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A collaborative program between the
ADA National Network and the
U.S. Access Board

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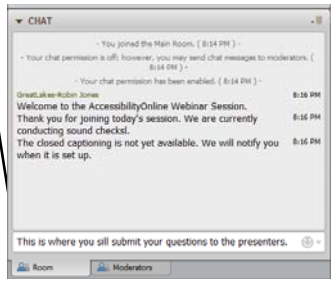

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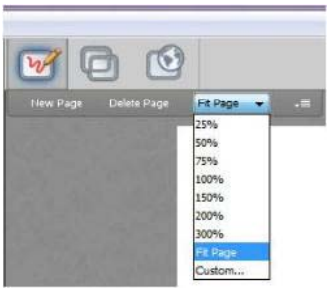

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Accessible Playground Surfaces

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Presenters

Peggy Greenwell

Jennifer Skulski

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Session Agenda

- **Study Background**
- **Review of Findings**
- **Questions and Answers**

National Center on Accessibility

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Study Background

- Playground surfacing number one concern!
- Focus on “performance” measure for firmness and stability began in early 90’s
- ASTM Laboratory test

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Study Background

- Additional requirements for surface inspection and maintenance added to the final rule
- Lack of reliable product performance data for playground owners to make informed choices

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A Longitudinal Study of Playground Surfaces to Evaluate Accessibility

Conducted by
National Center on Accessibility

Funded by
U S Access Board

Purpose of Study

To evaluate a variety of playground surfaces, their ability to meet accessibility requirements, their costs upon initial installation and maintenance over 3-5 years.

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Research Questions

Installation & Maintenance

1. How well do various playground surfaces meet the accessibility requirements upon installation?
2. What are the costs for the various playground surfaces and are the costs related to performance?
3. What accessibility issues arise out of initial installation?
4. What accessibility issues arise out of long term use and require maintenance?

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Research Design

- The first site visit was conducted within 12 months of installation
- Annual site visits during summer months
- Piloted data collection
- National advisory committee

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Playground Selection

- Municipal park settings
- Limited within driving distances of IU-Bloomington;
- Accessibility to children with and without disabilities;
- Surface materials consistent with study;
- Geographic location;
- Seasonal weather conditions; and
- Willingness of owner/operator to participate.

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Study Sample

Surface Type	N
Poured in Place Rubber (PIP) (w/EWF)	14 (5)
Tiles (TIL) (w/EWF)	10 (8)
Engineered Wood Fiber (EWF)	6
Shredded Rubber (SHR)	0
Hybrid (HYB)	5

N = 35

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Limitations

- Sample size, recruiting technique and ability to generalize findings to general population
- Visitor use and impact on surface conditions
- Weather
- Liability associated with sites found to be non-compliant with the standards may affect the playground owner's willingness to participate in the study

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5 Categories of Surfaces

1. Engineered wood fiber product
2. Shredded rubber / crumb rubber
3. Unitary rubber mat / tile surfaces
4. Unitary rubber "poured in place" surfaces
5. Combination or hybrid surface systems under development

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Surface Requirements

1. 2010 ADA Standard and Architectural Barriers Act Standard
   1. 1008.2 Accessible Routes
   2. 1008.2.6 Ground Surfaces
2. ASTM F1292-99 *Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment* as determined by the surface manufacturer in laboratory testing;
3. ASTM F1951-99 *Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment* as determined by the surface manufacturer in laboratory testing; and
4. ASTM F2075 *Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment. VOLUNTARY*

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On-site inspection

9 Critical Areas

1. Entry to playground where playground surface starts
2. Accessible route connecting accessible play elements
3. Egress point of slide(s)
4. Swings
5. Entry point(s) to composite structure(s)/transfer stations
6. Climber(s)
7. Ground level play element(s) such as spring rockers, play tables, interactive panels, etc.
8. Sliding poles
9. Other areas (i.e. water play elements, etc.)

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Instrumentation

1. Installation form
2. On-site visual inspection - form
3. Rotational Penetrometer measurements for firmness & stability
4. TRIAX 2000 measurements for impact attenuation (optional)

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Installation Form

- Completed by the playground owner
- Playground size, total surface area
- Equipment
  - Manufacturer and cost
- Surface
  - Manufacturer and cost
  - Base
  - Sub-base
  - Top layer
  - Installed in-house or by contractor, hours of labor

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1st On-site Measure

Surface Deficiency Score (SDS)

- Slope exceeds 1:16 (6.25%)
- Cross slope exceeds 1:48 (2.08%)
- Change in level greater than ½ inch
- Opening greater than ½ diameter

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Running slope less than 6.25% (1:16).
Cross slope less than 2.3% (1:48).
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STABILA
Ground level accessible route must not exceed 6.25% (1:16).
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Changes in level cannot exceed ½ inch.
Changes in level from ¼ to ½ inch must be beveled.
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Openings no greater than ½ inch sphere.
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ASTM F1951-99

- A lab test in a controlled environment
- Wheelchair work method
- 7% ramp used as baseline
- Measures work per sq. ft. for straight propulsion and turning
- Manual rehabilitation wheelchair with rider 165 + 11 lbs
- Records data applied to pushrim over 6 ½ ft. distance

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ASTM F1951-99

- The surface "passes in the lab" if the work to propel across the surface and to turn is less than the work required to propel across a 7% ramp.

PASS = WORK on surface sample < WORK on 7% ramp

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2nd On-Site Measure

Firmness & Stability

- Rotational Penetrometer
- Developed by Beneficial Designs as a portable field test to replace ASTM 1951.
- Wheelchair caster set in spring loaded caliper.
- Measures the vertical displacement of the penetrator.

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Sample Values for Various Surface Types*

Surface Type	Firmness	Stability
Concrete	.15 - .17	.17 - .19
Turfgrass	.55 - .65	.69 - .79
Carpet *(½ inch cut pile w/ ½ inch pad)*	.32 - .43	.41 - .55
Sand	1.13	< 1.13

**The values are from sample surfaces that are not part of a playground installation.*

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3rd On-Site Measure

Impact Attenuation (Optional)

Data Report

RecordID	PlaygroundID	AssessVisit#	AssessDate	Type_Surface	Type_Surf_Code	Location	AirTemp	SurfaceTemp	FirmnessAve	FirmnessSD	StabilityAve	StabilitySD	SumFirm+Stab	Slope	Cross slope	Change in level	Openings	DefScore
93	012EWF008	1	5/12/2009	EWF	3	1	72	108	0.334	0.040	0.820	0.125	1.154	1	1	0	0	2
94	012EWF008	1	5/12/2009	EWF	3	2	72	117	0.328	0.026	0.674	0.068	1.002	1	1	0	0	2
95	012EWF008	1	5/12/2009	EWF	3	5	72	109	0.296	0.040	0.628	0.124	0.924	1	1	1	0	3
96	012EWF008	1	5/12/2009	EWF	3	6	72	113	0.308	0.028	0.768	0.166	1.076	1	1	1	0	3
97	012EWF008	1	5/12/2009	EWF	3	7	72	76	0.314	0.027	0.754	0.131	1.068	1	1	1	0	3
98	012EWF008	1	5/12/2009	EWF	3	8	72	118	0.278	0.034	0.628	0.058	0.906	1	1	1	0	3
181	012EWF008	2	9/29/2010	EWF	3	1	74	115	0.320	0.041	0.886	0.053	1.206	1	1	1	0	3
182	012EWF008	2	9/29/2010	EWF	3	2	74	118	0.276	0.015	0.932	0.057	1.208	1	1	1	0	3
183	012EWF008	2	9/29/2010	EWF	3	5	74	114	0.260	0.012	0.814	0.036	1.074	1	1	0	0	2
184	012EWF008	2	9/29/2010	EWF	3	6	74	94	0.278	0.025	0.914	0.117	1.192	1	1	1	0	3
185	012EWF008	2	9/29/2010	EWF	3	7	74	115	0.282	0.026	0.744	0.104	1.026	1	1	1	0	3
186	012EWF008	2	9/29/2010	EWF	3	8	74	105	0.328	0.049	0.910	0.149	1.238	1	1	1	0	3

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TRIAX Report – ASTM F1292

No.	Peak	HIC	Ft/Sec	ANGLE	Date/Time	Comment
1	108	544	19.4	1	08/30/10 01:23p	6 ft between sliding pole & spiral slide
2	99	454	19.3	6	08/30/10 01:25p	
3	88	367	19.3	3	08/30/10 01:27p	
4	80	360	19.5	2	08/30/10 01:31p	6 ft between spiral slide & bump climber
5	66	233	19.4	8	08/30/10 01:32p	
6	63	215	19.4	8	08/30/10 01:33p	
7	83	338	18.0	5	08/30/10 01:39p	5 ft 2 in between double slide & transfe r system
8	76	276	18.0	1	08/30/10 01:41p	
9	74	260	18.0	2	08/30/10 01:42p	

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Key Findings

- Cost per square foot
- Surface Deficiency Score (SDS)
- Firmness & Stability
- Qualitative data

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Playground Sites

	Surface Area	Cost / sq ft	Total
PIP	755 to 7,720 sq ft	$6.59 to $19.80	$30,019 to $136,065
Tile	740 to 2,571	$8.96 to $21	$15,950 to $29,971
EWF	1,920 to 12,510	$1 to $2.50	$4,200 to $12,500
Hybrid	6,031 to 8,500	$7.50 to $12.65	$74,000 to $111,626

N = 35 sites

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Review of Values

- Surface Deficiency Score (SDS)
  - Slope, cross slope, openings, changes in level
  - 0 to 4 points
  - 0 = no deficiencies identified
  - Up to 4 max deficiencies for each location
- Firmness & stability
  - Measured in tenths-hundredths of an inch penetration into the surface

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PIP
$6.59 - 19.80

SDS
Mean = .04
Mode = 0

Firmness
.34531

Stability
.38357

Sum
.72888

Failure for impact attenuation

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Tiles
$8.96-21

SDS
Mean = .50
Mode = 0

Firmness
.27504

Stability
.30989

Sum
.58493

Changes in level

Separation at seams

Punctures

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55


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EWF
$ .74 – 2.50

SDS
Mean = 1.94
Mode = 2

Firmness
.34227

Stability
.78242

Sum
1.12469

Undulating running & cross slope

Displacement

Installation instructions


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STABILA
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STABILA
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HYB
$7.50 – 12.65

SDS
Mean = .30
Mode = 0

Firmness
.41123

Stability
.46081

Sum
.87205

Minimal deficiencies


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4
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Key Finding(s)

No surface type was found better than others when comparing ability to meet accessibility standards with issues related to installation and maintenance.

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Key Findings

- Within 12 months of installation, loose fill EWF had greatest number of deficiencies affecting accessible route (excessive running slope, cross slope, change in level).

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Key Findings

- Loose fill EWF had the highest values for firmness and stability, indicating greater work force needed to move across the surface.
- Unitary surfaces PIP and TIL had the lowest values for firmness and stability, indicating less work force necessary to move across the surface.

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Key Findings

- Deficiencies (excessive running slope, cross slope, change in level) among PIP, TIL and HYB began to emerge 24-36 months after installation.

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Key Findings

- Occurrences were identified where the installation did not parallel the manufacturer's installation instructions or procedures for the laboratory test sample for ASTM F1951.

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Key Findings

- A surface with fewer accessibility deficiencies and lower measurement for firmness and stability does not necessarily meet the safety standards for impact attenuation.

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General Findings – Design Issues

- Inaccurate application of the accessibility standards.
- Inefficient use of the intended accessible surface.
- Lack of initial site survey to address changes in site elevation.
- Deviations from design plan during construction.

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General Findings – Installation

- Intensive installation requirements require contractor specialization
- Learning curve for park personnel
- Costs for contractor return for repairs or patches
- Installation temperature & bonding agents

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General Findings – Maintenance

- Surface wear
- Over-filling loose fill material without leveling and compacting
- Puncture holes, separation at seams
- Cross-contamination between surface materials
- Vegetation growth in the surface material
- Exposure of sub-base like geo-textile fabric
- Learning curve on maintenance of various surface materials
- Lack of maintenance information/instructions provided to owner upfront

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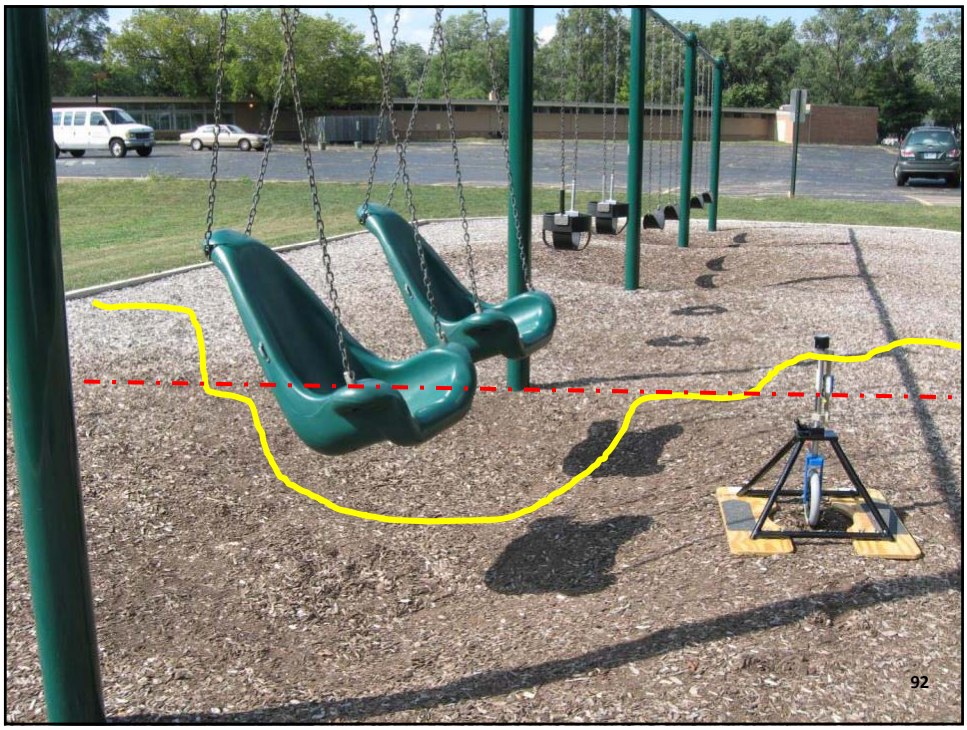
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General Findings – Product

- Owner/consumer concerns with chemical composition of surface materials and whether they are truly "eco-friendly" or "green"

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Positive Outcomes From Study

- Creating greater awareness amongst participating owners and perspective buyers
  - Purchasing specifications
  - Surface testing
  - Maintenance forecasting
- IPEMA position statement on installation of EWF
- Encouraging innovation for surface product research & development

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Questions?

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"FINAL RULE - Architectural Barriers Act (ABA) Accessibility Standards for Trails, Picnic and Camping Facilities, and Beach Access Routes"

November 8, 2013

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