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Terminology for Soil-Engaging Components for Conservation-Tillage Planters, Drills, and Seeders



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1 Purpose and Scope

1.1 The purpose of this Standard is to provide uniform terminology for the soil-engaging components of planters, drills and other seeders used in conservation-tillage systems so as to improve communication among those who design, develop, produce, sell, service, demonstrate and report the performance of such machines.

1.2 This Standard is limited to machine components for planters, drills and other row-type seeders used for establishing field crops with conservation-tillage systems. It does not include components for aerial, broadcast or other random-pattern seeding machines, nor those used exclusively for seeding vegetable or other specialty crops.

1.3 This Standard is limited to those machine components that actively engage and/or penetrate the soil during the seeding operation and which affect the total performance of the seeding machine.

1.4 This Standard includes numerous references to, but does not attempt thorough descriptions of, machine frames or transport components, drive mechanisms, metering devices, suspensions for seeding units, and hoppers and containers for seed or other materials that may be applied during the seeding operation.

1.5 Dimensions, spacing, operating depths and velocities are used in some cases as part of the component descriptions. These are for informational purposes only and do not imply performance specifications for any type of component design, soil condition, or seeding practice.

1.6 This Standard is intended to be consistent with terminology in other ASAE standards including ASAE Standard S414, Terminology and Definitions for Agricultural Tillage Implements, and ASAE Engineering Practice EP291, Terminology and Definitions for Soil Tillage and Soil-Tool Relationships.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies unless noted. For undated references, the latest approved edition of the referenced document (including any amendments) applies.

ASAE EP291, Terminology and Definitions for Soil Tillage and Soil-Tool Relationships

ASAE S414, Terminology and Definitions for Agricultural Tillage Implements

ASABE S506, Terminology and Definitions for Planters, Drills and Seeders

3 Definitions

3.1 soil-engaging components: Seeding-machine mechanical components that actively engage and penetrate the soil during the seeding operation, which are designed for or used to accomplish seeding functions or the placement or incorporation of fertilizers or pesticides. Also, those seeding-machine mechanical components that engage, but do not penetrate the soil during the seeding operation, which are designed for or used to control the depth of soil penetration or to actively press on the soil surface.

3.2 conservation tillage: Any tillage and planting system which maintains a minimum of 30% residue cover on the soil surface after planting or maintains at least 1 120 kg/ha (1000 lb/acre) of flat, small grain residue equivalent on the surface during critical erosion periods.

3.3 planters, drills and air seeders: Three basic categories of row-type seeding machines that are appropriate for use in conservation-tillage environments.

3.3.1 planters: Machines with multiple row-seeding units that are individually suspended from a main frame (see ASABE Standard S506). Planters utilize singulating seed metering devices and disc-type, hoe-type or runner-type ground openers to place the seed in rows. Seeding depth is typically set by depth-controlling components on each row unit (see paragraph 5.8).

3.3.2 drills: Machines with multiple-row seeding units that are each suspended from a main frame (see ASABE Standard S506). They use volumetric displacement type meters, place the seed in rows, and typically have on-row packing. Drills have a main frame which also supports a common seed hopper and seed metering for all rows. Metered seeds free-fall through individual delivery tubes to the point of deposition in each row behind each ground opener. Ground openers can be disc-type, hoe-type or chisel-type openers. Seeding depth is controlled by main frame elevation, by depth-control components on each seeding unit or on each gang of seeding units, and/or by the flotation characteristics inherent with the “soil opening for seed placement components” (see paragraph 5.4) on each seeding unit.

3.3.2.1 air drills: Air drills are machines that utilize a centralized hopper and volumetric metering device (see ASABE Standard S506). The seeds are pneumatically transported through tubes to the point of deposition in each row. Seeding depth is controlled by mainframe elevation, by depth-control components on each seeding unit, or on each gang of seeding units, and/or by the flotation characteristics inherent with the “soil opening for seed placement components” (see paragraph 5.4). Air drills typically have on-row packing.

3.3.3 air seeders: Air seeders are machines that utilize centralized seed hoppers and volumetric seed metering mechanisms (see ASABE Standard S506). Seed is pneumatically conveyed to the ground openers of the seeding tool or to spreaders located at the front of the tillage tool. A tillage tool may be used to prepare the seedbed and/or cover the seed. Harrowing and/or packing devices may be used as part of the seeder or air seeder. Air seeders typically do not have on-row packing.

4 Special Use of Components

4.1 Components for seeding in conservation-tillage environments have been partitioned into seven functional groups. On a seeding machine (see Figure 1) one or more compatible components from each group may be used to assure that seed is satisfactorily planted and that components which perform sequential functions will perform properly. Conservation-tillage environments require special functions or sequences of functions to compensate for little or no tillage to cut, incorporate, or bury previous crop residues and to loosen the soil prior to the seeding operation. The severity of the residue and soil conditions will determine which components should be used and whether or not some functional groups may be omitted from a seeding machine. Most of the components described herein were originally developed for tillage implements (see ASAE Standard S414, Terminology and Definitions for Agricultural Tillage Implements), or for seeding machines for residue-free, tilled-soil seeding environments. Those components are used with or without modifications in special configurations or sequences in the design of seeding machines for conservation-tillage environments.

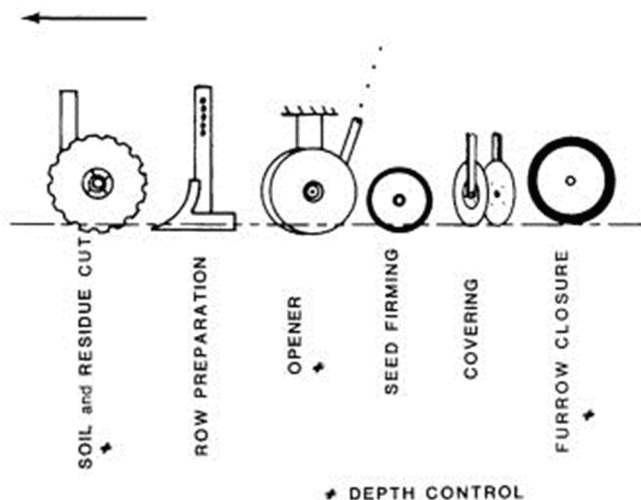


Figure 1 – Example of a sequence of soil-engaging components on a conservation-tillage seeding machine. The depth-control component may be located at any one or more of the locations indicated

5 Component Terminology and Illustrations

5.1 Components described in this Section are illustrated in Figures 2-8. The illustrations depict a common configuration of the component, understanding that many variations occur among manufacturing sources. All illustrations are side views with direction of travel from right to left, unless otherwise specified.

5.2 Soil and residue cutting components: These components cut and/or orient surface residue in the row area and cut or loosen the soil to enhance the performance of the components which follow. Soil and residue cutting components, if employed, precede all other planter, drill and seeder components. They may also serve as a drive wheel for seed metering or other mechanisms. Soil and residue cutting components penetrate the soil surface to a depth usually no greater than one or two times seeding depth. When conditions and seeding practices do not require separate soil and residue cutting components, the dual function of some “row preparation” components (see paragraph 5.3) or “soil opening for seed placement” components (see paragraph 5.4) will accomplish soil and residue cutting. The components described below are illustrated in Figure 2.

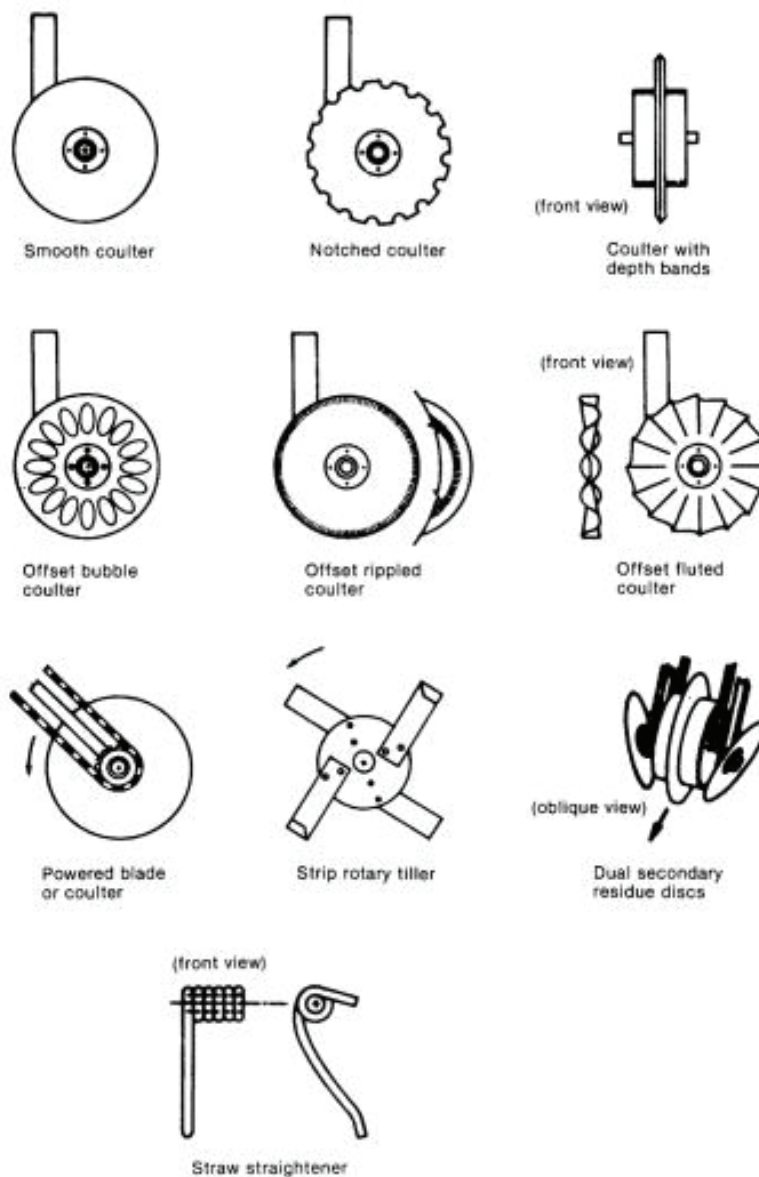


Figure 2 – Component options for soil and residue cutting

5.2.1 Smooth coulters: A flat circular disc blade with a sharpened circumference.

5.2.2 Notched coulters: A flat circular disc blade with a sharpened circumference and spaced, sharpened notches in the circumference.

5.2.3 Coulters with depth bands: A smooth or notched coulters with concentric cylindrical rings attached to both faces to limit the depth of soil penetration.

5.2.4 Offset coulters: A circular disc blade with sharpened circumference and various lateral offsets from the flat surface — rounded offsets or protrusions alternating between sides of the blade. The offsets are typically sinusoidal in cross section. Position, spacing, and radial length of the offsets distinguish between different offset coulters, as given below.

5.2.4.1 Bubble coulters: Offsets are recessed from the circumference providing a smooth cutting edge. Offsets are typically spaced at about 10 degrees, and protrude about 10 mm (3/8 in.) to each side, producing a working width of approximately 20 mm (3/4 in.). Offset radial length is about 70 mm (2.8 in.) for a blade of 450-mm (18-in.) diameter.