

Hillside Terraces

DEFINITION

A terrace is an earth embankment, channel, or a combination ridge and channel constructed across a slope.

CONDITIONS WHERE TERRACES ARE APPLIED

Terraces are used on sloping cropland to conserve rainfall, safely conduct runoff water from the land, and help control erosion. Terraces should serve as guides for good row layout in the field. They are an essential part of a water disposal system for sloping fields used to grow row crops.

CONSTRUCTION

The work shall consist of constructing terraces at the locations shown on the drawings or as staked in the field.

Foundation Preparation: The foundation shall be stripped to remove vegetation, topsoil, frozen soil, and other unsuitable materials as specified.

Foundation surfaces shall be graded to remove surface irregularities and loosened to a minimum depth of 2 inches. The loosened material shall meet the moisture and compaction requirements described in the plan and bonded with the first layer of earthfill.

Terrace Height: The top of the ridge shall be constructed to the design height plus overfill for settlement as shown on the drawings or staked in the field.

Terrace Channel: The terrace channel shall be constructed to the elevations specified on the drawings or staked in the field. The channel shall be constructed on a positive grade without depressions. If an underground outlet is planned, the terrace channel shall be graded to the riser intake(s).

Borrow: Topsoil from the terrace foundation shall be stripped and stockpiled. Spreading of topsoil shall not be done when the ground or topsoil is frozen, excessively wet, or in a condition detrimental to the work.

Finished borrow areas shall be free draining with a natural appearance.

Ridge Placement: Earth fill for the ridge shall be placed in horizontal layers not exceeding 9 inches in thickness prior to compaction. The moisture content of the earth fill shall be sufficient to form a moist, firm ball that will not readily separate. Compaction shall be obtained with 3 passes of rubber-tired hauling equipment or 200 psi sheep's foot roller so that the entire surface of each layer is traversed by not less than one tread track traveling in a direction parallel to the main axis of the fill. Other approved methods shall be specified in the Scope of Work.

Tile Outlet: The riser intake shall be installed as shown on the drawings. The riser openings shall extend to ground level or below to allow for surface water removal.

With the exception of the top terrace in a series, the riser intake shall be offset at least eight feet from the main line to prevent surface damage from affecting main line capacity, and to allow a vertical rotation or orientation of the riser.

The bottom width of the conduit trench shall extend one foot beyond each side of the conduit. Side slopes of the trench shall be 1:1 or flatter. Native material shall be used as backfill unless otherwise specified in the Scope of Work. Earth fill placed within 2 feet of a conduit or intake shall be compacted with a manually-directed power tamper in 4 inch lifts.

Heavy equipment including backhoe-mounted power tampers, vibrating compactors, and manually-directed vibrating rollers shall not be operated within two feet of a conduit or intake. The passage of

heavy equipment shall not be allowed over a conduit until backfill has been placed above the conduit to a height of two feet.

MEASUREMENT AND PAYMENT

Terraces are measured by the linear foot along the center line of the terrace planting area or bench.

The contract price paid per linear foot for terraces includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the terraces, complete in place, including removal of materials, clean up and disposal of waste construction debris, and backfilling and repairing holes, depressions, and other ground disturbance, as specified in Section III, General Provision, and as directed by the PPO/PRT Engineer.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be prepared for the terrace system. Specified actions include normal repetitive activities in the application and use of the practice (operation) and repair and upkeep of the practice (maintenance). The following activities shall be addressed in the plan:

- Establish a program for maintaining terrace capacity, storage, ridge height, and outlets
- Remove sediment that has accumulated in the terrace to maintain capacity, a positive channel grade, and to maintain capacity where soil infiltration serves as the outlet
- Repair or replace any damaged surface inlets
- Remove trash from around and inside the surface inlet
- Control weeds, brush, and trees by mechanical methods or chemicals
- Re-seed and fertilize as needed to maintain good vegetation

REFERENCES

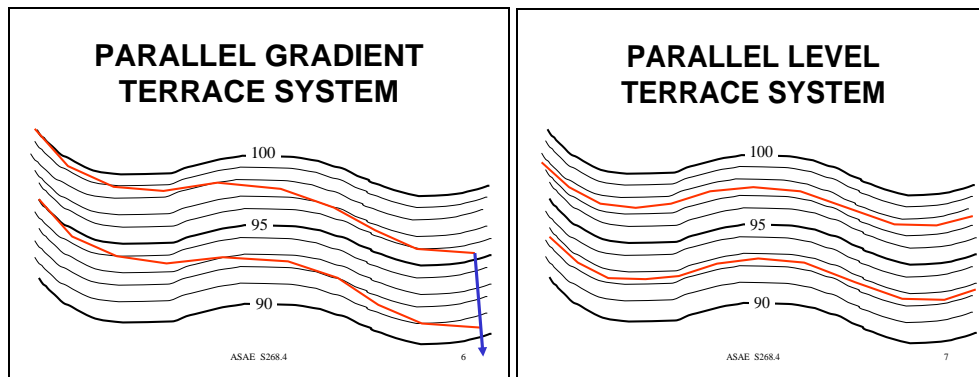
USDA-NRCS, National Engineering Handbook (NEH), Part 650, Engineering Field Handbook (EFH), Chapter 8

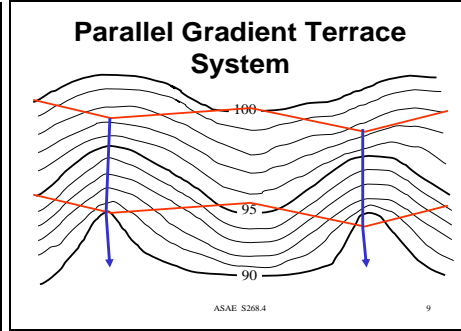
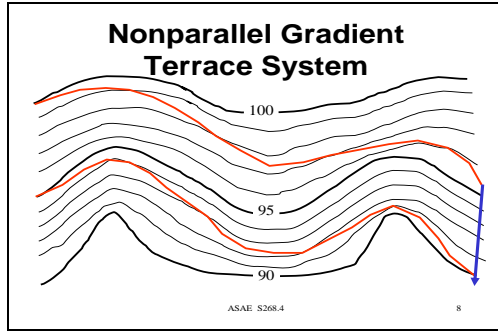
USDA-NRCS, National Engineering Handbook (NEH), Part 636, Chapter 52

USDA-NRCS, Conservation Practice Standard (ft) Code 600

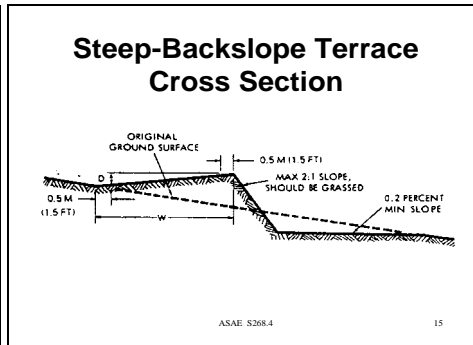
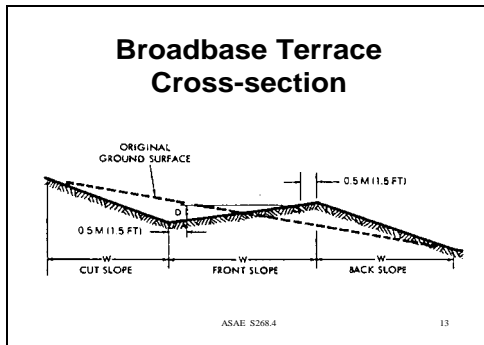
ASAE Power Point ASAE S268.4

Terrace System Classification

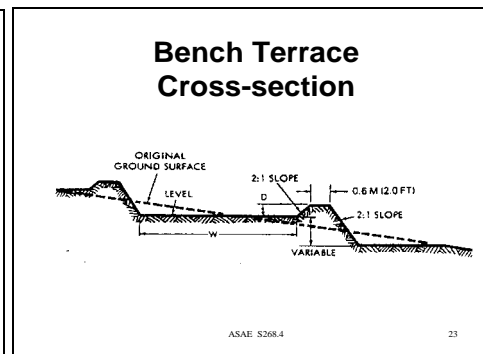
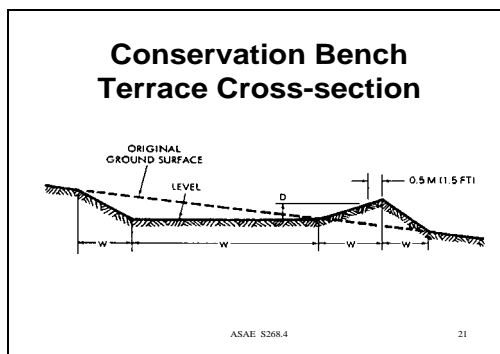
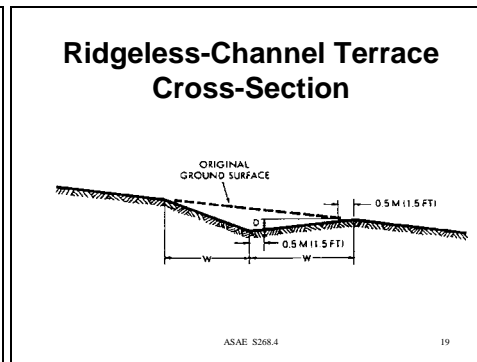
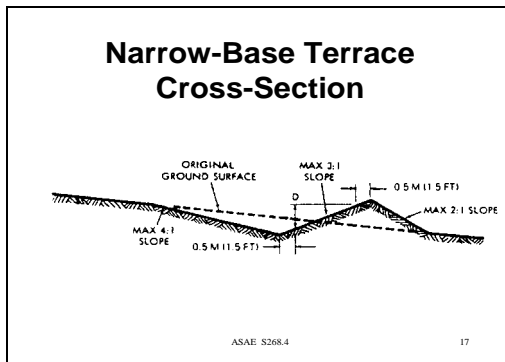




Typical Terrace Cross Sections

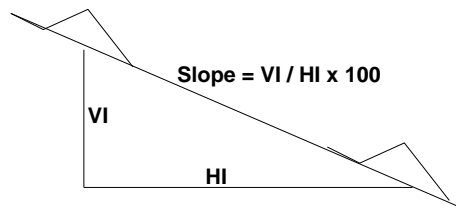


Typical Terrace Cross Sections (Continued)



Calculating Terrace Spacing

Terrace System Spacing



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$$VI = Xs + Y$$

- VI is the Vertical Interval between terraces in Feet
- s is the Field Slope between terraces in percent
- HI = Horizontal Interval or spacing
- $s = VI / HI * 100$ (definition of field slope)
- $HI = VI / s * 100$

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Calculating Terrace Spacing (cont)

$$VI = Xs + Y$$

- X is a factor that depends on the climate (rainfall) in the area
- X has a value range of $0.4 < X < 0.8$
- Higher value for less rainfall
- Use 0.6 for P2K
- Adjust as necessary

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$$VI = Xs + Y$$

- Y is a factor that depends on the soil erodibility and cover protection
- Highest value for erosion resistant soil with large amount of cover.
- Lower Value for easily eroded soil with little cover protection
- $1 < Y < 4$
- Use $Y = 2$ for average field conditions in P2K

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Maximum Terrace Length

MAXIMUM TERRACE LENGTH

- The maximum terrace length is based on a maximum drainage area.
- Terrace channels should drain no more than 3 acres of watershed
- Length x Spacing = Drainage Area

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