PATH AND PAVING SOLUTIONS: INCREASING FARMSTEAD ACCESSIBILITY

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NATIONAL TRAINING WORKSHOP

TUESDAY, MARCH 26, 2019

LINCOLN, NEBRASKA

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.

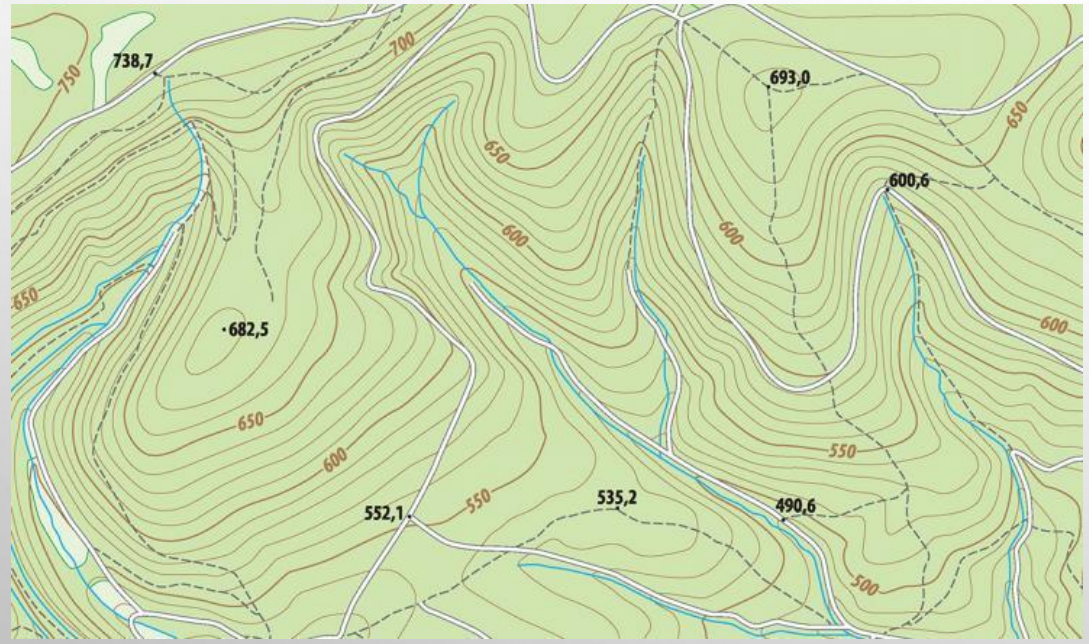
TERMINOLOGY

- **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)
- **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.

TERMINOLOGY

- **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

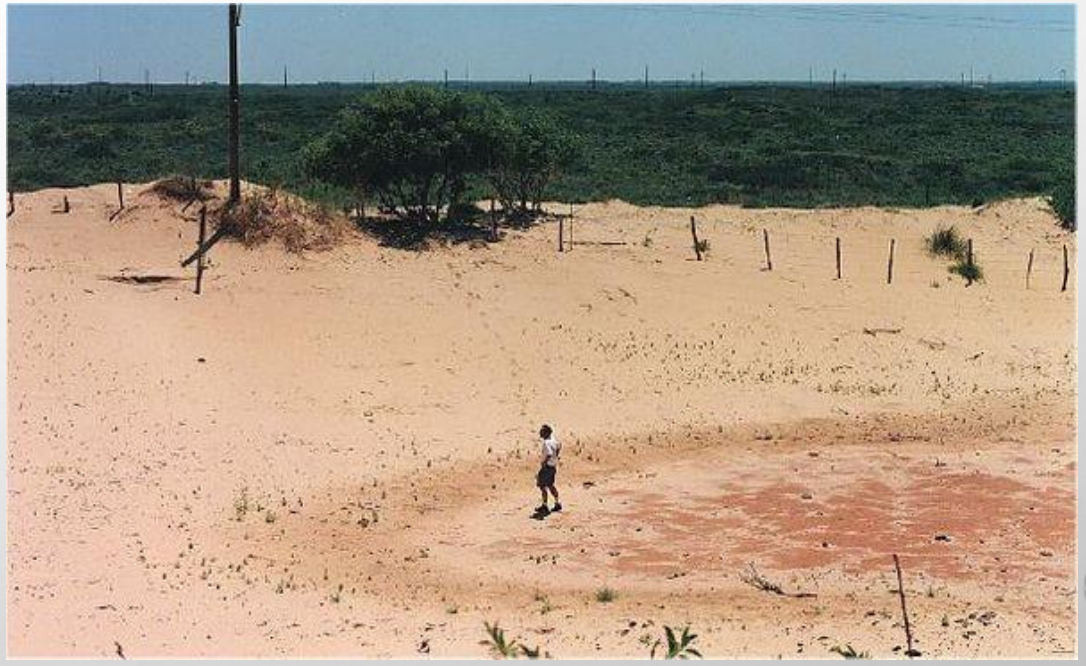
DEFINITION OF TERRAIN

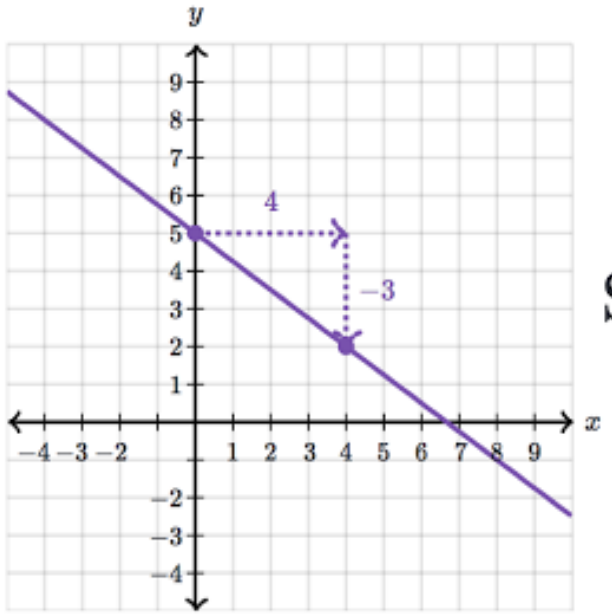


- **Terrain**/Relief: vertical and horizontal dimensions of land surface
- Defined: Physically, terrain is the “lay of the land”. Usually expressed in terms of elevation, slope, and orientation of terrain features. Affected by surface water distribution and flow of water.

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





$$\text{Slope} = \frac{\Delta y}{\Delta x}$$

- **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
  - SLOPE=RUN/RISE=ΔXΔY

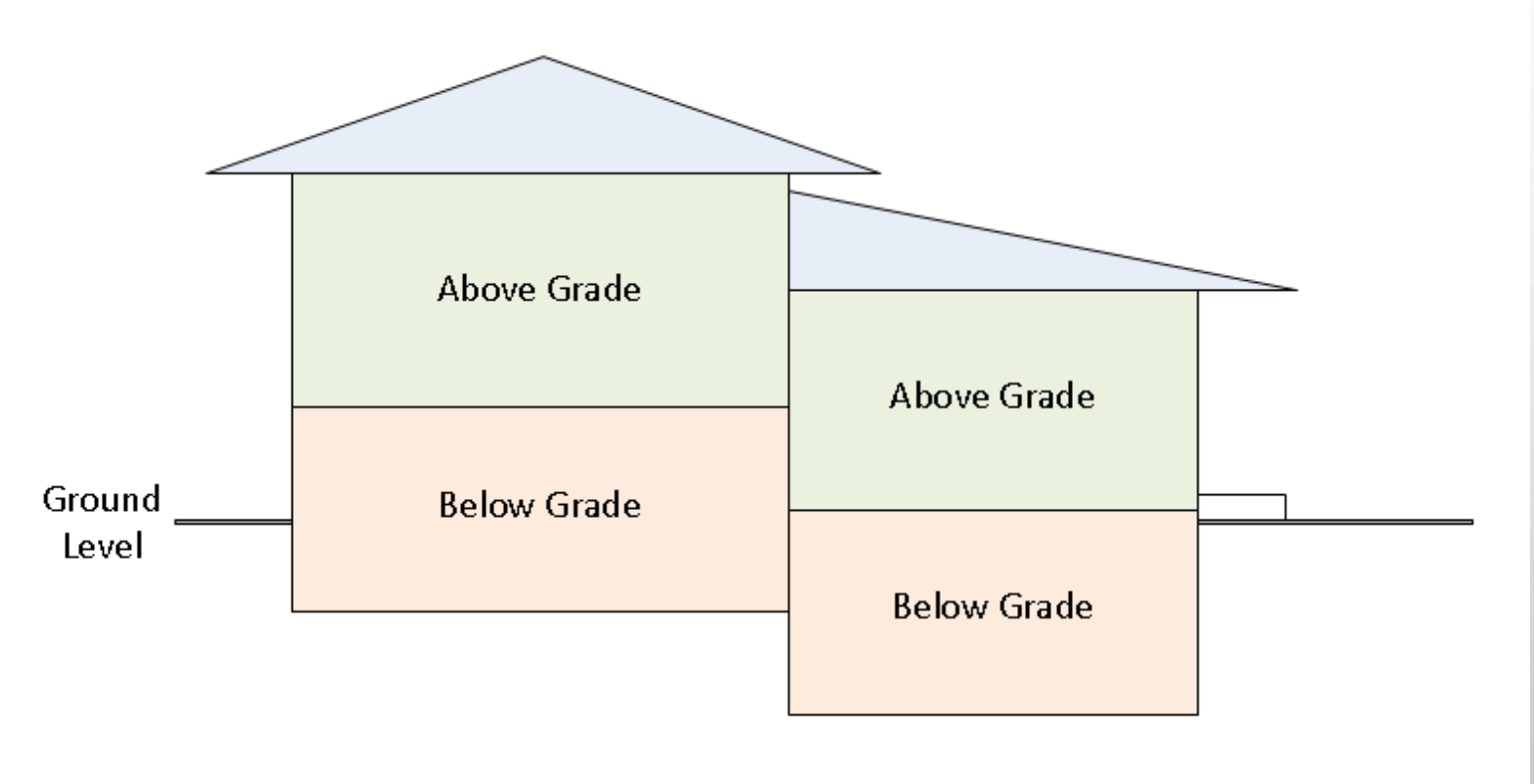
CONSTRUCTION TERMS

- **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.

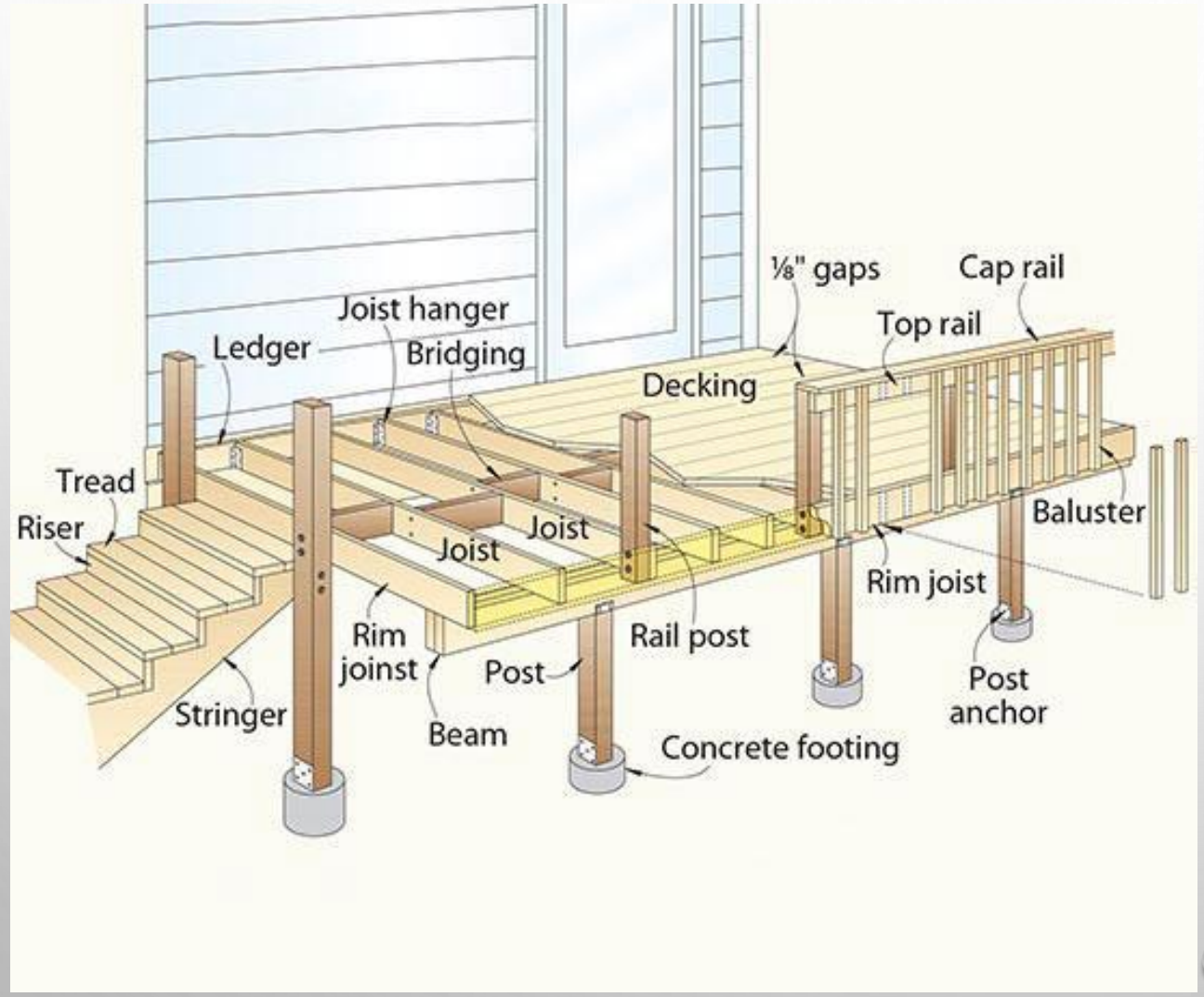
CONSTRUCTION TERMS

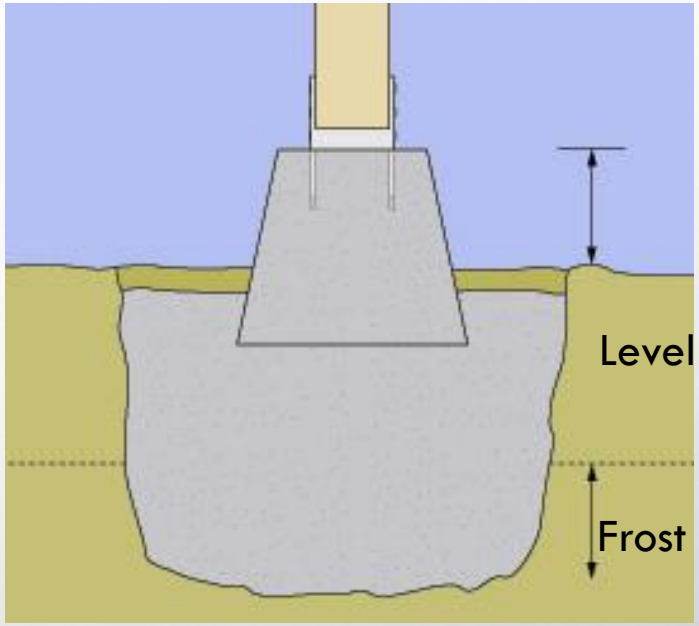
- **Level-** true horizontal.
- **Lumens**- unit of measure for total light output. The amount of light falling on a surface of one square foot.
- **Manufacturer's specifications**- the written installation and/or maintenance instructions which are developed by the manufacturer of a product and which 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



DECK TERMINOLOGY





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

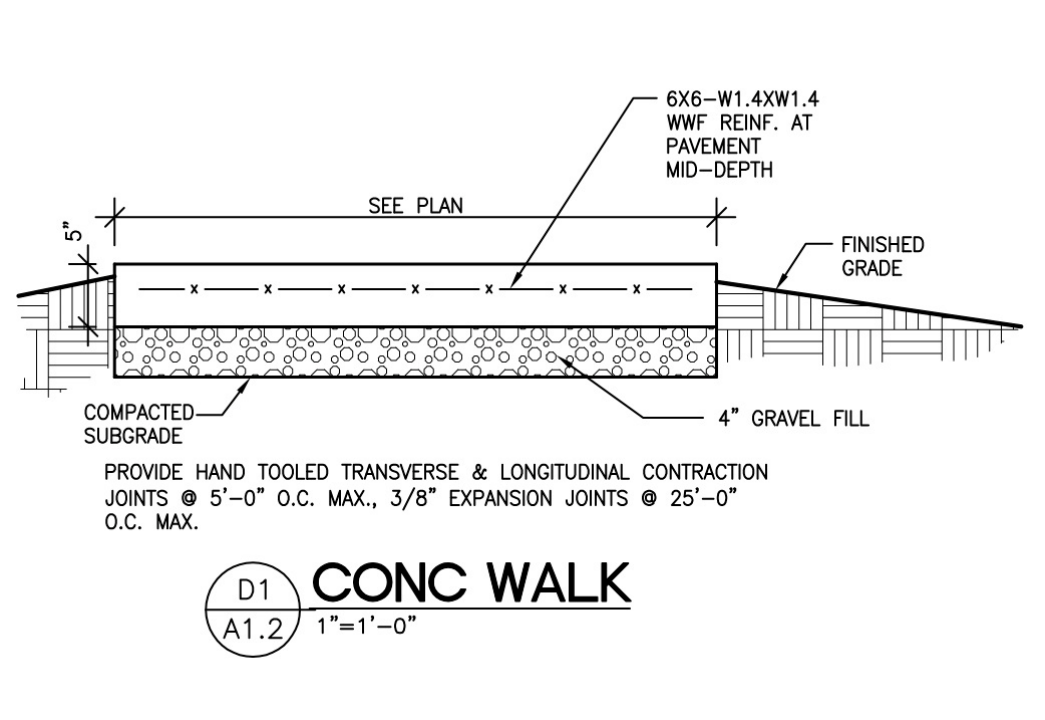
- FIRMNESS & STABILITY
  - Measured by mechanical instrument; Rotational penetrometer
- BEST RESULTS:
  - ¾ Inch limestone aggregate
  - Klingstone 400 soil stabilizer
  - Stalock stabilizer
- LIMITATIONS
  - No human testers/wheelchair users involved
  - Cost comparison not completed
  - Long-term maintenance costs not conducted

SOLUTIONS

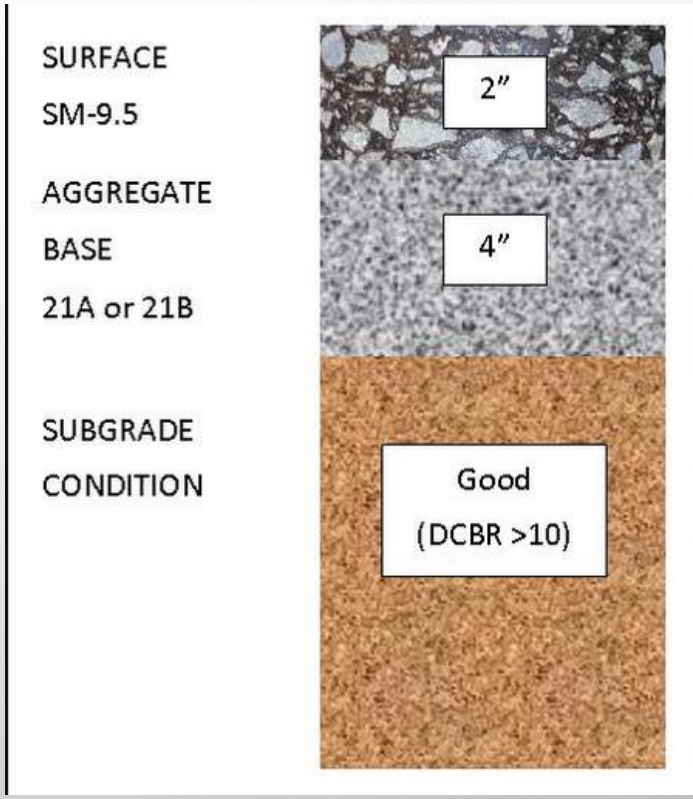
RANGE OF MATERIALS AVAILABLE TO INCREASE ACCESSIBILITY

SOLID SURFACES

CONCRETE



ASPHALT



SMALL SURFACE MATERIALS

WOOD FIBERS

GRAVEL

https://www.fibar.com/

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.

http://www.erapol.com.au/products/agency-products/klingstone/

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

http://www.stabilizersolutions.com/products/stalok-paving-material/

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

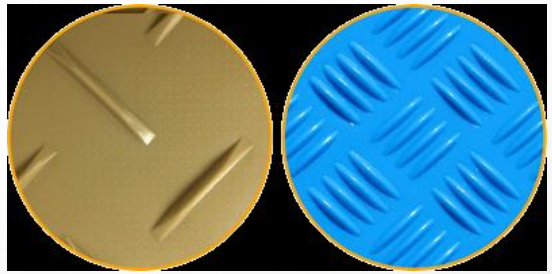
OTHER POLYMER BASED PRODUCTS

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

MODULAR SOLUTIONS

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

- **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



MODULAR SOLUTIONS

http://www.durolawn.com/

- **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)

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

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.zeager.com/

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:

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: Https://www.Homeadvisor.Com/r/15-questions-to-ask-contractors/
- Https://www.Aarp.Org/livable-communities/info-2014/7-steps-to-hiring-a-contractor.Html

REFERENCED MATERIALS

- UNITED STATES ACCESS BOARD: Https://www.Access-board.Gov/guidelines-and-standards/recreation-facilities/outdoor-developed-areas/background/committee-report/trails
- NATIONAL CENTER ON ACCESSIBILLITY: http://www.ncaonline.org/