

CATTLEGUARD DESIGN REQUIREMENTS WORKSHEET

Legal Location of cattleguard: Section_____, Township_____, Range _____
Landowner: _____, NRCS Program: _____

1. Is the access road maintained by a county road department? Circle one.

YES, then end worksheet evaluation and

Work with county for cattleguard specifications, design and permits.

NO, proceed with worksheet.

2. Use Vehicle Load Table below to determine the traffic axle loads on the cattleguard.

VEHICLE LOAD TABLE

CHECK THE TYPE OF VEHICLE TRAFFIC EXPECTED

CIRCLE AASHTO LOAD CLASS REQUIRED

NOTE: Maximum axle load or load class of vehicles are design limits.

Vehicle type	Maximum weight axle, LB	Yes	No	AASHTO Load Class
ATV (Trail Vehicle Only)	1,200			NA
Passenger Vehicle	3,000			H 10
Light Truck	3,000			H 10
Pickup	4,000			H 10
80 Hp Tractor	5,700			H 10
Service Vehicle	7,000			H 10
100 Hp Tractor	11,000			H 10
Van Delivery Truck	16,000			H 10
Rural Fire Truck	22,000			H 15
Large Delivery Truck	24,000			H 15
Semi Delivery Truck	24,000			H 15
Garbage Truck (single axle)	26,000			H 20/HS 20
Loaded Dump Truck	30,000			H 20/HS 20
Heavy Delivery Truck	32,000			H 20/HS 20
Heavy Semi Truck	32,000			H 20/HS 20
Standard Log Truck	33,600			H 25/HS 25
Concrete Transit Truck	38,000			H 25/HS 25
Garbage Truck	42,000			H 25/HS 25
Dump Truck	43,000			H 25/HS 25
Off Hwy. Log Truck	43,000			H 25/HS 25

Note: A. Federal and state axle weight limits: single axle 20,000 lb; tandem axle 34,000 lb

B. Washington axle permitted overweight: single axle 21,500 lb; tandem axle 43,000 lb

C. H 10 is the smallest loading grade considered by the AASHTO classification.

3. From the NRCS soil survey complete the first two columns of the SITE SOIL TABLE below for the soil series profile data at the cattleguard site. The maximum depth of soil survey profile data is 60 inches which is adequate for a cattleguard.

Soil information can be found at: http://www.or.nrcs.usda.gov/pnw_soil/wa_reports.html

- Select the project county
- Identify the soil series at the site from the soil Map page
- Under the county soil Reports link, select the site soil, then pick the ‘brief map unit description’ and generate report. Under the non-technical description category select SOI and generate the report. From this information complete the first two columns of the following table.

List the Soil Series _____

SITE SOIL TABLE

Soil Layer Thickness, inches (in)	Soil material identification, (Unified Soil Classification System, USCS)	Allowable Soil Bearing Capacity, (Bs), psf (see table below)

From the Presumptive Bearing Values table below select the Allowable Soil Bearing Capacity (Bs) for the USCS soil type listed at medium density to complete last column of the SITE SOIL TABLE.

Presumptive Bearing Values (approximate maximum safe-load values) of soils as related to the Unified Soil Classification System

USCS	Allowable Soil Bearing Capacity ¹ – Medium Density – (Units are pounds per square foot, psf)	
	Water Table ²	No Water Table
Gravel and sandy gravel (GW, GP)	5,500 psf	6,500 psf
Clayey gravel (GC)	3,800 psf	4,800 psf
Nonplastic soil: sands, silts, and NP silt (GM, SW, SP, SM)	3,000 psf	4,000 psf
Plastic soil: silts and clays (ML, MH, SC, CL, CH)	1,000 psf	2,000 psf
Organic Soil (OL, OH)	Not acceptable	500 psf

¹ Allowable soil bearing capacity is 1/3 of ultimate soil bearing capacity.

² The water table is assumed to be at the footing base. There is an assumed relative reduction of 1000 psf in bearing capacity in water table conditions.

Reference: National Engineering Handbook Section 8 (NEH 8), Engineering Geology

4. Calculate the required footing area.

SITE INVENTORY

1. Enter the Foundation Soil type from the completed SITE SOIL TABLE in step 3 above, according to the USCS classification system. This type of soil material should be soil material found at the depth of the footing foundation.
2. Enter the AASHTO load class circled on the VEHICLE LOAD TABLE in step 2.

CATTLEGUARD FOOTING

A = Area of footing without safety factor, feet (sq ft)

L = Enter the Maximum Axle Load, pounds (lb) expected that the cattleguard will experience as identified in the VEHICLE LOAD TABLE in step 2. (It is suggested for L to use the **bold** number as that is the maximum design axle weight for the particular AASHTO load classes.)

Bs = Enter the Allowable Soil Bearing Capacity, pounds per square foot (psf) value as identified in SITE SOIL TABLE in step 3 above. This should reflect the bearing capacity of the soil material found at the depth of the bottom of the footing foundation.

Complete Calculations: **A** = **L/Bs** = _____ lb/ _____ psf = _____ sq ft

Multiply this value 'A' times a safety factor of 3, commonly used for earth work.

AREA OF FOOTING REQUIRED = safety factor x **A** = 3 x _____ sq ft = _____ sq ft

Does the manufacturer footing meet or exceed the AREA OF FOOTING REQUIRED?

Circle one: YES NO

If NO, list manufactured footing area _____ sq ft.

Explain why this is acceptable _____

5. Determine the engineering practice standard Job Class PS 560, based on access road surface, _____. Circle respective job class.

Road Surface	Job Class
Dirt	1
Gravel	2
Bitum /Asphalt	3
Concrete	4
All	5

6. Fill in the information on the CATTLEGUARD FOOTING AREA REQUIRED CGUARD.pdf page. Completed design is drawing page, CS and O&M.

7. Attach the following information for the file documentation:

- a. Manufacturers cattleguard specification sheet
- b. The completed CATTLEGUARD DESIGN REQUIREMENTS WORKSHEET
- c. The completed CATTLEGUARD FOOTING AREA REQUIRED drawing
- d. Also include any specific O&M notes, field notes and photo documentation from the site and quality assurance installation inspections, etc.

Reviewed by NRCS Staff Technician or Engineer with adequate Job Approval Authority:

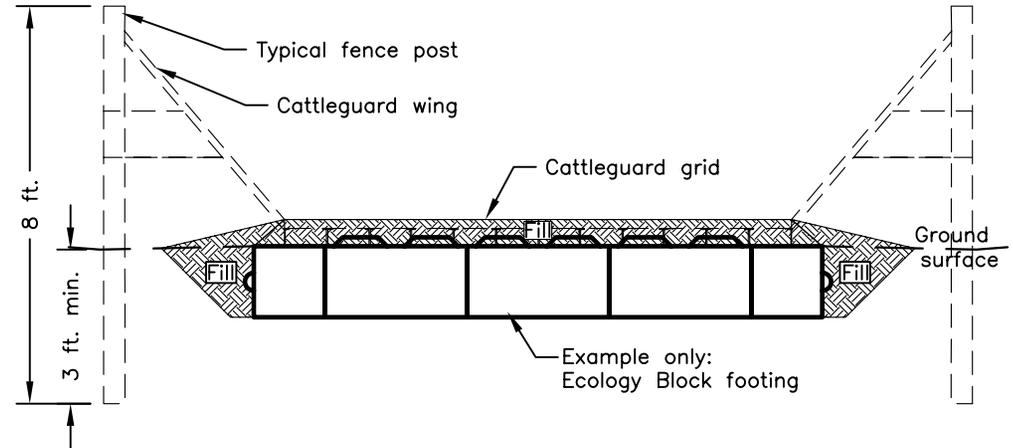
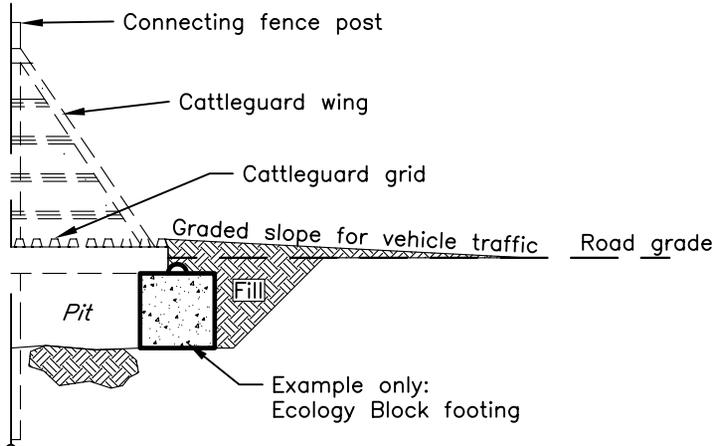
Signed: _____ Date: _____

Practice Standard 560, Access Road, Engineering Job Class: _____

GRADED ROAD APPROACH: HALF PROFILE CROSS SECTION

DRAWING NOT TO SCALE

FRONT CROSS SECTION VIEW



SITE INVENTORY

1. Foundation Soil (USCS): _____
(Refer site soil to worksheet)
2. AASHTO Load Class Cattleguard: _____
(Indicate landowner interview data to worksheet)

Cattleguard FOOTING
(Reference worksheet tables)

L = Maximum axle load is _____ lb.

Bs = Allowable soil bearing pressure _____ psf.

$A = \frac{\text{Maximum axle load, lb.}}{\text{Allowable soil bearing pressure, psf.}} = \frac{L}{Bs} = \text{_____ sq ft}$

AREA OF FOOTING REQ = safety factor x A = 3 x _____ = _____ SQ FT

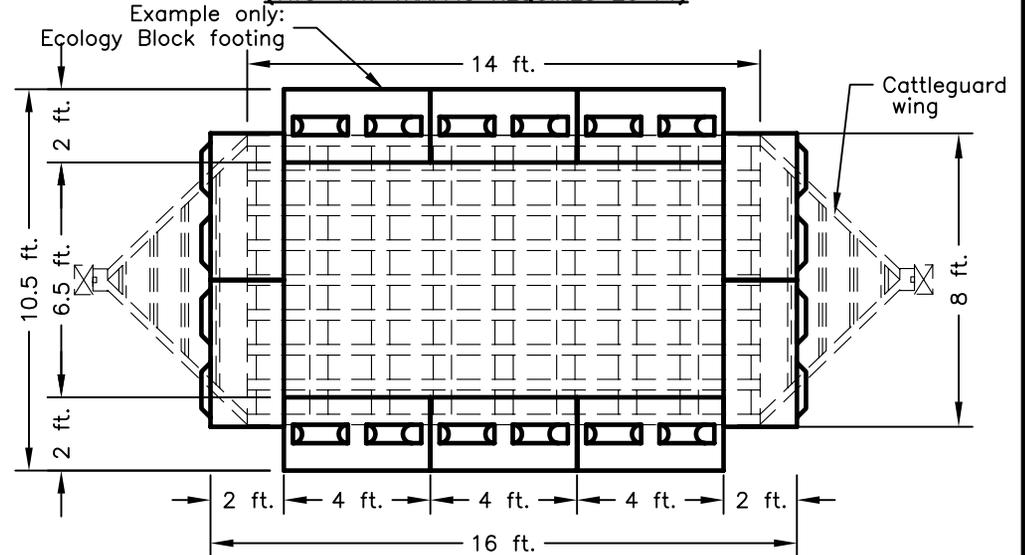
NOTES

1. The cattleguard shall have a footing foundation area that meets the footing required as specified above.
2. The cattleguard shall be designed to meet the AASHTO design live loads as shown above.
3. A manufacturer approved or equal footing shall be designed for the specific site conditions.
4. The installation of this practice shall be according to the cattleguard manufacturers recommendation.
5. Measures shall be taken to provide adequate drainage under the cattleguard to ensure foundation support.
6. Installation vertical tolerance shall be according to cattleguard manufacturers recommendation and provide for safe access road traffic flow.
7. A gate located next to the cattleguard is recommended to enable safe livestock passage.
8. The cattleguard shall be maintained for the life of the practice.
9. The project shall comply with all local regulations.

PLAN OR TOP VIEW

ONE-WAY TRAFFIC

(TWO-WAY TRAFFIC REQUIRES 20 FT)



CATTEGUARD FOOTING AREA REQUIRED

BASED ON SITE SOIL INVENTORY AND VEHICLE LOADS
PRACTICE STANDARDS 560 & 382, ACCESS ROAD & FENCE, JOB CLASS _____ WASHINGTON

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

DESIGNED JML, SSB DATE 11-05
DRAWN JML, MRM, SSB DATE 11-05
TRACED _____ DATE _____
CHECKED _____ DATE _____

APPROVED BY _____
TITLE _____
TITLE _____

SHEET _____ OF _____
DRAWING NO. CGUARD.dwg
REVISION NO. _____

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

SPECIAL CONSTRUCTION SPECIFICATION
CS-104: “CATTLEGUARDS”

104.1 SCOPE

This specification covers the installation of cattleguard grids, footings, and accessories for use in access road and livestock fence intersections. Installation shall be according to the manufacturer specifications to provide access and safe passage of vehicles and equipment. At the time of installation measures shall be taken if necessary to provide adequate drainage under the cattleguard to ensure foundation support.

104.2 MATERIALS

All materials shall conform to the requirements and dimensions as specified on the drawings.

Cattleguard grids shall be fabricated off-site at a commercial facility. The contractor shall submit a copy of the manufacturer’s specifications (including design data) to the NRCS technical representative. Construction shall not begin until the NRCS technical representative grants approval to the contractor.

Footings shall consist of pre-cast concrete block unless otherwise approved by the NRCS technical representative. The material and source of pre-cast concrete shall be approved by the NRCS technical representative prior to installation. Do not transport pre-cast blocks until the concrete has cured a minimum of 10 days.

All backfill material shall contain no frozen material and shall be free of organic and foreign material. Cobbles and rock fragments having a maximum lineal dimension of six inches and greater shall be removed from the fill prior to compaction. No fill shall be placed on frozen surfaces.

The pressure treated post shall be in accordance to the fencing specifications.

104.3 CATTLEGUARD GRID

Cattleguard grid shall meet the AASHTO load classification as specified on the drawings.

104.4 FOUNDATION PREPARATION

All organic and foreign material shall be cleared from within the construction area. After clearing, the foundation shall be excavated to grade. Over excavation shall be avoided. Over excavated area shall be backfilled. Drain the area to prevent water from pooling within the excavation. The

contractor shall immediately contact the NRCS technical representative if the foundation soil differs from that shown on the drawings or if soft spots are encountered.

104.5 PLACEMENT OF FOOTINGS, GRID, AND ACCESSORIES

Place footings to the grade and location as shown on the drawings or specified by the precast footing manufacturer. 100 percent of the footing base shall be in contact with the foundation soil to assure a proper bearing surface.

Place the grid on the footing top and to the inside of the raised keyways as shown on the drawings or specified by the grid manufacturer.

The end wings shall be securely attached to the pressure treated post and the cattle guard crossing grid.

104.6 COMPACTION

All fill material shall be placed in equal horizontal layers. The thickness of each fill layer, prior to compaction, shall not exceed four inches. A hand-directed power tamper shall be used for compaction. The tamper shall traverse the entire surface of each layer. The compacted fill shall have a density of not less than 85% of standard proctor density as determined by ASTM D-698.

104.7 MOISTURE CONTENT

All soil to be used as fill material shall be near (+/- 5%) the typical optimum moisture content for that soil type. If the material is too wet, it shall be allowed to dry before compaction or be removed from the fill area. If the material is too dry, sufficient water shall be added before compaction to insure proper compaction.

104.8 DISPOSAL OF WASTE MATERIAL

All surplus or waste material shall be disposed of in areas shown on the drawings or as approved by the landowner and the technical representative in accordance with all local, state and federal regulations. The disposal site shall be left in a neat condition, free of depressions and sloped to drain.

