

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

**HEAVY USE AREA PROTECTION**

(Ft.)

**CODE 561**

**SCOPE**

This specification shall consist of the clearing, grubbing, excavation, backfill, other appurtenances and services required for the construction and surface treatment to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles, including disposal of all cleared and excavated materials. The work shall consist of furnishing and installing the surfacing materials as specified, in order to provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles to treat animal health or water quality resource concerns. Construction shall be conducted in such a manner that erosion, water, air, and noise pollution will be minimized and held within legal limits as established by state and federal regulations, including AgPDES and NPDES permits.

The treatment area shall be constructed according to plans furnished by the Natural Resources Conservation Service (NRCS) and in accordance with the NRCS's engineering standards for these practices, as well as local building codes, state laws and regulations and current industry standards. Any deviation from the approved drawings and specifications must be approved by the engineer prior to construction.

**PUBLIC AND PRIVATE UTILITIES**

Utilities are defined to be public or private, overhead and underground power or communication lines, and any pipelines. The landowner/operator/contractor shall conduct their own search and discovery for utilities in order to lessen or avoid potential damages, injuries or loss of life. During planning, the owner/operator should complete an OK-ENG-45 UTILITIES INVENTORY to document known utilities in order to comply with State law prior to any ground disturbance and return it to a USDA-NRCS representative.

**QUALITY CONTROL**

Quality Control of all materials and construction procedures is the responsibility of the landowner and contractor. NRCS will make periodic review(s) of the work for the benefit of the agency which will include the final construction check.

**FOUNDATION PREPARATION**

The foundation shall be prepared by leveling, smoothing, and proper compaction of the area where the surfacing materials are to be installed. The base shall be reasonably smooth and free of debris, holes, depressions, projections, muddy conditions, standing or flowing water and loose rocks and clods larger than 3/8 inch in size. Excavation below natural ground to the design depth of the surfacing materials is required unless site conditions prevent this operation. Areas not excavated, including sites where partial excavations were made, other provisions shall be made to ensure containment of surfacing material.

When specified, a layer of sand or fine gravel shall be placed between the bottom of the surfacing material and subgrade. On moderately to high shrink/swell soils a minimum of a 4" layer of 3/8 inch crushed rock or concrete sand may be specified under concrete slabs or other non-flexible surfacing materials for a base, it shall be saturated to consolidate the sand or crushed rock base. The material shall be free of organic material, excess fines, and rock larger than 3/8 inch in size.

## **GEOTEXTILE**

All materials used in the installation shall be equal in size and quality to that specified or shown on the drawings. All materials shall conform to appropriate ASTM specifications. When not otherwise specified all geotextile shall be a Class 1 nonwoven geotextile fabric with a minimum weight of 8 ounces per square yard.

When geotextile is used, the geotextile shall be placed on the surface at the locations and in accordance with the details shown on the drawings. It shall be unrolled along the placement area and loosely laid, without stretching, in such a manner that it conforms to the surface irregularities when material are placed on or against it. The geotextile may be folded and overlapped to permit proper placement in designated areas.

For areas where the geotextile will be installed on slopes less than 1 percent, it shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet. The minimum overlap of geotextile panels shall be 24 inches (unless otherwise specified). The geotextile shall be temporarily secured during placement of overlying material to prevent slippage, folding, wrinkling, or other displacement of the geotextile. Unless otherwise specified, methods of securing shall not cause punctures, tears, or other openings to be formed in the geotextile.

When the geotextile material is laid on a slope that is greater than 1 percent, the geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height of more than 3 feet. The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified) and secured against the underlying foundation material. Securing pins approved and provided by the geotextile manufacturer shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. The pins shall be steel or fiberglass formed as a **U**, **L**, or **T** shape or contain "ears" to prevent total penetration through the geotextile. Steel washers shall be provided on all but the **U**-shaped pins. The upstream or upslope geotextile shall overlap the abutting downslope geotextile. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope laps, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line about 2 inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. The patch shall extend a minimum of 2 feet from the edge of any damaged area.

## **SURFACE TREATMENT**

All materials used in the installation shall be equal in size and quality to that specified or shown on the drawings. All materials shall conform to appropriate ASTM specifications. Unless otherwise specified, the top surface of the treatment shall be installed even with the natural ground surface outside the treatment area. The installed surface treatment should blend into the surrounding topography without any abrupt changes in elevation or grade.

### **Concrete**

**Design Mix.** The concrete shall be good quality using sound and clean aggregates. A job or ready-mix concrete shall consist of approximately 1 part cement, 2 parts sand, and 4 parts coarse aggregate (1 ½ inch maximum size). The concrete shall contain a standard known brand of Portland cement with washed sand and gravel. Clean water shall be used in the mix. The water-cement ratio shall be no more than 6 gallons of water to 1 - 80 pound sack of cement when dry aggregates are used. If the sand and gravel used is moist, the water shall be reduced to no more than 5 gallons per sack of cement. The design mix shall have a designed minimum 28 day compressive strength of 3,000 pounds per square inch (psi).

**Consistency.** All concrete is to consist of a workable mix that can be placed and finished in an acceptable manner. The concrete shall be delivered to the site and discharged into the forms within 1 ½ hours after the introduction of the cement to the aggregates unless the concrete mix is designed with set retarder and is approved for use by the technician. The amount of water used in the concrete shall be the minimum necessary to obtain the required workability. The consistency of the concrete shall be such that it can be worked readily into the corners and angles of the forms and around reinforcement but without permitting the materials to segregate or excess free water to collect on the surface. The slump shall be between 2 and 5 inches as tested by "The Test for Slump for Portland Cement Concrete", ASTM Specification C143.

**Reinforcement.** Reinforcement shall be placed as shown on the plans and shall be free of oil and other foreign matter such as loose coatings of rust, scale, or dirt. Steel bars for concrete reinforcement shall be deformed billet-steel bars, conforming to ASTM Specification A615, Grade 40 or 60. Welded wire fabric shall conform to the requirements of ASTM Specification A185.

Reinforcement steel shall be accurately placed and secured in position in a manner which will prevent its displacement during placement of the concrete. If reinforcing steel is spliced, the splices shall provide an overlap equal to 30 times the diameter of the smaller bar in the splice and shall be tied at both ends of the splice. Field bending of steel will be permitted. Heating of steel for bending will not be permitted.

Reinforcement steel and welded wire fabric shall be suspended off the ground and other concrete contact surfaces by using scotches of concrete bricks, concrete blocks or pieces of blocks, wire stands, or other approved method prior to the placing of concrete. Scotches of stones, wood materials, earth, earth clods, clay bricks, scrap metal and other unapproved materials are not acceptable. The reinforcement shall be tied in place so that it is no closer than 2 to 2½ inches from the finished surface of the concrete. Slab reinforcement shall rest on the horizontally projecting legs of the vertical bars.

During concrete placement welded wire reinforcement shall be pulled into the middle of the concrete or the position shown in the drawings. Unless otherwise specified, welded wire fabric shall be spliced by overlapping adjacent sections a minimum of six inches, or one full mesh plus 2 inches, whichever is greater. The splice length shall be measured from the center of the first transverse wire in one piece of fabric to the center of the first transverse wire in the lapped piece of fabric.

Welded wire or fiber reinforcement can be used for concrete pads or floors as shown on the standard drawing when applicable. See the Fiber Reinforced Concrete section below for more details.

**Forms.** Forms shall be of wood, steel, or other approved material. Forms shall be true to line and grade, mortar tight, and sufficiently rigid to prevent objectionable deformation under load. Form surfaces shall be smooth, free from irregularities, dents, sags, or holes when used for permanently exposed surfaces. Rods used for internal ties shall be so arranged that, when the forms are removed, metal will not be less than 1 inch from any concrete surface. Forms for walls and vertical sections 2 feet high and taller shall be stabilized with adequate tie rods, walers, cat-heads, and sufficient bracing to prevent shifting or movement of forms during placing of concrete.

Forms for exposed surfaces shall be coated with a non-staining form release agent that shall be applied before the concrete is placed. All excess release agent on the form surfaces and any on surfaces requiring bonding with concrete shall be removed.

All form removal shall be accomplished in such a manner as to prevent injury to the concrete. Forms for floor slabs and such work may be removed after a minimum of 24 hours. Forms for walls shall be left in place for a minimum of three days. All forms must be removed before final inspection of the work. All repair work must be done immediately after removal of forms.

**Timing and Temperature.** Concrete shall be placed within 1½ hours after introduction of water to the cement and aggregates. Concrete shall not be placed when the outside temperature is expected to fall below 40°F at the time the concrete is delivered and placed at the work site. Concrete shall not be exposed to freezing temperatures during the curing period. Concrete, when deposited in the forms during hot weather, will have a temperature not greater than 90°F at the time of placement. Ice may be used as a portion of the mixing water to control temperature provided all ice is melted in the mixing process. When the outside temperature reaches or exceeds 90°F., the concrete shall be placed within 45 minutes after batching.

**Conveying and Placing.** No concrete shall be placed until the approving official has given approval of the in-place subgrade, forms, reinforcing steel, and any other items involved or affected by the concrete placement.

Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation or loss of ingredients by using hoppers and chutes, pipes, or "elephant trunks". There shall be no vertical drop greater than 5 feet.

Unless otherwise authorized, all concrete shall be placed upon clean, damp surfaces free from frost, ice, standing and running water, and never upon soft mud, dried porous earth, or fill that does not meet specified compaction requirements. Soft mud or other unacceptable foundation material shall be removed and replaced with gravel or other approved material.

Concrete shall be deposited as close as possible to its final position in the forms. Concrete shall be thoroughly consolidated by rodding or mechanically vibrating the concrete in place supplemented by hand-spading and tamping to remove air voids. Vibrating equipment shall be used when pouring walls and other thin sections.

**Slabs and Floors.** When specified, a layer of sand or fine gravel shall be placed between the bottom of concrete slabs and subgrade. On moderately to high shrink/swell soils a minimum of a 4" layer of 3/8 inch crushed rock or concrete sand may be specified under concrete slabs for a base, it shall be saturated to consolidate the sand or crushed rock base. The material shall be free of organic material, excess fines, and rock larger than 3/8 inch in size.

Isolation or expansion joints shall be installed when a concrete slab is poured against something that could be affected by shrinkage or swelling of the concrete slab. Examples include but are not limited to water tanks and troughs, existing slabs, building walls, support columns or conduits. Isolation joints are formed by placing preformed joint material next to the column or wall or standpipe prior to pouring the slab. Isolation joint material should go all the way through the slab, starting at the sub-base, but should not extend above the top. Isolation Joint materials range from inexpensive asphalt-impregnated

fiberboard to cork to closed cell neoprene. For a cleaner looking isolation joint, the top part of the preformed filler can be cut off and the space filled with elastomeric sealant.

Concrete floor slabs may be placed at one time or may be poured in sections at different times. When the entire area to be surfaced can't be poured at one time, construction joints shall be used. When the slab will have no significant traffic crossing the joint, a plain butt joint, with no reinforcement crossing the joint, is acceptable. For a plain butt joint the bond area between the separate pours shall be left un-troweled and shall be thoroughly cleaned to insure a good bond between the two pours. When the slab is design to handle vehicular traffic, equipment or other non-foot traffic loading, a construction joint with load transfer capabilities will be required.

When steel reinforcement is specified for the floor slab, formed contraction joints shall be placed at intervals not to exceed 30 ft. in any direction unless otherwise specified. When steel is not used, joints shall be as specified in the section "Fiber Reinforced Concrete" of this specification. The formed edges of each section shall be keyed to lock the edges of adjacent sections together. The edge forms may be removable metal or wood forms having the required keyed shape or may be thin galvanized metal designed to be left in place. Smooth vertical edged joints will not be allowed.

Contraction or crack control joints shall be required in all concrete slabs greater than 100 square feet, greater than 10 feet in length or as specified on the drawings. Contraction joint spacing shall be no more than 10 feet. Cut the control joints to a depth of 25% of the depth of the slab. Contraction joints may be cut into fresh concrete using a grooving tool or zip strip. Contraction joints can also be saw cut into hardened concrete as soon as possible after the concrete hardens. In hot weather the concrete may crack if joints are not cut within 6 – 12 hours after finishing.

**Fiber Reinforced Concrete.** Fiber shall consist of 3/4 inch length virgin homopolymer polypropylene fibers, either the collated fibrillated type or the monofilament type. The minimum rate of application is 1.5 pounds of fiber per cubic yard of concrete.

The addition of fiber to a concrete mix may cause an apparent reduction in slump. However, no additional water shall be added to the mix to improve workability. If needed, a suitable plasticizer should be added to the concrete mix. During placement the fiber mix will generally require more effort and vibration to move the mix and consolidate it into the forms due to the lower slump nature. Properly controlled internal vibration is acceptable, but external vibration of the forms and exposed surfaces is preferable to prevent fiber segregation.

If welded wire fabric is omitted from concrete slabs and only fiber additives are used, contraction joint spacing will be a maximum of 15 feet in any direction. Sawn joints shall be 1/4 of the slab's thickness in depth. Formed joints shall be of a keyway type. Smooth vertical joints through the slab are not permitted.

**Finishing.** Defective concrete, honeycombed areas, voids left by the removal of tie rods, and unacceptable ridges left on concrete surfaces shall be repaired immediately after the removal of forms unless otherwise authorized and directed. Voids left by the removal of tie rods shall be reamed and completely filled with mortar.

Defective concrete shall be repaired by removing the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails or anchors. Excessive rubbing of formed areas will not be permitted. All unformed surfaces of concrete, exposed in the completed work, shall have a wood float finish without additional mortar.

**Curing.** Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. All exposed surfaces of concrete shall be protected from the direct rays of the sun for at least these first 7 days. All concrete shall be cured by keeping continuously moist for the entire curing period, or until curing compound is applied. Moisture shall be maintained by sprinkling, flooding, fog spraying, or by covering with materials kept continuously moist such as canvas, cloth mats, straw, sand,

polyethylene, or other approved material. Wood forms (except plywood) left in place during the curing period shall be kept wet. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

If a curing compound is used, two coats of it will be applied to all concrete surfaces except construction joints and surfaces to which other concrete will be bonded. The compound shall be sprayed on the moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs, and finishing of that surface are completed. Curing compound shall meet the requirements of ASTM Specification C309, Type 2, white pigmented.

**Aggregate**

When aggregate is used for the treatment area it shall meet the requirements called for by the design and/or the Oklahoma Conservation Practice Standard 561 – Heavy Use Area Protection. All aggregate shall be composed of clean, hard and durable mineral particles free from organic matter, clay balls, soft particles, or other substances that would interfere with the free-draining properties of the aggregates. A well graded aggregate consisting of sizes ranging from the maximum to the minimum specified so as to fill most of the voids shall be used. A well graded aggregate is a mixture of crushed stone that contains stone particles of a wide range of sizes and has a good representation of all sizes from the largest size specified, 3 inch or smaller, down to no more than 5 percent fines passing the No. 4 sieves (3/16 in.). The example gradations shown below or similar shall be used unless otherwise specified or approved by the designer.

**ASTM Size No. 2 (3 inch crusher run)**

Size of Rock for Livestock Hoof Interface (inches)	% Smaller by Weight
3	100
2-1/2	90-100
2	35-70
1-1/2	0-15
3/4	0-5

**ASTM Size No. 5 (1 1/2 inch crusher run)**

Size of Rock for Livestock Hoof Interface (inches)	% Smaller by Weight
1-1/2	100
1	90-100
3/4	20-55
1/2	0-10
3/8	0-5

When the treated area is not excavated below the natural ground elevation to allow for installation of the surfacing materials, containment features shall be installed as needed to keep the surfacing materials in place. Containment features could include, but are not limited to, treated lumber, railroad ties, steel edging, and prefabricated polyethylene cellular materials.

All aggregate surfaces shall be placed on geotextile unless otherwise specified on the drawings or site specific construction specifications. The aggregate shall be placed by equipment on the subgrade surface to the depth and dimension as shown on the drawings. It shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying

material. Compaction of the aggregate is not required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

**Bituminous Concrete Pavement.** Refer to *AASHTO Guide for Design of Pavement Structures* and the Oklahoma Department of Transportation specification for design and installation criteria for bituminous concrete paving.

**All Other Surfacing Materials.** All Surfacing materials not included above will have a site specific design, material and construction specification developed based on the properties of the material with compressive strengths necessary for the expected use and loading on the heavy use area.