAG and Developed Outdoor Recreation facilities

Create transition plan with goals and objectives for accomplishing access

UTAP Tools



Key UTAP & HETAP Information

Length



Grade



Width



Surface



Cross
slope



Features &
Facilities



UTAP at Work

Requires min 2 Person Teams (4 min is ideal)

Low cost of Equipment

Adaptable to
various trail
types & agency
requirements



HETAP at Work

One person to operate
Equipment significantly
more expensive

Consistent with UTAP Principles

Data easily Integrates into GIS

Increased Data Accuracy



HETAP- Rollawheel







HETAP-
ATV

**Last Station Recorded**

48 in

Hard

Aggregate/ Gravel

6628.0 Ft

-7.1 %

0.7 %

Copy Surf. Data ->**Tread Width:****Surface Category:****Surface Type:****Distance:****Grade:****Cross Slope:****Current Station To Record**

36

in

Set MCW

Soft

Sand

6640.7 Ft

4.9 %

2.6 %

Record Station**Add Features****Return Home****Distance Hold****Manual Entry****View Data****Alarm Settings****Calibration****New Segment****Current Segment:****3 Nature Fort 2009-01-06****Outslope**

Check Outslope Direction

<- Left

Right ->

Vehicle Orientation **Forwards** **Backwards**

Settings

Hide

Save Image

Compass Heading: ° True**GPS Location and Status****Lat:** 39° 0' 3.25" N**Lon:** 119° 46' 1.17" W**Apprx. Err:** ± 47 Feet**Elev:** 4647 ± 85 Feet

Fix is 3D



Distance: **6640.7**

Type: **Rock**

Description:
 Embedded Rock

Zone

Trail Bed **Visual**

Remaining Tread: **25** in

Dimensions

Units of Measure: **in**

L **12** W **8** H **4**

Quantity: Ending Distance:

1

End Distance Reminder

Optional Data

Recommended Action: **Remove**

Materials Needed:

For a Built Feature: Is this feature Accessible?

Yes **No** **This is not a Built Feature**

	Distance	Feature Type	E	D
34	6374.1	Sign	<input type="checkbox"/>	<input type="checkbox"/>
35	6413.9	Picnic Area	<input type="checkbox"/>	<input type="checkbox"/>
36	6606.2	Sign	<input type="checkbox"/>	<input type="checkbox"/>
37	6606.2	Bridge	<input type="checkbox"/>	<input type="checkbox"/>
38	6618.4	Restroom	<input type="checkbox"/>	<input type="checkbox"/>
39	6627.9	Parking	<input type="checkbox"/>	<input type="checkbox"/>

Record Feature

Stations

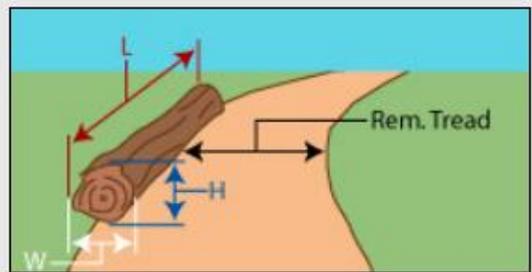
Manual Entry

Edit Feature

Copy Feature

Delete Feature

Rotational Penetrometer Data



Settings

Hide

Save Image

UTAP & HETAP are suitable for any trail or path of travel in an outdoor environment.

What are different types of trails?

Shared Use Path



Urban Shared Use Paths



Neighborhood Connector Trails



Recreation Trail (Front Country)



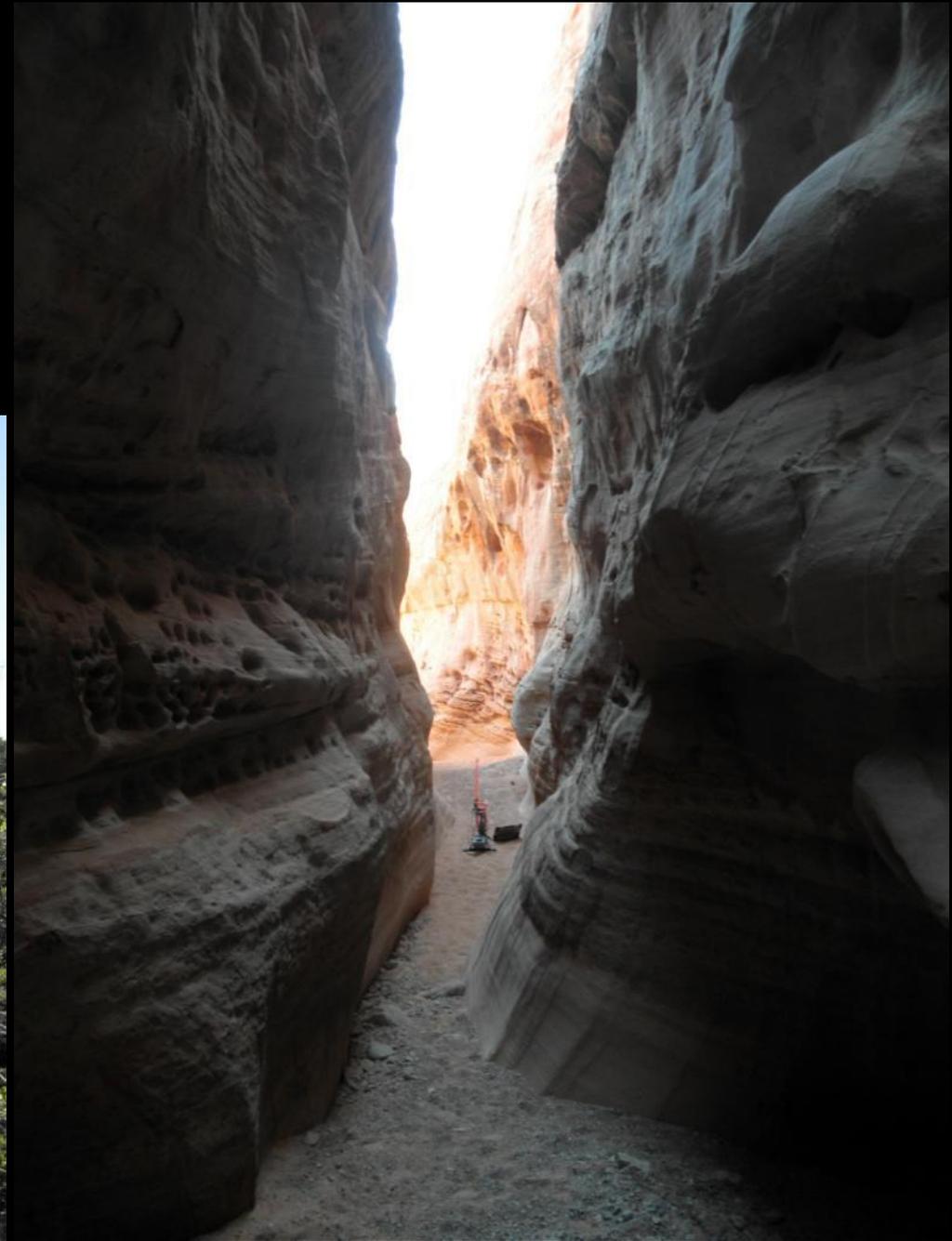
Front Country Trails



Recreation Trail (Back Country)



Narrow Trails



Backcountry single track trails



Cross Country Trails



Snowshoe Trails



Snowmobile Trails



State Parks/Day Use Areas



Motorized Trails



Outdoor Recreation Access Route (ORAR)



Paths of Travel at Recreation Facilities



UTAP & HETAP Record Typical and Extreme Values

Grade

Cross Slope

Width

<u>Trail</u>	Grade (%)		Cross Slope (%)	
	<u>Typ</u>	<u>Max</u>	<u>Typ</u>	<u>Max</u>
Kersey Lake	5	70	11	32
Indiana Falls	8	10	16	19

Stations Data Report: Tread Width

	Seg. Number	Station Location	Station Length	Cumul. Length	Cumul. Percent	Tread Width	X-Slope (%)	Grade (%)	Surface Category	Surface Type	Lat.	Lon.
1	1	235.8	3.3	3.3	0.1	24.0	3.9	14.8	Firm	Sand	39.290	-119.277
2	1	277.4	8.6	11.9	0.4	24.0	21.9	-16.1	Firm	Sand	39.290	-119.277
3	1	286.0	7.1	19.0	0.6	24.0	21.6	-12.0	Firm	Sand	39.290	-119.277
4	1	293.0	8.6	27.6	0.8	24.0	11.9	8.6	Firm	Sand	39.290	-119.277
5	1	345.1	19.8	47.4	1.4	24.0	-7.2	0.3	Firm	Sand	39.290	-119.277
6	1	365.0	17.0	64.4	2.0	24.0	-4.0	3.6	Firm	Sand	39.290	-119.277
7	1	382.0	20.9	85.3	2.6	24.0	1.8	-2.0	Firm	Sand	39.290	-119.277
8	1	472.4	8.7	94.0	2.9	24.0	2.9	-10.3	Firm	Sand	39.290	-119.276
9	1	481.1	29.4	123.4	3.8	24.0	-2.5	-5.5	Firm	Sand	39.290	-119.276
10	1	510.5	20.9	144.2	4.4	24.0	11.0	0.3	Firm	Sand	39.290	-119.276
11	1	531.4	10.5	154.8	4.7	24.0	16.0	5.2	Firm	Sand	39.290	-119.276
12	1	541.9	7.8	162.5	5.0	24.0	8.0	-3.1	Firm	Sand	39.290	-119.276
13	1	549.6	2.2	164.7	5.0	24.0	-1.2	4.8	Firm	Sand	39.290	-119.276
14	1	551.8	6.2	171.0	5.2	24.0	32.8	-8.8	Firm	Sand	39.290	-119.276
15	1	558.1	4.7	175.7	5.4	24.0	12.9	-12.5	Firm	Sand	39.290	-119.276
16	1	223.9	3.5	179.2	5.5	30.0	0.1	-28.4	Firm	Sand	39.290	-119.277
17	1	227.5	4.0	183.2	5.6	30.0	1.9	-31.0	Firm	Sand	39.290	-119.277
18	1	231.5	4.3	187.6	5.7	30.0	-0.3	-11.9	Firm	Sand	39.290	-119.277
19	1	452.3	8.3	195.9	6.0	30.0	9.7	-18.0	Firm	Sand	39.290	-119.276
20	1	460.6	11.8	207.7	6.3	30.0	6.2	-26.6	Firm	Sand	39.290	-119.276
21	1	562.8	14.2	221.9	6.8	30.0	-1.5	-3.3	Firm	Sand	39.290	-119.276
22	1	577.1	5.1	227.0	6.9	30.0	-11.9	13.2	Firm	Sand	39.290	-119.276
23	1	582.2	2.7	229.8	7.0	30.0	-16.7	18.4	Firm	Sand	39.290	-119.276
24	1	584.9	11.0	240.8	7.4	30.0	3.6	-10.0	Firm	Sand	39.290	-119.276
25	1	595.9	64.3	305.1	9.3	30.0	-2.0	-1.5	Firm	Sand	39.290	-119.276
26	1	660.2	36.1	341.2	10.4	30.0	-2.1	-2.7	Firm	Sand	39.290	-119.276

Features Data Report: Feature Height

	Seg. Num.	Aggr. Dist	Zone	Feature Type	Description	L	W	H	Qty.	End Dist.	Rem. Tread	Blt. & Acc.	Action Required	Material Needed
11	7	1242.6	Trail	Bollard	Metal bollard in center of bike path	0.4	0.4	3.0	1	0.0	48.0			
12	7	2824.8	Trail	Bollard	Metal bollard in center of bike path	0.4	0.4	3.0	1	0.0	48.0			
13	7	2859.5	Trail	Bollard	Metal bollard in center of bike path	0.4	0.4	3.0	1	0.0	48.0			
14	7	13.8	Visual	Bench	Wood and metal bench with backrest	8.0	2.0	2.7	1	0.0	0.0			
15	7	2024.1	Visual	Bench	Wood and metal bench with backrest	8.0	2.0	2.7	1	0.0	0.0			
16	7	3340.8	Visual	Bench	Wood and metal bench with backrest	8.0	2.0	2.7	1	0.0	0.0			
17	7	2327.1	Trail	Hole	Hole in asphalt	0.7	0.7	0.6	1	0.0	72.0			
18	7	821.2	Trail	Hole	Hole in asphalt	0.2	0.3	0.4	1	0.0	60.0			
19	7	173.0	Trail	Rut	Crack in asphalt	0.1	4.0	0.1	1	0.0	48.0			
20	7	352.9	Trail	Other Feature	Monitoring well manhole in trail	0.9	0.9	0.1	1	0.0	76.0			
21	7	451.7	Trail	Rut	Crack in asphalt	0.1	5.0	0.1	1	0.0	48.0			
22	7	555.7	Trail	Other Feature	Manhole in trail	1.3	2.0	0.1	1	0.0	36.0			
23	7	558.1	Trail	Rut	Crack in asphalt	0.1	7.1	0.1	1	0.0	48.0			
24	7	627.4	Trail	Rut	Crack in asphalt	0.1	7.1	0.1	1	0.0	48.0			
25	7	700.7	Trail	Rut	Crack in asphalt	0.1	7.1	0.1	1	0.0	48.0			
26	7	1024.3	Trail	Rut	Crack in asphalt	0.1	4.0	0.1	1	0.0	48.0			
27	7	1115.2	Trail	Rut	Crack in asphalt	0.1	5.0	0.1	1	0.0	48.0			
28	7	1222.0	Trail	Bump		0.1	8.2	0.1	1	0.0	24.0			
29	7	1240.3	Trail	Bump		0.1	8.2	0.1	1	0.0	0.0			
30	7	1346.1	Trail	Rut	Crack in asphalt	0.1	6.3	0.1	1	0.0	0.0			
31	7	1470.0	Trail	Rut	Crack in asphalt	0.1	6.3	0.1	1	0.0	12.0			

Surface Characteristics are Recorded with UTAP & HETAP

Surface Type (soil type)

Firmness Category

Paved

Hard

Firm

Soft

Very Soft



Rotational Penetrometer



Objective surface
measurement device

Draft Standard for
measure of firmness
and stability under
development

Available from
Beneficial Designs

Rotational Penetrometer Readings

Surface

Firmness

Stability

Decomposed Granite

0.18

0.82

Gravelpave2

0.17

0.38

Geoblock2

0.17

0.41

Envirogrid Geoweb

0.18

0.44

EGA20 Geoweb

0.20

0.62

Rotational Penetrometer Readings-Gravelpave 2

Before Application

Firmness Stability

0.18 0.77

0.17 0.87

0.17 0.77

0.18 0.88

0.18 0.79

0.18 Avg 0.82

After Application

Firmness Stability

0.17 0.37

0.17 0.38

0.18 0.42

0.17 0.35

0.18 0.40

0.17 Avg 0.38

Need for Assessment of Outdoor Developed Areas

No complete Inventory of Features or Elements

No Clarification of which Features or Elements are in Conformance



Features and Facilities

Location

Type

Description

Dimensions

Quantity



Feature Example



Scenic
Viewpoint

Outdoor Constructed Features:

Bench

Camp Shelter

Cooking Surface/Grill

Fire Ring, Wood
Stove/Fireplace

Outdoor Rinsing
Shower

Parking Area

Picnic Table

Pit Toilet



Outdoor Constructed Features:

Tent Pad/Platform

Toilet Building

Trash/Recycling
Receptacle

Utility/Sewage
Connection

Viewing Area at
Overlooks

Viewing Scope

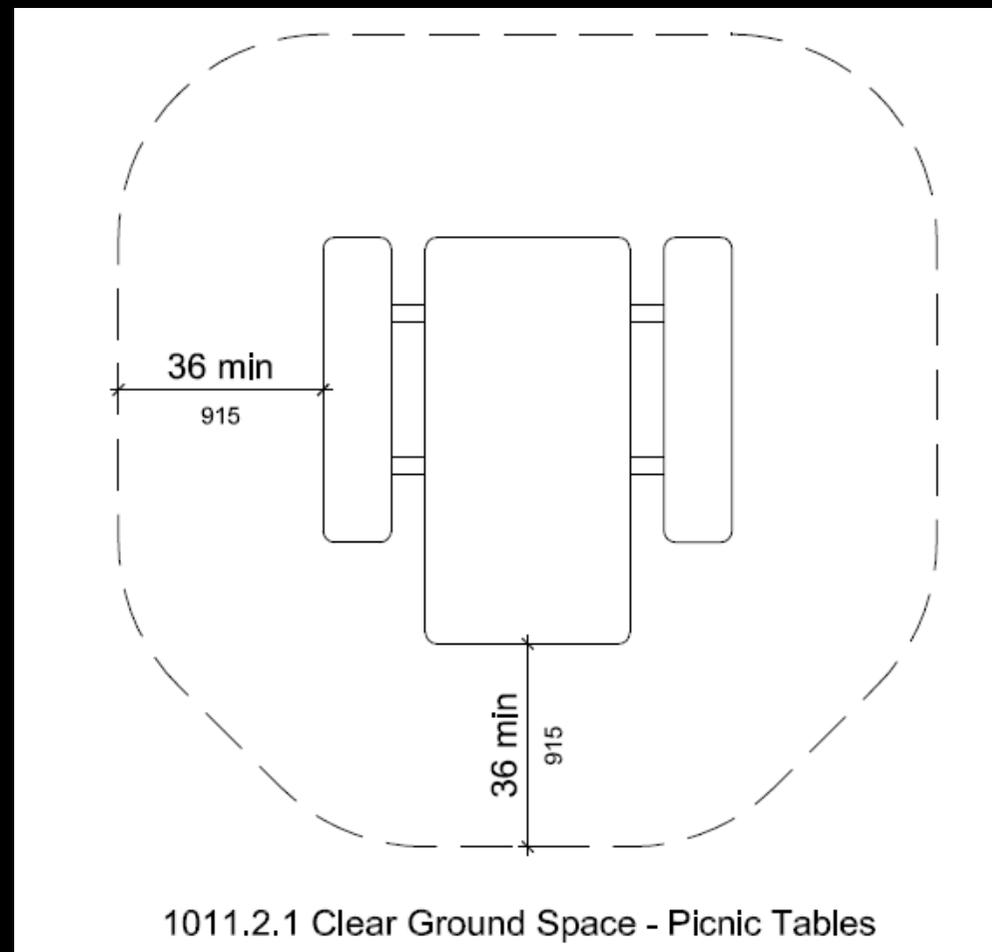
Water Spout



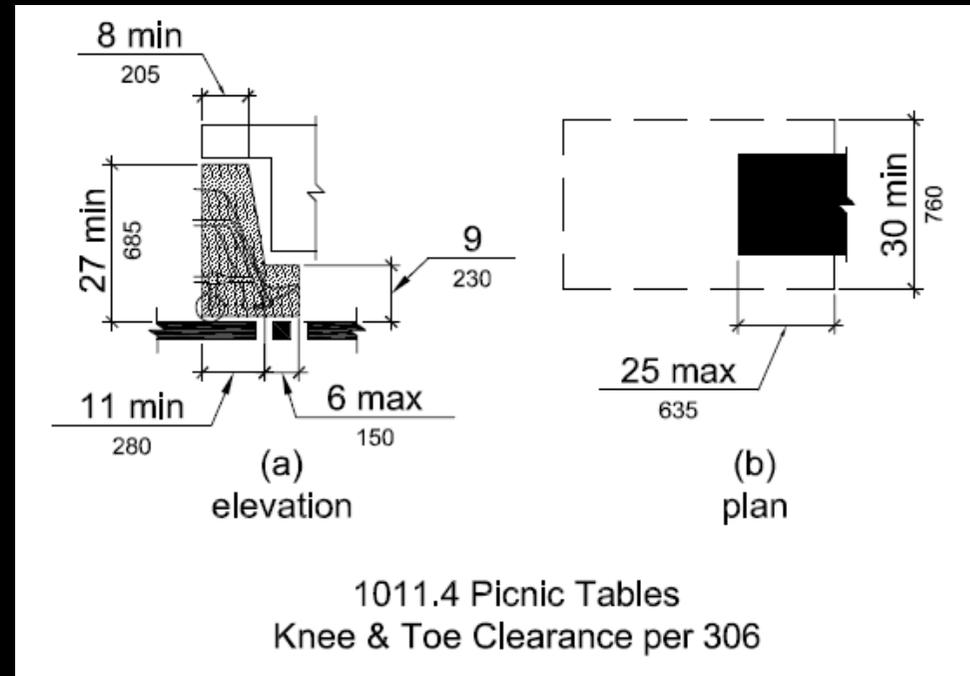
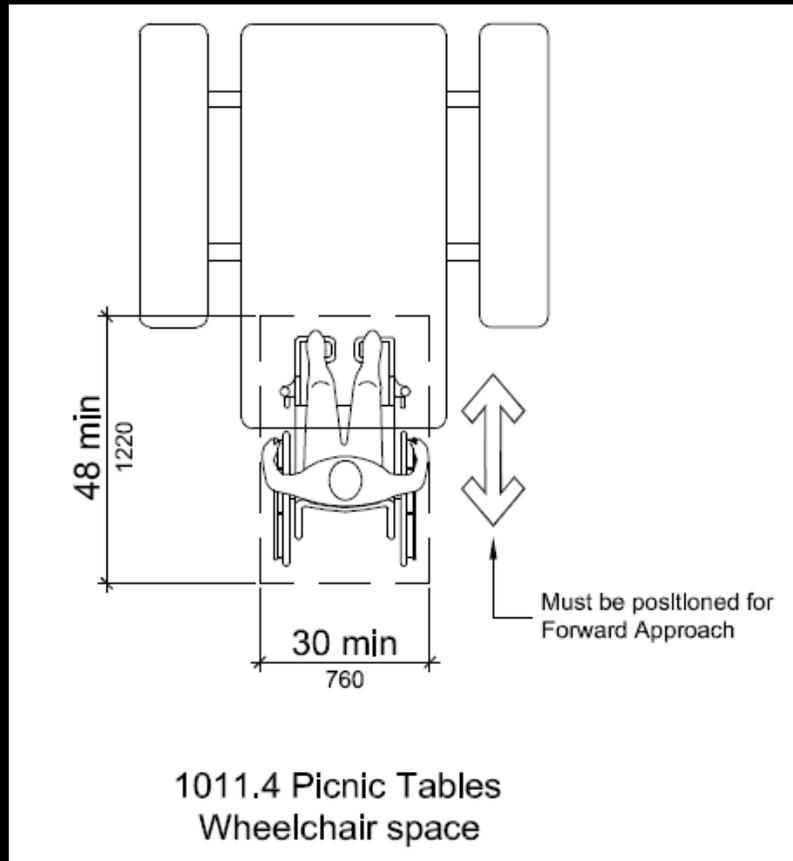
Outdoor Constructed Features: Picnic Table



Clear Ground Space
36 inches on all
useable sides

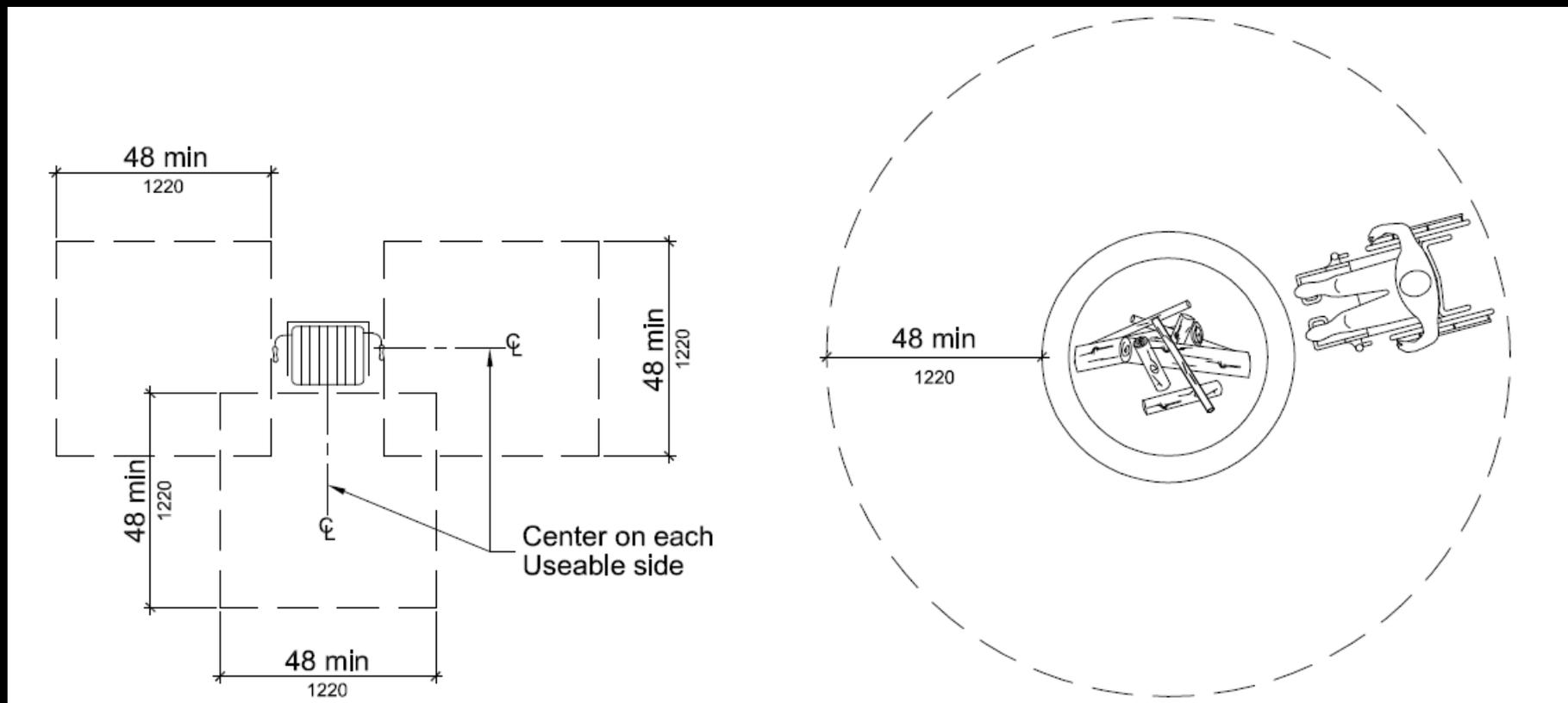


Outdoor Constructed Features: Picnic Table



Provide Wheelchair
Seating Space w/ min
Knee & Toe Clearance

Outdoor Constructed Features: Fire Rings, Grills, Fireplaces & Wood Stoves



Clear Space: 48" x 48" on all useable sides

Outdoor Constructed Features: Fire Rings, Grills, Fireplaces & Wood Stoves



Cooking Surface:

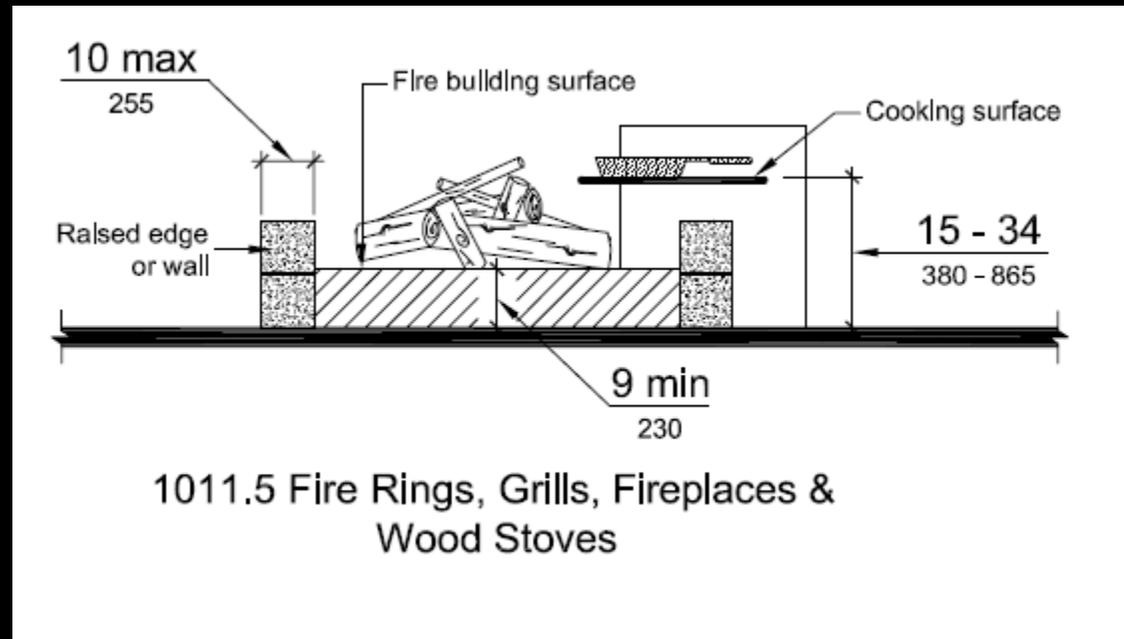
15min 34"max

Fire Building
Surface:

9"min above
Adjacent surface

Raised Edge or Wall:

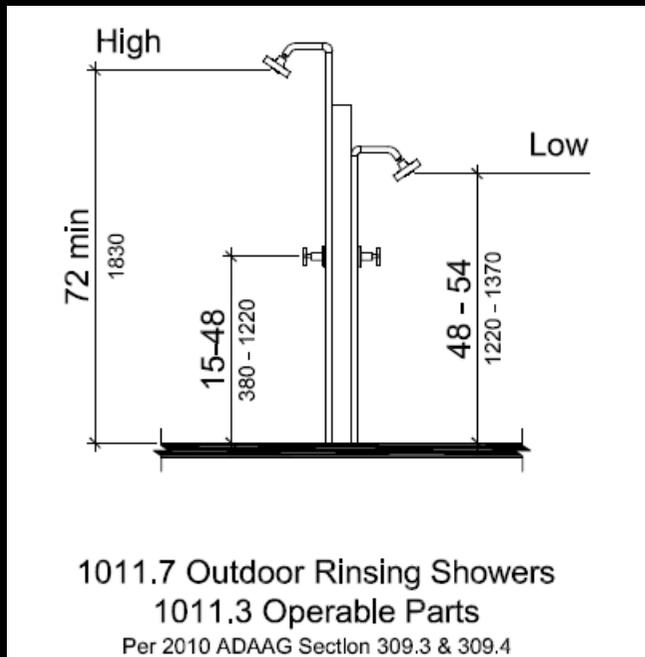
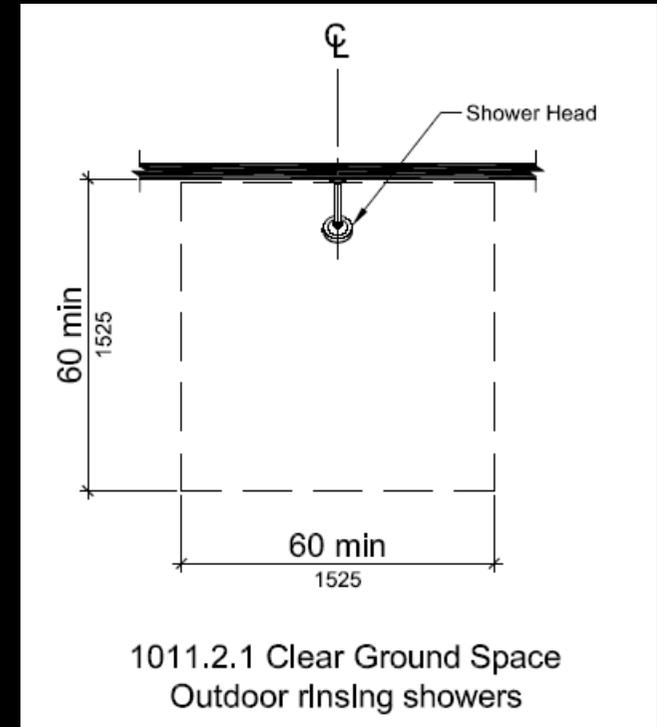
10"max wide



Outdoor Constructed Features: Outdoor Rinsing Showers



Clear Space:
60" min x 60" min, Centered
on Shower Head



Head Height:
Revision from Draft: Low only
required
Operable Parts

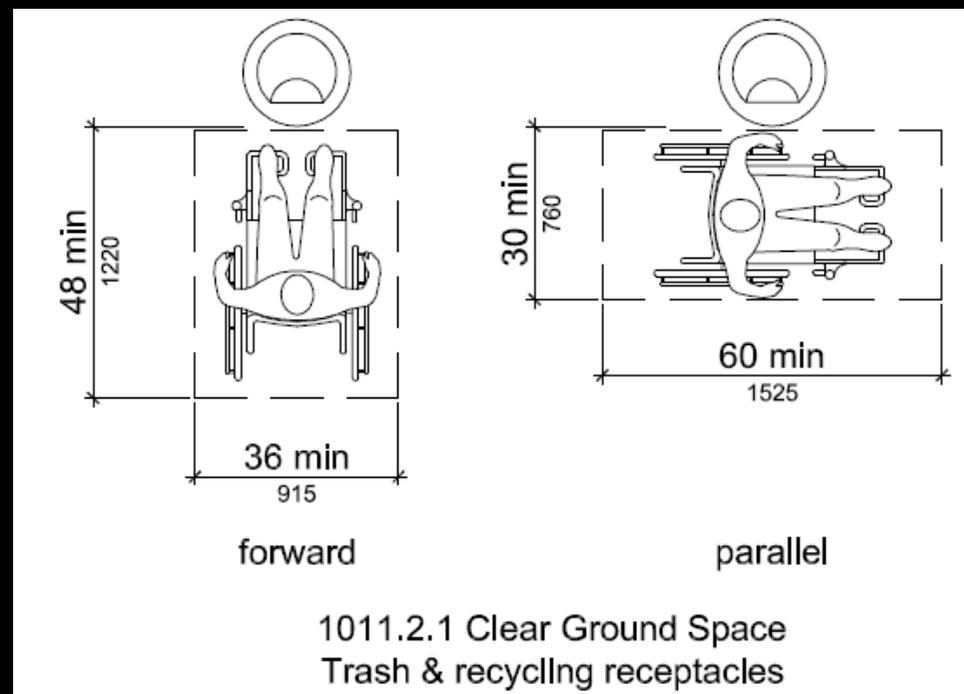
Outdoor Constructed Features: Trash & Recycling Receptacles



Clear Ground Space:

36"min x 48" Forward

60"min x 30" Parallel



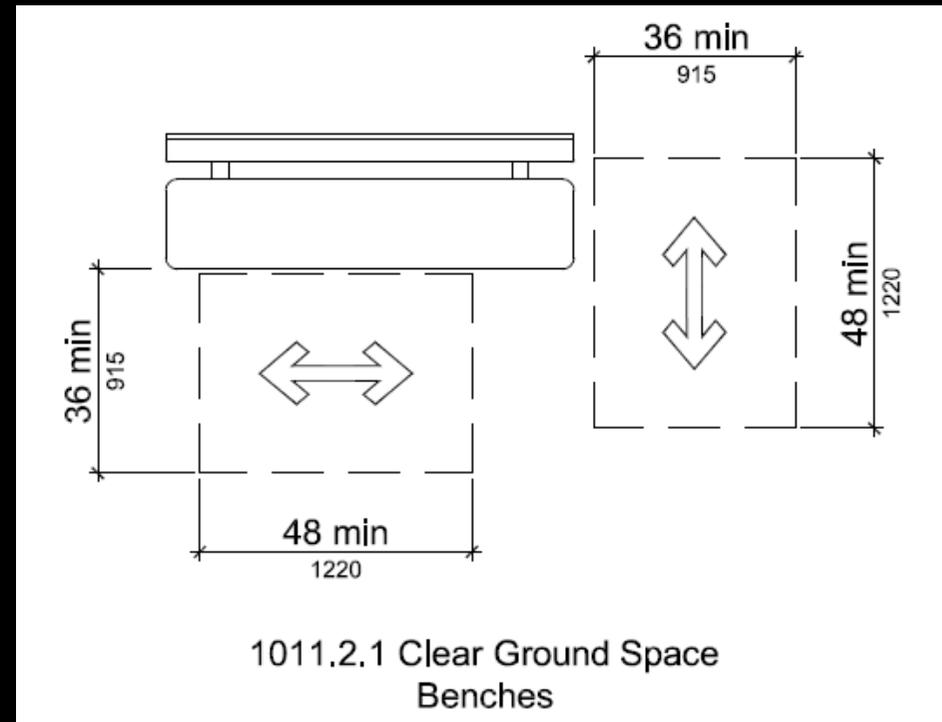
Outdoor Constructed Features: Benches



Clear Ground Space:

36"min x 48" in any orientation to the bench.

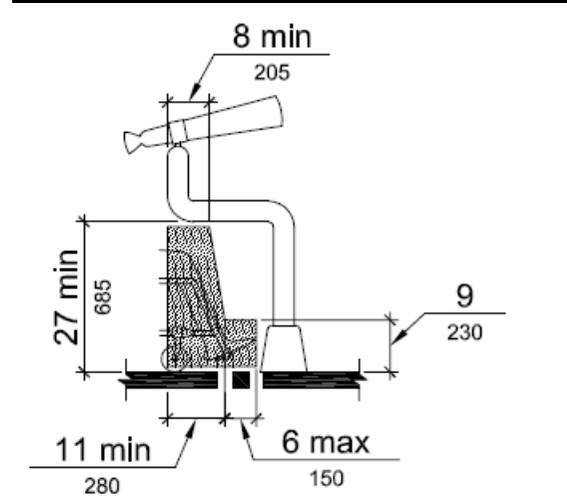
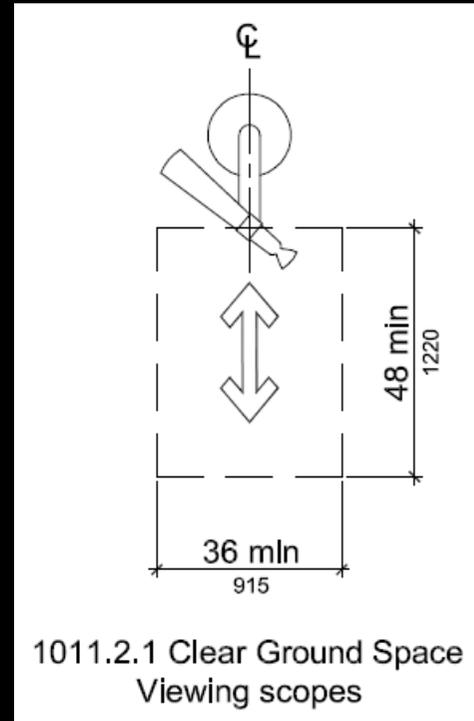
Positioned for Shoulder to Shoulder recommended



Outdoor Constructed Features: Viewing Scopes



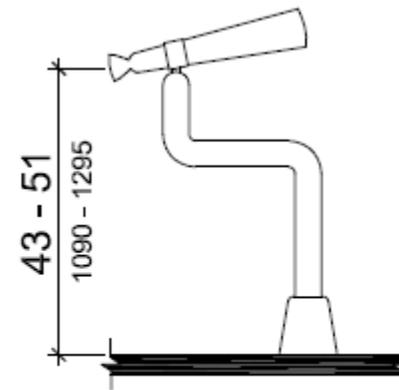
Clear Ground Space:
36"min x 48"
with min Knee & Toe
Clearance provided



Outdoor Constructed Features: Viewing Scopes



Eye Piece Height:
43"min and 51"max
above Ground
Surface



1011.2.1 Clear Ground Space
Viewing scopes, Knee & Toe Clearance (306)

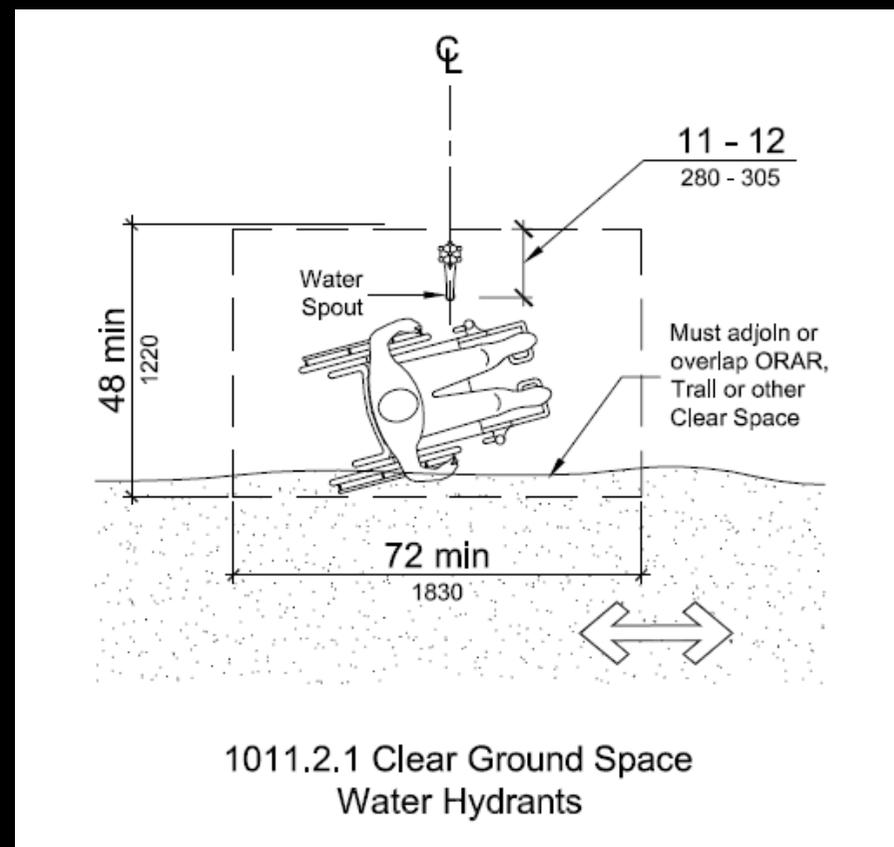
Outdoor Constructed Features: Water Hydrants



Clear Ground Space:

72"min x 48"min with
spout located 11-12"
from the back of the
Clear Space

Must adjoin or overlap
ORAR, Trail or other
Clear Space

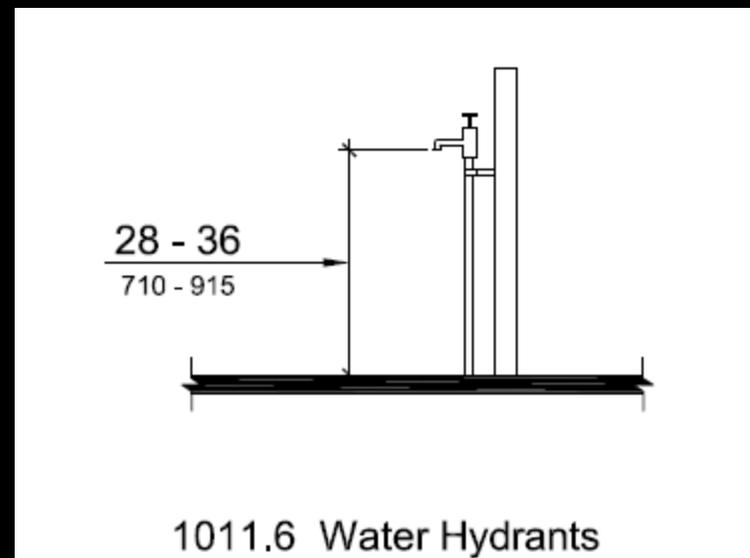


Outdoor Constructed Features: Water Hydrants



Spout Height:

28"min and 36"max
above ground surface



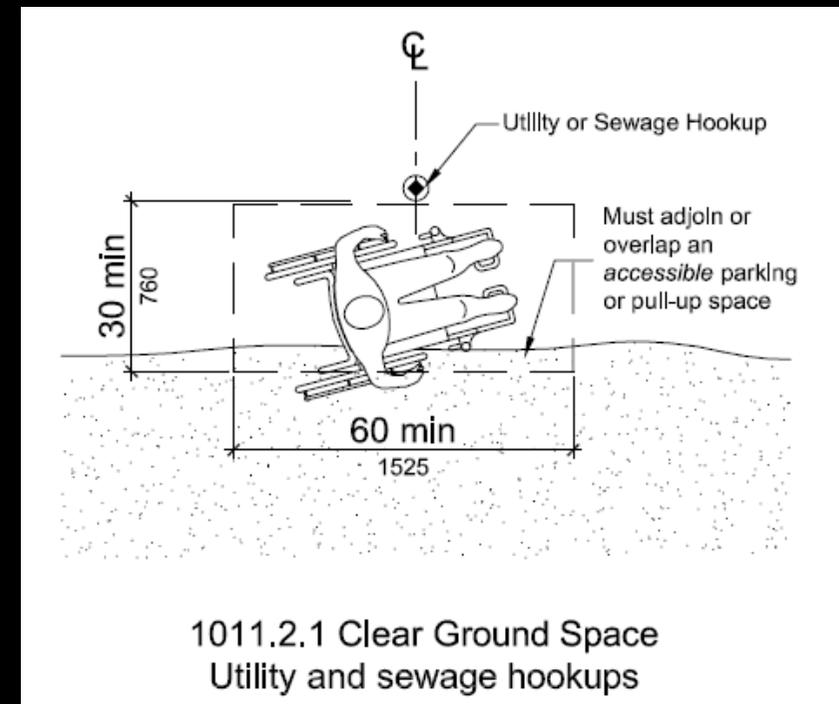
Outdoor Constructed Features: Utility & Sewage Hookups



Clear Ground Space:

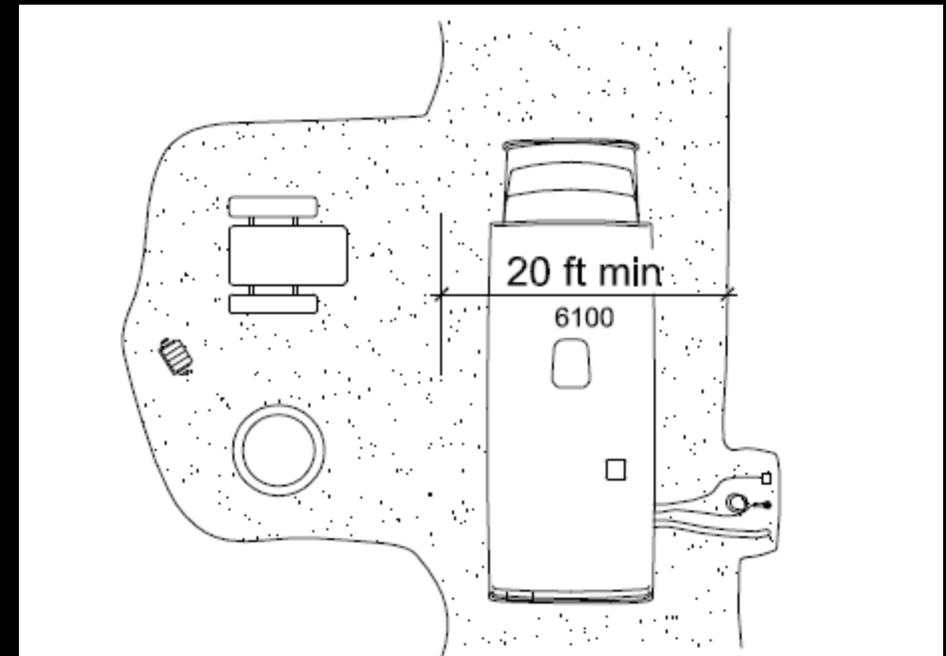
60" min x 30" min
centered on hookup

Must adjoin or overlap
accessible parking or
pull-up spaces



Outdoor Constructed Features: Recreational Vehicle Parking & Pull-up Spaces

Clear Width:
20ft min

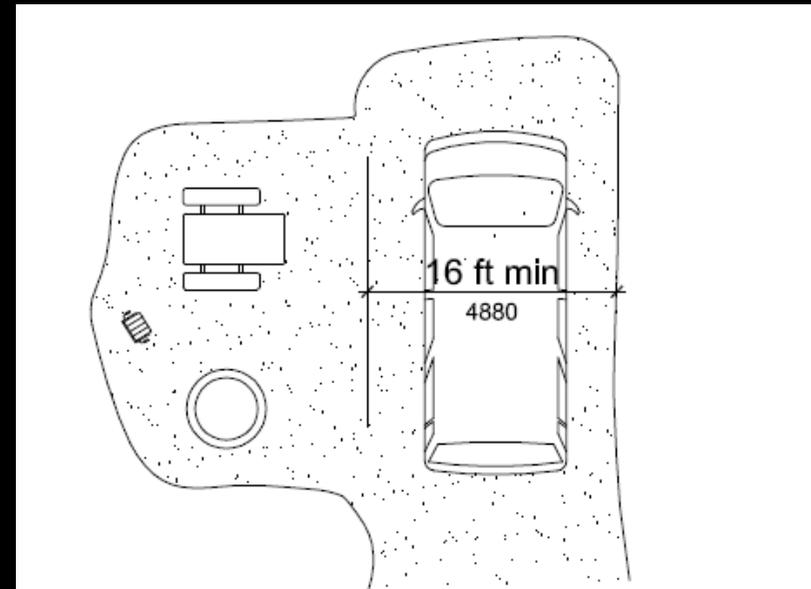


1012.2 Recreational Vehicles
Parking Spaces within Accessible Camping
Units and Picnic Units and Pull-Up Spaces at
RV Dump Stations

Outdoor Constructed Features: Parking & Pull-up Spaces



Clear Width:
16ft min



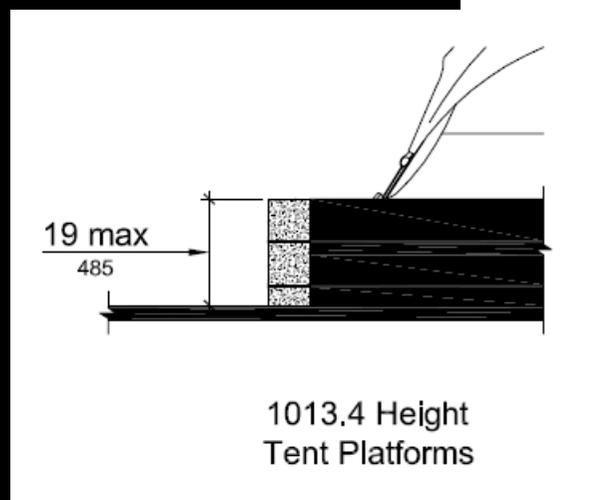
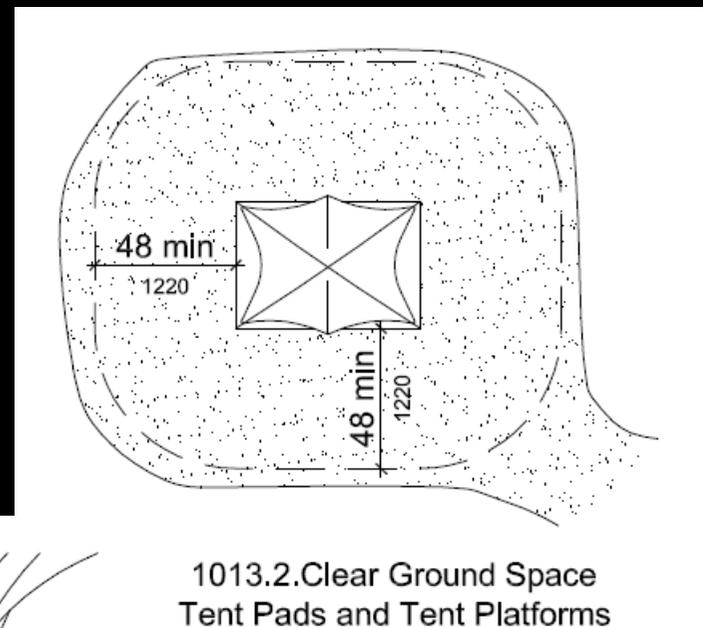
1012.3 Other Vehicles
Parking Spaces within Accessible Camping
Units and Picnic Units and Pull-Up Spaces at
RV Dump Stations

Outdoor Constructed Features: Tent Pads & Tent Platforms



Clear Ground Space:
48" min around tent
space

Platform Height:
19" max

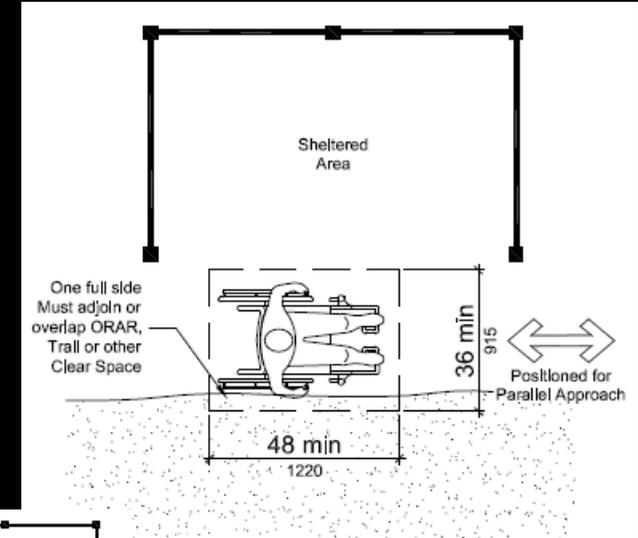


Outdoor Constructed Features: Camp Shelters



Clear Ground Space:

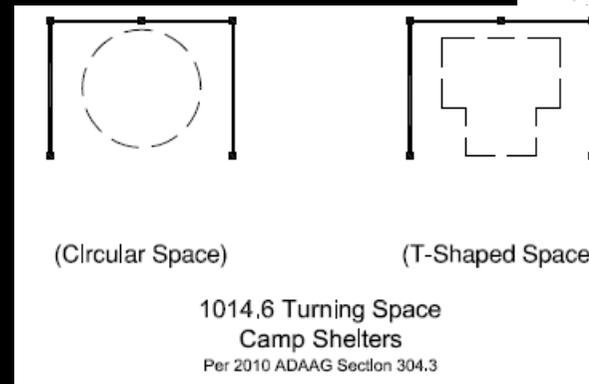
48" min x 36" min, Parallel,
& Overlapping



1014.2 Clear Ground Space
Camp Shelters

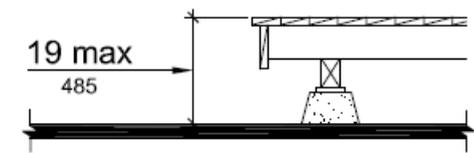
Turning Space:

Per section 304.3



Platform Height:

19" max

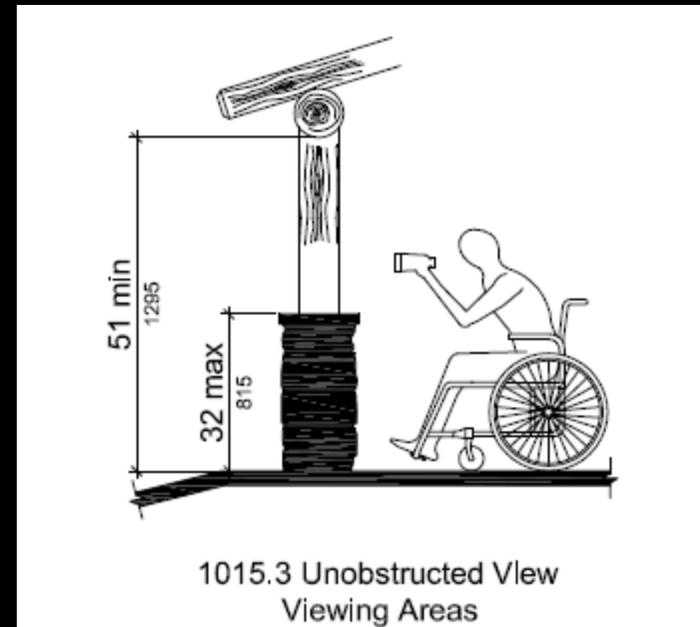


1014.5 Floor Height
Camp Shelters

Outdoor Constructed Features: Viewing Areas



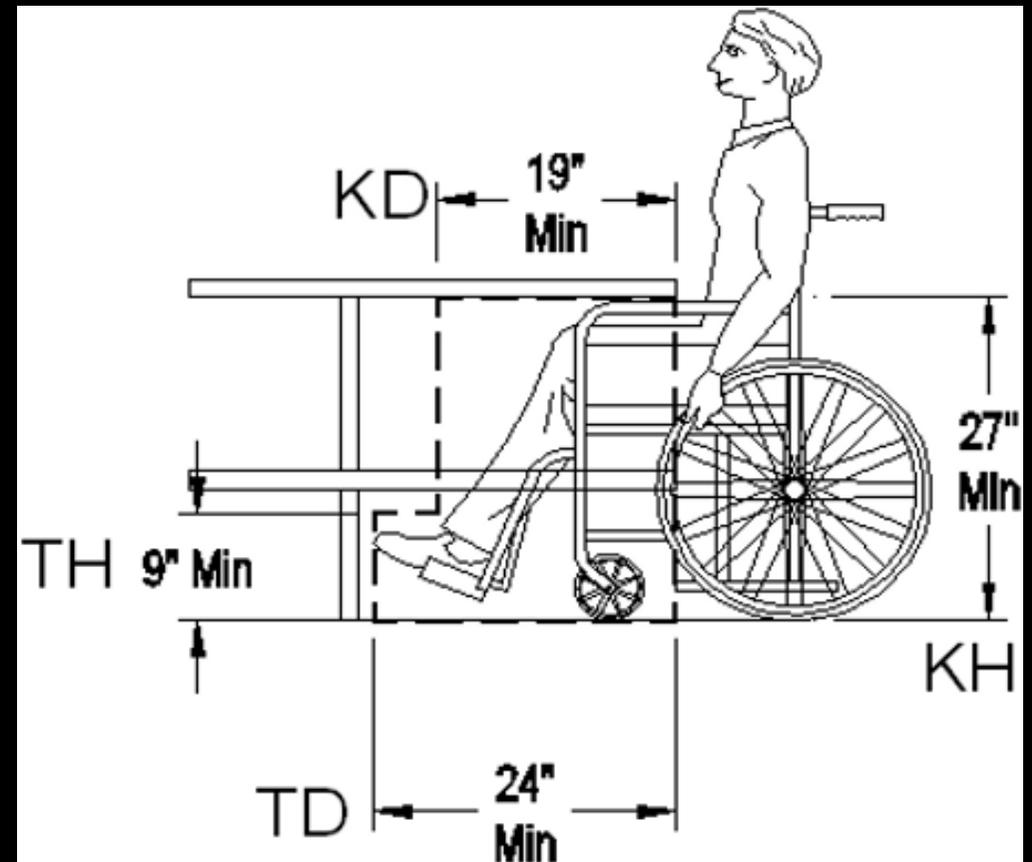
Clear Vertical Space:
From 32" max to 51" min





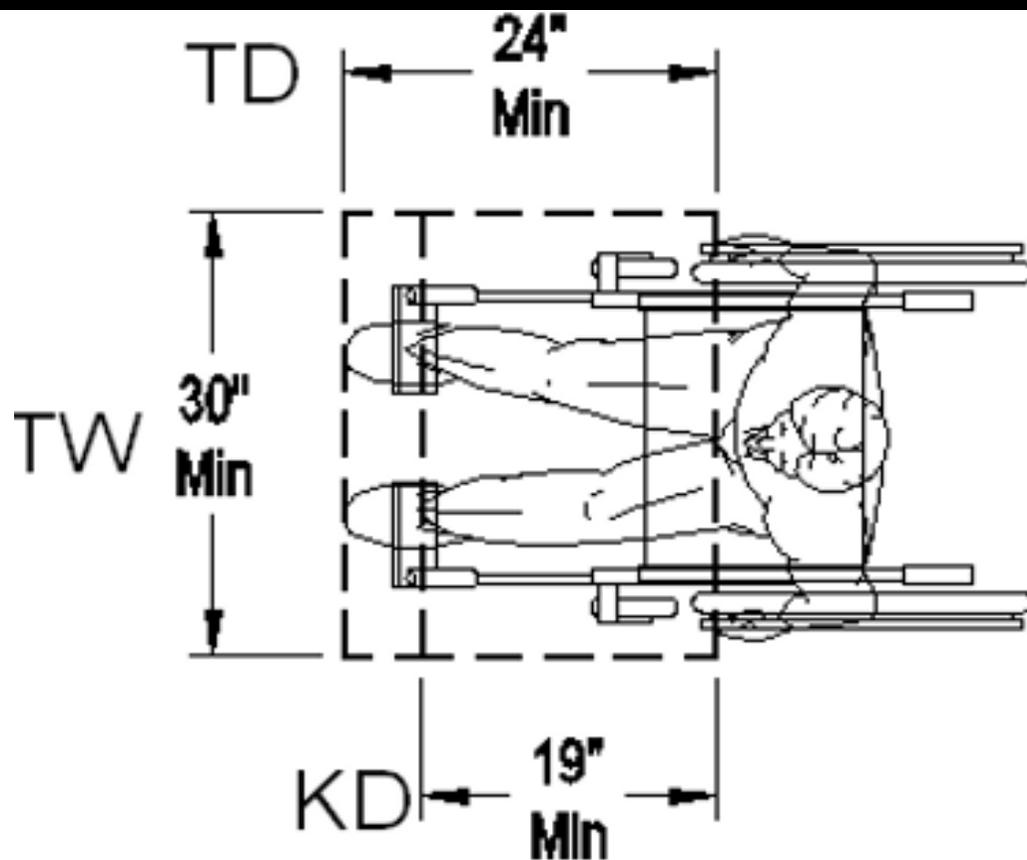
Clearance Space

	Min	Actual
TW (Total Width)	30 in	in
KD (Knee Depth)	19 in	in
KH (Knee Height)	27 in	in
TD (Toe Depth)	24 in	in
TH (Toe Height)	9 in	in
Accessible Spaces Available		
Perimeter Clear	Y	N



Clearance Space

	Min	Actual
TW (Total Width)	30 in	in
KD (Knee Depth)	19 in	in
KH (Knee Height)	27 in	in
TD (Toe Depth)	24 in	in
TH (Toe Height)	9 in	in
Accessible Spaces Available		
Perimeter Clear	Y	N



Min Requirements of Trail Signs in AGODA



1017.11 Trail Signs. *Trail signs shall include the following information:*

- 1. Length of the *trail or trail segment;***
- 2. Surface type;**
- 3. Typical and minimum tread width;**
- 4. Typical and maximum *running slope; and***
- 5. Typical and maximum *cross slope.***

TAI Information Sheet



Trail Uses



Hiking

Dogs on Leash



No Bikes



No Equestrians



No Motorized Vehicles

Hazards and Obstructions



Step
30



Rock
12



Root
6



Trail
Access
Information

Pacific Crest Trail

Eldorado National Forest

Trail Length 1.1 mi (1.8 km)

Linear trail

Trail is part of the Pacific Crest National Scenic Trail and starts next to the seasonally open visitor center at Carson Pass. Restrooms are available at trailhead. A \$3.00 parking charge is required to park and hike.

Envelopes/depository for fee is present. An overnight camping permit is required if staying overnight. Several local and regional maps are displayed at the trailhead.

Cumulative	Gain 427 ft (130 m)
Elevation Change	Loss 82 ft (25 m)



Typical Grade is 8.5%

48% of the trail is between 8% and 22%
144 ft (44 m) is between 20% and 22%
8% grade is a standard ramp.



Typical Cross Slope is 3.1%

20% of the trail is between 5% and 11%
226 ft (69 m) is between 8% and 11%



Typical Tread Width is 49 in (124 cm)

Tread Width ranges from 14 in (36 cm) to 100 in (254 cm)



Trail Surface is Soil

100% of the trail is Hard or better
5962 ft (1817 m) of the trail is Firm or better

Trailhead Location

At Carson Pass on Highway 88 directly on north side of the seasonally

Warning: Trail conditions may have changed since this trail was assessed. Temporary obstructions (e.g. fallen trees or land slides) may not have been mapped. Maximum grades and cross slopes may vary.

Obstructions less than 6.0 in (15 cm) or outside the tread area 12 in wide by 120 in (3 m) high were not measured. Minimum clearance boundaries were at least 12 in high.

This report has been generated by TrailWare which has been created by Beneficial Designs, Inc.

Trail Access Information (TAI) to Convey to Users

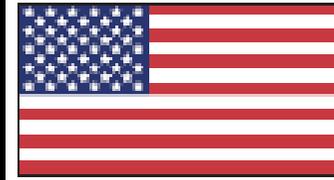
Grade

Cross Slope

Tread Width

Surface

Obstructions



Ruins Loop

Fort Churchill
State Historic Park

Length 0.6 mi (1.0 km)

Hikers

Bikes

Dogs OK

Equestrians

No Motorized Vehicles

Grade

Typical Grade 2.6%

8% of the trail is 5% to 12%

23 ft (7 m) is 12% to 17%
8% grade is a standard ramp

Cross Slope

Typical Cross Slope 5.9%

13% of the trail is 10% to 15%

455 ft (139 m) is 15% to 28%
8% grade is a standard ramp

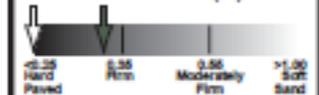
Tread Width

Typical 19 in (48 cm)
Minimum 12 in (31 cm)

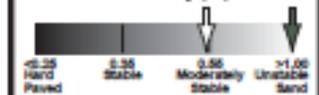
Surface

Soil
3% of the trail is Soft

Typical Firmness (In) 0.21
Minimum Firmness (In) 0.32



Typical Stability (In) 0.54
Minimum Stability (In) 1.03



Obstructions

Multiple 6 in (15.2 cm) Rocks

WARNING: Trail conditions may have changed since January 2004 when this trail was assessed. Temporary obstacles were not mapped.

Signage created by Beneficial Design, Inc. using data collected by a certified trail assessment coordinator.

Trail Access Information

Sparks Blvd. Bike Path
City of Sparks
Truckee River to Pyramid Hwy.
Length 6.8 mi (10.9 km)

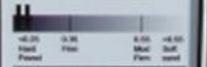
-  Hikers
-  Dogs on Leash
per posted restrictions
-  Bikes
-  No Equestrians
-  No Motorized Vehicles

 **Grade**
Typical Grade 1.7%
4% of the trail is 5% to 8%
131 ft (40 m) is 8% to 15%
8% grade is a standard ramp.

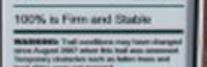
 **X-Slope**
Typical Cross Slope 2.3%
5% of the trail is 5% to 8%
185 ft (56 m) is 8% to 14%

 **Tread Width**
Typical Tread Width
109 in (276 cm)

 **Surface Type**
Concrete / Asphalt
Typical Firmness 0.19
Minimum Firmness 0.22



Typical Stability 0.25
Minimum Stability 0.27



100% is Firm and Stable

 **Trail Access Information**

TAI on Wooden Post





Narrow Trails



Color and Logos



Dune Trek
National Recreation Area

Length: 0.8 mi (1.3 km)
Elev. Gain: 600 ft (183 m)
Elev. Loss: 600 ft (183 m)
Elev. Range: 4,000 ft (1,220 m)

Icons:
• Water
• Shelter
• Single Use Location
• Restricted Area
• No Motorized Vehicles
• Grade

Grade:
Normal Grade: 4.0%
Steepest Grade: 10%
Average Grade: 4.0%
Steepest Grade: 10%
Average Grade: 4.0%

Cross Slope:
Normal Cross Slope: 4.0%
Steepest Cross Slope: 10%
Average Cross Slope: 4.0%
Steepest Cross Slope: 10%
Average Cross Slope: 4.0%

Tread Width:
Normal: 50 ft (15 m)
Steepest: 50 ft (15 m)

Surface:
Surface Type: Sand
Surface Condition: Very Soft
Surface at End of Trail: Sand
Normal Tread Width: 5.0 ft (1.5 m)
Steepest Tread Width: 5.0 ft (1.5 m)
Average Tread Width: 5.0 ft (1.5 m)
Steepest Tread Width: 5.0 ft (1.5 m)
Average Tread Width: 5.0 ft (1.5 m)

Map:
Map of the area showing the trail route.

Southside Lions Park



0 ft 300 ft

LEGEND

- Dam
- Bridge
- Parking
- Restroom
- Park Entrance
- Shelter / Pavilion
- Courts/Fields
- Playground
- River/Creek
- Road

A 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
Southside Lions	1.8 mi	2.1%	24.8 to 11%	1.2%	21.8 to 9%	120 in	60 in	Asphalt

Balance
 Merrill Lynch
 HDR
 WARNING: This map is for informational purposes only. It is not intended to be used as a legal document. The information is subject to change without notice.



LEGEND

-  Dam
-  Bridge
-  Parking
-  Restroom
-  Park Entrance
-  Shelter / Pavilion
-  Courts/Fields
-  Playground
-  River/Creek
-  Road



-  Road
-  River/Creek

Eisenhower Park Trails

A Trail Access Information

Typical Trail Qualities

Trail Name	Length	Typical Grade	Maximum Grade Standard Ramp is 8.3%	Typical Cross Slope	Maximum Cross Slope	Typical Tread Width	Minimum Clearance Width	Surface Type
Red Oak Trail	0.5 mi	7.1%	78 ft is 20% - 29%	5.7%	78 ft is 20% - 22%	48 in	48 in	Aggregate / Gravel
Shady Creek Trail	0.4 mi	5.4%	66 ft is 15% - 29%	4.4%	145 ft is 13% - 17%	44 in	36 in	Aggregate / Gravel
Cedar Flats Trail	0.8 mi	4.3%	133 ft is 15% - 21%	3.5%	87 ft is 9% - 10%	84 in	84 in	Asphalt
Hillview Natural Trail	2.6 mi	4.8%	353 ft is 21% - 37%	3.5%	231 ft is 15% - 26%	55 in	36 in	Crushed Stone (Fines)
Yucca Paved Trail	1.6 mi	4.0%	67 ft is 21% - 39%	3.3%	111 ft is 16% - 24%	72 in	30 in	Wood Chip / Mulch
Observation Tower Trail	0.1 mi	4.7%	124 ft is 11% - 17%	2.9%	45 ft is 6%	96 in	96 in	Asphalt
Live Oak Trail	0.1 mi	4.5%	33 ft is 11% - 15%	4.2%	65 ft is 10% - 19%	60 in	60 in	Wood Chip / Mulch



WARNING:

Trail conditions may have changed since March 2011 when these trails were assessed. Signage created by Beneficial Designs Inc. using trail data collected by a certified trail assessment coordinator.

Trail Name	Length	Typical Grade	Maximum Grade	Typical Cross Slope	Maximum Cross Slope	Typical Tread Width	Minimum Clearance Width	Surface Type
Red Oak Trail	0.5 mi	7.1%	78 ft is 20% - 29%	5.7%	78 ft is 20% - 22%	48 in	48 in	Aggregate / Gravel
Shady Creek Trail	0.4 mi	5.4%	66 ft is 15% - 29%	4.4%	145 ft is 13% - 17%	44 in	36 in	Aggregate / Gravel
Cedar Flats Trail	0.8 mi	4.3%	133 ft is 15% - 21%	3.5%	87 ft is 9% - 10%	84 in	84 in	Asphalt
Hillview Natural Trail	2.6 mi	4.8%	353 ft is 21% - 37%	3.5%	231 ft is 15% - 26%	55 in	36 in	Crushed Stone (Fines)
Yucca Paved Trail	1.6 mi	4.0%	67 ft is 21% - 39%	3.3%	111 ft is 16% - 24%	72 in	30 in	Wood Chip / Mulch
Observation Tower Trail	0.1 mi	4.7%	124 ft is 11% - 17%	2.9%	45 ft is 6%	96 in	96 in	Asphalt
Live Oak Trail	0.1 mi	4.5%	33 ft is 11% - 15%	4.2%	65 ft is 10% - 19%	60 in	60 in	Wood Chip / Mulch



Washoe Lake State Park

TRAIL USE

- Hiking
- Bicycles
- Equestrian
- Dogs on Leash
- No Motor Vehicles

- No public access beyond viewing tower on Wetlands Loop February 1-July 15 to protect nesting habitat
- No bicycles allowed on Wetlands Loop
- No equestrians allowed on Wetlands Loop and Deadman's Creek Trail

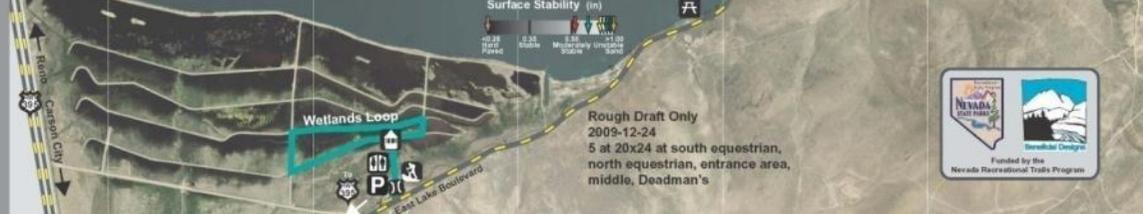
LEGEND

- Bridge
- Parking
- Restroom
- Picnic Area
- Boat Launch
- Drinking Water
- Maximum Grade
- Stair Viewing Tower
- Entrance Fee Station
- Horse Trailer Parking

A Trail Access Information

Trail Name	Length	Typical Grade	Maximum Grade	Typical Cross Slope	Maximum Cross Slope	Typical Tread Width	Minimum Clearance Width	Surface Type	Surface Firmness	Surface Stability
Beach Stroll	2.7 mi	1.8%	220 ft is 8 - 9%	2.8%	473 ft is 8 - 11%	42 ft	20 ft	Sand	0.98 1.00 2.01 2.03	
Day Use Pathway	0.4 mi	2.2%	9 ft is 9 - 15%	2.9%	333 ft is 5 - 7%	6 ft	48 in	Asphalt	0.16 0.16 0.18 0.18	
Deadman's Creek Trail	0.6 mi	7.5%	309 ft is 16 - 28%	7.8%	298 ft is 16 - 26%	26 in	16 in	Soil	0.17 0.18 0.46 0.57	
Dune Trek	2.4 mi	9.2%	175 ft is 35 - 49%	4.2%	217 ft is 15 - 23%	32 in	18 in	Sand	0.77 0.80 1.93 2.00	
East Loop	3.8 mi	2.0%	106 ft is 8 - 15%	1.8%	35 ft is 8 - 13%	43 in	18 in	Sand	0.41 0.53 1.06 1.59	
North Loop	3.4 mi	1.8%	173 ft is 10 - 27%	2.4%	200 ft is 7 - 9%	60 in	24 in	Sand	0.47 0.68 1.14 1.82	
South Loop	2.5 mi	1.6%	316 ft is 5 - 6%	2.1%	738 ft is 5 - 7%	60 in	24 in	Sand	0.35 0.43 0.71 0.96	
Wetlands Loop	1.1 mi	1.3%	335 ft is 5 - 11%	1.6%	28 ft is 5 - 11%	7 ft	48 in	Aggregat Gravel	0.23 0.27 0.61 0.67	

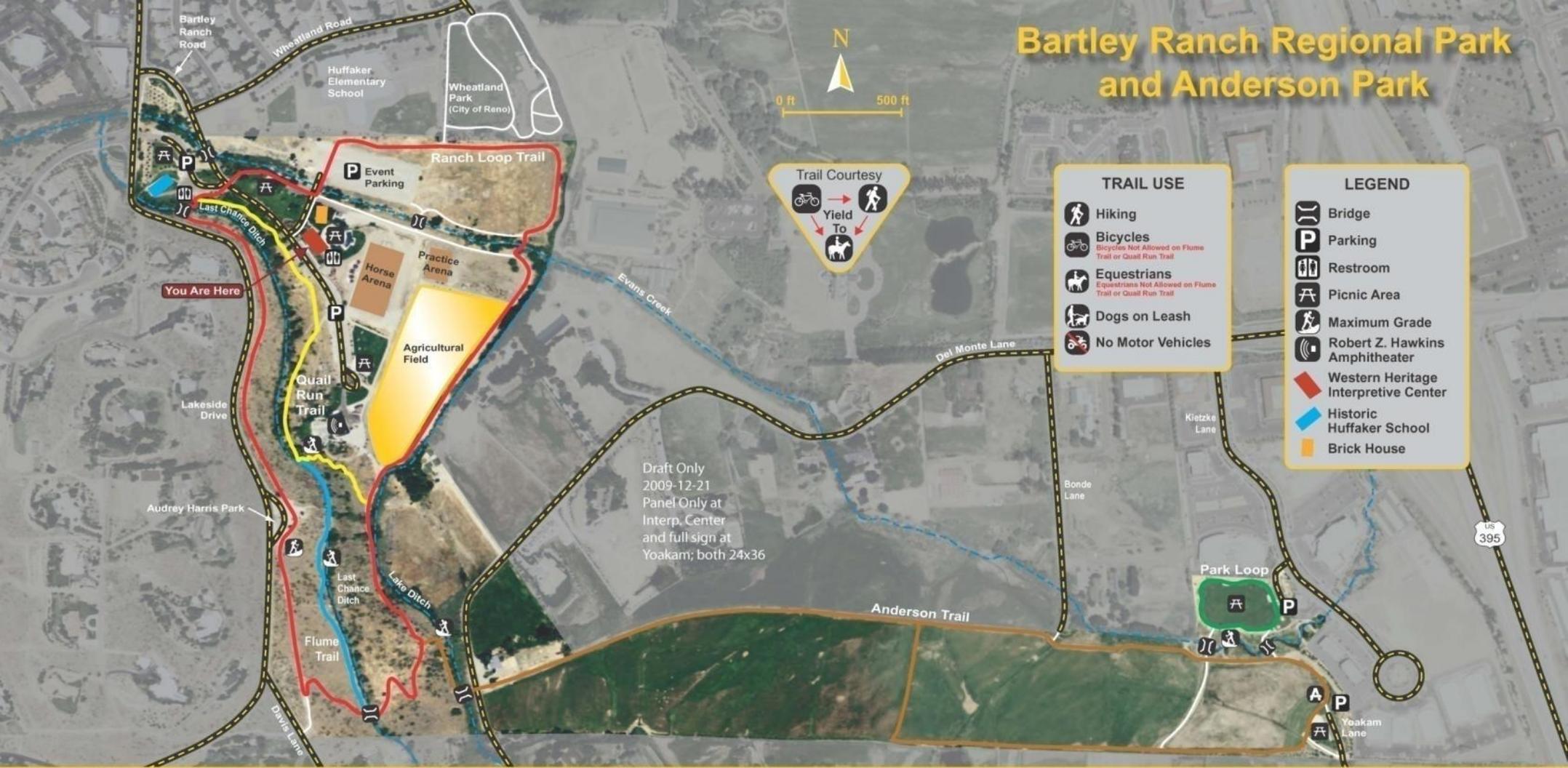
WARNING: Trail conditions may have changed since January 2009 when these trails were assessed. Secondary trails are shown in black. Not all trails are mapped. Signage created by Beneficial Designs Inc. using trail data collected by a certified trail assessment coordinator.



Rough Draft Only
2009-12-24
5 at 20x24 at south equestrian, north equestrian, entrance area, middle, Deadman's



Bartley Ranch Regional Park and Anderson Park



- TRAIL USE**
- Hiking
 - Bicycles
Bicycles Not Allowed on Flume Trail or Quail Run Trail
 - Equestrians
Equestrians Not Allowed on Flume Trail or Quail Run Trail
 - Dogs on Leash
 - No Motor Vehicles

- LEGEND**
- Bridge
 - Parking
 - Restroom
 - Picnic Area
 - Maximum Grade
 - Robert Z. Hawkins Amphitheater
 - Western Heritage Interpretive Center
 - Historic Huffaker School
 - Brick House

Trail Name	Length	Typical Grade	Maximum Grade	Typical Cross Slope	Maximum Cross Slope	Typical Trail Width	Minimum Clearance Width	Surface Type	Surface Firmness		Surface Stability	
									Typical	Worst	Typical	Worst
Ranch Loop Trail	1.5 mi	4.5%	371 ft is 16% – 25%	2.8%	18 ft is 16% – 20%	90 in	40 in	Aggregate/Gravel	0.19	0.22	0.36	0.60
Quail Run Trail	0.4 mi	7.3%	186 ft is 20% – 40%	3.5%	46 ft is 18% – 30%	60 in	25 in	Aggregate/Gravel	0.19	0.22	0.39	0.50
Flume Trail	0.2 mi	4.6%	37 ft is 14% – 19%	3.9%	47 ft is 12% – 14%	48 in	20 in	Soil	0.23	0.25	0.38	0.49
Anderson Trail (Round Trip)	1.7 mi	2.5%	196 ft is 14% – 21%	2.4%	311 ft is 7% – 11%	76 in	48 in	Aggregate/Gravel	0.19	0.22	0.39	0.52
Park Loop	0.2 mi	1.6%	64 ft is 4% – 5%	1.8%	230 ft is 3% – 4%	84 in	84 in	Aggregate/Gravel	0.18	0.19	0.37	0.43



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

Fort Churchill State Historic Park

TRAIL USE

- Hiking
- Bicycles
- Dogs on Leash
- No Equestrians
- No Motor Vehicles

LEGEND

- Bridge
- Parking
- Restroom
- Picnic Area
- Fee Station
- Campground
- Maximum Grade

To Highway 50
16.0 mi

To Alternate Highway 95
0.8 mi



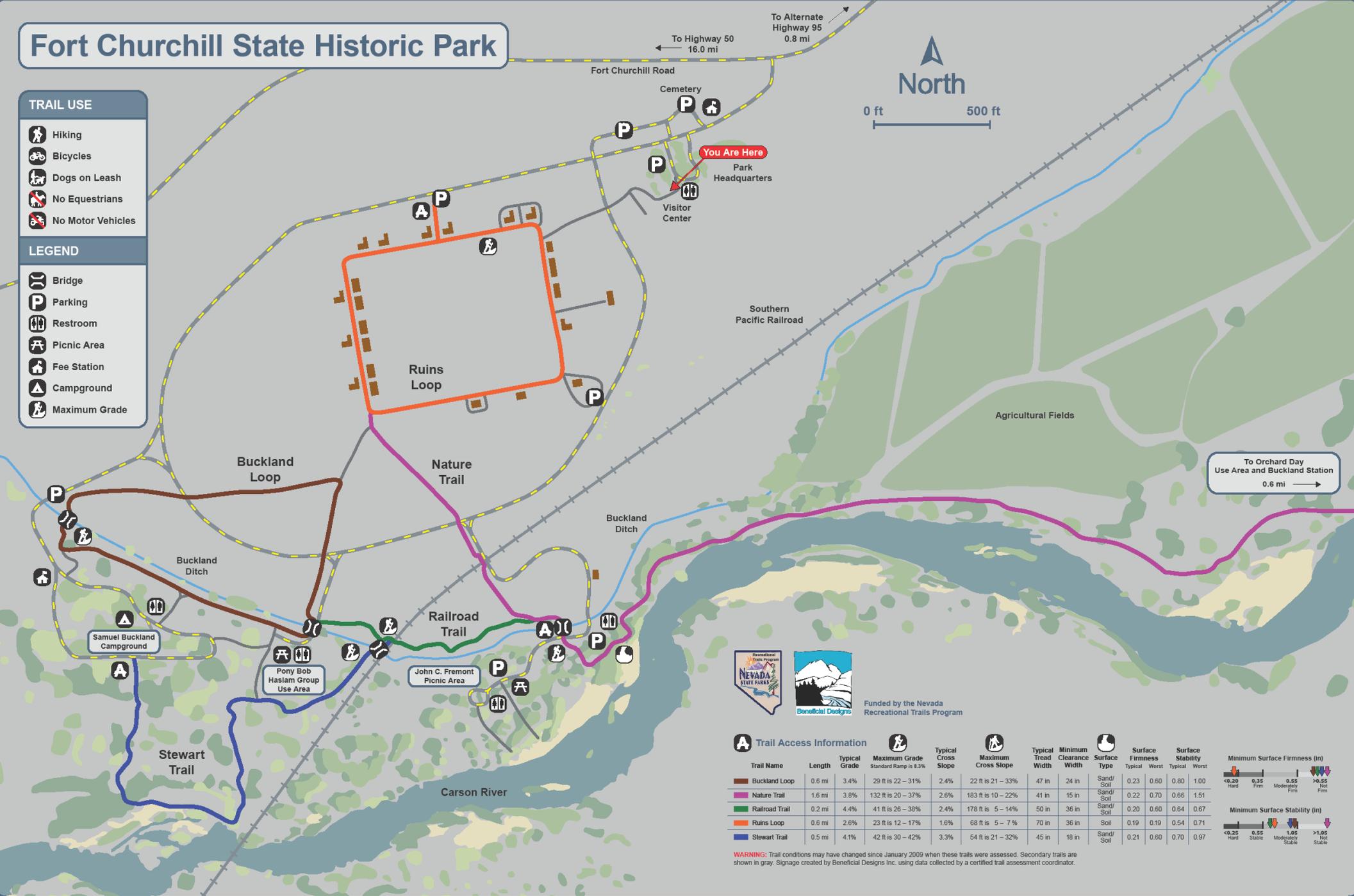
0 ft 500 ft

You Are Here

Southern Pacific Railroad

Agricultural Fields

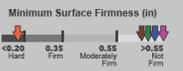
To Orchard Day Use Area and Buckland Station
0.6 mi



Funded by the Nevada Recreational Trails Program

A Trail Access Information

Trail Name	Length	Typical Grade	Maximum Grade Standard Ramp is 8.3%	Typical Cross Slope	Maximum Cross Slope	Typical Tread Width	Minimum Clearance Width	Surface Type	Surface Firmness		Surface Stability	
									Typical	Worst	Typical	Worst
Buckland Loop	0.6 mi	3.4%	29 ft is 22 – 31%	2.4%	22 ft is 21 – 33%	47 in	24 in	Sand/Soil	0.23	0.60	0.80	1.00
Nature Trail	1.6 mi	3.8%	132 ft is 20 – 37%	2.6%	183 ft is 10 – 22%	41 in	15 in	Sand/Soil	0.22	0.70	0.66	1.51
Railroad Trail	0.2 mi	4.4%	41 ft is 26 – 38%	2.4%	178 ft is 5 – 14%	50 in	36 in	Sand/Soil	0.20	0.60	0.64	0.67
Ruins Loop	0.6 mi	2.6%	23 ft is 12 – 17%	1.6%	68 ft is 5 – 7%	70 in	36 in	Soil	0.19	0.19	0.54	0.71
Stewart Trail	0.5 mi	4.1%	42 ft is 30 – 42%	3.3%	54 ft is 21 – 32%	45 in	18 in	Sand/Soil	0.21	0.60	0.70	0.97



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

Lampe Park



0 ft 500 ft

TRAIL USE

- Hiking
- Bicycles
- No Dogs
- No Equestrians
- No Motor Vehicles

LEGEND

- Bridge
- Parking
- Ball Field
- Restroom
- Skate Park
- Playground
- Picnic Area
- Horseshoes
- Soccer Field
- Tennis Court
- Batting Cage
- Group Pavilion
- Sand Volleyball
- Park Boundary

Trail Name	Outer Loop Trail	Inner Loop Trail	Senior Center Trail
Length	0.8 mi	0.6 mi	0.2 mi
Typical Grade Standard Ramp is 8.3%	1.3%	1.1%	1.5%
Maximum Grade 	17 ft is 5 – 8%	41 ft is 3 – 5%	27 ft is 5 – 6%
Typical Cross Slope	1.5%	1.0%	1.1%
Maximum Cross Slope 	142 ft is 5 – 6%	246 ft is 4 – 6%	63 ft is 3 – 5%
Typical Tread Width	10 ft	12 ft	9 ft
Minimum Clearance Width	49 in	8 ft	7 ft
Surface Type 	Decomposed Granite/Pavers	Decomposed Granite/Pavers	Decomposed Granite
Typical Surface Firmness	0.20 in (Worst 0.23 in)	0.20 in (Worst 0.23 in)	0.19 in (Worst 0.23 in)
Typical Surface Stability	0.26 in (Worst 0.33 in)	0.26 in (Worst 0.33 in)	0.28 in (Worst 0.33 in)

Minimum Surface Firmness (in)



Minimum Surface Stability (in)



WARNING: Trail conditions may have changed since July 2007 when these trails were assessed. Secondary trails are shown in gray. Signage created by Beneficial Designs Inc. using data collected by a certified trail assessment coordinator.

A Trail Access Information



Douglas County Parks & Recreation Offices



Funded by the Nevada Recreational Trails Program

TRAIL FEATURES

Customize your search by trail use and features.

TRAIL ACCESS

Find a trail to suit your ability. Search by grade, cross-slope and surface.

TRAIL MANAGEMENT

Authorized trail managers may add or edit trail information. Contact [Beneficial Designs](#).

CONTACT US



QUICK TRAIL SEARCH



Type in (a few letters of) a park or trail name:



OR

View trails by state:



PICK OF THE MONTH



Big Basin Redwoods State Park
Boulder Creek, CA

Features 2,000 year-old redwoods and over 50 miles of trails. Reservations required for camping. Phone: 831.338.8860

Have you ever finished a three hour hike in one hour? Have you struggled on a "moderate" trail? Have you ever encountered barriers on an "easy" trail? If so, you already know the benefits of having objective trail information. The Trail Explorer website conveys objective trail information in a unique [Trail Access Information](#) format to help trail users make informed decisions about which public lands to visit, and which trails will best meet their interests, abilities and desired experiences. Trail Explorer benefits all users, but is particularly helpful for individuals who may have specific trail needs, such as individuals with disabilities, older adults, parents with young children, and novice hikers.

Acknowledgement

Trail Explorer was designed by [Beneficial Designs](#) in collaboration with [American Trails](#), land management, and disability organizations and with the support of the US Department of Education.



Internet

**Who benefits from objective
Trail Access Information
(TAI)?**

User Benefits from TAI

Consistent information

Increased independence,
safety, opportunities and
enjoyment

Responsible and informed
trail selection

Knowledge of actual
conditions

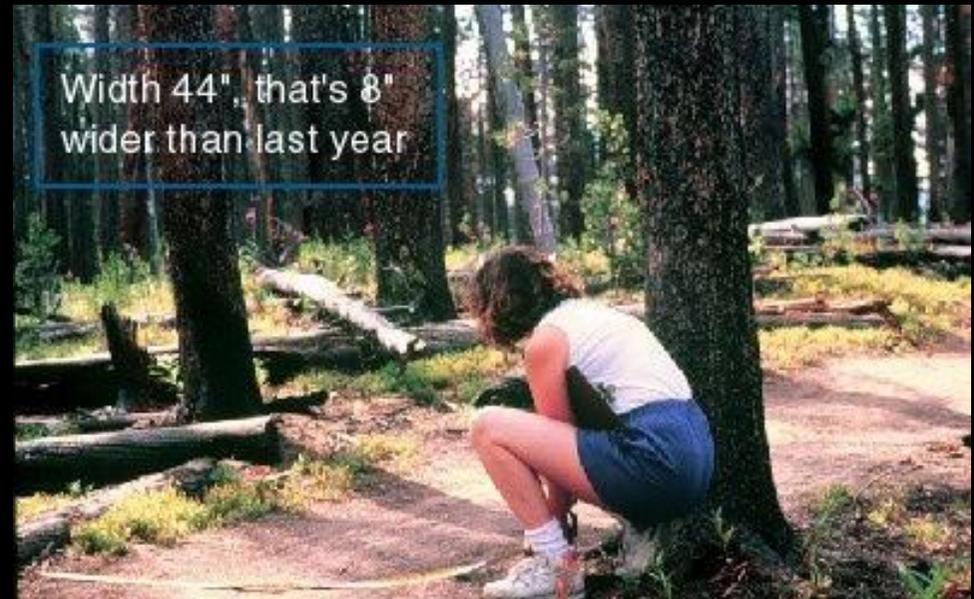


Land Manager Benefits

Increased user safety
and satisfaction

Provide more trail
opportunities

Monitoring of
environmental impact



Land Manager Benefits

Identification of work priorities

Enhanced planning & budgeting of projects

Enhanced search and rescue

Provides information for GIS (When use GPS)



People with
Disabilities



Users with limited
experience

Everyone benefits from TAI!



Children

Adults who
are older or
less fit



Unintended Benefits

Walking is one of the best exercises for people of all ages



Unintended Benefits

People with access to sidewalks and trails are 28% more likely to be physically active



(Environmental and policy determinants of physical activity in the United States, Brownson, Baker, Housemann, Brennan, & Bacak, 2001)

Unintended Benefits

Walkability adds
anywhere from
\$4,000 to \$34,000
to home values



(How Walkability Raises Home Values in U.S. Cities (Joe Cortright, Impresa, Inc., for CEOs for Cities, August 2009)

Overview Summary

Lack of information is the greatest barrier to access

UTAP & HETAP are objective, valid, repeatable and related to user perceptions

Generates and conveys all types of information for all types of trails

Benefits all users and land managers

Focuses on grade, cross slope, surface, width and features

Sidewalk Assessment Process (SWAP):

Introduced in FHWA publication...

Designing Sidewalks and Trails for
Access

Conducted using paper data forms



PROW-AP Phase I Project

Main Objectives

Automatic measurement of trip hazards
using laser technology

Develop user interface software screens
with SQL database

Demonstrate GIS sidewalk layer software
interface specifications

Wheeled Instrument Sensor Package (WISP)

Grades and Cross Slopes
measured within 0.1%
precision and 0.2% accuracy



Wheeled Instrument Sensor Package (WISP)



Automatic detection and alerting of Surface Events (i.e.: rough surface, gaps, vertical discontinuities)



Digital Measuring Wheel

Wireless Range of 60 meters

On-Device Field Collection Prompts

Measurement resolution of 0.1 Inches (1 mm)



Digital Height Measuring Device

Same Range and similar
Automatic population of Data

Measure vertical distances
from Zero to 44 inches

Measurement resolution of
.01 inches (0.1 mm)



Station Collection Page

PROWAP

Database View Toolbox Calibration Administrator Developer

Town of Minden Esmerelda Ave S Side from 5th St to 6th St Segments New Segment

Data Tree

- Town of Minden
 - Esmerelda Ave S Side f
 - 6th St E Side from Esm
- Test/Sample Data
- Town of Gardnerville
- Minden BK
- Old Data

Stations

Distance	Length	Grade	X-
0 ft	4.22 ft	-1.0%	0.0
4.22 ft		-0.1%	0.3

Previous

- 0.1%
- 0.3%
- 4.22
- 4.5
- Concrete
- Paved

Live

3.2%

2.3%

8.1

Current Segment

Ft

Distance

Running Features

Start	Length	Type
0 ft	8.5 ft	Fence

Features New Feature

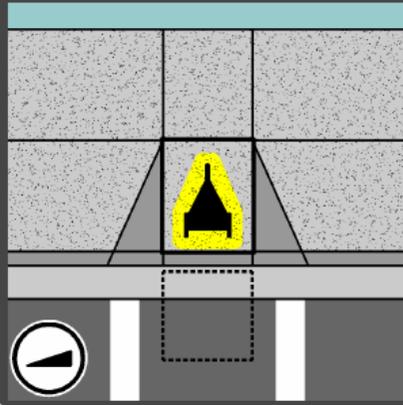
Grade	X-Slope	Latitude	Longitude	Elevation	HDOP	Satellites	WAAS
3.2%	2.3%	Latitude	Longitude	Elevation	HDOP	Satellites	WAAS

Data Tree

- ...
- ▼ Town of Minden
 - ▶ Esmerelda Ave S Side f
 - ▶ 6th St E Side from Esm
 - ▶ Test/Sample Data
 - ▶ Town of Gardnerville
 - ▶ Minden BK
 - ▶ Old Data

Field Collection

Position the cart near the center of the surface and record the Grade and Cross Slope values.



Curb Ramp\Grade

8.3%

PROWAG
ADA 2010
CBC

Min 5% Max 8.3%
 Min 5% Max 8.3%
 Min 5% Max 8.3%

Curb Ramp\X-Slope

2.0%

PROWAG
ADA 2010
CBC

Max 2%
 Max 2%
 Max 2%

Your Comments

Additional Info

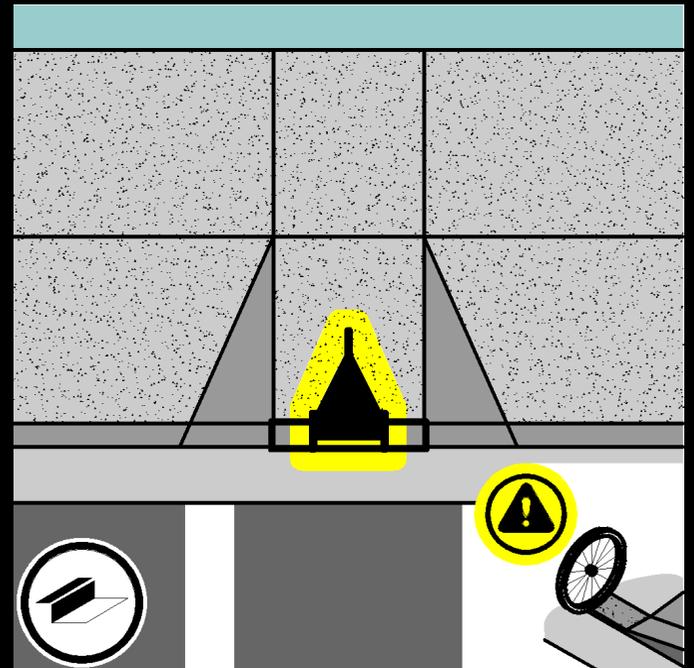
Components

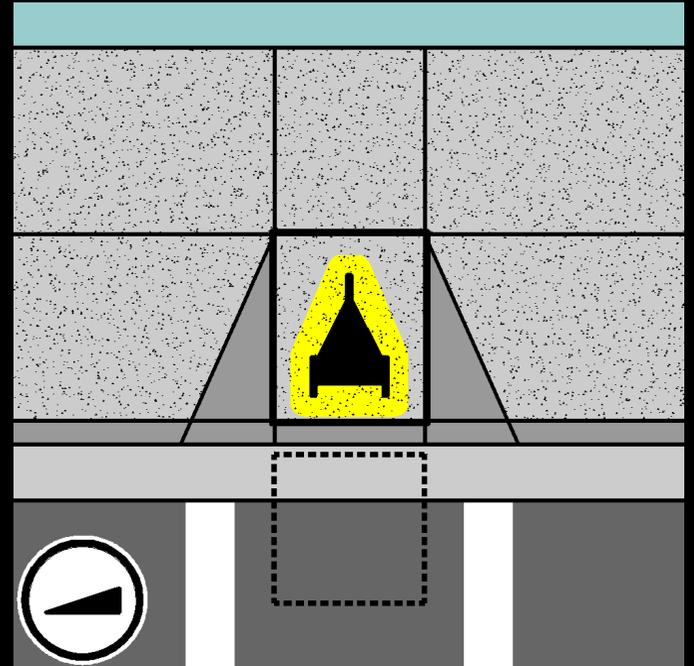
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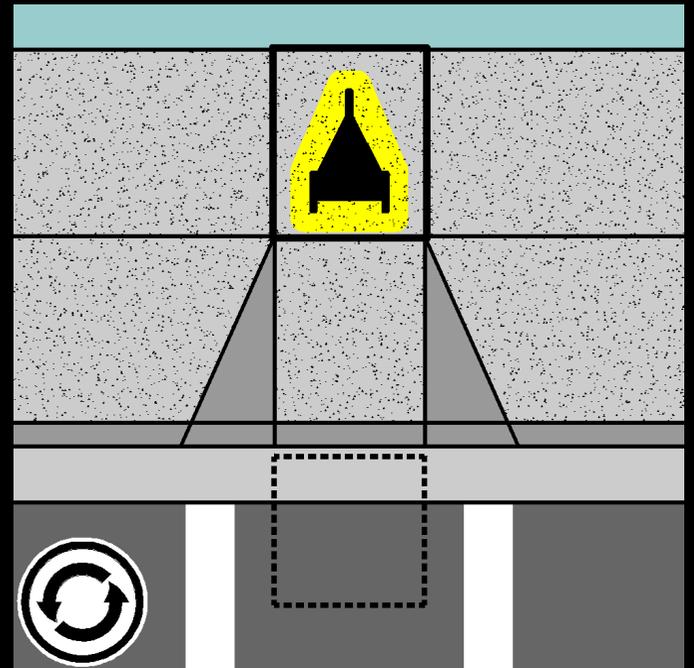
Close

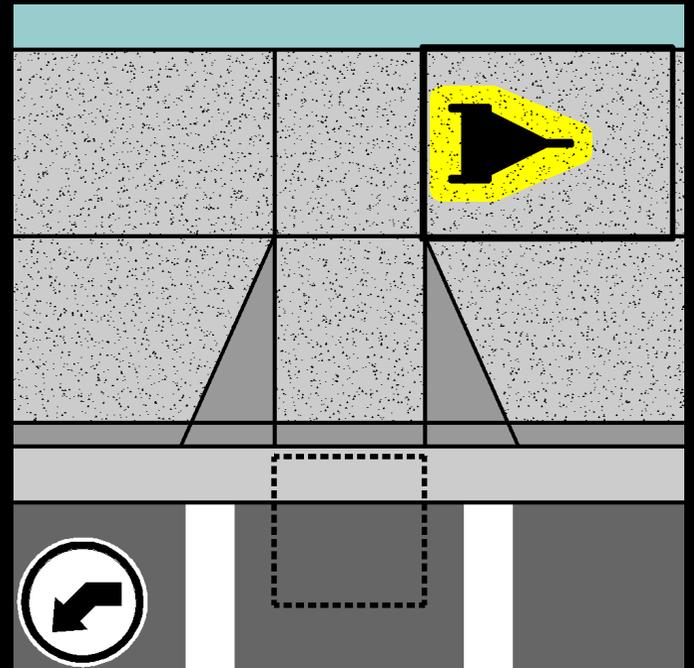


Grade	X-Slope	Latitude	Longitude	Elevation	HDOP	Satellites	WAAS
8.3%	2.0%	Latitude	Longitude	Elevation	HDOP	Satellites	WAAS





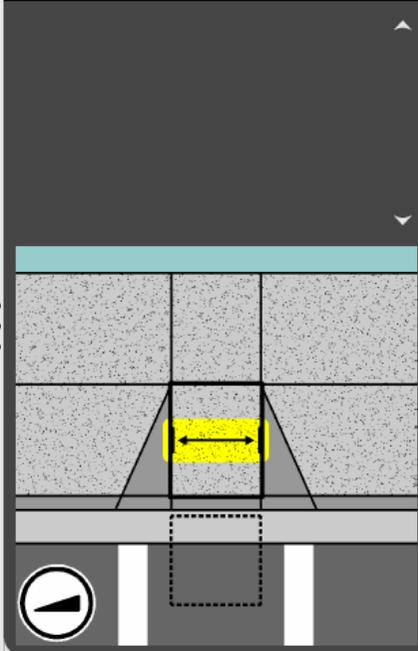




Data Tree

- ...
- Town of Minden
 - Esmerelda Ave S Side f
 - 6th St E Side from Esm
- Test/Sample Data
- Town of Gardnerville
- Minden BK
- Old Data

Field Collection



Curb Ramp\Width

58

in

PROWAG Min 48"
ADA 2010 Min 36"
CBC Min 36"

Your Comments

Empty comment text area.

Additional Info

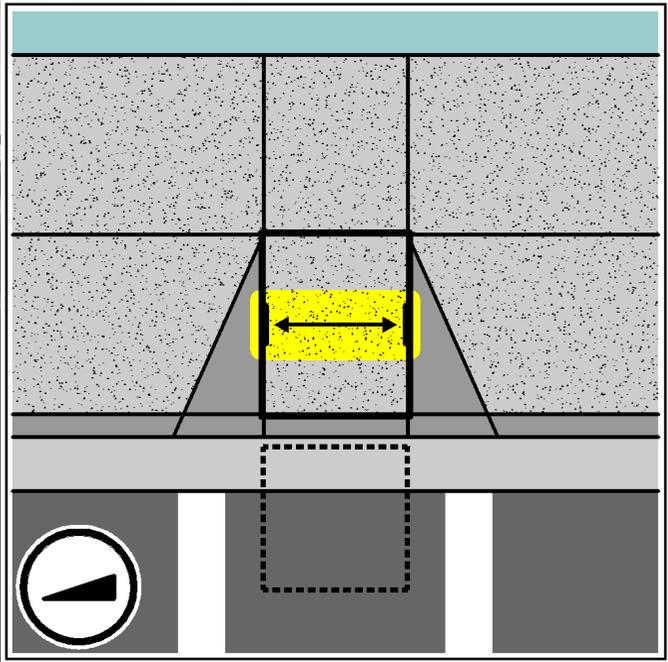
Components

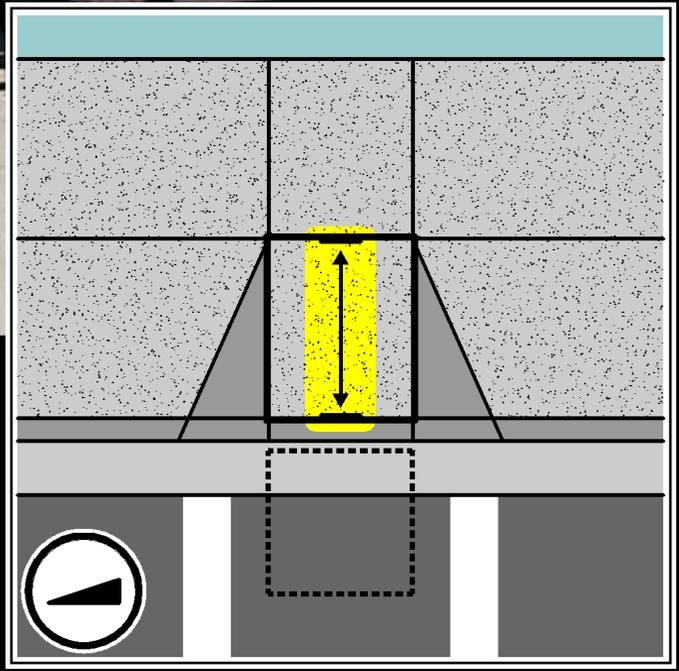
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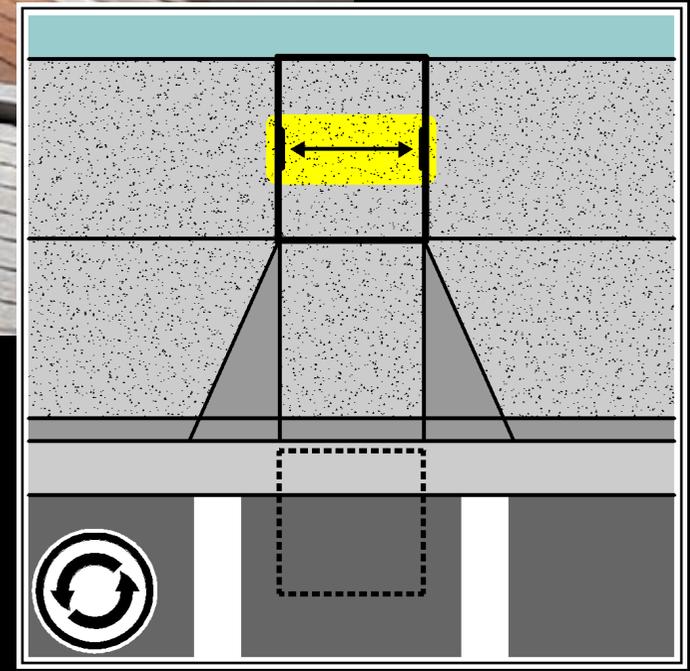
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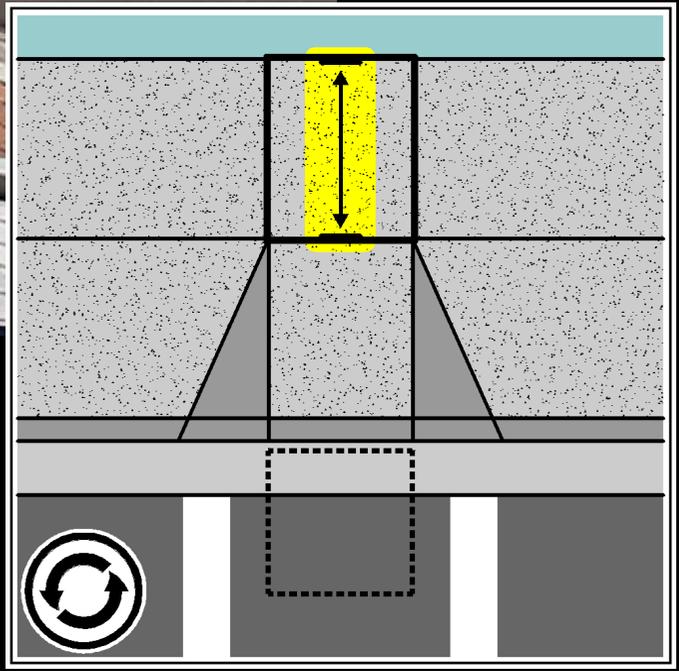


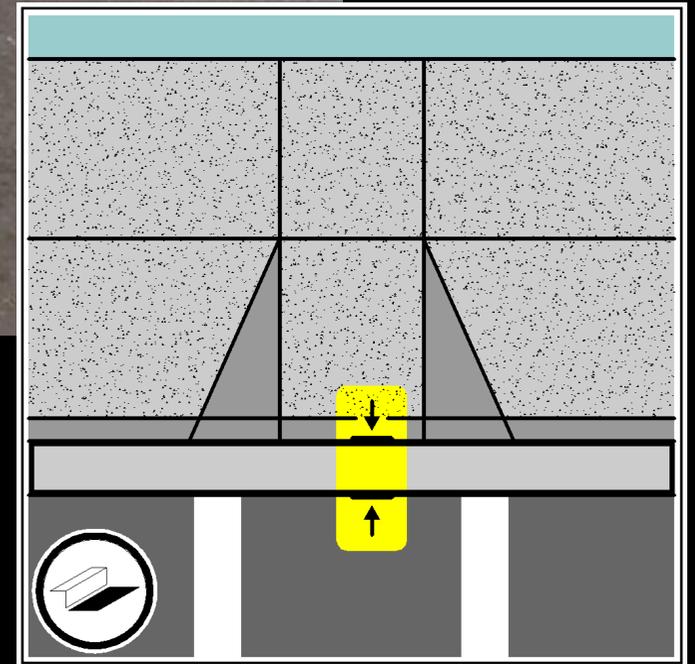
Grade	X-Slope	Latitude	Longitude	Elevation	HDOP	Satellites	WAAS
8.3%	2.0%	Latitude	Longitude	Elevation	HDOP	Satellites	WAAS











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