SESSION LEARNING OBJECTIVES:

• Session participants will identify the most recent path and paving materials available to increase farmstead accessibility.
• Session participants will be familiar with basic terminology to describe terrain and construction.
• Session participants will view product solutions for paths and paving
• Session participants will discuss cost estimates and justification for environmental modifications to pathways and walkways.
THE PROBLEM

Farms and ranches have variable terrain features that make accessibility difficult

- Mud
- Standing water
- Sandy conditions
- Inclines/declines
- Large stones, stumps
- Ruts left by vehicles and machinery
- Etc.
TERMINOLOGY

• **Accessibility**: design of products, devices, services, or environments for people with disabilities that ensures “direct access” (i.e. unassisted) and “indirect access” (i.e. compatibility with person’s assistive technology. (Wikipedia, [https://en.wikipedia.org/wiki/Accessibility](https://en.wikipedia.org/wiki/Accessibility))

• **Usability**: the extent to which a product (device, service, or environment) can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.
• **Universal Design**: Universal design is the design of buildings, products or environments to make them accessible to all people, regardless of age, disability or other factors.

• **Built environment**: Human-surroundings that provide a setting for human activity
DEFINITION OF TERRAIN

- **Terrain/Relief**: vertical and horizontal dimensions of land surface.
- Defined: Physically, terrain is the “lay of the land”. Usually expressed in terms of elevation, slope, and orientation of terrain features. Affected by surface water distribution and flow of water.
TERRAIN TERMINOLOGY

- **Depressions**: sunken or depressed area below the surrounding area; form by various mechanisms
  - Blowouts (erosion)
  - Subsidence (erosion/settling)
  - Sinkholes (collapse)

- **Elevations**: a height above or below a fixed point
  - Hills
  - Mounds
  - Rise

- **Expansive soils**: earth that swells and contracts depending on the amount of water that is present
- **Slope/gradient**: a line that describes the direction and steepness of a line

- Calculated by finding the ratio of the "vertical change" to the "horizontal change" between (any) two distinct points on a line

- Aka: Rise/run
  - \[ \text{Slope} = \frac{\Delta y}{\Delta x} = \Delta x \Delta y \]
CONSTRUCTION TERMS

- **Aggregate**- A mixture of sand and stone and a major component of concrete.
- **Above grade**
- **Backfill**- the replacement of excavated earth into a trench around or against a basement /crawl space foundation wall
- **Board foot**- A unit of measure for lumber equal to 1 inch thick by 12 inches wide by 12 inches long
- **Cement**- the gray powder that is the "glue" in concrete. Portland cement.
- **Concrete**- the mixture of Portland cement, sand, gravel, and water.
- **Cubic yard/foot-measure** of length, width, and depth of a rectangle
- **Egress**- A means of exiting a building
- **Exposed aggregate finish**- A method of finishing concrete which washes the cement/sand mixture off the top layer of the aggregate - usually gravel
- **Drain**- 3" or 4" perforated plastic pipe that goes around the perimeter (either inside or outside) of a foundation wall (before backfill) and collects and diverts ground water away
- **Faced concrete**- to finish the front and all vertical sides of a concrete porch, step(s), or patio.
- **Field measure**- to take measurements in the place itself instead of using the blueprint/topo/landscape design
- **Flatwork**- common word for concrete floors, driveways, basements, and sidewalks
- **Form**- temporary structure erected to contain concrete during placing and initial hardening
- **Frost line**- the depth of frost penetration in soil and/or the depth at which the earth will freeze and swell.
- **Grade**- ground level, or the elevation at any given point. Also the work of leveling dirt.
CONSTRUCTION TERMS

• **Level** - true horizontal.

• **Lumens** - unit of measure for total light output. The amount of light falling on a surface of one square foot.

• **Manufacturer’s specifications** - the written installation and/or maintenance instructions which are developed by the manufacturer of a product and which may have to be followed in order to maintain the product warrantee.

• **Masonry** - stone, brick, concrete, hollow-tile, concrete block, or other similar building units or materials; joined with mortar

• **Nosing** - the projecting edge of a molding or drip or the front edge of a stair tread.

• **Paver, paving** - materials—commonly masonry—laid down to make a firm, even surface

• **Plan view** - drawing of a structure with the view from overhead, looking down.

• **Pressure-treated wood** - lumber that has been saturated with a preservative. Aka: treated lumber

• **Road base** - aggregate mixture of sand and stone

• **Screed, concrete** - to level off concrete to the correct elevation during a concrete pour.

• **Settlement** - shifts in a structure, usually caused by freeze-thaw cycles underground

• **Stair landing** - A platform between flights of stairs or at the termination of a flight of stairs. Often used when stairs change direction. Normally no less than 3 ft. X 3 ft. Square.

• **Subgrade** - native soil that is graded and compacted to provide an even surface to support the sidewalk; should have uniform stiffness to avoid differing frost or expansion characteristics. In some cases, concrete is placed directly on the subgrade, but it is strongly recommended that a granular sub-base be placed between the native soil and the concrete slab.
LEVEL OF GRADE

- Above Grade
- Below Grade

Ground Level
DECK TERMINOLOGY

- Ledger
- Bridging
- Joist hanger
- Joist
- ½" gaps
- Cap rail
- Top rail
- Decking
- Rail post
- Rim joist
- Post
- Beam
- Stringer
- Concrete footing
- Frost Line
- Level grade
ACCESSIBILITY STANDARDS FOR TRAILS/PATHS
NATIONAL CENTER FOR ACCESSIBILITY NATIONAL TRAILS SURFACE STUDY REPORT, 2017
AUTHORS: MONTEMBAULT & YORK

- Must meet firmness & stability standards for wheelchairs
- Firmness: resistance to deformation/indentation
- Stability: resists change from contaminants or applied forces

- Eleven materials studied in report:
  - Crushed stone
  - Fines
  - Packed soils
  - Natural materials bonded to synthetic materials
- Found differences for different climates/regions
- All surfaces required maintenance/repair over time
ACCESSIBILITY STANDARDS FOR TRAILS/PATHS
NATIONAL CENTER FOR ACCESSIBILITY NATIONAL TRAILS SURFACE STUDY REPORT, 2014

• FIRMNESS & STABILITY
  • Measured by mechanical instrument; Rotational penetrometer
  • BEST RESULTS:
    • ¾ Inch limestone aggregate
    • Klingstone 400 soil stabilizer
    • Stalock stabilizer

• LIMITATIONS
  • No human testers/wheelchair users involved
  • Cost comparison not completed
  • Long-term maintenance costs not conducted
SOLUTIONS

RANGE OF MATERIALS AVAILABLE TO INCREASE ACCESSIBILITY
SOLID SURFACES

CONCRETE

ASPHALT

6X6-W1.4XW1.4
WWF REINF. AT
PAVEMENT MID-DEPTH

SEE PLAN

FINISHED
GRADE

COMPACTED
SUBGRADE

4" GRAVEL FILL

PROVIDE HAND TOOLED TRANSVERSE & LONGITUDINAL CONTRACTION
JOINTS @ 6'-0" O.C. MAX., 3/8" EXPANSION JOINTS @ 25'-0"
O.C. MAX.

CONC WALK

D1
A1.2
1"-1"-0"

SURFACE
SM-9.5

AGGREGATE
BASE
21A or 21B

SUBGRADE
CONDITION
Good
(DCBR >10)
SMALL SURFACE MATERIALS

WOOD FIBERS

GRAVEL
FIBAR

• Features:
  • Combines natural LEED certified materials with synthetic underlayment (geotextiles)
  • Materials developed for playgrounds, but could be used for pathways
  • Materials are controlled size and type of wood fibers: engineered wood fibers
  • Different installation specs for desert/wetter climates
  • Systems available that include drainage and sidewalls
  • Cons: Cost not publically available, must call for quote (advertised as $1.50 to $10 per square foot)

A complete FibarSystem 300 includes all the following:
1. Fibar® Engineered Wood Fiber (EWF) surface cushions falls and welcomes wheelchairs
2. FibarFelt geotextile fabric prevents stone and dirt from contaminating the EWF
3. FibarDrain strips collect and carry rain water away from the playground surface
4. FibarMat protects heavy wear areas to minimize maintenance
5. FibarGuard playground borders keep safety surfacing right where it belongs

https://www.fibar.com/
KLINGSTONE

• Features
  • Polyurethane soil stabilizer
  • Inert when cured
  • No mixing required
  • Binds with aggregate
  • Natural appearance
  • Cost: $2-3 sq ft material
  • Cons: application hazards for respiratory, skin, eye; flammable; must properly dispose or store of left-over chemical
  • Noticeable washout in areas at 2 years; must be resurfaced/re-treated

STALOK STABILIZER

• Features:
  • Polymer bonds with decomposed granite and other materials
  • Fills pores and locks together
  • Remains flexible
  • Resists weathering
  • Can be formulated for different regions and soil conditions; equestrian applications too

• Cons: proprietary mixing; costs not publicly available; long-term maintenance costs not known
OTHER POLYMER BASED PRODUCTS

• SOILTAC
• M10 & M50
• TECHNISOIL G5
• TOP-SHIELD (TS-100)
MODULAR SOLUTIONS

• ACCESS REC mats, decks, & surfaces

• Features of deck:
  • High-density polyethylene (HDPE)
  • Chemical and weather resistant capabilities
  • UV protected
  • Can be installed permanently or temporarily
  • Can withstand vehicle loads up to 8 tons per axle
  • **Easy to maintain and clean**
    • sustainable to temperature extremes
    • will not warp, rot, crack, or delaminate
    • anti slip patterns
  • Cons: Heavy, one panel weighs 69 lbs. & cost

http://www.accessrec.com/beach-access-mat
MODULAR SOLUTIONS

- **DUROLAWN** Features:
  - Non slip surface cellular structure
  - Reduce joint and bone impact while walking on hard surfaces
  - Can be used as an entry mat
  - Allows for dirt, debris and water to fall to the bottom of the mat due to their cellular structure
  - Wheelchair accessibility
  - Turns grass into a wheelchair accessible surface
  - Cons: Cost @ 30sq ft. (approx. 10’x3’ path)=$384 on top of existing sod ($12.80 sq. ft)

[http://www.durolawn.com/]
MODULAR SOLUTIONS

• MISTER BOARDWALK
• Features:
  • Can order in pressure treated (PT), cypress, teak, Trex
  • Can order corner/turn pieces
  • 20 year work life (according to manufacturer)
  • Can be permanently installed or temporary
  • Cons: 23” x 12 ft. roll = $111 of PT (cheaper than other modular though)

https://www.mrboardwalk.com/
MODULAR SOLUTIONS

• MOBI-DECK

• Features
  • 100% recyclable HDPE plastic are UV and weather resistant
  • Resilient to absorbing liquids and contaminates
  • Permanent or mobile applications
  • Each panel 5’ x 6’ long (86lb. Each)
  • Cons: cost (60” x 33’ section = $2,199); weight

https://www.mobi-mat-chair-beach-access-dms.com/mobi-deck/
MODULAR SOLUTIONS

• WOODCARPET BONDED I SYSTEM

• Features:
  • Installed on top of surfaces of gravel
  • Drains well, pervious to water
  • Cushiony
  • Impact resistant
  • Looks natural, but is “synthetic”

• Cons:

https://www.zeager.com/
CONSIDERATIONS

• Will probably “mix” surfaces depending on applications (i.e. Modular around entrances, aggregate on pathways); must design transitions adequately

• Costs may increase with use of proprietary connectors, borders, geotextile underlayment

• Arrangements for maintenance is necessary

• “Bargain basement” materials to build pathways:
  • Used dimensional lumber
  • Pallet slats
  • Other?

• Vehicle use? Vehicle crossing?

• ADA guidance can help, but does it need to be followed for custom applications?
CONSIDERATIONS

• Who will design it? Professional? Home-designed?

• What kind of environment? Weather, temperatures, terrain?

• How much will it cost? Materials, labor, predicted wastage

• How long will it take?

• Who will carry out the work? Family, volunteers, contractor, vendor?

• Permits? Contracts?

• Questions to ask potential contractors: [link]

• [link]
REFERENCED MATERIALS


• NATIONAL CENTER ON ACCESSIBILLITY: http://www.ncaonline.org/