

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATIONS**

RESIDUE MANAGEMENT, SEASONAL

Code 344

GENERAL SPECIFICATIONS:

The following general specifications are provided as guidance to ensure proper implementation of this practice to meet planned objectives.

Loose residue to be retained on the field shall be uniformly distributed on the soil surface. Where combines or similar machines are used for harvesting, they shall be equipped with spreaders capable of redistributing residue over at least 80 percent of the working width of the header. Residue will be shredded or chopped as necessary for field management.

Where annual crops are used for grazing, or where residue is removed by other means, enough growing crop or residue must be left at all times to control wind and water erosion or to meet other planned objectives. (See Job Sheet).

If residue is subject to blowing, it may be incorporated into the surface by light disking or cultivating.

Any tillage during the management period shall be limited to methods that leave residue on the surface and maintain the planned cover conditions. The following information can be used as a general guide to achieve this.

See Exhibit B, Table 3 for percent of residue covered by various tillage operations.

Where the objective is to manage snow to increase plant available moisture, the following guidance shall be followed.

Stubble shall be left standing as high as possible by the harvesting operation, but not less than 6 inches. It shall be maintained in a standing orientation over winter to trap and retain snow. Any tillage that occurs during this period shall be limited to undercutting tools such as blades, sweeps, or deep tillage implements such as rippers or subsoilers. See Exhibit B, Table 3.

Loose residue may be removed provided that the remaining residue is left standing.

Where surface salt accumulation is a concern, the residue shall be allowed to remain on the surface until seedbed preparation just prior to planting.

Where food and cover for wildlife are concerns, residue shall not be removed unless it is determined that the removal will not adversely affect habitat values. Tillage shall be delayed until the end of the management period to maintain the food and cover value of the residue.

OPERATION AND MAINTENANCE

Fields will be monitored during the critical erosion period to ensure that erosion is controlled.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Specification - 344 -2

The following estimates of residue amounts can be used as a guide for successful implementation of a residue management program.

EXHIBIT A Estimated Air Dry Residue by Production Various Crops

<u>Crop</u>	<u>Lbs of Air Dry Residue Expected</u>		
Wheat	100	to	135 per Bushel of Grain
Rye	100	to	120 per Bushel of Grain
Barley	80	to	90 per Bushel of Grain
Oats	50	to	70 per Bushel of Grain
Corn	60	to	70 per Bushel of Grain
Sorghum	70	to	90 per Bushel of Grain
Cotton	3	to	4 per Pound of Lint

EXHIBIT B CROP RESIDUE

CROP RESIDUE MANAGEMENT

Classes of Crop Residue

- (1) Crop residue has been generally classified as being either Non-Fragile or Fragile. classification based in part on the ease in which crop residue is decomposed by the elements or buried by tillage operations.
- (2) The classification of residue as Non-Fragile or Fragile is a subjective
- (3) Plant characteristics such as composition and size of leaves and stems, density of the residue, and relative quantities produced are considered when assigning classifications.
- (4) Table #1 lists agronomic and horticultural crops that are generally considered as having Fragile crop residue.
- (5) Table #2 lists agronomic and horticultural crops that are generally considered as having Non-Fragile residue.

**TABLE 1
CROPS WITH FRAGILE RESIDUE**

Canola/Rapeseed	Mustard
Dry Beans	Peanuts
Dry Peas	Potatoes
Fall Seeded Cover Crops	Safflower
Flower Seed	Soybeans
Grapes	Sugar Beets
Green Peas	Sunflower
Guar	Sweet Potatoes
Lentils	Vegetables
Mint	

TABLE 2
CROPS WITH NON-FRAGILE RESIDUE

Alfalfa or legume hay	Millet
Barley*	Oats
Buckwheat	Wheat*
Corn	Pasture
Cotton	Popcorn
Flaxseed	Rye*
Forage Seed	Sorghum
Forage Silage	Spelts*
Grass Hay	Triticale*

* If a combine is used with a straw chopper or otherwise cuts straw into small pieces in harvesting small grain, then the residue should be considered as being fragile.

NOTE: The classifications listed in Tables #1 and #2 are accepted by the Agricultural Research Service (ARS) and by the Equipment Manufacturers Institute (EMI).

Residue Burial

- (1) Tillage implements and other types of field equipment are the most important factors influencing residue burial and the rate of residue decomposition.
- (2) Field operations bury crop residue and mix them with the soil, reducing the amount of residue on the soil surface and increasing the rate of decomposition.
- (3) To plan crop residue management systems for erosion control or other conservation purposes requires a general working knowledge of the degree to which tillage and other field implements bury crop residue, and how much residue is likely to remain on the soil surface after a single pass of that implement.
- (4) Each tillage or planting operation leaves a percent of the residue that was present just prior to that operation. The numbers in Table #3 represent these remaining percentages.
- (5) Many factors affect the amount of residue left after each tillage or planting operation. Residue levels are sensitive to the depth and speed of equipment operation, and to row spacing.
- (6) Under some conditions, field cultivators, other finishing tools with field cultivator gangs, and some planters and drills return to the surface as much as 20 percent of the residue incorporated at shallower depths by operations that have recently occurred.

- (7) The following general rules of thumb should be used when selecting values from the ranges listed in Table #3:
 - (a) Select values from the lower end of the range in situations where equipment is used at deeper operating depths. At shallower operating depths, more residue is left on the surface; while at deeper operating depths, more residue is buried.
 - (b) Select values from the upper end of the range in situations where equipment is operated at slower speeds. Slower operating speeds tend to leave more residue on the surface; while faster speeds bury more residue.
- (8) The values in Table #3 may be used as a guide in selecting the types of equipment and types of blades, points, or sweeps to be used in a residue management system. Field measurements of the actual amounts of residue being left by an operation should be made, and adjustments made accordingly.

**TABLE 3
RESIDUE RETENTION-BURIAL, IMPLEMENT OPERATING DATA**

Implements:	Residue Remaining (Percent)		Depth of Operation (Inches)
	Fragile Residue	Non-Fragile Residue	
PLOWS			
Moldboard Plow	0-5	0-10	4-8
Disk Plow	5-15	10-20	4-8
MACHINES WHICH FRACTURE SOIL			
Paratill/Paraplow	75-85	80-90	8-12
"V" Ripper/Subsoiler 12"-14" deep 20" spacing	60-80	70-90	10-16
Combination Tools:			
Subsoil-chisel	40-50	50-70	10-16
Disk-subsoiler	10-20	30-50	8-16
CHISEL PLOWS With			
Sweeps	50-60	70-85	4-8
Straight chisel spike points	30-60	40-80	4-8
Twisted points or shovels	20-40	35-70	4-8
COMBINATION CHISEL PLOWS			
Coulter Chisel plows with:			
Sweeps	40-50	60-80	4-8
Straight chisel spike points	25-40	30-60	4-8
Twisted points or shovels	10-30	25-60	4-8
Disk Chisel plows with:			
Sweeps	30-50	60-70	4-8
Straight chisel spike points	25-40	30-60	4-8
Twisted points or shovels	10-30	20-50	4-8
UNDERCUTTERS			
Stubble-Mulch sweep or blade plows with:			
Sweep/"V"-Blade > 30" wide	60-80	75-95	3-6
Sweeps 20"-30" wide	50-75	70-90	3-6
DISK			
Offset			
Heavy plowing > 10" spacing	10-25	25-50	4-8
Primary cutting > 9" spacing	20-40	30-60	4-8
Finishing 7"-9" spacing	25-40	40-70	2-6
Tandem			
Heavy plowing > 10" spacing	10-25	25-50	4-8
Primary cutting > 9" spacing	20-40	30-60	4-8
Finishing 7"-9" spacing	25-40	40-70	2-6
Light tandem disk after harvest, before other tillage	40-50	70-80	2-4
One-way disk with:			
12"- 16" blades	20-40	40-50	4-8
18"-30" blades	10-30	20-40	4-8
Single gang disk	40-60	50-70	2-6

TABLE 3 (Continued)
RESIDUE RETENTION-BURIAL, IMPLEMENT OPERATING DATA

Implements:	Residue Remaining (Percent)		Depth of Operation (inches)
	Fragile Residue	Non-Fragile Residue	
FIELD CULTIVATORS: (Including leveling attachments)			
Used as the primary tillage operation:			
Sweeps 12"-20"	55-75	60-80	4-6
Sweeps or shovels 6"-12"	50-70	35-75	4-6
Duckfoot points	30-55	35-60	2-4
Field cultivators as secondary operation following chisel or disk:			
Sweeps 12"-20"	60-75	80-90	2-4
Sweeps or shovels 6"-12"	50-60	70-80	2-4
Duckfoot points	35-50	60-70	2-4
FINISHING TOOLS			
Combination finishing tools with:			
Disks, shanks and leveling attachments	30-50	50-70	2-4
Spring tooth & rolling basket	50-70	70-90	2-4
Harrows			
Springtooth (coil tine)	50-70	60-80	2-4
Spike tooth	60-80	70-90	2-4
Flex-tine tooth	70-85	75-90	2-4
Roller harrow (cultipacker)	50-70	60-80	1-2
Packer roller	90-95	90-95	1-2
Rotary Tiller			
Secondary operation 3" deep	20-40	40-60	3
Primary operation 6" deep	5-15	15-35	6
RODWEEDERS			
Plain rotary rod	50-60	80-90	2-4
Rotary Rod with semi-chisels or shovels	60-70	70-80	2-4
STRIP TILLAGE MACHINES			
Rotary tiller, 12" tilled on 40" rows	50-60	60-75	4-6
ROW CULTIVATORS (30" and wider)			
Single sweep per row	55-70	75-90	1-3
Multiple sweeps per row	55-65	75-85	1-3
Finger wheel cultivator	50-60	65-75	1
Rolling disk cultivator	40-50	45-55	1-3
Ridge Till cultivator	5-25	20-40	1-3
UNCLASSIFIED Machines			
Anhydrous applicator	45-70	75-85	4-8
Anhydrous applicator with closing disks	30-50	60-75	4-8
Subsurface manure applicator	40-60	60-80	4-8
Rotary Hoe	80-90	85-90	1
Bedders, lister & hippers	5-20	15-30	2-6
Furrow diker	75-85	85-95	2-6
Mulch Treader	60-75	70-85	2-4

TABLE 3 (Continued)
RESIDUE RETENTION-BURIAL, IMPLEMENT OPERATING DATA

Implements:	Residue Remaining (Percent)		Depth of Operation (inches)
	Fragile Residue	Non-Fragile Residue	
DRILLS			
Hoe Opener drills	40-60	50-80	1-2
Semi-deep furrow drill or press drill (7"-12" spacing)	50-80	70-90	1-2
Deep furrow drill with > 12" spacing	50-80	60-80	1-2
Single disk opener drills	75-85	85-100	1-2
Double disk opener drills (conventional)	60-80	80-100	1-2
No-till drills and drills with the following attachments in standing stubble:			
smooth no-till coulters	70-85	85-95	1-2
Ripple or bubble coulters	65-85	80-85	1-2
Fluted coulters	60-80	75-80	1-2
No-till drills and drills with the following attachments in flat residue:			
Smooth no-till coulters	50-70	65-85	1-2
Ripple or bubble coulters	45-65	60-75	1-2
Fluted coulters	40-60	55-70	1-2
Air seeders: (Refer to appropriate field cultivator or chisel plow depending on the type of ground engaging device used.)			
Air drills: (Refer to corresponding type of drill opener.)			
ROW PLANTERS			
Conventional planters with Runner openers	80-90	85-95	1-2
Staggered double disk openers	85-95	90-95	1-2
Double disk openers	75-85	85-95	1-2
No-till planters with Smooth coulters	75-90	85-95	1-2
Ripple coulters	70-85	75-90	1-2
Fluted coulters	55-80	65-85	1-2
Strip till planters with 2 or 3 Fluted coulters			
2 or 3 Fluted coulters	50-75	60-80	1-2
Row cleaning devices (8"-14" wide bare strip using brushes)	50-60	60-60	1-2
Ridge till planter	20-40	40-60	1-2
CLIMATIC EFFECTS			
Over winter weathering			
Following summer harvest	65-85	70-90	1-2
Following winter harvest	70-80	80-95	1-2

(10) References:

(a) Natural Resources Conservation Service (USDA) and Equipment Manufacturers Institute, 1992, as revised 1993. "Estimates of Residue cover Remaining After Single Operation of Selected Tillage Machines."

(b) Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana