

CONSTRUCTION KEYS

Principles for Great Systems

1



*Good Construction is the
Key to 'Good Systems'*

CONSTRUCTION PRINCIPLES FOR SUCCESSFUL INSTALLATIONS

- Keep it Dry - KIDD
- Keep it Natural - KINN
- Keep it Level – KILL
- Keep it Shallow - KISS



KIDD

- Keep it DRY



SEPARATION

- If you are wondering ask!



Redox features

Soil Verification

WHY OTHER THAN SEPARATION?

- Smearing
- Water movement
- Air movement



PLASTIC LIMIT

Too wet ~ Above PL

$< 1/8"$

Installation when "Below PL"

SOIL SMEARING

- Smearing: the damaging of soil structure by sliding pressure.
 - Any sandy loam or finer textured soil can be susceptible to smearing if enough water is present.
 - This is why we test the plastic limit before construction



FROZEN SOILS

- Any frost is too much frost for an above- grade system
- For below grade trenches frost could be present, however cannot extend to the depth of the required sidewall or bottom area of the trench/bed
- Snow should be removed with caution



FROZEN SOIL-WHY ARE THEY TOUGH?

- No way to test the plastic limit
 - Wet fall
- Scarification will not work
 - Soil can be frozen solid
 - Large clumps instead of exposing natural soil structure
 - Shattering in dry frozen soils
- If scarified when frozen,
 - as the soil thaws it can “seal off” the scratched area.
- The large frozen clumps will also hamper constructability



FROZEN SOIL- OTHER PROBLEMS?

- Stock piles of sandy/loamy soil material (cover) or topsoil borrow should not be allowed to freeze
- Attempting to use this material for cover will result in:
 - Uneven cover thicknesses
 - Increased erosion potential
 - Difficulties in establishing vegetative cover
 - **Poor frost protection**

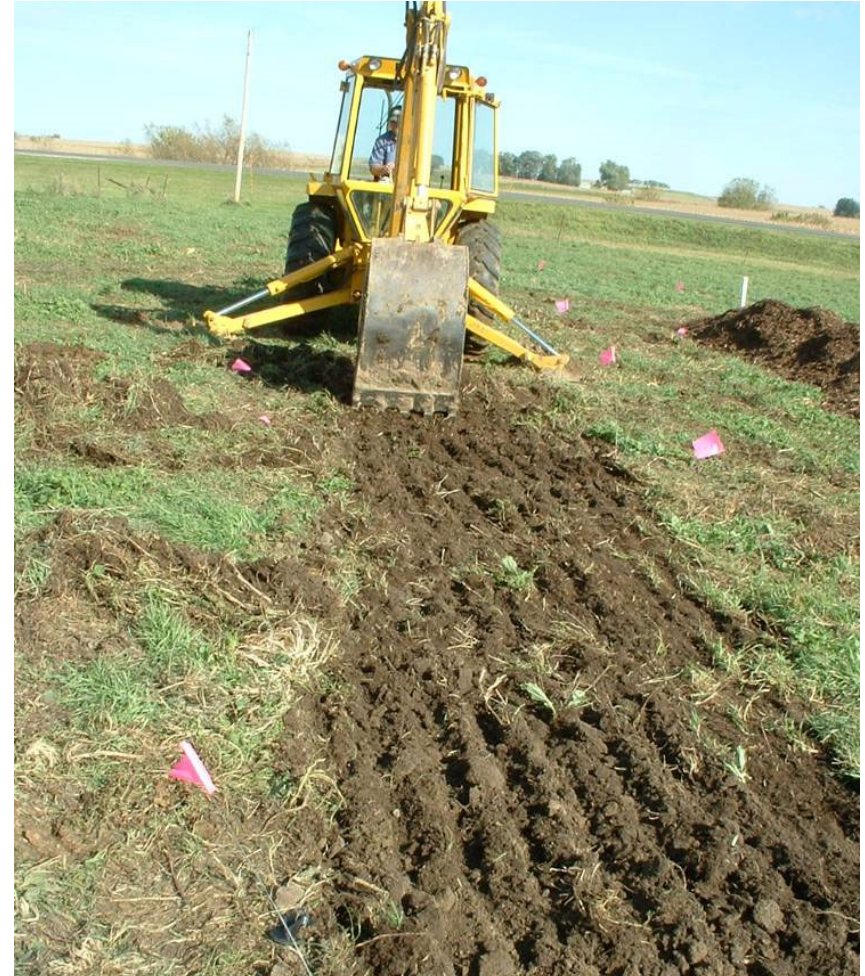
PRINCIPLES: KINN

- Keep it NATURAL



MAINTAINING NATURAL SOIL CONDITIONS

- Soil located at or near the soil **surface** is generally the best for:
 - Treatment
 - Dispersal
 - Oxygen-transfer
 - Evapotranspiration
 - Natural biological activity



HOW CAN WE COMPACT?

- Equipment
 - Choices
- System Materials
- Others on the site



GROUND PRESSURE

- Pressure exerted on the ground by tires or tracks of a motorized vehicle
 - Measured in pounds per square inch (PSI) =
Loaded weight ÷ Ground contact area
 - Lower weight equipment or bigger contact area results in lower ground pressure

Wheel

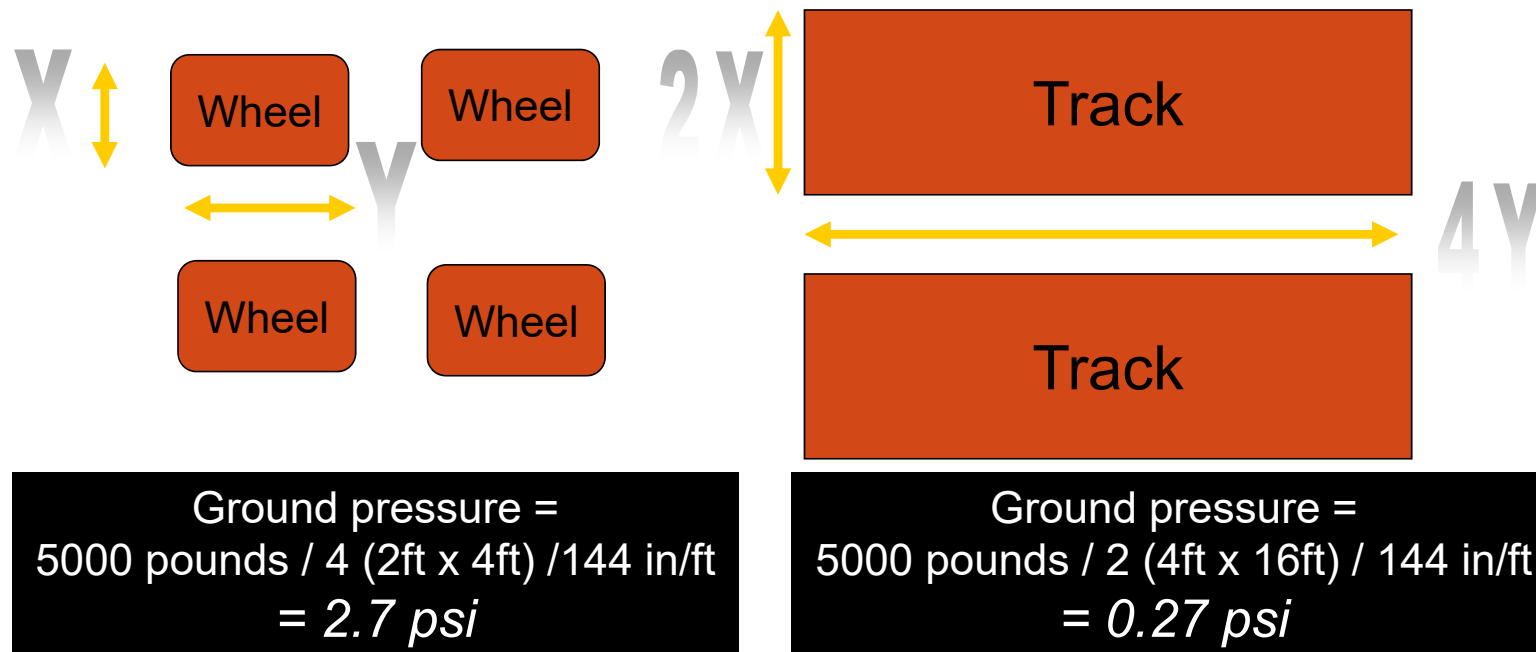
Track

WHEELS VERSUS TRACKS



GROUND PRESSURE

- For same piece of equipment, ground pressure will be much higher with wheels



DURING CONSTRUCTION



TODAY



SHOULD WE NEVER USE A COMPACTOR?

- Piping
- Tank settling
- Soil Treatment area- NEVER



COMPACTION APPLICATIONS & EQUIPMENT

■ Applications

- Pipe bedding
- Tank excavation area

■ Compaction equipment

- A compactor is a machine or mechanism used to reduce the size of waste material or soil through compaction
- In system construction, there are two main types of compactors:
 - Vibrating: Cohesive soil
 - Impact: Granular soil



COMPACTED SITE – WHAT TO DO?

- Avoid compaction
- Move system location
- Discuss options with Designer/Local unit of government
- Determine severity
 - Perc test
- Time will help
 - Freeze/thaw
 - Root activity
 - Weathering
- Experimental methods
 - Lower loading rates
 - Deep plowing/ripping
 - Removing & backfilling

Natural

Experimental

Verify changes



PROTECTING EXPOSED NATURAL SOIL

- If site has been scarified, immediately cover with media to prevent
 - damage
 - contamination
- When you can't cover exposed soil immediately, protect area with tarp



Above ground systems

PRINCIPLES: KILL

■ Keep it LEVEL



LASER LEVELS



WHAT IS IMPORTANT?

- Bench mark- Elevations
- Contours
- Top of Rock
- **Bottom of Rock**
 - Separation
- Pipe?



PRINCIPLES: KISS



- Keep it SHALLOW
- Keep it SERVICEABLE
- Keep it SIMPLE

WHY SHALLOW?

- Treatment
 - Saturated Soil
 - Bedrock
- Oxygen transfer
- Water movement
 - Soils- Structure
 - Evapotranspiration



SHALLOW

- Minimum cover
 - Tanks
 - STA
- Separation



FREEZING?

- Piping
 - SLOPE
 - Use
 - Traffic
 - Insulation
- Late Finish
 - Mulch: Protection
- Late start
 - Holding Tank



CONSTRUCTION TECHNIQUES FOR COLD TEMPERATURES

- Freezing may only be an issue 1 in 10 years, but better to prevent it
- **Key techniques**
 - Keep proper slope on pipes
 - Bed pipes properly to prevent dips
 - Insulate where appropriate
 - **Walkways/Parking**
 - **Shoveled**



CONSTRUCTION TECHNIQUES FOR COLD CLIMATES

- **Tanks and pretreatment units**
 - Insulate when there is less than 2 ft of soil cover
 - Piping
 - Air source warm
- **Soil treatment system**
 - Limit traffic over system
 - Vegetation is a critical part of natural insulation
 - Vigorous growth in the fall is advantageous
 - Fall installations should have temporary insulation light mulch material



SERVICEABLE

- Maximum Tank depth
- Risers
- Drop boxes
- Cleanouts
- Inspection Pipes



PROPER MATERIALS

- Registration Process
- Pipe
- Rock
- Geotextile
- Cover
- Inspection Pipes



INSPECTION OF SYSTEM

- Outcome- Compliance
 - 7080
 - Local Standards
- As-built
- Certified Statement





QUESTIONS

