County of Los Alamos

Public Works Design and Construction Standards

Revised September 2008
Supersedes January 2001

1. INTRODUCTION

1.1 GENERAL INFORMATION

This Standard presents criteria for use in the design and construction of municipal Public Works infrastructure in the County of Los Alamos, New Mexico. Material presented is intended for the use of qualified design professionals familiar with municipal infrastructure. The County has adopted NMDOT Design Standards and

Serials for the constructions of roads and bridges.

Criteria for Building Construction and Design are provided in the Los Alamos County Code - Title 15. Criteria for Fire Protection and Life Safety are provided in the Los Alamos County Code - Title 14.

Clarifications of this document shall be made by the County Engineer of Los Alamos County. Any subject/situation not addressed in this document or other County Standards shall be review and approved by the County Engineer.

2. COORDINATION OF PROPOSED IMPROVEMENTS

The project should be analyzed for geometric improvements, need for additional lanes, intersection design, traffic access control, drainage improvements, potential for bridge work or retaining walls, potential for cut-slope design, lighting, signalization and signing.

The Developer/Engineer will meet with the County to discuss proposed improvements.

3. STREET DESIGN

All roadway work shall be in accordance with the current edition of AASHTO "A Policy on the Geometric Design of Highway and Streets", the County's Survey Handbook (current edition), other County Department manuals, standards, guidelines, standard specifications and standard procedures.

The County may provide review of the Engineer's work for conformity with County procedures and contract terms only. Review by the County does not include detailed review or checking of design components and related details or the accuracy with which such is depicted. County acceptance of the Engineer's work product, plans, studies, etc., does not constitute County approval.

All project reports, which will be used as references during the development of the project shall be bound and labeled on the spine of the report as well as on the cover. Each report shall be bound with project identification, including date, clearly printed on the spine of the report. This is intended to ease the retrieval of the many volumes of information. The County Engineer or designee should be consulted before reports are bound.

3.1 GENERAL INFORMATION

The Engineer shall be responsible for all studies, analysis, coordination, engineering, and all else necessary to complete the project. It is the intent of the County that the Engineer will have full latitude and complete responsibility for developing a project.

This section provides criteria to promote the consistent and sound design of street

systems having acceptable performance characteristics for the County of Los Alamos, New Mexico. It is not intended to interfere with innovative design concepts and does not, in any way, relieve the designer of the responsibility to use sound professional judgment in the project design.

The work performed by the Engineer/Architect shall be done in imperial units in accordance with the Guidelines for Geometric & Roadway Design and Surveying or International Building Code. All documents shall have only imperial units.

3.2 LOCATION AND LAYOUT

Proposed street layouts shall conform to the Major Street Plan of the Transportation Circulation element of the Comprehensive Plan. Street layout shall be logically related to the topography of the land. The proposed street layout shall be continuous with and correspond in direction with any existing or platted streets that come to the boundary line of adjoining properties unless otherwise approved by the Planning and Zoning Commission. Local streets should be planned so as to discourage use by non-local traffic. The American Association of State Highway and Transportation Officials (AASHTO), Current Edition, A Policy on Geometric Design of Highways and Streets (AASHTO Policy), shall be used to provide geometric design criteria for streets.

3.3 MINIMUM RIGHT-OF-WAY AND PAVEMENT WIDTHS

All final right-of-way (ROW) and pavement widths shall be approved by the County Engineer. Based on specific site conditions, widths wider than the minimums may be required. The following table indicates the minimum required ROW and pavement widths for different types of streets:

Type of Street	ROW width (ft)	Pavement width (ft)
ARTERIAL	80	48
COLLECTOR	70	40
LOCAL – With On-Street Parking	50	32
LOCAL – Cul-de-Sac	50 Radius	45 Radius

Pavement widths are measured from face of curb to face of curb.

Right-of-way at intersections shall be rounded by a tangent arc the same radius as the curb return radius. The minimum curb return radius for a Local street type is 25 feet, Collector is 30 feet, and Arterial is 30 feet. Curb return radii are subject to approval by the County Engineer.

3.3.1 DRIVING AND PARKING LANE WIDTHS

Industrial development will have minimum driving lane width of 12 feet in each direction. Turning lanes when used at intersections will be 10 to 12 feet wide,

depending on the percentage of heavy commercial traffic. In commercial and industrial areas, parking lane width should be a minimum of 8 feet wide and will be provided on both sides of the street. The gutter pan width should be considered as part of the parking lane width.

3.3.2 BICYCLE LANES

Where bicycle facilities are included as part of the design, refer to AASHTO Guide for Development of Bicycle Facilities.

3.4 VERTICAL GRADE DESIGN CRITERIA

Because of the Los Alamos climate, vertical grades different from those required in the AASHTO policy are listed in the table below:

Type of Street	Minimum Grade	Maximum Grade
Arterial	0.5 %	6.0 %
Collector	0.5 %	7.5 %
Local	0.5 %	8.0 %

Any vertical street grade below the minimum or above the maximum shall require prior approval of the County Engineer.

The maximum grade at an intersection is (4) four percent for a distance of 50 feet from the curb of the intersected street. All other design criteria in the AASHTO policy concerning vertical alignment (grade change, vertical curve length, stopping sight distance ...) shall apply. One-fourth point grades will be provided for each curb return.

3.5 MINIMUM STREET PAVEMENT SECTIONS

A pavement design shall be performed to determine an adequate pavement section. AASHTO or New Mexico State Department of Transportation (NMDOT) procedures shall be used. If the design pavement section depths are below the minimum depths listed below, the minimum depth shall be used.

Type of Street	MINIMUM PAVEMENT DEPTH (in)	MINIMUM BASE COURSE DEPTH (in)
ARTERIAL	6	8
COLLECTOR	4	6
LOCAL	3	4

3.6 STREET LIGHT SYSTEMS

Street light systems will conform to the Los Alamos Development Code – Section 16-276. Outdoor lighting.

3.6.1 CONSTRUCTION REQUIREMENTS OF STREETLIGHT SYSTEMS

Electrical taps may be made at the closest transformers or pedestals. The Engineer will coordinate the tap with Los Alamos County Utilities Department.

Where a system is installed, i.e. subdivisions with multiple lights, these should be served with a meter pedestal. Wiring is to be sized to load and distances with #4 copper as a minimum size and 2 inch PVC conduit. Direct bury is not allowed. Minimum depth of bury is 24 inches.

All sizing and installations shall meet NEC (National Electrical Code) requirements. Meter installations must be permitted through the State Construction Industries Division and coordinated with the County.

Pole and base specification are included as the last sheet in this section.

3.7 STREET NAMES

Street names shall not duplicate or be confused with the names of existing streets. Where a proposed street is to be a continuation of an existing named street, the proposed street shall have the name of the existing street. The project owner and designer, subject to the approval of the Planning and Zoning Commission, shall determine street names with approval by the county addressor / surveyor.

The project owner at each intersection shall install street name signs per the requirements of the County Traffic Engineer. Once the County of Los Alamos has accepted the public improvements, the County of Los Alamos will maintain the street signs. Materials used for street name signs shall conform to the Materials Section of this document or as directed by the County Traffic Engineer.

3.8 DRIVEWAYS

Construction of driveways shall conform to the standard details contained in this publication.

All Commercial driveways shall conform to section 16-367(b) of the Los Alamos County Development Code.

All parking requirements shall be met on private property. All parking requirements shall conform to the Los Alamos Amended Code – Parking. Parking area to meet requirement shall not be allowed on right-of-way or other property not included in the lot.

The County Engineer has approved the following exceptions to section 16-367(b) of the Los Alamos County Development Code for Residential driveways:

3.8.1 RESIDENTIAL DRIVEWAYS ON ARTERIAL STREETS:

- No exceptions to Section 16-367(b).

3.8.2 RESIDENTIAL DRIVEWAYS ON COLLECTOR STREETS:

- Maximum slope shall not exceed ten percent. Designers should pay special attention to the winter conditions in Los Alamos and average vehicle clearance requirements. Steep driveways (above eight percent slope) are not recommended. Heating systems should be investigated especially on north facing lots.

- Parking spaces do not need to be internally accessible.

3.8.3 RESIDENTIAL DRIVEWAYS ON LOCAL STREETS:

- Maximum slope shall not exceed twelve percent. Designers should pay special attention to the winter conditions in Los Alamos and average vehicle clearance requirements. Steep driveways (above eight percent slope) are not recommended. Heating systems should be investigated especially on north facing lots.

- Turning and maneuvering movements shall be allowed on right-of-way.

- Parking spaces do not need to be internally accessible.

- Driveways on new subdivisions shall conform to drawing Street Typical- Drive Pad Detail.

All other exceptions to section 16-367(b) of the Los Alamos County Development code of driveways shall require approval from the County Engineer on a case by case basis.

3.9 SIDEWALKS

Sidewalks will be required on both sides of each street type. A six foot minimum is required for both arterial and collector streets. A five-foot minimum width is required for residential street.

Sidewalks will conform to the most current Americans Disability Act (ADA) requirements. Sidewalks will conform to County of Los Alamos Engineering Standards

– Street Typicals and NMDOT PAD 001 – Pedestrian Access Details (10 sheets) Attachment 12.7

A separation between the curb and sidewalk is required to provide separation between pedestrian traffic and vehicular traffic. The designer will recommend a separation dimension to the County Engineer for approval.

3.10 ACCESS MANAGEMENT ON STATE ROADS (NM 4, NM 502, NM 501)

The development of New Mexico's modern highway system has included access management for many years. The Federal Highway Administration (FHWA) and the New Mexico State Highway Commission have had access control policies in effect since the 1960's. In 1989, the New Mexico Department of Transportation (NMDOT) adopted the *Regulations for Driveway and Median Openings on Non-Access Controlled Highways* and formally instituted procedures for managing access on non-interstate highways in their programs. In 2001, the NMDOT updated and consolidated their access management procedures into a State Access Management Manual, which is in accordance with new Rule 18.31.6 NMAC, State Highway Access Management Requirements. The new rule and manual address access management for both interstate and non-interstate highways, and continues to provide the NMDOT a legal means of managing access to the state and federal highway systems.
Regulating the location, spacing and the design of Driveways, Medians, Median Openings, Intersections, and Interchanges Access management requires that land use planning and development is coordinated with transportation needs. It should proceed in a manner that leads to improved safety and efficiency of the transportation system while enhancing economic development in the long term.

4. HYDROLOGY AND STORM WATER MANAGEMENT

4.1 GENERAL INFORMATION

This section provides criteria to promote the consistent and sound design of drainage systems having acceptable performance characteristics for the County of Los Alamos, New Mexico. It is not intended to interfere with innovative design concepts and does not, in any way, relieve the designer of the responsibility to use sound professional judgment in the project design.

When required by the Planning and Zoning Commission or the County Engineer a Drainage Report shall be prepared for a project. A New Mexico registered professional engineer with knowledge and experience in storm water analysis and management shall prepare this report. The Drainage Report shall include the following information unless the County Engineer grants a written waiver:

- Drainage Report Information Sheet
- Purpose and Scope of the Project

- Site Location
- Existing Drainage Conditions, Including Off-Site Drainage
- Existing Condition Hydrologic Analysis
- Proposed Condition Hydrologic Analysis
- On-Site Storm Water Management and Drainage Structures
- Off-Site Drainage Structures

4.2 DRAINAGE REPORT INFORMATION SHEET

A "Drainage Report Information Sheet" shall be included with each Drainage Report. A blank form of the information sheet is included as **Attachment 12.1** in these standards.

4.3 PURPOSE AND SCOPE OF PROJECT

A description of the project purpose and scope is to be included as part of the Drainage Report.

4.4 SITE LOCATION

A written description of the project site location and site map shall be included as part of the Drainage Report. The written description shall include proximity to major roads and structures (i.e.: Diamond Drive, North Road, Golf Course, Mesa Public Library,).

4.5 EXISTING DRAINAGE CONDITION INCLUDING OFF-SITE DRAINAGE

A description of existing site conditions shall be included in the Drainage Report. This section shall provide a description of the site slope, soil conditions, vegetative cover, and historic storm water flow patterns. Any off-site storm water that flows through the project site shall be identified in this section. A map may be helpful in describing the existing conditions, but is not required.

4.6 EXISTING CONDITION HYDROLOGIC ANALYSIS

This section shall include an analysis of the existing site conditions to determine storm water runoff quantities (both peak flow rate and volume) including off-site storm water runoff that flows across the project site. The rational method or City of Albuquerque AHYMO program shall be used to determine the quantities. A written request must be submitted to and approved by the County Engineer prior to analysis, if a different method is used.

The analysis shall consider the 100-year frequency storm. Rainfall Intensity - Duration Curves for the Los Alamos, New Mexico area have been included as **Attachment 12.2** of these standards. The Duration of the design storm shall be determined as the time of concentration (T_c) for the drainage basin, but not less than 10 minutes or greater than 60 minutes.

T_c is defined as the time it takes for runoff to reach an analysis point from the most hydraulically remote location in the basin. T_c shall be the sum of the travel times of the sub-reaches in the basin and can be calculated with equation 4.7

4.6.1 RATIONAL METHOD

The Rational Method relates rainfall intensity, a runoff coefficient and a drainage area size to the direct runoff from the drainage basin.

Three basic assumptions of the Rational Method are:

a. The frequency of the storm runoff is the same as the frequency of the rainfall producing the runoff (i.e., a 25-year runoff event results from a 25-year rainfall event).
b. The peak runoff occurs when all parts of the drainage basin are contributing to the runoff.
c. Rainfall is uniform over the watershed.

The Rational Method, as presented herein, can be used to estimate peak discharges, the runoff hydrograph shape, and runoff volume for small, uniform drainage areas that are not larger than 160 acres in size. The method is usually used to size drainage structures for the peak discharge of a selected return period. An extension of the basic method is provided to estimate the shape of the runoff hydrograph if it is necessary to design detention facilities and/or to design drainage facilities that will require routing of the runoff hydrograph through the structure.

The Rational Method is based on the equation: $Q = C\ I\ A$ (4-6)

Where Q = the peak discharge, in cfs, of selected return period,
C = the runoff coefficient,
I = the average rainfall intensity, in inches/hr,
A = the contributing drainage area, in acres.

GENERAL CONSIDERATIONS

a. Depending on the intended application, the runoff coefficient (C) should be selected based on the character of the existing land surface or the projected character of the land surface under future development conditions. In some situations, it may be necessary to estimate C for both existing and future conditions.

b. Land-use must be carefully considered because the evaluation of land-use

will affect both the estimation of C and also the estimation of the watershed time of concentration (T_c).

c. The peak discharge (Q) is generally quite sensitive to the calculation T_c and care must be exercised in obtaining the most appropriate estimate of T_c.

d. Both C and rainfall intensity (I) will vary if peak discharges for different flood return periods are desired.

e. Since the T_c equation is a function of rainfall intensity (I), T_c will also vary for different flood return periods.

APPLICATIONS AND LIMITATIONS

a. The total drainage area must be less than or equal to 160 acres.

b. T_c shall not exceed 60 minutes.

c. The land-use of the contributing area must be fairly consistent over the entire area; that is, the area should not consist of two or more land-uses, such as 50% commercial and 50% undeveloped. This will lead to inconsistent estimates of T_c (and therefore I) and errors in selecting the appropriate C coefficient.

d. The contributing drainage area cannot have drainage structures or other facilities in the area that would require flood routing to correctly estimate the discharge at the point of interest.

e. Drainage areas that do not meet the above conditions will require the use of an appropriate rainfall-runoff model (the HEC-1 Program) to estimate flood discharges.

Estimation of Area (A)

An adequate topographic map of the drainage area and surrounding land is needed to define the drainage boundary and to estimate the area (A), in acres. The map should be supplemented with aerial photographs, if available, especially if the area is developed. If the area is presently undeveloped but is to undergo development, then the land development plan should be obtained because these may indicate a change in drainage boundary due to road construction or land grade changes. If development plans are not available, then land-use should be based on current zoning of the area.

Estimation of Rainfall Intensity (I)

The intensity (I) is the average rainfall intensity in inches/hour for the period of maximum rainfall of a specified return period (frequency) having a duration equal to the time of concentration (T_c) for the drainage area. The frequency is usually specified according to a design criteria or standard for the intended application. The rainfall intensity (I) is obtained form an intensity-duration-frequency (I-D-F) graph. Two methods can be used for obtaining I-D-F information: 1) one generalized I-D-F graph is

provided that can be used for any site in White Rock town site or Los Alamos town site. 2) A site specific I-D-F graph can be developed, if desired. Procedures for developing a site-specific I-D-F graph can be obtained from the County Engineer upon request.

The intensity (I) is the average rainfall intensity for rainfall of a selected return period from an I-D-F graph for a rainfall duration that is equal to the time of concentration (T_c) as calculated according to the procedure described below. A minimum rainfall duration of 10 minutes is to be used if the calculated T_c is less than 10 minutes. The Rational Method should not be used if the calculated T_c is greater than 60 minutes.

Estimation of Time of Concentration (T_c)

Time of concentration (T_c) is to be calculated by the following equation 4-7:

$$T_c = (L1/V1 + L2/V2 + \ldots\ldots)/60 \text{ sec/min} \qquad 4\text{-}7$$

$$V = K^*(S)^{0.5}$$

Where T_c = the time of concentration, in minutes,
L = the length of the sub-reach, in feet,
V = the velocity in the sub-reach, in feet/sec
S = the slope in the sub-reach, in percent, and
K = depends on the surface as indicated in **Table 4.6**

Table 4.6
Coefficient (K) For Use With The
Rational Method T_c Equation

Description of Landform or Surface	K
Grass and landscaped area	0.7
Bare ground	1.0
Paved areas (sheet flow)	2.0
Streets and Channels	3.0

Selection of Rational Method Runoff Coefficient (C)
The runoff coefficient (C) is selected from the following site conditions:

0.30 Soil uncompacted by human activity with 0 to 9 percent slopes. Native grasses, weeds and shrubs in typical densities with minimal disturbance to ground cover.

0.45 Irrigated lawns, parks and golf courses with 0 to 9 percent slopes. Native grasses, weeds and shrubs and soil uncompacted by human activity with 10 to 19 percent slopes.

0.65 Soil compacted by human activity with minimal vegetation. Unpaved parking lots, roads, trails, and most vacant lots. Irrigated lawns and parks with 10 to 19 percent slopes. Soils uncompacted by human activity with slopes at 20 percent or greater. Soils with very low permeability and generally classified by Soils Conservation Service (SCS) Hydrologic Soil Group D. HSG D are soils consisting of very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with clay pan at or near the surface, and shallow soils over nearly impervious materials. The soils have a very slow rate of water transmission.

0.95 Impervious areas, pavement and roofs.

Estimation of Hydrograph Shape

This procedure is to be used where routing of the storm inflow through the drainage structure is desired, such as for the design of the detention basin or pump station. The procedure is based on synthesizing a hydrograph from the peak discharge estimated by the Rational Method and by use of some dimensionless hydrograph shapes from TR-55 (Soils Conservation Service, 1986). Two sets of dimensionless hydrographs are provided; one set is for use with urbanized watersheds (Table 4-7), and other set is for use with undeveloped watersheds (Table 4.8). Both sets of dimensionless unit hydrographs are functions of T_c.

TABLE 4-7
URBAN WATERSHED -COORDINATES (q_t) OF DIMENSIONLESS HYDROGRAPH TO BE USED WITH THE RATIONAL METHOD

Time[a]	q_t values, in cfs/inch runoff [b]									
	T_c , in hours									
hours	0.17	.18-.25	.26-.35	.36-.45	.46-.62	.63-.88	.89-1.12	1.13-1.38	1.39-1.75	1.76-2.5
0.0	0	0	0	0	0	0	0	0	0	0
1.0	24	23	20	18	17	13	11	10	9	7
1.3	34	31	28	25	23	18	15	13	11	9
1.6	53	47	41	36	32	24	20	18	15	12
1.9	334	209	118	77	57	36	29	25	21	16
2.0	647	403	235	141	94	46	35	29	25	18
2.1	1010	739	447	271	170	68	47	38	31	21
2.2	623	800	576	468	308	115	72	54	41	27
2.3	217	481	676	592	467	194	112	81	58	36
2.4	147	250	459	574	529	294	168	118	82	49
2.5	123	166	283	431	507	380	231	163	112	64
2.6	104	128	196	298	402	424	289	213	147	82
2.7	86	102	146	216	297	410	329	256	184	104
2.8	76	86	114	163	226	369	367	284	216	127
3.0	66	70	80	104	140	252	313	311	255	171
3.2	57	61	66	77	96	172	239	266	276	201
3.4	51	54	57	63	74	123	175	212	236	226
3.6	46	49	51	56	61	93	133	163	198	205
3.8	42	44	46	49	53	74	103	129	159	193
4.0	38	40	42	44	47	61	83	104	129	171
4.3	34	35	37	38	41	49	63	78	98	132
4.6	32	33	33	34	36	41	50	61	76	105
5.0	29	30	31	31	32	35	40	47	57	79
5.5	26	27	28	28	29	31	33	37	43	58
6.0	23	24	24	25	26	27	29	31	35	45
6.5	21	21	22	22	23	24	26	27	30	36
7.0	20	20	20	21	21	22	23	24	25	30
7.5	19	19	19	20	20	20	21	22	23	26
8.0	18	18	18	18	19	19	20	20	21	23
9.0	15	16	16	16	16	17	17	18	18	20
10.0	13	13	13	14	14	15	15	16	16	17
12.0	12	12	12	12	12	12	12	12	12	13
16.0	0	0	0	0	0	0	0	1	1	3

Reference: TR-55 (1986), Exhibit 5-II for IA/P = 0.10 and Travel Time = 0.0

Notes:

a -Time is the TR-55 hydrograph time minus 10 hours.

b -The maximum unit peak discharge, q_{tmax} is underlined for each hydrograph.

TABLE 4-8
UNDEVELOPED WATERSHED -COORDINATES (qt) OF DIMENSIONLESS HYDROGRAPH TO BE USED WITH THE RATIONAL METHOD

Time [a]	q_t values, in cfs / inch runoff [b]									
hours	0.17	0.18-0.25	0.26-0.35	0.36-.45	0.46-.62	0.63-.88	0.89-1.12	1.13-1.38	1.39-1.75	1.76-2.5
0.0	0	0	0	0	0	0	0	0	0	0
1.0	24	23	20	18	17	13	11	10	9	7
1.3	34	31	28	25	23	18	15	13	11	9
1.6	53	47	41	36	32	24	20	18	15	12
1.9	334	209	118	77	57	36	29	25	21	16
2.0	647	403	235	141	94	46	35	29	25	18
2.1	1010	739	447	271	170	68	47	38	31	21
2.2	623	800	676	468	308	115	72	54	41	27
2.3	217	481	676	592	467	194	112	81	58	36
2.4	147	250	459	574	529	294	168	118	82	49
2.5	123	166	283	431	507	380	231	163	112	64
2.6	104	128	196	296	402	424	289	213	147	82
2.7	86	102	146	216	297	410	329	256	184	104
2.8	76	86	114	163	226	369	367	284	216	127
3.0	66	70	80	104	140	252	313	311	255	171
3.2	57	61	66	77	96	172	239	266	276	201
3.4	51	54	57	69	74	123	175	212	236	226
3.6	46	49	51	56	61	93	133	163	198	205
3.8	42	44	46	49	53	74	103	129	159	193
4.0	38	40	42	44	47	61	83	104	129	171
4.3	34	35	37	38	41	49	63	76	98	132
4.6	32	33	33	34	36	41	50	61	76	105
5.0	29	30	31	31	32	35	40	47	57	79
5.5	26	27	28	28	29	31	33	37	43	58
6.0	23	24	24	25	26	27	29	31	35	45
6.5	21	21	22	22	23	24	26	27	30	36
7.0	20	20	20	21	21	22	23	24	25	30
7.5	19	19	19	20	20	20	21	22	23	26
8.0	18	18	18	18	19	19	20	20	21	23
9.0	15	16	16	16	17	17	17	18	18	20
10.0	13	13	13	14	14	15	15	16	16	17
12.0	12	12	12	12	12	12	12	12	12	13
16.0	0	0	0	0	0	0	0	1	1	3

Reference: TR-55 (1986), Exhibit 5-II for iA/P = 0.10 and Travel Time = 0.0

Notes: a -Time is the TR-55 hydrograph time minus 10 hours.

b -The maximum unit peak discharge, q_{tmax}, is underlined for each hydrograph.

4.6.2 AHYMO PROGRAM FOR RUNOFF QUANTITIES

If the Arid-Lands Hydrologic Model (AHYMO) program is used to determine the runoff quantities, a 100 year 24 hour rainfall distribution based on SCS type II-A with peak at 6.0 hours shall be used. The following information shall be used for the program input file:

Type =	5
Rain Quarter =	1.87 in.
Rain One =	2.35 in.
Rain Six =	2.80 in.
Rain Day =	2.90 in.

All calculations shall be included as an attachment to the Drainage Report.

4.7 PROPOSED CONDITION HYDROLOGIC ANALYSIS

The site shall be analyzed based on the proposed uses and conditions. The same method of analysis used for existing conditions shall be used for the proposed conditions. A comparison of the runoff conditions shall be included in this section of the Drainage Report. The grading plan submitted for the project shall be consistent with the proposed conditions and storm water flow paths indicated in the Drainage Report.

All calculations shall be included as an attachment to the Drainage Report.

4.8 ON-SITE STORM WATER MANAGEMENT AND DRAINAGE STRUCTURES

All off-site storm water runoff flowing across the site at the time the Drainage Report is submitted shall be included as part of the runoff quantities for the project site. If flow paths of the off-site storm water runoff are changed, drainage easements will need to be dedicated for the new flow paths. Existing drainage easements not needed by the change in flow paths may be vacated.

Storm water management shall be in accordance with New Mexico State Law 119(2).

A landowner cannot collect surface water into an artificial channel and precipitate it in unnatural quantities upon the land of his neighbor to the injury of the latter, notwithstanding that no more water is collected than would have naturally flowed upon the property in a diffused condition.

All necessary structures shall be constructed in conformance with the current New Mexico Department of Transportation, Standard Specifications for Highway and Bridge Construction and applicable Serials Drawings. A minimum culvert size of 24 inches shall be used unless previously approved by the County Engineer. Inlet capacities of structures shall be determined and calculations shall be included as part of the Drainage Report. Capacity of channels and storm drains shall be determined using Manning's equation and the following n values:

Reinforced Concrete Pipe	0.013
Poured Concrete	0.013
No-Joint Cast in Place Concrete Pipe	0.014
Reinforced Concrete Box	0.015
Reinforced Concrete Arch	0.015
Streets	0.017
Flush Grouted Rip-Rap	0.020
Corrugated Metal Pipe	0.025
Grass Lined Channels	0.025
Earth Lined Channels	0.030
Wire Tied Rip-Rap	0.040
Medium Weight Dumped Rip-Rap	0.045
Grouted Rip-Rap (exposed rock)	0.045

Drainage systems shall not be pressurized unless the County Engineer grants prior approval. A hydraulic grade line analysis shall be included in the Drainage Report, if the system is pressurized.

All outlets shall require erosion control structures or measures, and shall be described in this section.

4.9 OFF-SITE DRAINAGE STRUCTURES

If the storm water runoff quantities for the proposed site condition are greater than existing conditions, the effect on downstream drainage structures and systems shall be determined. The use of detention and retention ponds is acceptable.

4.10 DRAINAGE REPORT INFORMATION SHEET (BLANK FORM)

Attachment 12.1

4.11 RAINFALL INTENSITY – DURATION CURVES

Attachment 12.2

4.12 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND SWPPP

The Engineer shall prepare an erosion and sediment control plan in accordance with the requirements of the most current NMDOT NPDES handbook. The completed

plans shall include the temporary erosion and sediment control measures in accordance with the NPDES requirements. The Engineer shall submit an NPDES package that includes: If the disturbed area is greater than 1 acre, the Engineer shall prepare a storm water pollution prevention plan (SWPPP), see attachment **12.3 SWPPP** for an example of the information for the SWPPP. The Engineer shall also prepare temporary erosion and sediment control plans (TESCP), see attachment **12.4 TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES** for an example of a TESCP. Sample drawings and details are available in Public Works Departments – Engineering Division.

4.12.1 STORM DRAINAGE AND EROSION CONTROL PLAN

Applicants shall submit a storm drainage and erosion control plan demonstrating on- and off-site drainage compliance in accordance with the requirements of this section. Such plans shall include:

A. A topographic map indicating the boundaries and total acreage of on-site and off-site drainage areas pertaining to the site. For off-site conveyance, a U.S.G.S. quadrangle map may be used. For drainage generated or conveyed on-site, the topographic map shall be at a scale and contour interval which adequately delineates the drainage pattern as determined by a licensed surveyor or professional engineer and approved by the County Engineer. If the topographic map is not accurate and clear, the County Engineer may require that a topographic map be signed and sealed by a registered land surveyor, professional engineer or other qualified professional.

B. A map at the same scale as the plat, development plan, or site plan, as applicable, indicating predevelopment and post-development drainage conditions, soil types, areas contained within a floodway, and areas contained within a flood fringe.

C. Calculation of quantities of water, measured in cubic feet per second (cfs) for a 100-year frequency, 24-hour duration storm, reaching and being expelled from the site, for conditions existing prior to construction of the development; and, for conditions representing the development after completion of all phases of construction predicting runoff prior to and after any site mitigation measures to regulate runoff.

D. A minimum of 3 typical cross sections shall be surveyed for each major watercourse with a design storm discharge "Q" in excess of 100 cubic feet per second (100 cfs) if any development is proposed in or within 25-feet of the bank or edge of the drainage way as determined by the County Engineer; additional information may be required if the "Q" is 1000 cubic feet per second or greater.

E. The location, type, size, and design of proposed mitigation measures to regulate excess storm water runoff; the conveyance capacity; the calculated flow, maximum water depth, and velocity for a 100-year frequency, 24-hour duration storm for each control structure; and all other appropriate design details necessary to shall clearly explain the construction and operation of all surface and subsurface drainage and erosion control structures.

F. Pursuant to paragraphs A through E of this subsection, the applicant shall

design and construct check dams, energy dissipaters or other drainage improvements in order to control and reduce runoff from the Buildable Area. The design and specifications for these drainage facilities shall be prepared by a professional engineer registered in the State of New Mexico and submitted to the County Engineer for approval.

G. County approval for detention in lieu of the plan required above shall be allowed for single-family residential development meeting the following criteria:
   1. Proposed development sites are located outside of a regulated 100-year floodplain and on slopes less than 10 percent;
   2. Proposed development site including patios, garages, accessory structures, driveways and other development that decreases the permeability of infiltration of pre-development surfaces is no more than 6000 square feet and total impermeable surfaces (roofs, paved areas, patios etc.) do not exceed 2500 square feet; and
   3. Detention ponds or check dams with a minimum volume of 600 cubic feet will be installed at a location approved by the County Engineer. Such ponds shall be integrated with the landscaping or revegetation on the lot.

In addition, the engineer or developer must follow the County's NPDES General Permit for Storm Water Discharge from Construction Activities (current version).

4.12.2 DRAINAGE AND EROSION CONTROL STANDARDS

A. Calculation of the design peak discharge of storm water shall be based on a 100-year frequency, 24-hour duration rainstorm. Distribution SCS Type II-A Peak at 6.0 hour
B. The peak discharge of storm water resulting from the development shall not exceed the peak discharge calculated prior to the development and differences between pre- and post-development discharge shall be detained or retained on site.
C. Provisions for design storm drainage shall detain or safely retain storm water. Runoff discharge accumulated into drainage channels, storm sewers or natural watercourses shall not cause increased damage or increased flooding downstream, decreased time of concentration, lag time, time to "Q", or alter downstream drainage patterns.
D. Storm drainage facilities shall have the sufficient carrying capacity to accept peak discharge runoff from the development in addition to that originating upstream.
E. Incorporation of landscaped areas in the storm drainage and erosion control plan for the retention and use of excess storm water is encouraged. Any ponding areas used in drainage control facilities shall be landscaped and maintained. The landscaping may consist of native grasses or other vegetation for the slopes of the pond and bottom. A Landscaping Plan and maintenance agreement for ponding areas shall be submitted as part of the storm drainage and erosion control plan.
F. Ponding uphill from the development shall not be counted toward detention

ponding volumes unless approved by the County Engineer.

G. Pursuant to paragraphs A through F of this subsection, the applicant may be required to design and construct berm ditches along the top of cut slopes in order to intercept the tributary drainage above the cut slope. The design for these berm ditches shall be submitted with the storm drainage and erosion control plan.

H. No on-site building, development or construction activity shall disturb any existing watercourse or other natural drainage system, whether on-site or off, in a manner which causes a change in watercourse capacity or time to peak, time of concentration or lag time or other natural drainage system or increase of the pre-development "Q".

I. All floodways shall be designated as drainage easements or drainage rights-of-way. All natural drainage ways and arroyos which traverse or affect one or more lots or buildable areas shall-be identified on the plan and/or plat with a notation indicating the approximate area, extent or area of inundation of the 100-year floodplain or tributaries thereof.

J. An applicant requesting a development on lands where periodic flooding occurs is encouraged to establish the area contained within the floodplain as permanent open space with a drainage easement.

K. The following note shall be added to plats or plans where a 100-year floodplain exists: NOTE: No alteration of or development within the 100-year floodplain can occur without the prior written approval of the County Flood Plain Manager.

L. In order to avoid flood and erosion hazards, a 25 foot minimum setback from the natural bank or edge, as determined by the County Floodplain Manager, of streams, waterways, drainage ways or arroyos that have a capacity to convey a "Q" of 100 cubic feet per second (cfs) or more generated by a design storm (100 year recurrence, 24 hour duration) is required: such drainage ways shall be set aside as No Build Areas. The bank or 'edge of stream" shall be determined based on analysis of the drainage plan submitted pursuant to this section. The required setback may be increased if the Flood Plain Manager determines that a clear hazard exists based on slope stability and hydrologic/hydraulic conditions. In evaluating the need to increase the setback the County Flood Plain Manager shall consider property and channel slope, velocity of channel flow, hydraulic radius, roughness coefficient and sectional area of the particular drainage way. Development of roads and bridges to cross such drainage ways to access the building site of a lot may occur with approval by the County Engineer. A requirement for increased setback imposed by the Floodplain Manager for a particular project shall not be considered an engineered development plan for purposes of development or encroachment to any FEMA designated 100-year floodplain or significant tributary thereof. The County Engineer shall review drainage affecting a County owned or maintained Road.

M. Drainage affecting a County-owned or —maintained road shall be reviewed by the County's Public Works Department.

4.12.3 LOS COUNTY TERRAIN MANAGEMENT PLAN FOR DEVELOPMENTS

The Los Alamos County Terrain Management Plan is intended to protect and promote health, safety, and welfare of citizens and landowners. All changes to property within the county, including plats that involve disturbing the natural topography and/or drainage characteristics must follow the standards in this subsection. These are intended to minimize soil and slope stability, erosion, sedimentation and storm water run-off and to protect water quality and natural character of the land. The standards (also known as grading and drainage, erosion control, slope analysis, etc.) are guidelines. They are intended to give home owners and home builders a simplified overview of terrain management requirements in the County. Of course a complex site or large scale development will require professional architectural and/or engineering assistance.

Site planning standards are applicable for all new development for residential uses and structures, subdivisions, and commercial and industrial uses and structures.

Attachment **12.5 Los Alamos County Terrain Management Checklist** shall be used to assist in the preparation of the building or home plans. In addition, the property owner/architect/engineer follow attachment **12.6 Los Alamos County Terrain Management Plan** as a requirement in the building permit process.

4.13 DRAINAGE ANALYSIS ON DEVELOPMENTS ADJACENT TO STATE ROADS

Prepare Preliminary and Final Drainage Reports. The drainage reports will require a detailed study of the project area and recommendations are to be developed with alternate proposals to correct any of the problems.

4.13.1 PRELIMINARY DRAINAGE REPORT

Prior to performing a preliminary drainage study, the Engineer shall meet with the NMDOT assigned Drainage Engineer to discuss the hydrologic analysis of existing and proposed drainage structures that are being proposed adjacent to a state road. The Preliminary Drainage Report shall summarize the results of the preliminary drainage analysis. The report shall include:

- Discussion of soil types
- Vegetation and land use distribution
- Curve number or rational formula "C" calculations
- Time of concentration calculations
- Drainage area topographic map with existing structures inventory
- Drainage areas
- Design (50yr) and 100-year discharges and their corresponding headwater depths
- Summary of the drainage field inspection results including District personnel (public and other local agencies) interview and drainage structure field inspection forms

- Summary table of existing and recommended drainage structure sizes and types, and identification of sources used in the analysis
- Preliminary erosion protection and energy dissipaters design and preliminary details

For urban projects, the preliminary hydraulics shall be computed based on existing information to provide scope of drainage work and cost estimate that will be the basis for the Final Scope Report and the Final Drainage Report. The Preliminary Drainage Report shall include preliminary design and locations of drop inlets, trunk lines, other preliminary drainage data, and dimensions of easements and ponds needed.

4.13.2 FINAL DRAINAGE REPORT

The Final Drainage Report is basically a refinement of the Preliminary Drainage Report. A detailed hydraulic analysis such as: backwater profiles, flow velocities, scour calculations, and other hydraulic design data are required for major structures and design of permanent erosion protection.

In preparing the Final Drainage Report, the Engineer shall perform, on all major structures or channels, a hydraulic analysis using the HEC-2, HECRAS or WSPRO computer model to develop water surface profiles for the existing conditions and for the proposed conditions. An approved Final Drainage Report shall be prepared for the selected alternative which shall incorporate all pertinent design data into a concise document including: drainage map(s); inventory of existing drainage structures; detailed structure recommendations including drainage areas, design discharges, head water depths; and a Water Surface Profile Structure Layout Sheet for any major structures. If a retention pond is needed, the Engineer shall prepare and submit a Notice of Intent (NOI) groundwater application, as may be required, as per the Drainage Section's approval and District Construction Engineer's signature. If Section 401 and 404 applications are required, the Engineer shall prepare and submit the necessary applications with the approval and signature of the Drainage Engineer. This work shall not be done prior to the completion and approval of the environmental documentation.

For urban projects, include in the Final Drainage Report the storm drain design data at each drop inlet and manhole such as design discharges, carry over discharges, intercept discharges, and other hydraulics data. The construction plans shall include storm drain system data such as hydraulic grade line for 100-year discharge, invert elevations, slopes, velocities, and discharges.

It is the Policy Administrative Memorandum Number 221, Rural/Urban Drainage, of the New Mexico Department of Transportation (NMDOT) to design drainage structures to meet certain minimum standards. In general, drainage structures are designed to safely pass a flood flow, the magnitude of which is commensurate with an appropriate level of public safety and economic risk. This document establishes minimum standards in terms of design frequency floods and their effects on the transportation facility. Design frequency floods shall be estimated using the standard procedures described in the NMDOT Drainage Manual, latest edition. **Drainage Design Criteria for NMDOT projects is subject to change without notice. All drainage designers**

are encouraged to verify that they are using the current Drainage Design Criteria by contacting the NMDOT Drainage Section in Santa Fe. Also, the Engineer shall use the NMDOT "National Pollutant Discharge Elimination System (NPDES) Handbook, 2003 Edition" or current revision for methodologies in preparation of the Final Drainage Report. New Mexico Department of Transportation - National Pollutant Discharge Elimination System Manual

5. TRAFFIC CONTROL DESIGN

5.1 GENERAL INFORMATION

This section provides criteria to promote the consistent and sound design of traffic control systems having acceptable performance characteristics for the County of Los Alamos, New Mexico. It is not intended to interfere with innovative design concepts and does not, in any way, relieve the designer of the responsibility to use sound professional judgment in the project design.

The U.S. Department of Transportation Federal Highway Administration, current edition, Manual on Uniform Traffic Control Devices for Streets and Highways shall be the design criteria for traffic control design for the County of Los Alamos.

5.2 TRAFFIC CONTROL DESIGN

Traffic control plans shall be developed in accordance with the following:

- MUTCD, Current Edition and all subsequent revisions.
- Latest edition of the NMDOT Standard Specifications for Highway and Bridge Construction.
- Appropriate NMDOT approved construction traffic control standard drawings.
- Appropriate NMDOT and County approved traffic notes.

The plans shall be prepared only after consultation with the County Traffic Engineer and Traffic Division Traffic Control Specialist and have approved a construction sequence plan. The proposed approved construction sequence shall be included with the traffic control plans package.

6. RIGHT-OF-WAY DESIGN

6.1 GENERAL INFORMATION

When right-of-way design is necessary on a plat, the Engineer/Surveyor will provide right-of-way surveying, mapping, title reports, and monumentation. This section is intended to provide basic direction to the Engineer/Surveyor in developing right of way/monumentation mapping on the development. All sections of the County Development Code will be adhered to.

All right-of-way documents shall use imperial units.

The Engineer/Surveyor will be responsible for making all revisions to the right-of-way plans and documents. If easements are added during construction of the development, it will be the responsibility of the developer/Surveyor to update the plat on the development to reflect as-built conditions.

6.2 RIGHT-OF-WAY SURVEYING

The development of the right-of-way surveying work shall be closely coordinated with the Engineering Division Surveying Section staff. Contact the Chief of Survey at (505) 662-8162.

All right-of-way surveying shall be performed by a qualified Professional Surveyor licensed in New Mexico and ultimately should conform with 12.8.2.13 NMAC of the Minimum Standards for Surveying in New Mexico adopted by the New Mexico Board of Registration for Professional Engineers and Surveyors effective May 1, 2007. Right-of-way surveying, mapping, monumentation should also conform with the NMDOT 2000 Surveying Handbook for Right-of-Way Surveying, Mapping, and Monumentation Procedures/Policies and subsequent guidelines, standards, revisions and amendments.

Prior to commencing right-of-way mapping the Engineer/Surveyor shall meet with the County Surveyor to review and concur on the scope of right-of-way surveying and mapping and monumentation required on the development. Information such as preliminary development design plans, report and the preliminary property ownership layout maps will be reviewed by the County Surveyor. Right-of-way surveying, mapping, and monumentation will be performed as determined by development design requirements and areas where surveying, mapping, and monumentation of existing Right-of-way may be required.

The Engineer/Surveyor shall meet with the County Surveyor to review the completed right-of-way survey map. Key topics of review and discussion at this session will be confined to the methodology utilized in the determination of existing/proposed right-of-way limits, intersecting property lines, encroachments, hiatus, prescriptive rights, accepted/rejected monuments etc. This meeting should be scheduled prior to beginning the preparation of right-of-way maps.

The Engineer/Surveyor, having obtained all the necessary field data, will prepare the right-of-way survey maps and will show all pertinent survey data, existing right-of-way limits, easements, intersecting property lines, accepted and rejected monuments, encroachments, buildings, structures within one hundred feet of the right-of-way, etc.. Include relevant annotation and notes upon which future right-of-way acquisition boundaries will be electronically overlaid and computed.

6.3 RIGHT-OF-WAY MAPPING

The Engineer will prepare the preliminary right-of-way maps for presentation and review at the pre-final design submittal. Immediately following the review and, prior to the final design review, the Engineer shall submit one (1) full size final Right-Of-Way Map print sets of the final Right-of-Way Map with one copy of all documents including legal descriptions, acquisition parcel computations, and title reports to the County Surveyor for first review (99% complete). Ownership shall be shown on the right-of-way maps exactly as listed in the title reports. These final Right-of-Way Maps shall locate all right-of-way fee parcels and easements. The County Surveyor will not provide an extensive detail check of any of the final maps and plans. Therefore, any errors and/or omissions in the final Right-of-Way Maps, legal descriptions, and subsequent monumentation mapping and staking will be the full responsibility of the Engineer.

The second review prior to the Final Design submittal review is primarily for the purpose of assuring that the red-lined markups of the first review set have been made and to assure that items of concern resulting from the first review are adequately addressed and communicated to the Engineer/Surveyor.

6.4 TITLE REPORTS

All title services work shall be performed in accordance with Executive Order No. 89-15, dated March 30, 1989 and the policies and procedures as contained in the NMDOT Right-of-Way Handbook Volume II, utilizing the forms and/or formats set out therein or as recommended by the County Surveyor.

6.4.1 RIGHT-OF-WAY FEE PARCELS AND EASEMENTS (CME'S, DE'S, UE'S, PE'S)

The Engineer/Designee shall provide the following:

- A minimum thirty-three (33) year certified title search on every parcel affected in the right-of-way acquisition.
- A Chain of Title (Index) reflecting all transactions affecting said parcel should be provided.
- Copies of all pertinent documents described in Chain of Title (Index).
- A five-year tax search (or computer print out) reflecting the current assessed owner, address, description of property and the amount of taxes for the current assessed year reflecting whether paid or unpaid.
- Caption sheet or title sheet showing current owner and address of record, description of property being abstracted.
- Work map and index identifying each parcel abstracted.
- Information on any mortgages, liens, or judgments that have been released of record does not have to be shown on said search. For any probates or district court proceedings only pertinent proceedings need be shown, not the complete case file.

6.4.2 TEMPORARY CONSTRUCTION PERMITS (TCP'S)

The Engineer/Designee shall provide the following:

- Provide current ownership.
- Title sheet showing current owner, address of record, description of property, document creating ownership and certificate.

6.4.2.1 GENERAL

The Engineer/Designee shall:

- Confer with the County Engineer or designee prior to commencement of title services regarding preparation and format of title work. The County Surveyor must be present at this initial conference.
- Execute and submit with each title report the "Certificate of Title" form and hold the title reports in confidence and reveal the title reports or opinions only to the County Surveyor unless otherwise directed in writing by the County Engineer.
- Deliver title reports to the County Engineer "satisfactorily completed" in a timely manner. Delivery of such shall be defined as (1) actual transfer of possession in the form approved by the County Engineer incorporating all required corrections and clarifications, and (2) written acceptance by the County Engineer of the Engineer/Designee's work.
- The County Surveyor acceptance or rejection of the Engineer/Designee's work product shall be given in writing. The Survey Section shall return deficient or inadequate title reports within 30 calendar days of receipt.
- The dates for the submission of title reports shall be determined at the initial meeting between the Public Works and the Engineer/Designee.
- All documents must be letter size, except for surveys and/or maps which may be folded. All title reports must be bound securely (abstract form). A licensed and bonded Title Company must prepare all title reports submitted.
- Promptly correct all deficiencies and return the title reports for further review within (30) calendar days from date of return.
- Be fully responsible for the accuracy of all work.

6.4.2.2 THE ENGINEERING DIVISION - SURVEY SECTION

- Shall return to the Engineer/Designee, within thirty (30) calendar days of receipt, individual title reports found to be deficient or inadequate with the reviewer's comments, if applicable.
- May hold a review of the title work for the purpose of further discussion of the type of title work required.
- Shall make available to the Engineer/Designee, Survey Section records as may be available and pertinent for the purpose of the work herein described.
- May schedule and hold a review with the Engineer/Designee and representatives of the County involved in the project as necessary.

6.5 MONUMENTATION

Upon assignment of a final Right-of-way map date by the County Surveyor, the Engineer/Surveyor shall prepare the preliminary monumentation mapping. Field staking of right-of-way limits as defined by the final Right-of-Way Maps and Right-of-Way Certification and recordation of the final Right-of-Way Monumentation Map(s) will be required. Field staking in accordance with approved final Monumentation Maps shall not occur prior to the issuance of the Right of Way Certification letter by the County Surveyor. The final monumentation maps shall meet NMDOT Monumentation Mapping Unit guidelines/policies and pertinent provisions of the Minimum Standards for Surveying in New Mexico, current edition.

6.5.1 PERMANENT MONUMENTS

All primary subdivision boundary corners shall be marked with permanent monuments at the point or if necessary with an offset marking. A permanent monument shall be concrete with brass or aluminum cap, The concrete monument shall be a minimum of 6 inches in diameter and shall be placed 30 inches below the finished grade; and , subject to applicable requirements of New Mexico Survey Standards:

1. Any described mark shall be permanently affixed to rock or concrete through the use of an expansion bolt, set and a drilled hole with ferrous metal rod (rebar or pipe) of a minimum length of 48 inches.
2. A survey post approved by the County Surveyor.
3. Any monument of higher standard may be substituted.

6.5.2 SECONDARY MONUMENTS

Secondary monuments may be rebar, pipe or other metal rod, not less than ½ inch diameter and 16 inches in length with surveyor's registration number on the cap which may be aluminum, plastic, brass or comparable material. Secondary monuments shall be set at all corners, points of curve, easements, and boundary angle points.

7. MATERIALS

7.1 GENERAL INFORMATION

Unless otherwise noted in this document, the New Mexico Department of Transportation (NMDOT), Current Edition, Standard Specifications for Highway and Bridge Construction shall provide the specifications for drainage, street and traffic control construction. The following pages in this section are intended to provide specific and supplemental information on materials that will be accepted by the County of Los Alamos.

7.2 CLEARING AND GRUBBING

All provisions of Section 201 of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified below:

DESCRIPTION:

201.34 Removal and Disposal of Materials. All material designated for disposal shall be disposed of in a legal landfill. There shall be no burning at the construction site.

The project site and adjacent areas shall be left in a neat and finished appearance. No accumulation of flammable material shall remain on or adjacent to the right of way.

7.3 EXCAVATION, BORROW, AND EMBANKMENT

All provisions of Section 203 of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as appended below:

DESCRIPTION:

203.331 Blasting Requirements. All information on the specification shall apply. Add, no blasting shall be allowed in the County of Los Alamos unless a blasting permit has been obtained from the Los Alamos County Fire Department.

7.4 BASE COURSE AND SUBBASE

All provisions of Section 304 of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply.

Unless otherwise specified, the Contractor shall use the Type I gradation.

7.5 UNSTABLE SUBGRADE STABILIZATION

SPECIAL PROVISION
FOR
SECTION 306-B UNSTABLE SUBGRADE STABILIZATION

All provisions of Section 304 of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply and be supplemented by the following.

1.0 DESCRIPTION

These specifications cover the requirements for correcting unstable subgrade encountered in non-borrow sections such as cuts or existing grades, due to no fault or neglect of the Contractor. The work includes all materials, labor, equipment, storage, private lab testing, sampling, handling, excavation, disposal, tools, removal, placement, hauling, processing with the subgrade, shaping, compacting, surveying, finishing to grade, curing, fees, permits, test-rolling and/or proof-rolling the subgrade including all appurtenances and incidentals necessary to complete the work.

For purpose of this specification, unstable subgrade is defined as subgrade that is soft, gummy, pumping, and/or displaces with applied loading.

Subgrade modified by this specification is for stabilization only and is not considered in the structural design of the pavement structure; thus no modification of the pavement structure shall be made.

Prior to stabilization, the subgrade shall be test rolled with a roller having a sufficient weight to identify unstable subgrade locations. Areas lacking sufficient stability in the opinion of the Project Manager shall be treated as unstable subgrade.

Prior to placement of the base/sub-base material, the stabilized subgrade shall be proof rolled with a roller having a minimum weight of 30 tons (27 metric tons) and shall exhibit no displacement when proof rolled.

The Contractor may choose any of the options contained in this specification unless otherwise indicated on the plans or in the contract documents and at the contractors option, change to the other option during that project at no additional cost to the County.

Option A - Chemically Stabilized Subgrade - This work shall consist of Chemical Stabilization to stabilize the subgrade. Chemically Stabilized Subgrade includes, but is not limited to, Portland Cement, Lime, etc. or combinations thereof. The contractor shall determine the percentage of chemical by weight of soil required for proper stabilization.

Option B – Mechanically Stabilized Subgrade - This work shall consist of Mechanical Stabilization to stabilize the subgrade. Mechanically Stabilized Subgrade includes, but is not limited to, ripping/drying/replacing, excavation of unstable material and replacement of stable barrow material, aggregates, rock, underdrains, geotextiles, and/or reinforcement materials, or combinations there of. Prior to placement, the County Project Manager shall approve the barrow source of material to be used for stabilization.

Quantities shown in the plans are an estimate only. The Project Manager shall adjust quantities as field conditions warrant. Adjustments to the unit price for increased quantities will not be allowed under **Subsection 104.2, Significant Changes In The Character Of Work**, unless this item is considered a major item of work as defined elsewhere in the contract.

2.0 MATERIALS

Materials used must be on the list of NMDOT's approved products for its intended use, or be currently accepted under either the NMDOT's Standard Specifications for Road and Bridge Construction, special provisions, supplemental specifications, serial drawings or standard drawing.

3.0 CONSTRUCTION REQUIREMENTS

Where unstable subgrade is due to the failure of the Contractor to maintain adequate surface drainage, or is damaged due to the operations or any other fault or neglect of the Contractor, the unstable condition shall be corrected at no expense to the County.

The Contractor is responsible for making the necessary adjustments in the equipment or operation so that underground utilities and permanent structures are not damaged.

The Contractor shall handle the processing of material in such a manner that the dust or debris created by the operation will not be hazardous to the public or workers.

Stabilized subgrade shall be constructed in such a manner that water will not gather and that proper drainage is assured.

When within the top 6 inches (150 mm) of the subgrade elevation, the stabilized subgrade shall meet the grade and compaction requirements of **SECTION 207 SUBGRADE PREPARATION**. Additional payment will not be made under **Item Number 207000 – "Subgrade Preparation"** and quantities will be adjusted as field conditions warrant.

4.0 ACCEPTANCE

Prior to placement of the base/sub-base material, the stabilized subgrade shall be proof rolled with a roller having a minimum weight of 30 tons (27 metric tons) and shall exhibit no displacement when proof rolled. Stabilized subgrade locations that continue to exhibit displacement are to be corrected at no additional cost to the County.

Once the subgrade has been stabilized the overlying base/sub-base shall meet the requirements of **SECTION 303 - BASE COURSE (QC/QA)**, or **SECTION 304 BASE COURSE subsection 303.31** or **304.31** as applicable.

7.6 PLANT MIX BITUMINOUS MIX (SUPERPAVE - NON QC/QA)

PMBP used in the County of Los Alamos shall meet the requirements of PMBP SP-III or SP-IV.

All provisions of Section 422 of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply.

422.221 Gradation. All subsection text will apply. Add the County will utilize SP-III on roadway projects, with minimum lift thickness of 2.5 inches and maximum lift thickness of 3.5 inches. Bike paths, pedestrian paths type projects will utilize SP-IV with minimum lift thickness of 1.5 inches and maximum lift thickness of 3.0 inches.

422.341(a) Temperature and Weather Limitations. PMBP shall not be placed on wet or frozen surfaces or when weather conditions otherwise prevent the proper

handling, finishing, and compaction of PMBP. PMBP shall not be placed when the ambient temperature is below 45 degrees Fahrenheit; when the chill factor is below 35 degrees Fahrenheit; When polymerized asphalt cement is used, PMBP may only be placed when ambient temperature is 55 degrees Fahrenheit or above and the chill factor is 45 degrees Fahrenheit or above. When the ambient temperature is 90 degrees Fahrenheit or above the chill factor will no be considered. The chill factor is defined as the ambient temperature on degree Fahrenheit minus the wind velocity in miles per hour (mph). The wind velocity shall be the velocity in MPH determined by the average of the maximum and minimum wind velocity observed during a three (3) minute period immediately prior to or concurrent with ongoing PMBP placement operations taken at five (5) feet above the surface of the road.

422.341 (b) The Project Manager will determine a minimum placement temperature within a range from 220 ° F to 300 ° F. When polymer modified asphalts are used the maximum temperature shall be 350 ° F. The established placement temperature, which is measured immediately behind the lay-down machine, shall not vary more than plus or minus twenty degrees (20 ° F) from that established by the Project Manager.

423.23 Bituminous Material. The type and grade of bituminous material will be PG 64-22 unless otherwise approved by the County's Pavement Engineer.

7.7 UTILITY ACCESS COVER ADJUSTMENTS

Construction work involving County utilities (Gas, Water, Sewer, and Electric) access covers shall conform to the current Department of Public Utilities Construction Standards.

7.8 PORTLAND CEMENT CONCRETE

All pertinent provisions of the current New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Construction, shall apply and be supplemented by the following.

Concrete supplied for the specific construction of Drive Pads shall be Class AA (4000 psi) fiber reinforced concrete. Fiber reinforcement shall be Polypropylene fibers of length between ¾" and 1-½". No wire mesh reinforcement shall be used for 608106 Drive Pads.

7.9 SEEDING

All provisions of Section 632 - of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply.

BEST MANAGEMENT PRACTICE
PERMANENT SEEDING

Seeding is an important and cost-effective method to rehabilitate disturbed areas following disturbance. The major benefit of seeding is the stabilization of areas that pose a high risk of erosion. Through seeding, erosion, sediment transport, and volume of runoff are reduced due to increase infiltration rates. Coupled with mulch, or erosion control cloth or blankets, seeding is appropriate for treatment of staging areas, moderately steep slopes, and stream banks.

Seeding treatments should be confined to slopes of 30% or less.

Installation Guidelines

Timing

- Seed should be applied to areas that have been returned to the original grade.
- All traffic should be kept out of seeding areas for about one year.
- Site preparation should be completed as soon as possible, but application of seed should wait until immediately before the summer rainy season or immediately before expected snowfalls. Optimal times for application of seed are in late June-early July and in early to mid-November.

Site Preparation

- Bring the area to final grade.
- Install any storm water diversion controls to channel away water from area to be seeded.
- For compacted soil, loosen with discing, raking, or harrowing.
- Harrows should be horizontal across the face of the slope.
- Ensure that the top three inches of soil is loose and free of clods and stones.

Planting

- Seed should be spread evenly using hand crank seeders or cyclone seeders. When grass seed is too course for spreaders, hand broadcasting is required.
- If the treated area is small, lightly rake the seed into the soil with hand rakes or McLeods.
- Seeding should be initiated as soon as practicable following completion of final grading activities.
- If seeding requires harrowing, tracking, or furrowing, these activities shall be conducted horizontally across the face of the slope.
- The spreading of mulch should immediately follow seeding

Applications

- Slope protection
- Sediment trapping
- Temporary stabilization
- Permanent stabilization

Related BMPs

- Surface roughening
- Mulching
- Cover crops

when seeding in adverse soil conditions, during excessively hot or dry weather, where heavy rains are expected, or on slopes greater than 2:1

- Seed shall be applied uniformly using calibrated spreaders, cyclone seeders, mechanical drills, broadcast spreading, or hydroseeders.

Seed mixes

Seed mixes can be from commercial suppliers or can be mixed from individual seed types. All seeds should be certified to be free of invasive species.

Los Alamos, 6,900 to 7,400 feet

Common Name	Scientific Name	Percent of mix
Blue gramma	*Bouteloua gracilis*	20
Foothills brome	*Bromus carinatus var. polyanthus*	20
Slender wheatgrass	*Elymus trachycauldus*	30
Big Bluestem	*Andropogon gerardii*	30

Los Alamos, 6,000 to 6,900 feet

Common Name	Scientific Name	Percent of mix
Blue gramma	*Bouteloua gracilis*	30
Galleta	*Pleuraphis jamesii*	20
Sideoats gramma	*Bouteloua curtipendula*	20
Little Bluestem	*Schizachyrium scoparium*	30

Application Rate

Seed should be applied at a rate of no less than 50 pounds of seed per acre.

7.10 TRAFFIC CONTROL PLAN AND MANAGEMENT

Special Provision
for
Section 702-A
Traffic Control Plan and Management

All pertinent provisions of the current version of New Mexico Department of Transportation's Standard Specifications for Highway and Bridge Construction shall

apply in addition to the following.

1.0 DESCRIPTION

1.01 This work shall consist of implementing an approved traffic control plan in conformance with the contract and the Manual of Uniform Traffic Control Devices, NMDOT Standard Specifications, ATSSA Quality Standards for Work-zone Traffic Devices, and Los Alamos County Code. The Contractor shall submit his proposed traffic control plan to the Project Manager and the LAC Traffic Division or designee for review and approval prior to implementation.

1.02 **Traffic Control Plan**: The Traffic Control Plan (TCP), shall be detailed drawing which conforms to the *Manual on Uniform Traffic Control Devices* (MUTCD) and represent the area in which the work is to be performed. The TCP shall include the following items:

1. A list of all devices that will be used to complete the work zone.
2. Speed limits in all areas affected by the work zone.
3. All distances and measurements specific to the work zone, i.e., taper lengths, spacing between devices, buffer zone, etc.
4. Driveways, business entrances, sidewalks, crosswalks or any other public or private right-of-way that may be affected by this work zone.
5. Name and contact phone number for the onsite Traffic Control Supervisor.
6. All devices specific to nighttime operations.

2.0 MATERIALS

2.01 All materials necessary to complete the work shall conform to the applicable requirements which include, but are not limited to SECTION 701-TRAFFIC SIGNS & SIGN STRUCTURES, SECTION 702 – TRAFFIC CONTROL DEVICES FOR CONSTRUCTION, SECTION 704 – PAVEMENT MARKINGS.

2.02 **Traffic Control Devices**: Prior to commencement of work or placement of devices on the roadway; all devices shall comply with the acceptable standards as set forth in the *ATSSA Quality Standards for Work Zone Traffic Control Devices*. A copy of this standard is available in the Traffic Engineering Office for review prior to initial setup. Prior to approval of the traffic impedance permit, the contractor must schedule an inspection of all devices with the County Project Manager and Traffic Division.

3.0 CONSTRUCTION REQUIREMENTS.

3.01 All construction shall be affected by the Contractor in accordance with the applicable specifications and the approved traffic control plan.

3.02 All materials and devices shall be maintained and replaced, if necessary, for the duration of the project.

3.03 Traffic control shall be maintained in conformance with SECTION 618 – TRAFFIC CONTROL MANAGEMENT, for the duration of the project.

3.04 **Traffic Control Supervisor**: A Traffic Control Supervisor will be designated and be available for callout 24 hours per day throughout the duration of the traffic permit. The Traffic Control Supervisor shall be certified in Work Zone Traffic Control and will perform daily onsite inspections on the work zone. Inspection sheets are available at the Los Alamos County Traffic Engineering Office. These inspections will occur twice daily and once nightly if the traffic control devices will be in place during nighttime hours.

3.05 **Inspection**: Random daytime and nighttime inspections will be performed by Los Alamos County Traffic Engineering staff, any deficiencies noted will be immediately brought to the attention of the Traffic Control Supervisor who will be expected to correct the problem(s) immediately and record the incident. The Traffic Control Supervisor will immediately report all accidents related to this work zone to the Los Alamos Police Department, County Project Manager, and Los Alamos County Traffic Engineering Staff. All incidents and accidents will be recorded in the Work Zone Daily Inspection Log. **The Work Zone Daily Inspection Log will be brought in to the Los Alamos County Traffic Engineering Office no later than 12:00 p.m. every Monday (excluding holidays) for inspection and review.**

It is the ultimate responsibility of the contractor and his/her employees to maintain a safe and proper work zone at all times.

7.11 TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEMS

SPECIAL PROVISIONS MODIFYING

SECTION 705
GENERAL REQUIREMENTS FOR TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEMS

All pertinent provisions of the New Mexico Department of Transportation Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein:

705.3 CONSTRUCTION REQUIREMENTS.

705.31 General.

In Section **705.31 General.**, delete the entire subsection and substitute the following:

Electrical work shall conform to NEC requirements and to applicable local ordinances. The Contractor shall obtain a permit from the State Electrical Board (or equivalent state or local agency) prior to constructing traffic signals, highway lighting systems, or other electrical installations required by the contract. The Contractor shall provide permit proof to the Project Manager before work begins.

A licensed journeyman electrician(s) must be on site and directly supervise the installation of all signalization and lighting work.

In addition, the Contractor shall obtain approval from the local power company for the exact location of the electric service before its installation.

Prior to final inspection of the project, the Contractor shall submit evidence to the Project Manager that all electrical work and installations have been inspected and approved by an authorized representative of the State Electrical Board, the County Transportation Division, and County Utilities Department. All systems shall be complete and in operation to the satisfaction of the Project Manager at the time the work is accepted.

It shall be the Contractor's responsibility to know the requirements of the NEC and all local requirements, and to notify the Project Manager promptly of any conflicts with the contract documents.

7.12 TRAFFIC SIGNAL AND LIGHTING – LIGHTNING PROTECTION SYSTEM

NEW MEXICO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS MODIFYING

SECTION 705A
GENERAL REQUIREMENTS FOR TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEMS

All pertinent provisions of the New Mexico Department of Transportation Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein:

In **Section 705**, supplement the following Los Alamos County Specification:

Los Alamos County Transportation Division
Traffic Operations Specification
Lightning Protection System

The contractor shall furnish all labor, materials, equipment and services to provide a complete lightning protection system for the traffic signal components(s) included in this contract. The system(s) shall include strike termination devices, interconnecting conductors, a proper grounding system, interconnection with other grounded systems, and surge suppression at service disconnects. The system design shall comply with the National Fire Protection Association (NFPA) Standard if 780, the Lightning Protection Institute (LPI) Standard if 175, and Underwriters' Laboratories, Inc. (UL) Standard 1* 96A. The manufacturer of the material components shall be a manufacturer member of the Lightning Protection Institute, and all materials shall be listed and labeled in accordance with the requirements of UL Standard 1* 96. The system installation shall be made by a licensed Lightning Protection Installer under the supervision of an LPI Certified Master Installer, proof of licensing and certification will be required. Upon completion the contractor will deliver to the owner an as-built drawing and the appropriate system Certification documents under the UL & LPI programs.

7.13 TRAFFIC SIGNAL ASSEMBLY – (LED) PEDESTRIAN SIGNAL – (LED)

All provisions of **Section 712** – Signal Assemblies of the New Mexico Department of Transportation Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein:

NEW MEXICO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS FOR

TRAFFIC SIGNAL ASSEMBLY–(LED)
PEDESTRIAN SIGNAL–(LED)
SECTION 712–A

1.0 DESCRIPTION.

All provisions for signal assemblies with incandescent light and pedestrian signal with neon or incandescent lighting applies, except that the optical units will be replaced with light emitting diodes (LED) as the light source. Each light emitting diode signal module shall be designed to be installed in the doorframe of a standard traffic or

pedestrian signal housing.

2.0 MATERIALS.

2.1 Traffic Signal Assembly (LED).

2.1.1 Optical Units.

Light emitting diode signal modules shall be designed as retrofit replacements for optical units of standard traffic signal sections and shall not require special tools for installation. Light emitting diode signal modules shall fit into existing traffic signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) publication ST-008B, "Vehicle Traffic Control Signal Heads (VTCSH)" without modification to the housing.

(a) Installation of light emitting diode signal modules shall not require the removal of material in the traffic signal section except the optical unit components, that is, lens, gaskets, lamp, lamp socket and reflector. Installed light emitting diode signal modules shall fit securely in the doorframe and shall be weather tight.

(b) Connections shall be to the terminal block in the signal face or shall utilize an adapter that screws into the medium base lamp socket. Splices will not be allowed.

(c) The lens of the light emitting diode signal module shall be integral to the unit, shall be convex with a smooth outer surface and shall be made of ultraviolet stabilized plastic or glass. The lens shall be capable of withstanding ultraviolet (UV) (direct sunlight) exposure for a minimum period of 48 months without exhibiting evidence of deterioration.

(d) If a polymeric lens is used, a surface coating or chemical surface treatment shall be used to provide front surface abrasion resistance.

(e) Light emitting diode signal modules shall be rated for use in the operating temperature range of –40°C to +74°C.

(f) Light emitting diode signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures to protect the internal components.

(g) Light emitting diode signal modules shall be a single, self-contained device, not requiring on-site assembly for installation into existing traffic signal housing. The power supply for the light emitting diode signal module shall be integral to the unit.

(h) The light emitting diode signal module assembly shall be manufactured to withstand mechanical shock and vibration from high winds and other sources.

(i) The minimum initial luminous intensity values for light emitting diode signal modules shall conform to the requirements in Section 11.04 of the Institute of Transportation

Engineers (ITE) publication ST-008B, "Vehicle Traffic Control Signal Heads (VTCSH)" at 25°C.

(j) Light emitting diode signal modules shall meet or exceed 85 percent of the standard light output values specified in VTCSH, after 48 months of continuous use over the temperature range of -40°C to +74°C in a traffic signal operation.

(k) The measured chromaticity coordinates of light emitting diode signal modules shall conform to the requirements for chromaticity in Section 8.04 and Figure 1 of VTCSH over the temperature range of -40°C to +74°C.

(l) The luminous intensity measurements shall be taken over the temperature range of -40°C to +74°C.

(m)Color requirements shall be measured while operating throughout the temperature range of -40°C to +74°C.

(n) Light emitting diode signal modules shall operate over a voltage range from 120VAC: 80V to 135V, 240VAC: 184V to 276V, 12VDC: 8V to 24V at a frequency of 60 Hz ±3 Hz. The light emitting diode circuitry shall prevent perceptible flicker over the specified voltage range. The fluctuations of line voltage shall have no visible effect on the luminous intensity of the indications.

(o) Wiring and terminal blocks shall conform to the requirements in Section 13.02 of VTCSH. Two secured, color coded 600 V, 20 AWG minimum, jacketed wires, conforming to the National Electric Code, rated for service at or greater than 105°C, are to be provided for electrical connection for each light emitting diode signal module.

(p) The light emitting diode signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as specified in Section 2.1.6 of NEMA Standard TS2-1992.

(q) Light emitting diode signal modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers and conflict monitors).

(r) Light emitting diode signal modules and associated on-board circuitry shall meet Federal Communications Commission (FCC) Title 47, Sub Part B, Section 15 regulations concerning the emission of electronic noise.

(s) Light emitting diode signal modules shall provide a power factor of 0.90 or greater while operating throughout the temperature range of -40°C to +74°C.

(t) Light emitting diode signal modules shall be compatible with the controller unit, conflict monitor and load switch.

2.2 Pedestrian Signal

2.2.1 Pedestrian Signal (LED)

Light emitting diode pedestrian signal modules shall be designed as retrofit replacements for optical units of standard pedestrian signal sections and shall not require special tools for installation. Light emitting diode signal modules shall fit into existing pedestrian signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) publication ST-008B, "Vehicle Traffic Control Signal Heads (VTCSH)" without modification to the housing.

(a) The LED signal module shall consist of a double side-by-side message combining the symbols of a hand and walking person. The LED's shall be arranged in a manner to form an outline of the symbols. The shape of the outline shall conform to the standard symbols for pedestrian signals.

(b) The measured chromaticity coordinates for the "lunar white" walking person and the "Portland orange" hand shall conform to the chromaticity requirements of section 8.04 and Figure 1 of the VTCSH standard. The chromaticity measurements shall remain unchanged over the input line voltage range of 80 VAC to 135 VAC for 120AC, 184 VAC to 276 VAC for 240 AC, 8V to 24V for 12 DC.

(c) The LED's shall be distributed evenly along the message outline. The distance between each LED shall not vary more than 10%. The hand/man symbols shall be not less than 10" in height and 6.5 " in width. The individual LED light sources shall be interconnected so that a catastrophic failure of single LED will result in a total loss of not more than 3 LED's or 5% of the signal light output. There shall be no electronic components visible on the front of the display face. The display face shall consist solely of LED's mounted on a mat black PCB.

(d) The LED Signal module shall be rated for use in the ambient operating temperature range of -40°C (-104°F) to +74°C (+165°F.) The LED module shall be completely sealed against dust and moisture intrusion per the requirements of NEMA Standard 250 – 1991 sections 4.7.2.1 and 4.7.3.2 for type 4 enclosure to protect all internal components.

(e) The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into existing traffic signal housing. The assembly of the LED module shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

(f) The driver board shall drive the LED's at a DC current not exceeding the maximum rating recommended by the LED manufacturer (20ma). The driver board shall regulate the LED drive current on both hand/man messages to compensate for line voltage fluctuations over the range of 80VAC to 135 VAC for 120 V, 184 VAC to 276 VAC for 240 V. The luminous output shall not vary more than 10% over the voltage range and shall not be perceptible to the human eye. The drive circuitry shall include voltage surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as stated in section 2.1.6, NEMA Standards TS-2, 1992. The on-

board circuitry shall meet FCC title 47, Sub-Part B, Section 15 regulations concerning the emission of electronic noise. The circuitry shall ensure compatibility and proper triggering and operation of load switches and conflict monitors in signal controllers currently in use by the procuring traffic authority.

(g) In order to reduce long term degradation to LED's the signal modules shall be designed to reduce the intensity of light output in response to diminished ambient light level. The dimming circuit shall have a 30-sec. delay to prevent interference caused by shadows or headlights. A switch or jumper connector shall be provided to allow user to disable the dimming feature.

3.0 CONSTRUCTION REQUIREMENTS.

3.1 Installations and Training.

The contractor shall install LED signal assemblies per the manufacturer's recommendations. All material shall be new.

3.2 Warranties and Maintenance.

(a) The Contractor shall obtain and assign to the Department all manufacturers and producer's guarantees or warranties which are normally provided as customary trade practice for items and materials incorporated into the work. In the absence of a manufacturer's or producer's guarantee, the Contractor warrants that mechanical and electrical equipment and material incorporated into the work are free from any defects or imperfections in workmanship and material for a period of six months after acceptance by the Department staff. The Contractor shall be responsible for repairing any malfunction or defect in any such equipment or material, which develops during the six-month period at no cost to the Department.

(b) The Contractor shall also supply installation guide and user manuals to the Department for the equipment incorporated in the project.

(c) The Contractor shall provide the Department with a Certificate of Compliance from the manufacturer in conformance with the requirements in these specifications. The certificate shall also include a copy of applicable test reports on the light emitting diode signal and pedestrian modules.

7.14 TRAFFIC DETECTORS

All provisions of **Section 713** – Detectors of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein.

713.2 MATERIALS

713.21 Vehicle Detector. Unless otherwise specified, video detection systems shall be installed instead of loop vehicle detection systems. The system shall be installed in conformance with the current NMDOT standard.

7.15 LUMINARIES

All provisions of Section 716 – Luminaires of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein.

716.2 MATERIALS

716.28 Lamps.

Insert the following text:

"No Mercury Vapor Luminaries shall be used."

7.15 TRAFFIC SIGNAL CONTROLLERS

NEW MEXICO DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS MODIFYING

SECTION 714
TRAFFIC SIGNAL CONTROLLERS

All pertinent provisions of the New Mexico Department of Transportation Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein:

In **Section 705**, supplement the following Los Alamos County Specification:

Los Alamos County Transportation Division
Traffic Operations Specification

Cabinet & Terminal Facility Specifications TS2

4.0 TS 2 CABINET ASSEMBLY

4.0.1 This specification describes the minimum acceptable requirements for a TS 2 cabinet assembly to house a NEMA TS 2 Type 2 solid-state full-actuated controller unit. The assembly shall include the cabinet, flasher, card rack(s), an external power supply, two bus interface units, six flash transfer relays and 16 load switches. All cabinets shall include appropriate mounting hardware. Any cabinet specifications not

specifically referred to in this document shall be required to conform to standards contained in *NEMA Standards Publication TS 2 -2003 v02.06*

4.1 Construction Requirements

4.1.1 Traffic signal controller cabinets shall normally be installed on concrete bases at the location shown in the contract or as directed by the Project Manager. The cabinet door shall face away from the street unless otherwise specified in the contract. Upon installation of a ground-mounted controller cabinet, the necessary grout or caulking shall be placed between cabinet and concrete base to provide a weather resistant, dust-tight installation. No conduit entry shall be made into the side of the cabinet.

4.1.2 Ground-mounted control cabinet foundations shall be the flush-top type or as shown in the contract. All anchor bolts shall be properly located and placed during concrete placement for the cabinet to be furnished. A Class A concrete base pad shall be placed in front of control cabinet foundations. The concrete pad shall be constructed as detailed in contract drawings.

4.2 Cabinet Design Requirements

4.2.1 The cabinet shall be constructed using unpainted sheet aluminum with a minimum thickness of 0.125". No wood, wood fiber products, or other flammable material shall be used in the cabinet. All welds shall be neat and of uniform consistency.

4.2.2 The size of the cabinet shall be size "7" as defined by TS 2 Clause 7.3 of the *NEMA Standard Publication TS 2-* 2003, as specified by the plans. The load bay shall be configuration 4 (16 position) as defined by 152 Clause 5.3, as specified by the plans.

4.2.3 Two aluminum-lifting eyes or ears shall be attached to the cabinet with a single carriage bolt or dual carriage bolts each to permit lifting the cabinet with a sling. The corners of each eye or ear shall be rounded and in the down position when shipped.

4.2.4 Vertical shelf support channels shall be provided to permit adjustment of shelf location in the field. The channels shall have a single continuous slot to allow shelves to be placed at any height within the cabinet. Channels with fixed notches or holes are not acceptable.

4.2.5 Each cabinet shall be equipped with an extra set of unistrut channels or a keyhole panel on either side of the front section of the cabinet to permit the purchaser to mount additional equipment as necessary.

4.2.6 Shelves shall be at least 15" deep and be located in the cabinet to provide a 0.5" clearance between the back of the shelf and the back of the cabinet. A

1.5" drawer shall be provided in the cabinet, mounted directly beneath the controller support shelf. The drawer shall have a hinged top cover and shall be capable of storing documents and miscellaneous equipment. This drawer shall support to 50 lbs in weight when fully extended. The drawer shall utilize ball bearing type runners to open and close smoothly. Drawer dimensions shall make maximum use of available depth offered by the controller shelf and be a minimum of 24".

4.2.7 Three shelves shall be provided in the cabinet and shall be at minimum 12" apart in height. There shall be sufficient shelf space to accommodate a controller unit 13" high, an MMU, one 8 position card rack and one external power supply. An additional space at least 12" high, 13" wide, and 12" deep shall be provided. The controller unit, MMU, card racks, and power supply shall be placed on the shelves in such a manner that sufficient ventilation is provided to all components. Labels showing the proper placement of each component shall be provided along the shelves to ensure proper placement.

4.2.8 The cabinet shall be vented and cooled by 2 thermostatically controlled fans. The fans shall be a commercially available model with a capacity of at least 3.5 yd3 / mm. A thermostat for each fan shall be adjustable in the range of 20° C to 70° C. A press-to-test switch shall be provided to test the operation of the fans. An exhaust plenum divider shall be incorporated to prevent recirculation of air in the case of only one fan running.

4.2.9 The cabinet shall be provided with a unique five digit serial number which shall be stamped directly on the cabinet or engraved on a metal or metallic mylar plate, epoxied or riveted with aluminum rivets to the cabinet. The digits shall be at least .25" in height and located on the upper right sidewall of the cabinet near the front.

4.3 Cabinet Doors

4.3.1 The cabinet shall be equipped with full-size doors in front and rear that will provide access to the cabinet. The doors shall be provided with a full-length piano hinge with stainless steel pins spot-welded at the top of the hinge.

The hinge shall be mounted so that it is not possible to remove it from the door or cabinet without first opening the door. The bottom of the door opening shall extend at least to the bottom level of the backpanel. The doors and hinges shall be braced to withstand 50 lbs per vertical foot of door height load applied to the outer edge of the door standing open. There shall be no permanent deformation or impairment of any of the door or the cabinet body when the load is removed.

4.3.2 The cabinet doors shall be provided with a door stop at the top and bottom of each door which holds the door open at the 90°(±10°), 120° (±10°) and 160° (±10°) positions. Doorstops shall be designed to prevent accidental release of the doorstop. The stop and catch arrangement shall be capable of holding the door open at 90° with a load of 15 lbs per square foot applied uniformly over the face of the door.

4.3.3 A three point latch is required on front and rear doors. The latching

means shall be operable without the use of tools. Rotation of the door handles shall not extend beyond the perimeter of the door at any time. The operation of the handle shall not interfere with the key, police door, or any other cabinet mechanism or projection.

4.3.4 The cabinet doors shall be fitted with a Number 2 Corbin lock and a stainless steel handle with a 0.75" (minimum) diameter shaft (or equivalent cross-sectional area for a square shaft). The lock and latch design shall be such that the handle cannot be released until the lock is released. Two keys shall be provided for each cabinet. The external handles shall provide a means of externally padlocking the latching mechanism. A lock with a 0.375" diameter shackle shall be accommodated. A gasket shall be provided to act as a permanent dust and weather resistant seal at the controller cabinet door facing. The gasket material shall be of a nonabsorbent material and shall maintain its resiliency after long-term exposure to the outdoor environment. The gasket shall have a minimum thickness of 0.25'. The gasket shall be located in a channel provided on the cabinet or on the door(s). An "L" bracket is acceptable in lieu of this channel if the gasket is fitted snugly against the bracket to insure a uniform dust and weather resistant seal around the entire door facing. Any other method is subject to written purchaser approval during inspection of an order.

4.3.5 A locking auxiliary police door shall be provided in the front door of the cabinet to provide access to a panel that shall contain a signal shutdown switch and a signal flash switch. The police door shall be gasketed to prevent entry of moisture or dust and the lock shall be provided with one brass key. The police door shall be provided with a lock that can be operated by a police key, Corbin Type Blank No. 04266 or equivalent. Two keys shall be furnished with each cabinet.

4.3.6 The intake for the vent system shall be filtered with a permanent air filter. The minimum filter dimensions shall be 16" wide by 12" high by I" thick. The filter shall be securely mounted so that any air entering the cabinet must pass through the filter. The cabinet opening for intake of air shall be large enough to use the entire filter. The air intake and exhaust vent shall be screened to prevent entry of insects. The screen shall have opening no larger than 0.25" sq. The total free air opening of the exhaust vent shall be large enough to prevent excessive back-pressure on the fan.

4.4 Wiring

4.4.1 All wiring within the cabinet shall be neat and routed such that opening and closing the doors or raising or lowering the back panel will not twist or crimp the wiring. All wiring harnesses shall be braided, sheathed in nylon mesh sleeving, or made of PVC or polyethylene insulated jacketed cable. All connecting cables and wire runs shall be secured by mechanical clamps. Stick-on type clamps are not acceptable. Wiring leading to the cabinet door shall be sheathed in nylon mesh sleeving or be PVC jacketed cable only. All SDLC cabling shall be Belden #7203A or approved equivalent.

4.4.2 Size

A. All conductors between the main power circuit breakers and the signal power contactor shall be a minimum size 10 AWG stranded copper. Load switches shall be

bussed in groups of four. The bus conductor for each group shall be a minimum size 12 AWG stranded copper. All conductors carrying individual signal lamp current shall be a minimum size 16 AWO stranded copper. All AC service lines shall be of sufficient size to carry the maximum current of the circuit or circuits they are provided for. Minimum cabinet conductor wire size shall be 22 AWG stranded copper. All wiring and insulation shall be rated for 600 V or greater.

B. Conductors for AC common shall be white. Conductors for equipment grounding shall be green. All other conductors shall be a color different than the foregoing.

4.4.3 A barrier terminal block with a minimum of three compression fitting terminals designed to accept up to a #4 AWG stranded wire shall be provided for connection of the AC power lines. The block shall be rated at 50 Amperes.

4.4.4 All terminals shall be permanently identified in accordance with the cabinet wiring diagram. Where through-panel solder lugs or other suitable connectors are used, both sides of the panel shall have the terminals properly identified. Identification shall be permanently attached and as close to the terminal strip as possible and shall not be affixed to any part that is easily removable from the terminal block panel.

A. Each controller input and output function shall be distinctly identified with no obstructions, at each terminal point in the cabinet, with both a number and the function designation. The same identification must be used consistently on the cabinet wiring diagrams.

B. Each load switch socket shall be identified by phase number, overlap number, and pedestrian phase number as applicable. No cabinet equipment, including the load switches themselves, may obstruct these identifications.

C. Each flash transfer base and power relay base shall be properly identified with no possible obstructions.

D. Each harness within the cabinet shall be distinctly identified by function on the connector end.

E. The flasher socket shall be distinctly identified with no possible obstruction.

F. All other sockets needed within the cabinet to fulfill the minimum requirements of the Invitation to Bid, or attachments thereof, shall be distinctly identified.

4.4.5 The controller unit harness (A plug) shall be long enough to reach any point 16" above the timer shelf. The MMU harness and any required auxiliary harness shall reach 24" from the MMU shelf.

4.4.6 An unused, spare terminal block providing ten terminals shall be provided. This block shall be double 8-32 X 5/l 6" binder head screw design with shorting bars. These terminal strips shall be located on the lower third of either side of the cabinet.

4.4.7 Copper ground buses shall be provided for both the power supply neutral (common) and chassis ground. Each bus bar must provide a minimum of ten unused

terminals with 8-32 X 5/16" or larger screws. The AC neutral and chassis ground buses shall be jumpered together with a minimum #10 AWG wire.

4.4.8 Three 20 Ampere and one 50 Ampere thermal-magnetic type circuit breakers shall be mounted and wired in the cabinet. One 20 ampere breaker shall protect the base light, trouble light & GFCI duplex receptacle. One 20 ampere breaker shall protect 3 duplex receptacles, and the fans. One 20 ampere breaker shall be for the two-circuit flasher. The 50 ampere breaker shall protect the signal load circuits, controller circuits, MMU, and card rack detector power supply. The breakers shall be Square "D" QUO 150 Series, or approved equivalent.

4.4.9 The circuit breakers shall be equipped with solderless connectors and installed on the right side wall (facing the cabinet) inside the cabinet. The breakers shall be easily accessible. The breakers shall be positioned so that the rating markings are visible.

4.4.10 A Ground Fault Circuit Interruption (GFCI) type duplex receptacle shall be mounted and wired in the lower right side wall of the cabinet. Three additional duplex (non-GFCI) receptacles (for use with communication and video functions) shall be mounted and wired in the upper left side of the cabinet behind the preempt / interconnect panel. These receptacles shall be wired on the load side of the 20 Amp circuit breaker.

4.4.11 The above breakers are in addition to any auxiliary fuses that may be furnished with the controller to protect component parts, such as transformers, etc.

4.4.12 The cabinet shall include a pluggable surge protection unit on the AC service input that meets or exceeds the following requirement: (EDCO SHA-1250 or equivalent utilizing 12 pin and 2 guide pins Beau connectors). The surge arrestor shall be a multi stage series hybrid type power line surge device. The surge arrestor shall be installed between the applied line voltage and earth ground. The unit shall have 2 LED indicators for operational display status. The surge arrestor shall be capable of reducing the effect of lightning transient voltages applied to the AC line and provide filtering that conforms to 50kHz with a minimum insertion loss of 50db. The arrestor shall conform to the following

Peak surge current for an 8 X 20 microsecond waveform; 20,000 A for 20 occurrences.

Clamp voltage at 20,000 A; 280 V maximum.

Maximum continuous operating current at 120 V/GO Hz: 15 A

Series Inductance: AC Line/AC Neutral — greater than 20 mh typical.

Response time: (<a nanosecond) Voltage never exceeds 280V during surge.

Temperature range: -40 to t85 degrees Celsius

Spike suppression for +/- 700V spike: +/- 40 V deviation from sine wave all phase angles between 0 and 180 degrees.

The arrestor shall have the following terminals:

1) Main Line (AC line first stage terminal)

2) Main Neutral (AC neutral input terminal)

3) Equipment Line In (AC line second stage input terminal, 1OA)

4) Equipment Line Out (AC line second stage output terminal, 1OA)

5) Equipment neutral out (neutral terminal to protected equipment)

6) Ground (GND) (earth connection).

The arrestor shall be encapsulated in a flame-retardant material.

The equipment line out shall provide power to the controller.

4.4.13 The suppresser ground connection shall be connected to the cabinet by means of a short, copper ground strap. The strap shall be bonded to the cabinet.

4.4.14 The suppresser shall be connected to the line filter as recommended by the manufacturer. Number 10 AWG or larger wire shall be used for connections to the suppresser, line filter and load switch bus.

4.4.15 A fluorescent light, with switch and rapid start ballast, shall be installed in the cabinet. This light shall turn on when the cabinet door is opened, and turn off when the cabinet door is closed. An MOV or other such transient suppression device shall be placed across the AC power input to the light.

4.4.16 A radio frequency interference (RFI) suppresser shall be provided and installed on the load side of the signal circuit breaker and shall be protected by the surge protector. This filter shall be rated at 50 amperes and shall provide a minimum attenuation of 50 decibels over the frequency range of 200 Kilohertz to 75 Megahertz.

4.4.17 Transient suppression devices shall be placed on the coil side of all relays in the cabinet. DC relay coils shall have, as a minimum, a reversed biased diode across the coil. AC relays shall have MOV's or equivalent suppression across their coils. RC networks are acceptable. One suppression device shall be supplied for each relay.

4.4.18 Except where soldered, all wires shall be provided with lugs or other approved terminal fittings for attachment to binding posts. Insulation parts and wire insulation shall be insulated for a minimum of 600 volts.

4.4.19 The outgoing traffic control signal circuits shall be of the same polarity as the line side of the power source.

4.4.20 A switch shall be provided on the inside face of the cabinet door that shall be labeled "NORMAL-FLASH." The switch shall operate according to Figure 5-5 of the *NEMA Standard Publication TS 2— 2003.*

4.4.21 A switch shall be provided near the "FLASH-NORMAL" switch to cause the controller unit, and any auxiliary equipment, to stop timing. It shall be labeled "STOP TIMING".

4.4.22 A switch shall be provided near the "STOP TIMING" switch to de-energize the controller and auxiliary equipment when switched to the off position. It shall be labeled "CONTROLLER ON/OFF"

4.4.23 The cabinet shall be wired so that activation of the MMU will cause the controller unit, and any auxiliary equipment, to stop timing.

4.4.24 Conflict and manual flash shall be wired for all red.

4.4.25 The cabinet shall be designed and equipped with enough transfer relays for the purchaser to change any mainstreet indications (movements 2, 6, and/or 1, 5) to amber for the conflict and/or manual flash operation on the face of the back panel or a side panel, using only simple tools.

4.4.26 Transfer relays shall be the plug-in type manufactured by Midtex (Part No. 136-62T3A1) or AEMCO (Part No.136-4992), or equivalent. The relays shall have contacts a minimum of 3/8" diameter in size and shall be rated at a minimum of 30 Amps 102/240 VAC, 20 Amps 28 VDC.

4.4.27 The red enable and remote reset from the MMU shall be terminated on the face of the back panel.

4.4.28 A 75 Amp, solid-state relay shall be wired between the RFI filter output and the signal power bus. The relay shall be energized to provide power to the signal bus. The relay shall be mounted to a heat sink designed to allow the maximum current flow allowed by the main breaker at 740 C without damaging the relay.

4.4.29 All exposed AC wiring points, including the RFI filter, surge suppresser. and solid state relay shall be covered with a clear non-conductive plastic cover to prevent accidental contact. Unless otherwise noted in this specification, wiring at terminal strips is exempt from this requirement.

4.4.30 The load switch outputs shall be brought out through posted 10-32 X 5/16" binder head screw terminals. All field terminals shall be clearly labeled. Field wiring for the signal heads shall be connected at this terminal strip.

4.4.31 The cabinet shall include a door switch to log an event to the system master that the door is either open or ajar.

5.0 DETECTOR PANEL AND CARD RACK

5.1 The cabinet shall have a detector panel mounted on the left side of the cabinet. This panel shall provide for all connections between loops at the street and the detector amplifiers as described in the following sections.

5.2 Detector Card Rack

5.2.1 The card rack for the cabinet configuration (16 position back panel) shall be TS 2 detector rack configuration 2 and shall accommodate up to eight (2) two channel or four (4) four channel TS 2 detector units. The detector rack shall be configured concurrently in 2 channel operation.

5.2.2 The detector card rack shall have a rigid frame and shall be fabricated from aluminum and shall have slots set in a modular fashion such that the PCB edge connectors shall plug into the rear while sliding between top and bottom card guides for each module. Mounting flanges shall be provided and be turned outward for ease of access. The detector card rack shall be bolted to a cabinet shelf. It shall be possible to unbolt the rack using simple tools.

5.2.3 All wiring to the rack shall be labeled and neatly run to other parts of the cabinet and detector termination panel. All loop inputs shall be wired with shielded twisted pair leads (Beldon 9451, 2 conductor, 22 AWG w/ 24 AWG drain wire, shielded cable or approved equivalent) to improve signal isolation. All grounds within the twisted pair leads shall be connected at the detector terminal panel.

5.2.4 The slots shall be numbered 1 to 8 left to right when viewed from the front of the rack. A flange shall be provided on the top and the bottom of the rack to label each individual channel.

5.2.5 The Detector DC Supply shall be bussed to a common point and wired to the Intersection Detector Panel.

5.2.6 The Chassis Ground shall be bussed to a common point and wired to the Detector Panel.

5.2.7 The Logic Ground shall be bussed to a common point and wired to the Detector Panel.

5.2.8 The Data Address for the detector channels shall be according to TS 2.

5.3 Detector Panel

5.3.1 The Detector Panel shall provide all connections between the detector loops and the detector amplifiers.

5.3.2 The panel shall be constructed of 2.28 mm formed aluminum.

5.3.3 The panel shall contain a series of 10mm vertical slots to accommodate 6.7mm mounting bolts.

5.3.4 All inputs from the loops shall be brought through posted 10-32 X 5/16 inch binder screw terminals or 8-32 X 5/16 inch binder screw terminals.

5,3.5 Each loop pair shall be protected by lightning surge suppressers pre-approved for use on loop detector inputs by the Divisions' Traffic Operations Manager. The suppressers may be mounted either on the front or behind the panel.

5.3.6 The detector panel shall provide the following connection points as a minimum for sixteen (16) detectors:

CONNECTION POINT NO. OF CONNECTION POINTS
EXTERNAL 24V POWER SUPPLY 1
LOOP INPUTS 32,2 FOR EACH DETECTOR
LOGIC GROUND 1
SPARES 6
CHASSIS GROUND BUS I BUS

5.3.7 A chassis ground bus bar shall be provided on the panel and connected to the cabinet by an insulated braided copper ground strap and shall be tied to the loop lead-in grounds. The strap shall be bonded to the cabinet.

5.3.8 An additional neutral bus bar shall be provided on the panel and tied to the pedestrian commons.

5.3.9 Toggle switches shall be provided to permit the user to input a vehicle or pedestrian call to the control unit. Switches will be provided as follows:

One per detector channel and a minimum of 4 pedestrian switches shall be provided

Toggle switch panel shall be mounted in a location that will prevent accidental activation or movement of the switches.

5.4 Detector Rack BIU

5.4.1 The detector rack shall utilize a BIU conforming to the requirements of Section 8 in the publication: NEMA *Standards Publication TS* 2 -2003 *v02.06.* The detector rack BIU address inputs shall control the assignment of detector functions as

shown in Table 5-11 and Table 5-12 in the publication: *NEMA Standards Publication TS 2-2003 v02.06*

6.0 PREEMPT/COMMUNICATION PANEL

6.1 A preempt / communication panel shall be provided that contains all interface circuits and wiring for preemption and communication functions. The panel shall be located on the left side of the cabinet interior.

6.2 Three input relay circuits, with 120 VAC coil and contacts rated for the application, shall be provided on the pre-empt panel. These circuits shall be used to isolate the incoming preempt commands from the controller unit logic circuitry. The circuits shall be programmable to operate with either a normally tRelays used shall be plug-in Potter Brumfield KIOP series / Magnecraft W-78 series or interchangeable equivalent. The relays shall be mounted in relay sockets.

6.3 Adequate protection of the input relay circuits as well as the preemptor circuitry shall be provided to eliminate damage or false preemption commands caused by line transients or lightning surges. The devices shall have a minimum rating of 20 Joules.

6.4 Three momentary test switches, one for each preempt circuit, shall be provided on the preempt panel. The operator shall not be exposed to hazardous voltages during operation of the test switches.

6.5 All necessary interconnection cables and mounting hardware shall be provided.

6.6 There shall be a switch on the pre-empt / communication panel which shall release the local controller to operate in an isolated, full-actuated manner, when necessary for maintenance purposes. The switch positions shall be labeled "SYSTEM" and "FREE".

6.7 Terminal connections for 2 twisted pair communication lines shall also be provided with a coordinated 4 stage electrical protection; including primary over voltage protection, resettable overcurrent protection, secondary clamping voltage protection, and fast transient filtering. The secondary over voltage stage shall allow peak voltages of no more than 250 volts. The fast transient filtering stage shall provide no less than 40 dB / decade of attenuation to transients above the required pass band. The 4-stage protection shall be provided in an integrated closure with input / output terminations and ground connection.

7.0 POWER SUPPLY

7.1 The power supply shall be a shelf mounted, enclosed, 24 VDC power supply in accordance to Clause 5.3.5 of the *NEMA Standards Publication TS 2-2003.*

7.2 One power supply cable per power supply shall be furnished and installed in each cabinet. The wires shall be terminated to bus bars, terminals on the front of the

back panel, detector panels, or connector as appropriate. The connections shall be with forked spade lugs or otherwise as needed. Each individual wire shall be cut to the length required to reach the point at which it is to be connected.

7.3 Electrical requirements for the power supply shall be in accordance with Clause 5.3.5.3 of the *NEMA Standards Publication TS 2-2003.*

8.0 TWO CIRCUIT SOLID STATE FLASHER

8.1 The solid state, two-circuit flasher shall meet the electrical and physical characteristics described in Clause 6.3 of the *NEMA Standards Publication TS* 2-2003. The flasher shall be Type III (dual circuit rated at IS Amps per circuit) unit and so constructed that each component may be readily replaced if needed.

8.2 The two-circuit flasher shall be of solid-state design and contain no electro-mechanical devices.

9.0 CABINET CONTROL & DETECTION HARDWARE

9.1 Los Alamos County shall provide the following equipment for installation in the traffic signal cabinet:

(1) 1 - Quixote Model 3000-PC-TS2, Type 2 NTCIP, NEMA solid state full-actuated controller unit.
(2) 1 - Peek Traffic, Double Diamond TS2, 16 channel NEMA MMU
(3) 1 - Iteris Vantage EDGE 2 Video detection system which shall consist of the following:
  (a) 2 - EDGE 2 Dual Channel Rack Mount Video Processors
  (b) 1 – Vantage eAccess Ethernet communication card with cables
  (c) 4 – Vantage RZ4 Color Detection Cameras with mounting brackets
  (d) 1 – Iteris rack mount 15" Color LCD Video display
(4) 1 – Pelco Spectra IV SE Series Dome PTZ Camera System
(5) 1 – VPort 2310 Series single channel industrial video encoder
(6) 1 – Encom Commpak 4.9 GHz Broadband Ethernet Radio
(7) 1 – EDS-408A Managed Ethernet Switch with 8 10/100
(8) 1 – Tesco Traffic 22BBS, Self-contained battery backup system

10.0 LOAD SWITCH

10.1 The solid-state load switches shall meet the requirements set forth in Clause 6.2 of the *NEMA Standards Publication TS 2-2003,* and shall be "Triple-Signal Load Switch" type.

10.2 An indicator light for each circuit shall be provided in each load switch. The indicator light shall be on when a "Low Voltage Active" input to the load switch is present.

11.0 DOCUMENTATION

11.1 Each cabinet shall be provided with the following documentation:

A. Three complete, accurate, and fully legible diagrams and one schematic for every electronic device. This shall include but not be limited to cabinet wiring, back panel, detector panel, power panel, preempt panel, flasher circuit, load switch, card rack power supply, bus interface unit, and power supply diagrams.

B. Complete parts list including names of vendors for pads not identified by universal part numbers such as JEDEC, RETMA, or EIA.

C. Manufacturer's specifications for cooling fans that includes the CFM rating of fans.

11.2 Each controller unit shall be provided with the following documentation:

A. One service manual per unit that includes description of controller unit, description of its operation, and basic maintenance and troubleshooting information.

B. Two complete, accurate, and readable schematic diagrams for all circuitry in the controller unit. One set of these diagrams may be included in the service manual.

C. Pictorial of components layout for each circuit board or individual component identification permanently printed on each circuit board. Regardless of which of the above is provided, each electronic component on the board will need to be clearly identified or labeled. This may be included in the service manual.

11.3 Each MMU shall be provided with one each of the following documentation:

A. Complete and accurate schematic diagram.

B. Pictorial of component's layout on circuit board(s).

C. One service manual per unit, which includes description of MMU unit, description of its operation and basic maintenance, and troubleshooting information.

11.4 Bidders shall furnish NEMA certification for the complete cabinet assembly.

12.0 REQUIREMENTS

12.1 The supplier's facilities shall be of sufficient size and staffing that any and all warranty repairs to the cabinet assembly provided can be made on a timely basis. Timely return of equipment is interpreted as a period of time no longer than 18

calendar days from the date of receipt by the supplier to the return receipt of the equipment at the specified location. This requirement may be met by field service. Failure to meet these requirements may result in rejection of future bids.

12.2 The controller cabinet shall be delivered on 100 mm X 100 mm runners covered with 12.5 mm plywood to facilitate handling. Runners consisting of stacked 50 mm X 50 mm boards are not acceptable.

12.3 All shelf mount and plug in equipment shall be boxed and securely packed inside each cabinet.

12.4 Polypropylene strapping material shall be used to secure all cabinet components for shipping. All load switches and flash transfer relays must also be secured, but glass filament tape may be used for these components. Other means of securing components are acceptable but require written approval by the Traffic Operations Manager.

13.0 TEST AND ACCEPTANCE OF CONTROLLER CABINET ASSEMBLY

13.1 The supplier shall burn in each controller cabinet assembly for a period of 48 hours at a temperature of 60° C and for a period of 96 hours at a temperature of 23° C. A certification shall be included with or attached to each controller cabinet indicating the dates of the burn in period, number of hours, burn in temperature, and results.

13.2 The purchaser may test any controller cabinet assembly under load in a shop environment for a period of at least 120 hours. During this time, the entire controller cabinet assembly will be inspected for compliance with the specifications.

13.3 The purchaser may then perform any or all tests described in NEMA *Standard Publication TS 2-2003* on one or more complete controller cabinet assemblies on a random sample basis. Testing will be performed in the normal operating (i.e. non-flashing) range of 95-135 VAC. All traffic signal cabinet assembly components shall operate normally at 95 VAC as the unit would operate at 120 VAC. If any of the assemblies fail any of the tests, the supplier will be permitted to make one complete repair of the order on a timely basis that will be determined by the purchaser and the testing will be redone. The supplier shall reimburse the purchaser for any retesting required during acceptance. The cost for each retest will be based on time and charges and is estimated at $500.00 per test.

13.4 Minor discrepancies noted in sampling and test of this item received shall be corrected within a maximum of 30 days of written notice of the discrepancies or as stated in the notice. Major discrepancies that in the opinion of the purchaser will substantially delay receipt and acceptance of the item will be cause for cancellation of the purchase order. Discrepancies found in partial shipments shall be corrected prior to the delivery of subsequent shipments.

13.5 The traffic signal controllers and cabinets shall be identical to the approved pre-shipment sample. Any deviations from the approved sample shall be

submitted for evaluation and approval before any shipment is accepted for payment.

13.6 Deviations from the approved sample after shipment of any parts of the order shall be cause for rejection and non-payment of the remainder of the order. Excessive delays or noncompliance by the vendor at any point in the approval process may be cause for cancellation and non-payment.

13.7 Date of acceptance will be date that the Los Alamos County Traffic Operations approves the controller cabinet assembly.

13.8 Los Alamos County Traffic Operations shall be provided closed loop software to monitor controller operations during testing.

13.9 WARRANTY

14.1 The cabinet assembly including all contents shall be fully warranted for parts and labor for a minimum of 2 years from the date of acceptance.

14.2 Software / firmware updates shall be included as part of the warranty.

.

7.13 QUALITY CONTROL/QUALITY ASSURANCE (QC/QA)

All provisions of Section 901 – Quality Control/Quality Assurance (QC/QA) of the NMDOT Standard Specifications for Highway and Bridge Construction, Current Edition, shall apply except as modified herein.

Quality Assurance Testing (Acceptance Testing): Sampling and testing performed by the County, or its designated agent, to determine acceptability for payment and pay factor.

Laboratory Duties. Perform sampling and testing for materials used in construction. Comply with standards and ascertain the compliance of materials used.

Promptly notify the County Project Manager/Engineer and project owner of observed irregularities or deficiencies noted in work or products.

Submit written reports of each test to the County Project Manager/Engineer and project owner. The frequency of test results and reports will be agreed upon between the County Engineer and Developer.

MINIMUM TESTING REQUIREMENTS.

ITEM	JOB CONTROL TESTS
1 Subgrade Preparation	
(a) In-Place Field Densities (Nuclear)	1 per 150 feet or any portion thereof
2 Earthwork	
(a) Proctors	1 per soil change
(b) In-Place Field Densities (Nuclear)	1 per 500 cubic yards or any portion thereof
3 Base Course	
(a) In-Place Field Densities (Nuclear)	1 per 150 feet or any portion thereof
(b) Gradations	1 per source and per 250 lineal feet of placeme
4 Plant Mix Bituminous Pavement	
(a) Asphalt Content, Gradation and Air Voids	1 per 500 tons roadway with a minimum of 2 per day's run.
(b) In-Place Field Densities (Nuclear)	1 per 250 feet or any portion thereof
(c) Asphalt Cores	1 per day's run (Maximum Specific Gravity)
5 Backfill (Structure and Pipe)	
(a) Proctors	1 per soil change
(b) In-Place Field Densities	1 per 100 feet section each per 2 feet of fill or any portion thereof
6 Portland Cement Concrete	
(a) Fine Aggregate Gradation	1 per 100 cubic yards
(b) Course Aggregate Gradation	1 per 100 cubic yards
(c) Concrete Cylinders	1 set (3) per 30 cubic yards with a minimum of 1 per day's run.
(d) Air Entrainment	1 per 30 cubic yards with a minimum of 1 per day's run.
(e) Slump	1 per 30 cubic yards with a minimum of 1 per day's run.
7 Curb and Gutter	
(a) In-Place Field Densities (Nuclear)	1 per 125 lineal feet or any portion thereof
8 Sidewalk	
(a) In-Place Field Densities (Nuclear)	1 per 125 lineal feet or any portion thereof

The County Engineer or his representative may require additional testing. Each project will vary in size. The developer will submit in writing a takeoff on roadway material quantities and proposed minimum testing requirement plan to the County Engineer for review. The County Engineer will review and notify the developer if the testing plan is acceptable.

8. ENVIRONMENTAL DOCUMENTATION

8.1 ARCHAEOLOGICAL, HISTORIC, CULTURAL SITES AND LANDMARKS

8.1.1 PURPOSE AND INTENT

The standards of this section are intended to preserve and enhance the unique heritage of the County of Los Alamos. Standards are established for historic and cultural sites, landmarks and archaeological sites. Such sites and landmarks include, but are not limited to, structures which either are designated by the official register of cultural properties maintained by the New Mexico Cultural Properties Review Committee or are properties which may contain historic or pre-historic structures, ruins, sites or objects, desecration or destruction of which would result in an irreplaceable loss to the public of their scientific, educational, informational, or economic interest or value. Preservation of historic and cultural sites, landmarks and archaeological sites shall be achieved by establishing a procedure for discovering, evaluating, reporting and treating such resources at the planning stage of development proposals.

8.1.2 APPLICABILITY

All development that involves site disturbance shall be required to conduct a reconnaissance survey and prepare a report demonstrating compliance with the requirements of this section.

8.1.3 DESIGNATION OF HISTORIC OR CULTURAL SITES AND LANDMARKS

A. Any parcel located in the County on which a structure is located which has been, or is after the effective date of the Code, placed on the official register of cultural properties maintained by the New Mexico Cultural Properties Review Committee or the National Register of Historic Places.

B. Other areas of exceptional historical, archaeological scientific, architectural or cultural interest or value hereafter designated by the Board as Historic or Cultural Sites or Landmarks.

8.1.4 REVIEW AND REPORT PROCEDURES FOR DEVELOPMENT

Pursuant to the requirements of in subsections A and B, below, applicants shall submit 2 copies of reports, drawings, and surveys, describing all proposed changes to structures, or development. Unless a report is specifically required by the Community Development Director, individual permits for construction of single dwelling units, accessory structures, agricultural facilities, roads, utility installations, and land

divisions and subdivisions that create no more than 2 lots, that do not alter any known historic or cultural site or landmark and lands that have been previously surveyed by a professional archaeologist and accepted by the Community Development Director are exempt from these reporting requirements.

A. Historic or Cultural Sites and Landmarks

A report and drawings describing all proposed changes to structures or development within a historic or cultural site or landmark listed above shall be prepared by a professional qualified to evaluate, design and report on such changes. Two (2) copies of this report shall be submitted to the Community Development Director with the Preliminary Plat submittal. The report shall include a treatment plan which provides methods by which the site or landmark affected by the development will be protected, preserved or salvaged. The treatment plan shall be reviewed by the IDRC, who shall decide on further course of action regarding treatment.

B. Archaeological Sites

1. **Reconnaissance Survey and Report Required**

   a. Applicants proposing divisions of land creating more than 2 lots, subdivisions, multifamily and nonresidential development, shall submit an archaeological reconnaissance survey and report for all land to be disturbed, including easements and building sites. Such surveys and reports shall be submitted with Preliminary Plat or Development Permit applications unless the project area has been previously surveyed and a report has been prepared that is acceptable to the Community Development Director. Two copies of such surveys and reports shall be submitted to the Community Development Director.

   b. The Community Development Director may waive the above survey and report requirements or may reduce the area to be surveyed and the sampling methods to be employed for developments that are located in areas with extensive surface disturbance, such as gravel quarries.

2. **Professional Qualifications: Archaeologist**

   All archaeological reconnaissance surveys, reports and treatment plans required shall be conducted by a professional archaeologist who is permitted by the State Cultural Properties Review Committee to conduct surveys on State lands and who is also approved by the Community Development Director.

C. Reconnaissance Survey

The reconnaissance survey shall consist of:

i. Research and analysis of the Archeological Records Management Systems (ARMS) site files; the State Register of Cultural Properties maintained by of the State of New Mexico, Historic

Preservation Division; the Bureau of Land management historic plat records maintained in the BLM State Office public room; and

ii. A visual examination of the property for evidence of archaeological features, artifacts or culturally altered landscape at least 75 years old following the archaeological survey procedural manual prepared by the Museum of New Mexico, Office of Archaeological Studies, Notes No. 24A (1994), as amended. Linear transects shall be used. A sample of surface artifacts shall be analyzed during the field survey.

D. Cultural Remains Reports

1. Remains Founds

Where cultural remains are found, 2 copies of a report shall be submitted to the Community Development Director containing the following:

a. Name of the person who prepared the report and survey and the name of the property owner;

b. A brief description and justification of the research design, methods and techniques used;

c. Quantitative and qualitative summaries of cultural remains tested and analyzed during the field investigations including a description and the significance of the remains. If the remains are significant the requirements of Sec. 8.1.4D.3 shall also apply;

d. A brief description of human occupation and land use, as evidenced through documentary and archaeological research; additional research of archival sources, land titles and historic maps, is required when historic period cultural remains are found;

e. A complete listing of sources, including individuals with personal knowledge of a site, records and literature, which were consulted during the reconnaissance;

f. Documentation of the project site including a site map at a minimum scale of one inch equals 400 feet showing the location of field work; visible cultural sites or structures; photographs of sites or structures completed; State of New Mexico site inventory and activity forms which can be obtained from the New Mexico Historic Preservation Division; and an overview of previous work and findings in the vicinity;

g. An assessment of the impact of the proposed development on the cultural remains of the site; and

h. One of the following recommendations to the Community Development Director:

(1) The proposed development will not affect a significant site or the integrity of the site and no further treatment is required;

(2) The proposed development will adversely impact a significant site or structure or the integrity of the site, but the effects can be mitigated by a non-disturbance easement,

through avoidance of the site by project redesign, or through a specified treatment plan as outlined below; or

(3) The proposed development will adversely impact a significant site or structure or the integrity of the site, and the affected structures or sites are of such size or significance that an adequate treatment is not feasible. Therefore, a protective non-disturbance easement, avoidance of the site by project redesign, or other protective measure approved by the board is required.

2. **Remains Not Found**

Where cultural remains are not found, 2 copies of a report shall be submitted to the Community Development Director containing the following:

a. The name of the person who prepared the report and survey and the name of the property owner;

b. A description of the project site and proposed land altering development;

c. A brief description and justification of field methods and research techniques used; and

d. A brief summary of the findings of the ARMS, state register and BLM historic plat reviews.

3. **Cultural Treatment and Mitigation Plan**

If an archaeological site is determined to be significant and a cultural treatment and mitigation plan is recommended the plan shall be completed as follows:

a. A sample of surface artifacts shall be collected and documented.

b. If there is reason to believe that subsurface remains exist, excavations shall take place following current professional standards up to the maximum funding limit allowed pursuant to Sec. 8.1.4 .I, below. Excavations shall proceed to a depth where no archaeological features or artifacts are encountered.

c. Further archival research shall be conducted concerning human occupation and the land use of the site. A final report of the results of treatment is required and shall be submitted to the Administrator.

d. If test excavations are required to recover additional information about a site for the purposes of guiding subsequent treatment, then a preliminary excavation report for the results of the test excavations shall be submitted to the Community Development Director.

e. If excavations do not exhaust retrievable information from a

significant site, then a non-disturbance easement shall be required to protect the remaining portions of the site. 8.1.4 Review and Report Procedures for Development

f. The cost of implementing the treatment plan and associated report shall not exceed the maximum funding limit pursuant to Sec. 8.1.4.I. Where the cost of the treatment plan is proposed to exceed this cost, the County shall require a non-disturbance easement.

E. Review Procedures: Historic or Cultural Sites, Landmarks or Archaeological Sites

1 Two copies shall be submitted to the Administrator during the preliminary stage of the development review process. The Administrator shall submit comments summarizing the report's findings to the IDRC or applicable Planning and Zoning Commission and to the Board of County Commissioners when the development is presented for review.

2 If the applicant does not agree with the findings of the report and proposed treatment plan, the applicant may engage a consultant, who meets the qualifications of this section, to review the findings and the proposed treatment plan and render a second opinion.

3 If, after the second opinion, the applicant still does not agree with the findings, the applicant may request an opinion regarding the findings from the New Mexico State Historic Preservation Division. If necessary, the opinions and recommendations of the New Mexico State Historic Preservation Division or the consultant will be presented to the County Development Department, who will decide the required action to be taken.

4 A mapped and written record shall be kept by the County of all surveyed areas.

5 The Community Development Director shall submit for filing one copy of reports and surveys to the Archaeological Records Management System at the Historic Preservation Division.

F. Archaeological Sites – Unexpected Discoveries; Human Remains; Penalties

1. A report of any unexpected discoveries of cultural remains during construction activities shall be made to the Community Development Administrator. Construction activities within the area of the discovery that in any way endangers the cultural remains shall cease. The applicant shall be responsible for having a qualified archaeologist visit the site within 48 hours, excluding weekends or holidays, and determine the archaeological significance and the data potential of the site. If the site is determined to be significant and to have data potential, then:

   a. the archaeologist will determine a buffer area in which construction activities shall temporarily cease; and

b. the property owner shall present a treatment plan to the Community Development Director for approval. The treatment plan shall meet the procedural requirements of Sec. 8.1.4.D.3, Cultural Treatment and Mitigation Plan. Alternatively, a non-disturbance easement may be platted to protect the significant site.

2. Human remains are considered part of an archaeological record, and shall be afforded special treatment pursuant to the provisions of NMSA 1978 §18-6-11.2, New Mexico Cultural Properties Act, which shall be followed whenever unmarked human remains are discovered. If the remains represent permanent interment in any church, church yard or cemetery, they may not be disturbed without a court order, in accordance with NMSA 1978 §30-12-12, as amended.

G. Non-Disturbance Easement
No construction or alteration of the landscape may occur within a non-disturbance easement without prior approval of the Administrator.

H. Public Use
If the owner of an archaeological, historic, or cultural site or landmark intends to make the premises open to the public or charge user fees to the public for visiting the site, the owner shall be subject to the provisions of this Development Code.

I. Maximum Funding Limit
In no case shall the applicant be required to spend more than 2 percent of the value of the proposed development shown on the Site Development Plan in preparing for and completing treatment. A non-disturbance easement shall be placed over any site which is not treated.

9. BRIDGE DESIGN

9.1 INTRODUCTION

The Engineer shall design a bridge structure in accordance with the following section.

9.2 BRIDGE DESIGN

Design Guidelines	The NMDOT Bridge Procedures and Design Guides (Latest Revision)
Specifications:	Latest AASHTO Standard Specifications For Highway Bridges.
Design Loading:	HS-20 Minimum - For spans up to 100 feet. HS-25 Minimum - For spans 100 to 150 feet.

Vertical Clearances:
16'8" Minimum

Depth to Span Ratios: Meet AASHTO recommended limits and in no case exceed 1/25.

9.3 PRELIMINARY BRIDGE DESIGN

A bridge type study shall be conducted for all bridges with a span greater than 120 feet or with an overall length greater than 500 feet. The type study shall be coordinated with the County. A bridge type study report shall be developed and shall include a decision matrix. The bridge type study report shall receive concurrence of the County Engineer. The Engineer shall submit four (4) copies of the bridge type study report to the Public Works Department after concurrence is obtained.

The County will review the preliminary bridge layouts. The preliminary bridge layouts are required to insure that serviceability requirements are met and that the proposed bridges are cost effective. The preliminary bridge layout for each bridge shall be approved for serviceability and cost effectiveness by the County Engineer or his representative before final bridge design begins.

A preliminary cost estimate for each bridge shall be submitted with the preliminary bridge layout .

The preliminary layouts shall show each bridge in plan and elevation. The layouts shall include a typical section indicating the type and depth of superstructure for each bridge. Expansion joint locations need to be indicated. Also, types and locations of major construction joints need to be identified, if any. The anticipated substructure types shall be shown. The overall bridge layout concept shall be indicated on the preliminary plans.

All grades and typical roadway sections shall be indicated. The roadway sections are to indicate the roadway crown and super-elevation. Vertical clearance calculations shall be included with each bridge submittal.

Proposed bridge layouts shall be reviewed to determine and minimize future maintenance needs.

Bridges shall be designed for permit loads that frequently travel through New Mexico. Longer span bridges (those with spans greater than 150 feet) will require greater design loadings in order to meet the needs of the permit loads that travel the highway system in New Mexico. The CALTRANS P13 Overload Provision will most likely be required. The County Engineer or NMDOT State Bridge Engineer will make a determination of this overload requirement, but in no case will the longer span bridges be designed for less than HS-25. When the preliminary bridge layouts are submitted, the Engineer will need to assure that permit truck serviceability is satisfied. Truck serviceability computations will need to be submitted for all spans greater than 150 feet.

The County must approve any change from the preliminary layouts.

9.4 FINAL BRIDGE DESIGN

Final bridge plans shall be formatted and contain all pertinent layouts, details, diagrams, references, etc. relevant to the bridge and/or structure. The layout of the bridge plans shall be similar to the format that the NMDOT has used in the past. Examples of previous bridge plans are available from NMDOT.

Early and continuous coordination and review by the Engineer and the County will allow for timely reviews by the County to meet the schedule for this project. The Engineer shall be responsible for insuring that coordination and communication is timely. The County will not perform the final bridge review. Final bridge review will be the responsibility of the Engineer. The bridge plans will not be considered final until signed by the County Engineer or his representative.

The Engineer shall submit three (3) half size sets of final bridge design plans for each bridge in addition to the set included in the final project plan submittal. In addition to the final plan submittal, final bridge design computations shall be submitted to the County Engineer. Three (3) sets of bound computations shall be submitted for each bridge. These design computations shall be stamped by the responsible New Mexico registered professional engineer(s).

10. GEOTECHNICAL DESIGN

10.1 INTRODUCTION

The Engineer shall provide geotechnical recommendations related to any structures and submit Preliminary and Final Foundation Reports. The Preliminary Foundation Report will be submitted as part of the Pre-Final Inspection. The Final Foundation Report will be submitted as part of the final design.

The Foundation Reports, to include detailed recommendations for structures and retaining walls, shall be prepared for the selected structure alternatives.

10.1.1 PRELIMINARY FOUNDATION REPORT

The following activities shall be conducted during Design for the development of the Preliminary Foundation Report.

Geotechnical Investigation and Laboratory Testing

Foundation and geologic/geotechnical exploration shall follow the procedures, requirements and guidelines as outlined in the latest edition of the NMDOT Materials Geotechnical Manual. The geotechnical exploration and laboratory testing shall include at least the following:

- For bridge elements, one soil boring and/or rock core shall be completed at each abutment and each pier element. At the abutments the borings should be taken to a depth of 80 feet. At the piers, the borings should be taken to a depth of 100 feet. Lesser depths of exploration will be acceptable with the presence of bedrock or very dense soil strata.
- For retaining walls, one soil boring and/or rock core shall be completed every 200 feet with no less than two borings completed per wall. Borings should be taken to a depth of twice the height of the walls.
- For drainage structures, the need for borings will be determined on a site by site basis.
- Perform required lab testing and soil classifications as required by the Manual. Lab testing may require consolidation and tri-axial testing of undisturbed samples if clay soils are encountered, direct shear tests, or rock core point load and unconfined compression tests.

Preliminary Foundation Report

The Preliminary Foundation Report shall document the recommendation for the most suitable structure foundation and/or retaining wall alternatives based on the geology documented from the geologist's field exploration cards. Analysis shall include development of two conceptual bridge foundation and/or retaining wall alternatives. A cost comparison should be performed between the two alternatives as well as a comparison of which alternative is most constructable. A recommendation shall be made for the most suitable foundation/wall alternative with concurrence given by the County Engineer. Preliminary points-of-fixity shall be provided for deep foundation alternatives. Recommended state of stress lateral soil pressures and equivalent soil-spring constants shall be provided as required. Three (3) copies of this report shall be submitted to the County Engineer.

10.1.2 FINAL FOUNDATION REPORT

The following activities shall be conducted during the design for the development of the Final Foundation Report.

Retaining Walls

Retaining walls shall be designed based on AASHTO and/or FHWA DEMO 82 Reinforced Soil Structures design guidelines. Bearing capacity, settlement, and global stability analyses shall be performed at all retaining walls to insure serviceability of the walls. Requirements for stabilization of unsuitable subsoil's will be specified where required to meet serviceability requirements. Mechanically Stabilized Earth (MSE) walls will utilize the County's approved MSE wall manufacturers.

Bridge Foundation Analysis

Perform geotechnical analyses of foundations to determine type, size and depths of foundations recommended. Load capacity analysis for vertical loads including immediate and long-term settlement analysis will be required. Lateral load analysis will

be required to develop equivalent points of fixity, substructure stiffness and design forces of substructure elements. Suitable design methods are covered in the Manual or as recommended by the County Engineer. Provide a written report, showing completed soil boring lab test results, engineering analysis, foundation recommendations and required foundation depths

Approach Embankment Analysis

Approach embankments shall be analyzed for long term settlement potential, including settlements due to low in-situ density, hydro-collapsible soils. Requirements for stabilization of unsuitable subsoil's will be specified where required to meet serviceability requirements. Approach embankments shall be specified for 100% standard Proctor density as required by NMDOT standard details with approach slabs bearing on AASHTO A-1-a material.

Final Foundation Report

The Final Foundation Report shall document the results of the field exploration and laboratory testing, bridge foundation recommendations and analyses retaining wall recommendations and analyses. All work shall be completed according to the standards set forth in the most recent edition of the NMDOT Materials Geotechnical Manual or as approved by the County Engineer. Three (3) copies of this report shall be submitted to the County Engineer. The requirements are detailed as follows.

Geotechnical Design Recommendations

Final design recommendations shall address some or all of the following:

- Stabilization/densification of unsuitable embankment or native soils
- Slope stability/steepened slope design
- Mitigation of settlements
- Rock excavation and blasting requirements
- Rock fall mitigation
- Maximum cut slope angles in soil and rock
- Suitability of foundation soils or rock to support an embankment or structure
- Shrink and swell factors of earthwork
- Groundwater affecting the project/need for cut-off trenches
- Special treatments, i.e. use of geotextiles, soil nails, pressure grouting,etc.

11. FINAL ROADWAY AND BRIDGE DESIGN FORMAT

The Engineer shall provide final design plans which shall include, but are not limited to, the following:

1. General Sheets
    - Title Sheet
    - Vicinity Map
    - Project Layout Sheet
    - Index of Sheets

- Summary of Quantities
- General Notes and Incidental Items
- Environmental Concerns and Mitigation Measures

2. Miscellaneous Sheets
    - Typical Sections
    - Miscellaneous Details
    - Surfacing Schedule
    - Structure Quantities
    - Miscellaneous Quantities
    - Curb and Gutter Layouts
    - Metal Barrier Layouts
    - Erosion and Sediment Control
    - Seeding and Landscaping
    - Grading Plans
    - Visual/Aesthetic Details
3. Plan and Profiles Sheets
    - Mainline
    - Major Side Streets
4. Turnout Profiles
5. Bridge/Retaining Wall/Noise Wall Plans
6. Traffic Control Plans
    - Notes
    - Sequence of Construction
    - Sign Face Details
    - Traffic Control Plans
7. Signal Plans
    - Signal Warrant Analysis for at-grade intersections
    - Signal Design Plans
8. Lighting Plans
    - Lighting Analysis
    - Lighting Plan
9. Permanent Signing and Striping Plans
    - Plans
    - Overhead Signs
    - Sign Face Details
10. Drainage Plans
    - Plan and Profile
    - Structure Sections

11.0 Earthwork Cross- Sections

11.1 GENERAL

The Engineer shall develop complete design plans for the pre-final design review, final design review, and plans, specifications & estimate (PS&E) office review (100% complete). The Engineer shall prepare construction cost estimates for each submittal. County policies, procedures, check lists, etc., shall be used and followed for all reviews.

11.2 COPIES

At least four (4) bound sets of plans (11 X 17 reduced) must be submitted for each of the design reviews. Also, one (1) unbound full size set of mylars of the final accepted project plans for each project; and one (1) unbound (full size) original set of mylars of the final accepted right-of-way maps. The Engineer should contact the County Engineer to ascertain the required numbers of copies.

11.3 DESIGN TEAM REVIEWS

The Engineer shall schedule and conduct the pre-final design and final design reviews and the Public Works and Utilities Department. The number of reviews will be dependent on the design and construction phasing and priority plan.

11.4 FINAL DESIGN REPORTS

The Engineer shall prepare and submit to the County Engineer reports subsequent to the pre-final design and final design reviews, detailing project status, minutes and required plan modifications.

11.5 FINAL BRIDGE DESIGN PER SECTION 9.4

11.6 PROPERTY OWNER INTERVIEWS

The Engineer shall conduct and document property owner interviews with all owners from whom the County will require takes, TCP's, CME's, or work permits. In addition, the Engineer shall contact and give the opportunity for a property owner interview to each property owner and renter on the corridor as directed by the County Engineer.

The Engineer shall discuss the design process, project details and document questions, comments, and agreements for each property owner interview. The property owner interviews shall be held after right-of-way requirements have been established.

The Engineer will provide to the County Engineer a bound document containing all of the property owner interviews that were conducted.

11.7 WORK PERMITS

The Engineer shall obtain all work permits for the project from property owners as directed by the County Engineer or representative. Work permits shall be obtained as part of property owner interviews.

11.8 PLAN VERIFICATION

After the final design plan inspection submittal and prior to the PS&E submittal, the Engineer shall conduct a thorough verification of all design plans. Plan verification shall be conducted under the direction of the County Engineer or designee from the Engineer's team who has less than 10% time dedicated to the project or an independent firm working as a sub-consultant. The verification comments shall be clearly marked on a full size set of plans and shall be submitted to the County for review prior to submitting the PS&E package. The verification checklist available from the County Engineer shall be followed for each project.

Engineers having their own plan verification policy and/or an approved QA/QC plan that includes plan verification, with County approval may use it in place of the plan verification requirement listed above.

11.9 DESIGN DATA TRANSMITTAL

All surveying, mapping, preliminary design and final design data shall be submitted to the County Engineer in an AutoCAD (.dwg) format or other compatible format approved by the County. The Engineer must obtain the latest version of the Engineering Division information table from the Surveying Section prior to digitizing any data. The Engineer must obtain the latest symbols, layer names, and template data from County Surveyor prior to digitizing any data. Data must be submitted to the County Engineer on CD ROM.

The package shall include construction plans, project specific specifications, project notices, earthwork cross sections in a hard copy format (11" x 17"), a hard copy earthwork run with the information required to produce the earthwork calculations (geometry, shrink factor, etc.) Electronic files may be accepted if the electronic information matches the hard copy submittals.

12. ATTACHMENTS

12.1 DRAINAGE REPORT INFORMATION SHEET

Project Title:_____

Project Address:_____

Legal Description:_____

Engineering Firm:_____ Contact:_____

Address:_____ Phone:_____

Owner:_____ Contact:_____

Address:_____ Phone:_____

Architect:_____ Contact:_____

Address:_____ Phone:_____

Surveyor:_____ Contact:_____

Address:_____ Phone:_____

Pre-Design Meeting:

__ No

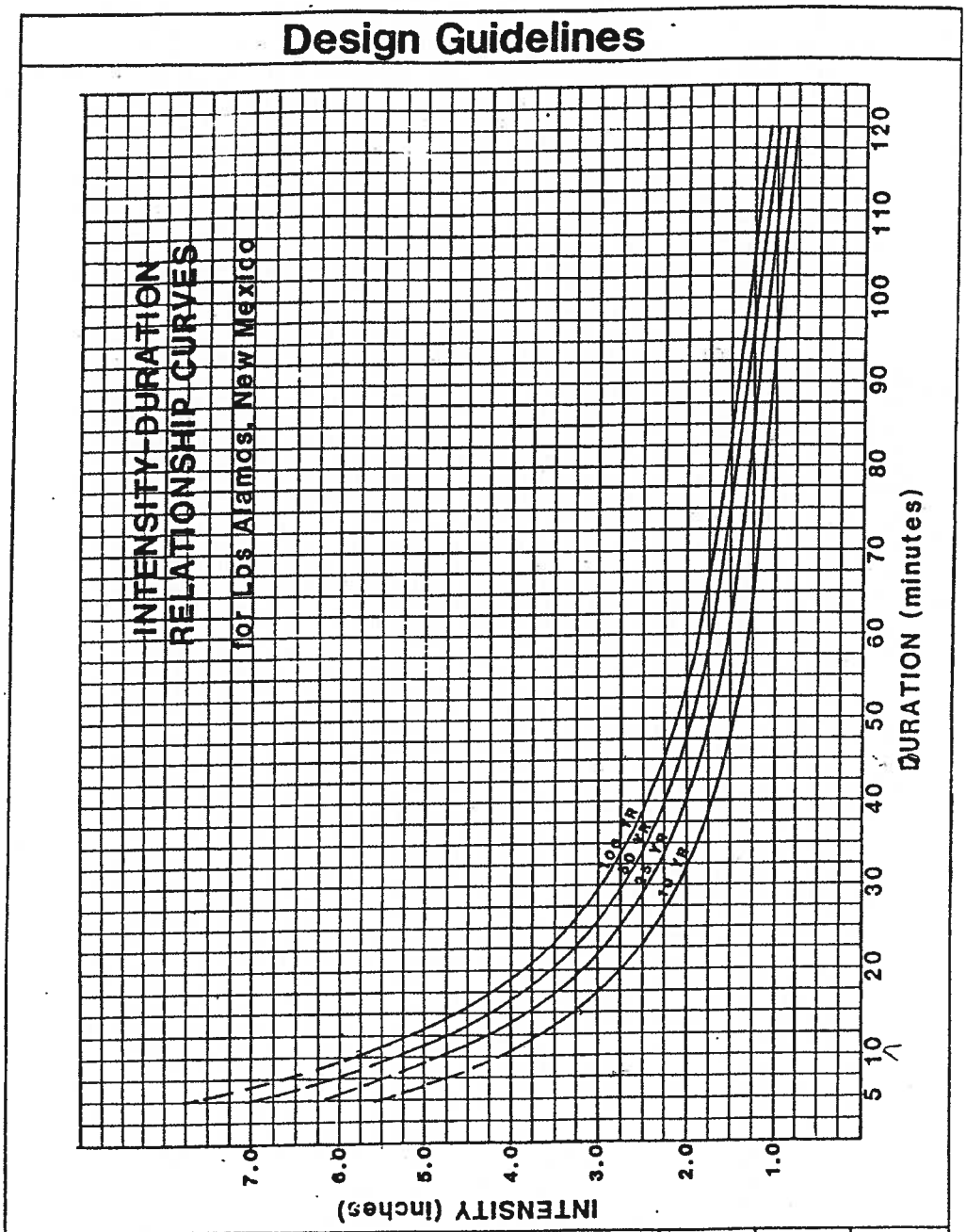
__ Yes

__ Copy of meeting minutes attached

Date Submitted:_____

Submitted by:_____
Name Title

12.2 RAINFALL INTENSITY – DURATION CURVES FOR LOS ALAMOS



12.3 SWPPP EXAMPLE

SWPPP INFORMATION SHEET

SITE DESCRIPTION & NOI INPUTS

NATURE OF ACTIVITY		
GENERAL LOCATION AND SITE MAP		
DISTURBED AND UNDISTURBED AREA		
STRUCTURAL & NON-STRUCTURAL CONTROLS		
LOCATIONS WHERE STABILIZATION WILL OCCUR		
TOTAL SITE AREA		
RECEIVING WATER		
TOTAL DISTURBED AREA		
LATITUDE		
LONGITUDE		
ESTIMATE OF LIKELIHOOD OF DISCHARGE		
ENDANGERED SPECIES OR CRITICAL HABITAT (YES OR NO)		
PART I.B.8.c(2) OF THE PERMIT (a, b, c, or d)		

DRAINAGE PARAMETERS

DRAINAGE PATTERNS		
APPROXIMATE SLOPES AFTER MAJOR GRADING		
RAINFALL 2-YEAR 24-HOUR (cm/mm		
2 YEAR, 1 HOUR, inch (mm)		
INTENSITY, in/hr (mm/hr) FOR T = 10 minutes		
HYDROLOGICAL SOIL GROUP		
CURVE NUMBER(CN), UNDISTURBED AREA		
CURVE NUMBER(CN), DISTURBED AREA		
RUNOFF COEFFICIENT PRIOR TO CONSTRUCTION		
RUNOFF COEFFICIENT DURING CONSTRUCTION		
RUNOFF COEFFICIENT AFTER CONSTRUCTION		

RUNOFF DISCHARGE & VOLUME CALCULATION

THE FOLLOWING PROCEDURES SHOULD BE USED TO CALCULATE THE RUNOFF DISCHARGE AND VOLUME TO DESIGN THE EROSION CONTROL MEASURES

DISCHARGE $Q = CIA$ (English) $Q = 0.00278CIA$ (Metric)

WHERE Q = DISCHARGE, cfs (m^3/s)
C = RUNOFF COEFFICIENT
I = RAINFALL INTENSITY, in/hr (mm/hr)
A = AREA OF THE SITE, acres (hectares)

VOLUME $V = QT_c$

WHERE V = VOLUME, ft^3 (m^3)
$T_c = (1.1 - C) \times 100 \times L^{0.5} / S^{0.33}$, minutes

AND/OR T_c = TIME OF CONCENTRATION FOR BASINS WITHIN PROJECT LIMITS
L = LENGTH OF WATERSHED, ft (m)
S = SLOPE, ft/ft (m/m)

GENERAL NOTES:

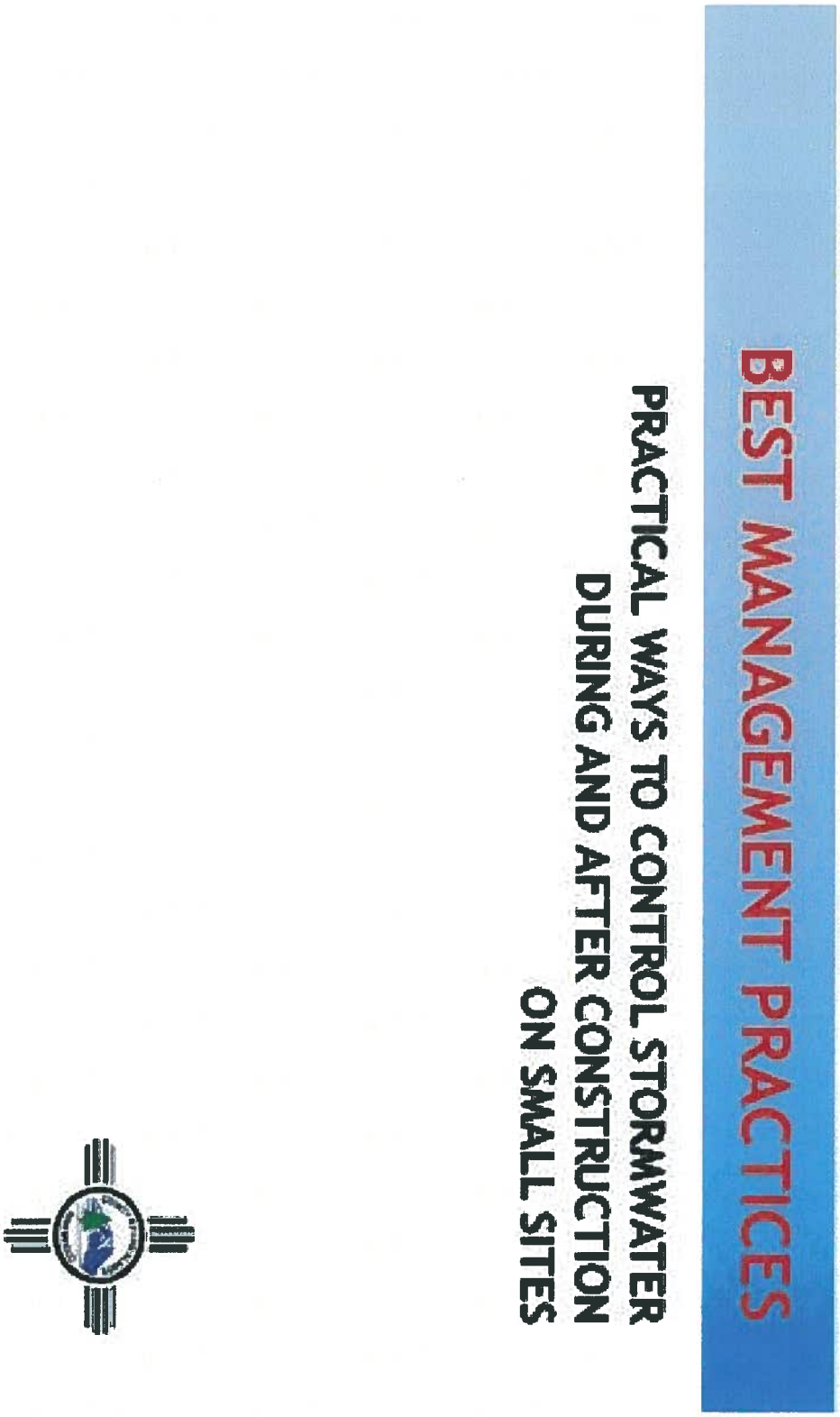
1. THE 1997 EDITION OF NYSDOT'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) HANDBOOK AND SECTION 209 - TEMPORARY EROSION & SEDIMENT CONTROL OF THE SPECIFICATIONS OF THE NEW YORK STATE HIGHWAY AND TRANSPORTATION DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION - SHALL BE USED AS MINIMUM REQUIREMENTS TO DEVELOP OR MODIFY THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP).

2. THE NPDES PERMIT NUMBER FOR THE PROJECT OR A COPY OF THE NOTICE OF INTENT (NOI) IF A PERMIT NUMBER HAS NOT YET BEEN ASSIGNED, SHALL BE POSTED AT THE PROJECT SITE OR THE FIELD OFFICE AT ALL TIMES DURING CONSTRUCTION.

3. THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ALL MAINTENANCE AND INSPECTION REPORTS SHALL BE SIGNED BY A QUALIFIED INSPECTOR ASSIGNED BY CONTRACTOR. THE SWPPP AND THE INSPECTION REPORTS SHALL BE AVAILABLE TO EPA REPRESENTATIVE AT ALL TIMES DURING CONSTRUCTION.

4. ALL DRAINAGE INFORMATION NEEDED TO COMPLETE THE NOTICE OF INTENT (NOI) ARE PROVIDED IN THIS PLAN.

12.4 TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES



Written and designed by the Pajarito Plateau Watershed Partnership. Funded by a Clean Water Act Section 319 Grant administered by the New Mexico Environment Department and the U. S. Environmental Protection Agency

Contents

SEDIMENT CONTROL

Sediment is loose pieces of minerals and rock that have been knocked away from its source by abrasion by water, wind, or mechanical means. The size of the pieces ranges from boulders to tiny clay particles. Stormwater can carry all sizes of sediment, but it is sand- and clay-sized pieces that are of concern on construction projects. On project sites, disturbance exposes the soil with the potential for flowing water to transport sediment downhill.

Water can carry sediment only when it has enough energy to keep the particles in suspension. As water loses energy, the sediment drops out and is deposited at a new location. Large amounts of sediment degrade water quality in rivers and lakes; it can clog storm drains, settle on roadways, or ruin landscaping, all of which may require costly maintenance operations.

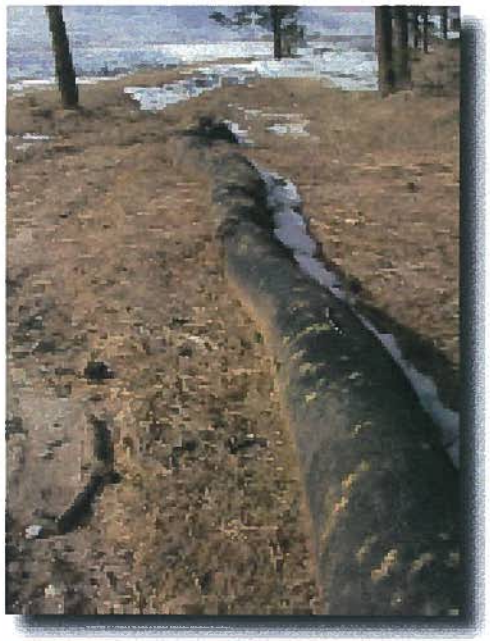
The purpose of sediment control is to provide obstructions or detention mechanisms for sediment-laden water to create opportunities for it to slow down and subsequently drop its sediment load in a location where it can be efficiently removed.

BEST MANAGEMENT PRACTICE
FIBER ROLLS

Fiber rolls can be made of straw, wood, compost, or other materials. The material is rolled into a tight tube and secured to the ground. When properly installed, fiber rolls can reduce the flow velocity of runoff and trap sediment on slopes.

Objectives

Easy to install, fiber rolls can be used to control sediment on slopes, around material stockpiles, along project perimeters, and for certain applications, as check dams.



Installation Guidelines

Excavate a shallow trench for the fiber roll. The bottom of the trench should be one-third the depth of the roll.

Fiber rolls should be laced together end-to-end with rope to create a continuous length. Loose ends of the continuous length should be buried two feet into the soil.

The upper surface of the fiber roll should be parallel to the slope. Hand tools should be used to complete finished elevations.

Finished grades should be of a natural appearance with smooth transitions.

Wood stakes for fiber rolls should be installed and driven into place centered on the top of the roll and spaced 4 feet on center throughout the length of the roll.

After securing the roll backfill the trench with native soil and tamp it firmly into place.

Slope guidelines on slopes 1:4 or less, fiber rolls should be placed 18 feet apart; on slopes between 1:4 and 1:2, rolls should be 15 feet apart; on slopes greater than 1:2, rolls should be placed 10 feet apart.

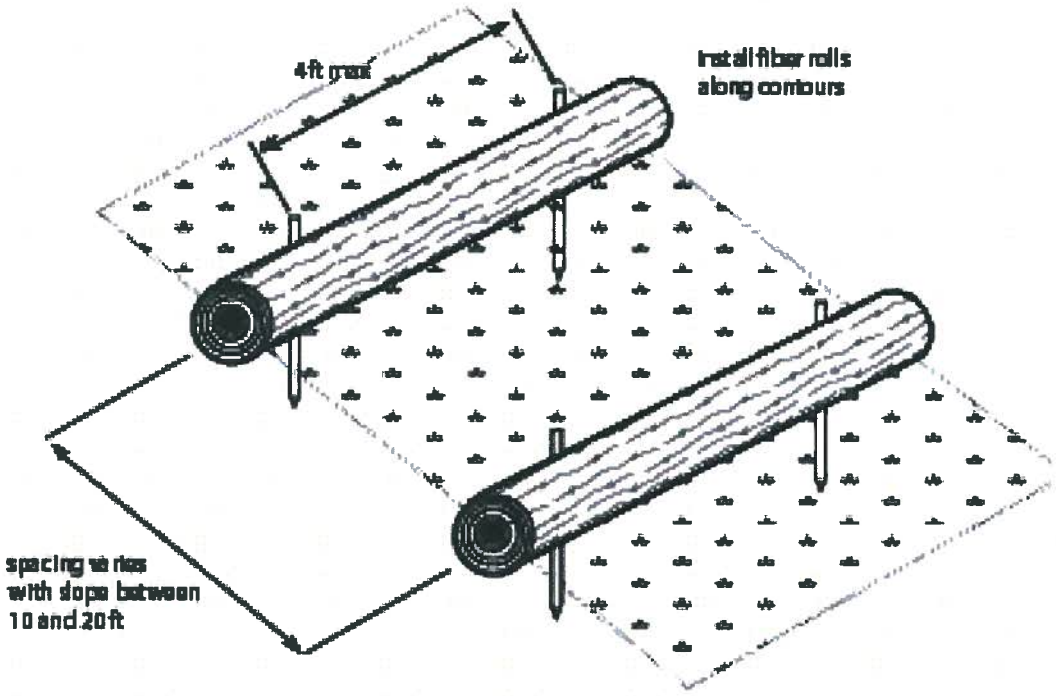
Many types of fiber rolls are typically left in place and allowed to degrade.

APPLICATIONS

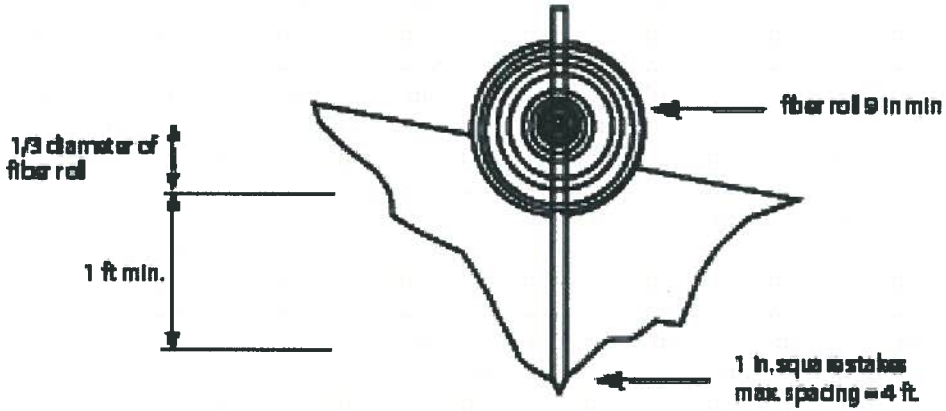
- Sediment trapping
- Temporary stabilization

Maintenance and Inspection

- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast. Perform maintenance as needed.
- Inspect fiber rolls following rainfall events and at least daily during prolonged rainfall. Perform maintenance as needed.
- Maintain fiber rolls to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches three quarters (3/4) of the barrier height.



FIBER ROLL INSTALLATION



FIBER ROLL INSTALLATION DETAIL

BEST MANAGEMENT PRACTICE
ONE ROCK DAM

Slowing the flow of water over the surface and dissipating its energy is important in reducing erosion, soil loss, and sediment transport. Simple energy dissipation devices can be effective. A one-rock dam is so named because it is only one-rock tall. A single layer of rocks placed in the correct position is all that is necessary. One-rock dams are used to raise channel bed elevation and control or modify slope gradient, and are best suited to rocky channels, especially intermittent streams, arroyos, rills, and developing gullies.

Installation Guidelines

Location of one-rock dams

- One-rock dams are effective for reducing flow velocity in rills, gullies, small drainages, and on open slopes.
- To protect features such as trails, select a location about six feet upslope from the feature.
- For rills or gullies on hillslopes, select a location close to the head of the channel.

Construction

- Use native rock taken from the site.
- All rocks used in the dam should be at least six inches in diameter and less than 12 inches in diameter. Using oversized rocks in the structure will generate turbulence that could undermine it.
- One-rock dams should be made with only one layer (course) of rock. Do not stack rocks on top of one another.
- Rocks should be placed in a triangle with one apex of the triangle located in the center of the rill or gully.
- Rocks should be selected, sized, and placed so that the completed structure ends up relatively level from bank to bank and flat from the upstream edge to the downstream edge. Place larger rocks in the deepest part of the channel, smaller ones to either side.

APPLICATIONS

- Sediment control
- Permanent stabilization

- The width of the dam should be about two times the width of the channel or gully.
- Along the length of the channel, one-rock dams should be placed at intervals equal to 10 times the width of the channel.

Reference

An Introduction to Ind ized Meandering: A Method for Restoring Stability to Incised Stream Channels, Bill Zeedyck, 2003.

upslope

downslope

ONE ROCK DAM

BEST MANAGEMENT PRACTICE
STORM DRAIN INLET PROTECTION

Storm drain inlet protection measures prevent soil and debris from entering storm drain drop inlets. These measures are temporary and are implemented before a site is disturbed.

Types of Protection

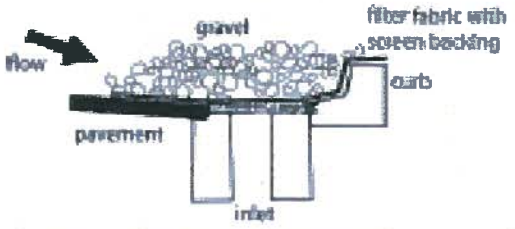
- Excavating a small area around an inlet creates a settling pool that removes sediments as water is released slowly into the inlet through small holes protected by gravel and filter fabric.
- Erecting a barrier made of porous fabric around an inlet creates a shield against sediment while allowing water to flow into the drain. This barrier slows runoff while catching soil and other debris at the drain inlet.
- Standard concrete blocks and gravel can be used to form a barrier to sediments that permits water runoff to flow through select blocks laid sideways.

Installation Guidelines

- Install these controls before any soil disturbance in the drainage area. Excavate around drop inlets at least 1 foot deep (2 feet maximum). Side slopes leading to the inlet should be no steeper than 2:1. Design the shape of the excavated area such that the dimensions fit the area from which storm water is expected to drain. For example, the longest side of an excavated area should be along the side of the inlet expected to drain the largest area.
- Stake fabric inlet protection close to the inlet to prevent overflow onto unprotected soils. Stakes should be at least 3 feet long and spaced no more than 3 feet apart. Construct a frame for fabric support during overflow periods, and bury it at least 1 foot below the soil surface. It should rise to a height no greater than 1.5 feet above the ground. The top of the frame and fabric should be below the downslope ground elevation to keep runoff from bypassing the inlet.
- Block and gravel inlet barriers should be at least 1 foot high (2 feet maximum). Do not use mortar. Lay the bottom row of blocks at least 2 inches below the soil surface, flush against the drain for stability. Place one block in the bottom row on each side of the inlet on its side to allow drainage. Place 1/2-inch wire mesh over all block openings to prevent gravel from entering the inlet. Place gravel (3/4 to 1 /2 inch in diameter) outside the block structure at a slope no greater than 2:1.

APPLICATIONS

- Sediment trapping
- Temporary stabilization



STORM DRAIN INLET PROTECTION

BEST MANAGEMENT PRACTICE
CHECK DAMS

Check dams are used in linear flow channels to reduce erosion and to collect sediment. Check dams may be constructed of rock, gravel bags, fiber rolls, or specially designed materials that are triangular in cross-section. They should be used for drainage areas less than 5 acres. To be effective, check dams are high-maintenance structures that require regular cleaning.

Objectives

Check dams are installed to reduce flow velocity along channels or in diversion pathways. Check dams are not designed to detain water, but only to slow the velocity. They should only be used as temporary measures to reduce flows while permanent measures are established.

Installation Guidelines

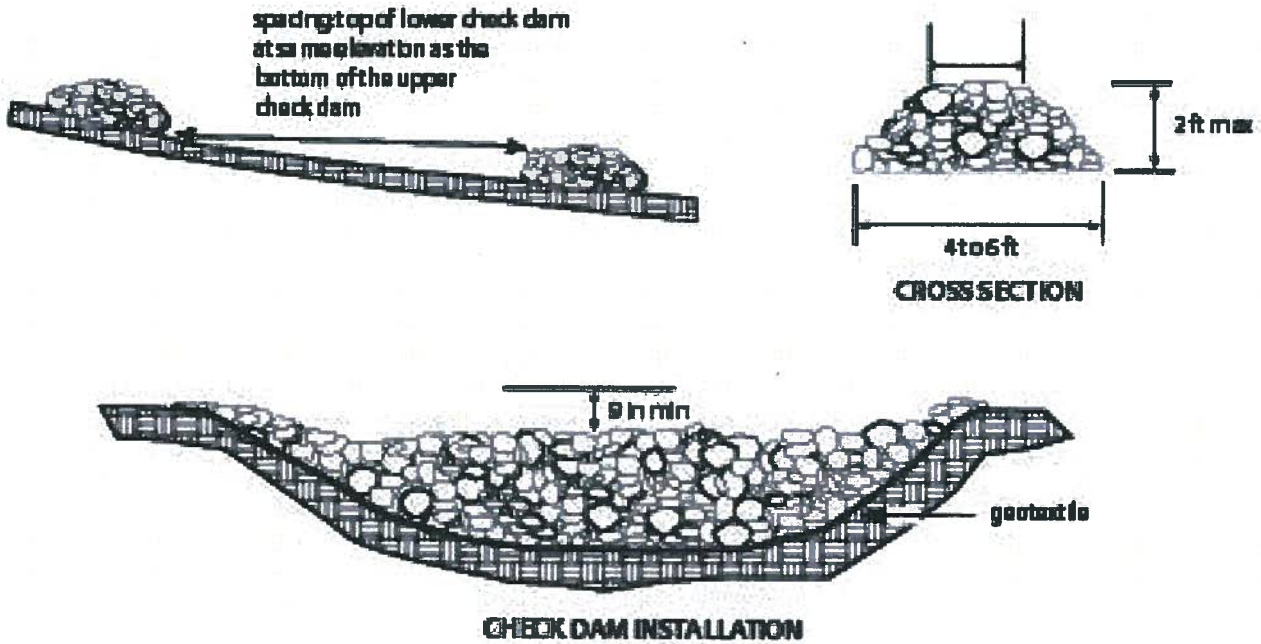
- Check dams should be installed at least 15 feet from outfalls.
- The distance between check dams depends on the size and characteristics of the drainage area (see drawings).
- High flows should flow over check dams and not impound water behind them.
- Rock installations should be mechanically placed and not dumped.
- Gravel bag installations should include high-strength bag material and be at least 18 inches long and 12 inches wide.
- Check dams should not be constructed of straw bales or silt fence.

APPLICATIONS

- Sediment trapping
- Erosion control
- Temporary stabilization

Maintenance and Inspection

- Inspect check dams following every rainfall event over .25 inches.
- Remove sediment from behind check dams when the fill reaches one-third of the dam height.
- Remove check dams when they are no longer needed


spacing top of lower check dam at same elevation as the bottom of the upper check dam
2 ft max
4 to 6 ft
CROSS SECTION
9 in min
geotextile
CHECK DAM INSTALLATION

BEST MANAGEMENT PRACTICE
SEDIMENT BASIN

Sediment basins and rock dams can be used to capture sediment from stormwater runoff before it leaves a construction site. Both structures allow a pool to form in an excavated or natural depression, where sediment can settle. The pool is dewatered through a single riser and drainage hole leading to a suitable outlet on the downstream side of the embankment or through the gravel of the rock dam. The water is released more slowly than it would be without the control structure.

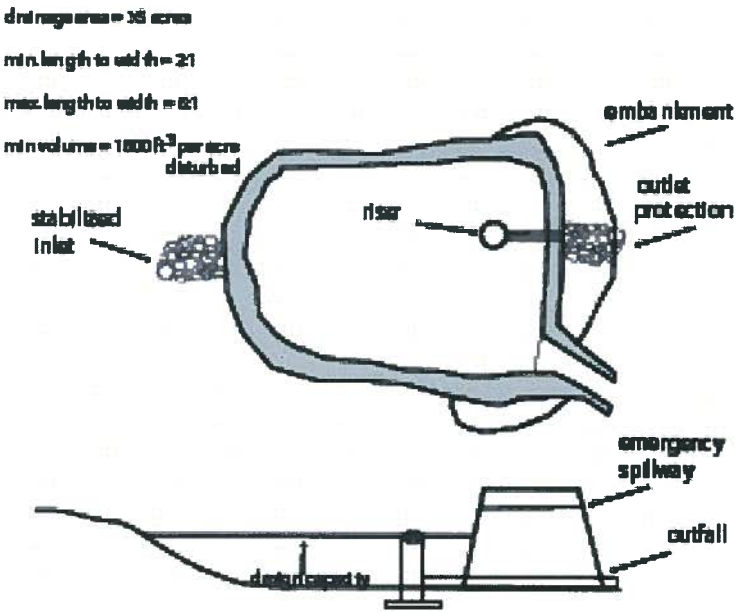
A sediment basin is constructed by excavation or by erecting an earthen embankment across a low area or drainage swale. The basin can be temporary (up to 3 years) or permanent.

Applicability

Sediment basins are usually used for drainage areas of 5 to 100 acres.

APPLICATIONS

- Sediment trapping

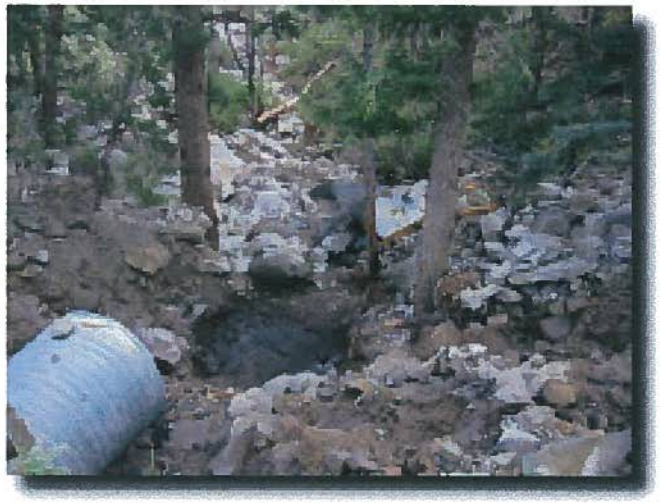


SEDIMENT BASIN

EROSION CONTROL

When moving fluid such as water or air comes in contact with soil or rock, energy imparted from the fluid can dislodge small or large peices of material. This is particularly true in areas of bare soil such as construction sites. Raindrops falling are an important agent of erosion, but water flowing across the surface also dislodges soil particles.

Erosion control seeks ways to dissipate theenergy of water o air before it reaches an erodable material. Measures employed to prevent erosion include: soil stabilization practices, limited grading, mulch, temporary or permanent cover, compos tapplication, and construction phasing.



BEST MANAGEMENT PRACTICE GEOTEXTILES OR EROSION CONTROL FABRIC

A wide variety of synthetic and organic materials are available to provide instant cover to disturbed areas or slopes. Mats of plant fibers or biodegradable plastic can be applied over seeded areas to protect the seed, to hold moisture, and to provide temporary cover while the vegetation is established. Fabrics come in a wide variety to match the specific needs of the site and are relatively inexpensive for certain applications.

Objective

Geotextiles can be used in various ways for erosion control on construction sites. They can be used as matting to stabilize the flow of channels or swales or to protect seedlings on recently planted slopes until they become established. Matting can be used on stream banks where high flows might wash out new plantings. Geotextiles can be used to protect exposed soils immediately and temporarily, such as when active piles of soil are left overnight. They can also be used as a separator between riprap and soil, which prevents the soil from being eroded from beneath the riprap and maintains the riprap's base.

Installation Guidelines

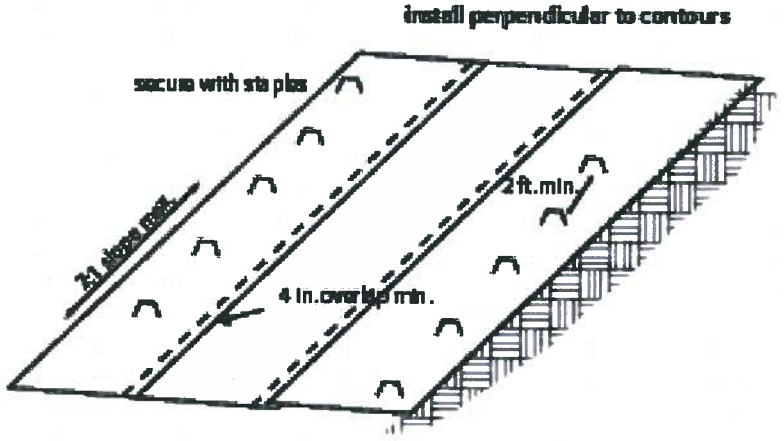
- Carefully select the fabric for its intended use.
- To ensure the effective use of geotextiles, keep firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil, and erosion will occur underneath the material.
- Carefully follow the manufacturer's installation guidelines.

APPLICATIONS

- Final stabilization
- Slope protection

Limitations

Geotextiles (primarily synthetic types) have the potential disadvantage of disintegrating when exposed to light. Consider this before installing them. Some geotextiles might increase runoff or blow away if not firmly anchored.



EROSION CONTROL FABRIC INSTALLATION

BEST MANAGEMENT PRACTICE
COMPOST BLANKETS

A compost blanket is a layer of loosely applied compost or composted material that is placed on the soil in disturbed areas to control erosion and retain sediment resulting from sheet-flow runoff. It can be used in place of traditional sediment and erosion control tools such as mulch, netting, or chemical stabilization. Composts used in compost blankets are made from a variety of feedstocks, including municipal yard trimmings, food residuals, separated municipal solid waste, biosolids, and manure.

Objective

When properly applied, the erosion control compost forms a blanket that completely covers the ground surface. This blanket prevents stormwater erosion by:

- presenting a more permeable surface to the oncoming sheet flow, thus facilitating infiltration
- filling in small rills and voids to limit channelized flow
- promoting establishment of vegetation on the surface

Compost blankets are most effective when applied on slopes between 4:1 and 1:1, such as stream banks; road embankments; and construction sites, where stormwater runoff occurs as sheet flow. Compost blankets are not applicable for locations with concentrated flow. Because the compost is applied to the ground surface and not incorporated into the soil, a compost blanket provides excellent erosion and sediment control on difficult terrain—including steep, rocky slopes.

Installation Guidelines

Compost blankets can be placed on any soil surface: rocky, frozen, flat, or steep. The method of application and the depth of the compost applied will vary depending upon slope and site conditions. The compost blanket can be vegetated by incorporating seeds into the compost before it is placed on the disturbed area (recommended method) or the seed can be broadcast onto the surface after installation.

The compost should be applied to the soil surface in a uniform thickness, usually between 1 and 3 inches thick. A typical application depth is 2 inches (Glanville et al., 2003). The compost can be distributed by hand using a shovel or by mechanical means such as a spreader unit (e.g., bulldozer or manure spreader) or pneumatic blower. The compost blanket should extend at least 3 feet over the shoulder of the slope to ensure that stormwater runoff does not flow under the blanket.

APPLICATIONS

- Final stabilization
- Slope protection
- Permanent seeding

BEST MANAGEMENT PRACTICE
FLEXIBLE GROWTH MEDIUM

Flexible growth medium (FGM) is essentially a hydraulically applied blanket. It is made of long-strand, thermally processed wood fiber, crimped interlocking fibers, and additives. The package is applied with hydromulch equipment for soil protection and seed germination on slopes.

Objective

FGM offers the protection of erosion matting with a high-speed application method.

Installation Guidelines

Always follow the manufacturer's application guidelines.

APPLICATIONS

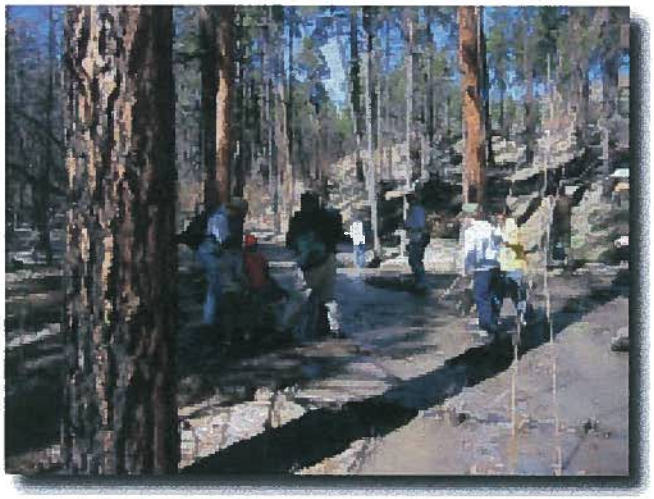
- Final stabilization
- Slope protection
- Permanent seeding

STABILIZATION

A construction project that disturbs soil is not completed until the ground surface is again stabilized to prevent erosion. Stabilization means that post-construction run-off from a site is less than or equal to pre-construction volume and velocity.

The best protection for soil is vegetation. In the Los Alamos area, soil is usually protected from normal run-off by about 70 percent cover of live vegetation. Plants can be be ground cover, shrubs, or trees. Because of their extensive and thick root systems, native grasses often provide the best soil protection.

Ground preparation is important for permanent stabilization by vegetation. Compaction by traffic during construction makes the ground unsuitable for fostering plant growth. Surface roughening and cover crops can assist in soil preparation.



BEST MANAGEMENT PRACTICE
LOP AND SCATTER

Protecting of seeding from runoff is a key to successful seed germination and growth, and for soil stabilization. Providing seeds and sprouts with cover increases on the ground humidity, and other materials can increase surface roughening. Both techniques can improve germination by 100 percent.

Installation guidelines

When available, slash material from dead ponderosa pines or piñon can be applied instead of erosion control cloth. Lop-and-scatter treatment requires small diameter tree material be distributed on the terrain with as much surface contact as possible. Available trees should be limbed. The boles can be left in place or bucked to 36 inches in length. Limbs should be scattered on the seeded area, then cut so that they are no more than 24 inches long and stand no more than 12 inches above the surface. Woody material should cover at least 60% of the surface.

APPLICATIONS

- Slope protection
- Sediment trapping
- Temporary stabilization
- Permanent stabilization

RELATED BMPS

- Permanent seeding
- Surface roughening
- Cover crops

BEST MANAGEMENT PRACTICE
TEMPORARY SEEDING

Temporary seeding can be a cost-effective method to provide stabilization with appropriate fast-growing annual plants. As a short-term measure, vegetation can reduce erosion on areas that are part of a project but will not be disturbed for more than 21 days as other segments of construction are completed. Care must be taken to use species that will not invade natural areas. Temporary seeding can be used on soil stockpiles, berms, excavation slopes, and other areas that will be inactive for extended periods of time. The same techniques required to assist establishment of permanent seeding (mulching, surface roughening, etc.) should be applied to temporary seeding.

Installation Guidelines

Timing

Planting should take place during times most favorable to growth.

Site Preparation

- Install any storm water diversion controls to channel away water from area to be seeded.
- For compacted soil, loosen with discing, raking, or harrowing.
- Harrows should be horizontal across the face of the slope.

Planting

- Seed should be spread evenly using hand crank seeders or cyclone seeders. When grass seed is too course for spreaders, hand broadcasting is required.
- See Cover Crops for suggested species for temporary seeding.

Application Rate

Seed should be applied at a rate of no less than 50 pounds of seed per acre.

APPLICATIONS

- Slope protection
- Sediment trapping
- Temporary stabilization

BEST MANAGEMENT PRACTICE
COVER CROPS

Cover crops may be used to quickly and effectively establish vegetation before permanent seeding or other measures can take hold. Cover crops are fast-germinating, fast-growing, and non-propagating annual plants. Their seeds germinate within few days, they take hold of soil within weeks, and live for a single season. Effective cover crops in Los Alamos are grass species.

Objective

Cover crops are used to quickly stabilize soil, increase soil organic matter, and suppress the spreads of weeds. They are a temporary measure to provide appropriate conditions for permanent stabilization measures.

Installation Guidelines

- Appropriate cover grasses for Los Alamos are barley, winter wheat, and cereal rye. Certified weed-free seed sources are recommended.
- If the seed is raked or drilled into the soil, the application rate is 70 pounds per acres. If the seed is broadcast on the surface, use 100 pounds per acre.
- Cover crops may be used in conjunction with erosion control blankets

Limitations

- Seed success is dependent on temperature and precipitation.
- The use of annual legumes of other forbs as cover crops should be avoided as they often are spread into areas of native vegetation by wind or water.

APPLICATIONS

- Slope protection
- Sediment trapping
- Temporary stabilization

BEST MANAGEMENT PRACTICE
PERMANENT SEEDING

Seeding is an important and cost-effective method to rehabilitate disturbed areas following disturbance. The major benefit of seeding is the stabilization of areas that pose a high risk of erosion. Through seeding, erosion, sediment transport, and volume of runoff are reduced due to increase infiltration rates. Coupled with mulch, or erosion control cloth or blankets, seeding is appropriate for treatment of staging areas, moderately steep slopes, and stream banks.

Seeding treatments should be confined to slopes of 30% or less.

Installation Guidelines

Timing

- Seed should be applied to areas that have been returned to the original grade.
- All traffic should be kept out of seeding areas for about one year.
- Site preparation should be completed as soon as possible, but application of seed should wait until immediately before the summer rainy season or immediately before expected snowfalls. Optimal times for application of seed are in late June-early July and in early to mid-November.

Site Preparation

- Bring the area to final grade.
- Install any storm water diversion controls to channel away water from area to be seeded.
- For compacted soil, loosen with discing, raking, or harrowing.
- Harrows should be horizontal across the face of the slope.
- Ensure that the top three inches of soil is loose and free of clods and stones.

APPLICATIONS

- Slope protection
- Sediment trapping
- Permanent stabilization

RELATED BMPS

- Surface roughening
- Cover crops

Planting

- Seed should be spread evenly using hand crank seeders or cyclone seeders. When grass seed is too course for spreaders, hand broadcasting is required.
- If the treated area is small, lightly rake the seed into the soil with hand rakes or McLeods.
- Seeding should be initiated as soon as practicable following completion of final grading activities.
- If seeding requires harrowing, tracking, or furrowing, these activities shall be conducted horizontally across the face of the slope.

BEST MANAGEMENT PRACTICE
PERMANENT SEEDING

- Seed shall be applied uniformly using calibrated spreaders, cyclone seeders, mechanical drills, broadcast spreading, or hydroseeders.

Seed mixes

Seed mixes can be from commercial suppliers or can be mixed from individual seed types. All seeds should be certified to be free of invasive species.

Application Rate

Seed should be applied at a rate of no less than 50 pounds of seed per acre.

SEED MIX FOR 6,900 TO 7,500 FEET

Common Name	Scientific Name	Percent of mix
Blue gramma	*Bouteloua gracilis*	20
Foothills brome	*Bromus carinatus var. polyanthus*	20
Slender wheatgrass	*Elymus trachycaulus*	30
Big Bluestem	*Andropogon gerardii*	30

SEED MIX FOR 6,000 TO 6,900 FEET

Common Name	Scientific Name	Percent of mix
Blue gramma	*Bouteloua gracilis*	30
Galleta	*Pleuraphis jamesii*	20
Sideoats gramma	*Bouteloua curtipendula*	20
Littlebluestem	*Schizachyrium scoparium*	30

BEST MANAGEMENT PRACTICE
SURFACE ROUGHENING

Surface roughening involves creating on a bare soil surface, horizontal grooves, depressions, or steps that run parallel to the contour of the land. Roughening methods include grooving or furrowing, stair step grading, and tracking. These temporary features control erosion by reducing runoff velocity, increasing infiltration, trapping sediment, and aiding in the establishment of vegetative cover, and may be used on all slopes.

Installation Guidelines

- For slopes steeper than 3:1 but less than 2:1, use stair-step grading or groove cuts. For slopes steeper than 2:1, use stair-step grading.
- Use stair-step grading on soils containing large amounts of small rock or any erodable material soft enough to be ripped with a bulldozer.
- Construct stairs wide enough to work with standard earth moving equipment.
- Vertical cuts shall be no more than 2 feet deep in soft materials or no more than 3 feet deep in rocky materials.
- When constructing groove cuts, create a series of ridges and depressions that run across the slope, parallel to the contour.
- Grooves may be constructed using any implement that can be safely operated on the slope. Seed roughened areas as quickly as possible.
- The face of the slope should consist of loose, uncompacted fill 4-6 inches deep.
- Seed roughened areas as quickly as possible.

APPLICATIONS

- Sediment trapping
- Slope protection
- Temporary stabilization
- Permanent stabilization

BEST MANAGEMENT PRACTICE
TREE PROTECTION ZONES

Retaining native vegetation is a cost-effective method to reduce stormwater runoff and accelerate final stabilization. Providing tree protection zones will keep well-established trees free of damage during the construction process.

Tree Protection Zones (TPZ) should be established for trees that are designated to remain within the construction site area.

- The limits of all TPZ's will be clearly identified in the field. A barrier such as snow fencing or chain link fence will be erected to enclose the TPZ. The height of the barrier fencing should be at least 3-feet high. Fences will remain in place until all site work has been completed. Fences may not be relocated or removed without the written permission of the designated county representative.
- No materials, equipment, spoil, waste, or washout water may be deposited, stored, or parked within the TPZ.
- Within the TPZ, trees to be removed will be removed by a qualified arborist. Trees will be cut near the ground level and the stump will be ground out.
- Shrub clearing will be accomplished with hand-operated equipment.
- All downed trees and shrubs falling within the TPZ will be removed from the TPZ, either by hand or with equipment sitting outside the tree protection zone. Extraction will occur by lifting the material out, not by skidding it across the ground.
- Any damage to trees due to demolition activities will be reported to the designated contact person within 2 hours so that remedial action can be taken.
- To protect the soil, temporary haul or access roads that must pass over the root areas of protected trees must include a roadbed of 6 inches of mulch. The roadbed material will be replenished as necessary to maintain the 6-inch depth.
- Erosion control devices such as silt fencing, debris basins, and water diversion structures will be installed to prevent silt accumulation or erosion within the TPZ.
- Before grading or excavation for trenches all tree roots will be root-pruned one foot outside the root protection zone by cutting all roots clean to a depth of 18 to 24 inches to the maximum depth of root penetration (usually not more than 3-feet). Root pruning can be accomplished by using a cement saw, vibrating knife or other approved root-pruning equipment.
- All roots exposed or damaged during construction will be cut cleanly with a sharp pruning saw or hand pruning tool (bypass type hand pruner only) back to sound tissue that is flush with the construction trench; The roots should be pruned back immediately after the damage is done.
- If roots larger than two inches in diameter are encountered then hand trenching around the root should be considered/ will be done. Severing roots, of this size will surely damage and impact the trees health.
- All trenches impacting tree roots will be filled in within 24 hours of opening the trench. No construction debris should be used to fill trenches.

APPLICATIONS

- Permanent stabilization

BEST MANAGEMENT PRACTICE
NATIVE PLANTS FOR PERMANENT STABILIZATION

When selecting plants for permanent stabilization, always look for species native to the area. This practice helps reduce the spread of invasive or problematic species, and reduces the water requirements for such landscaping. Select species that are appropriate for the elevation and for the habitat being restored.

6,900 to 7,500 feet

Common Name	Scientific Name	Comments
Trees		
Ponderosa pine	*Pinus ponderosa*	
Box elder	*Acer negundo*	wet areas
Narrowleaf cottonwood	*Populus angustifolia*	wet areas
Shrubs		
Mountain mahogany	*Cercocarpus montanus*	recommended
Forbs		
Louisiana wormwood	*Artemisa ludoviciana*	
Skyrocket	*Ipomopsis aggregata*	
Penstemon spp.	*Penstemon spp.*	recommended
Yarrow	*Achillea lanulosa*	recommended
Dotted gayfeather	*Liatris punctata*	
Hairy golden aster	*Chrysopsis villosa*	
Indian paintbrush	*Castilleja integra*	
Bigelow aster	*Machaeranthera bigelovii*	

6,000 to 6,900 feet

Common Name	Scientific Name	Comments
Trees		
Pinon pine	*Pinus edulis*	
Ponderosa pine	*Pinus ponderosa*	
Box elder	*Acer negundo*	wet areas
Narrowleaf cottonwood	*Populus angustifolia*	wet areas
Shrubs		
Pale wolfberry	*Lycium pallidum*	
Big sagebrush	*Artemisa tridentata*	
Pale wolfberry	*Lycium pallidum*	
Snakeweed	*Gutierrezia sarothrae*	recommended
Banana yucca	*Yucca baccata*	recommended
Soaptree yucca	*Yucca angustissima*	recommended
Mountain mahogany	*Cercocarpus montanus*	recommended
Skunkbush	*Rhus trilobata*	
Cane cholla cactus	*Opuntia imbricata*	
Long-spined prickly pear	*Opuntia polyacantha*	
Forbs		
Skyrocket	*Ipomopsis aggregata*	
Pale trumpet	*Ipomopsis longiflora*	
Bitterweed	*Hymenoxys richardsonii*	
Penstemon spp.	*Penstemon spp.*	
Desert four-o'clock	*Mirabilis multiflora*	
Perky Sue	*Hymenoxys acaulis*	
Hairy golden aster	*Chrysopsis villosa*	
Indian paintbrush	*Castilleja integra*	

PERMANENT STORMWATER CONTROLS

Permanent sediment and erosion control must be a part of every construction project in New Mexico. State requirements stipulate that post-construction runoff and flow velocity must be equal to or less than pre-construction levels. This requirement dicates careful site planning that includes design features that manage stormwater.

Site plans should include methods for capturing runoff and planning for its slow release. This can be accomplished by mangement of contours, capturing rainwater for future use, detaining stormwater in ponds that slowly release the flow, or providing moving water with a rough surface to dissipate energy.

Terracing is an age-old and very attractive method for managing stormwater. Many site plans incorporate detention basins with carefully engineered release mechanisms for controlled release of captured water. Rainbarrels and cisterns are effective methods for harvesting roof runoff for later use on landscaping.

BEST MANAGEMENT PRACTICE CULVERT INLET AND OUTLET PROTECTION

Erosion at pipe or channel outlets is common. Determination of the flow condition, scour potential and channel erodibility should be a standard component of stormwater management design. The only safe procedure is to design the outfall on the basis that erosion at the outlet and downstream channel is to be expected.

Two types of erosion result from stormwater discharges:

- Local scour in the vicinity of pipe or channel outfall
- General channel degradation further downstream

Local scour is the result of high velocity flow at the pipe outlet. It tends to have an effect for a limited distance downstream. Because the channel cross section, including the floodplain, is generally larger than the pipe flow area while the frictional resistance of a natural channel is less than the frictional resistance of a concrete pipe, natural channel velocities are almost universally less than pipe outlet velocities.

Channel degradation represents a long term lowering of the stream channel which may proceed in a fairly uniform manner over a long length or may be evident in one or more abrupt drops. Most stream channels in Los Alamos County are degrading as a result of increased stormwater runoff volumes.

Installation Guidelines

Design the extent of the protection, the diameter of the materials used, and apron size based on calculations of pipe grade, peak flow and design discharge. Surface must not be smooth but as rough as possible. The apron should extend up the channel banks at least one foot

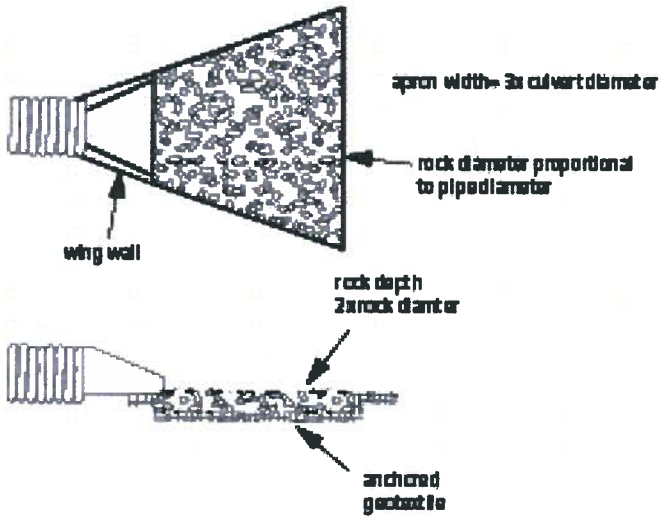
1. Clear the foundation area of trees, stumps, roots, grass, loose rock, or other unsuitable material
2. Excavate the cross-section to the lines and grades as shown on the design plans. Backfill over-excavated areas with moist soil compacted to the density of the surrounding material.
3. Ensure there are no abrupt deviations from the design grade or horizontal alignment.
4. Place filter cloth and riprap to line and grade and in the manner specified. Sections of fabric should overlap at least 2 feet and extend 2 feet beyond the rock. Secure the filter cloth at the edges via secure pins or a key trench.
5. Ensure the construction operations are done so as to minimize erosion or water contamination, with all disturbed areas vegetated or otherwise protected against soil erosion.

APPLICATIONS

- Permanent stabilization
- Channel protection

Limitations

May require continual maintenance to replace material or to clean out sediment.



BEST MANAGEMENT PRACTICE
GRADIENT TERRACES

Gradient terraces are earthen embankments or ridge and channel systems that reduce erosion by slowing, collecting and redistributing surface runoff to stable outlets that increase the distance of overland runoff flow. Terraces hold moisture and help trap sediments, minimizing sediment-laden runoff.

Gradient terraces perform most effectively in barren areas with an existing or expected water erosion problem. Gradient terraces are effective only if suitable runoff outlets are available. Do not build terraces on slopes comprised of rocky or sandy soil because these soil types may not adequately redirect flows.

Installation Guidelines

- Gradient terraces should be properly spaced and constructed with an adequate grade, and they should have adequate and appropriate outlets toward areas not susceptible to erosion or other damage. Acceptable outlets include grassed waterways, vegetated areas, or tile outlets.
- Whenever possible, use vegetative cover in the outlet.
- At the junction of the terrace and the outlet, make the terrace's water surface design-elevation no lower than the outlet's water surface design-elevation when both are performing at design flow.

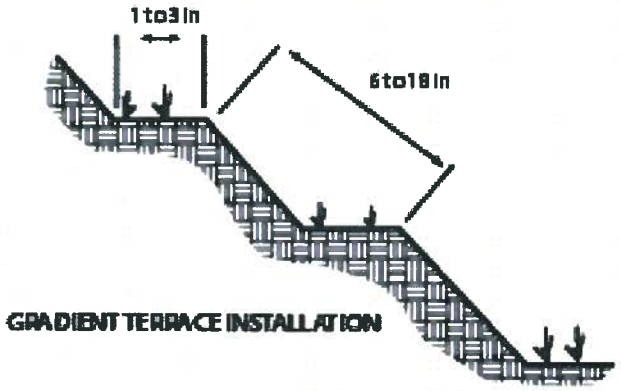
APPLICATIONS

- Permanent stabilization

- When constructing the terrace system, follow dust control procedures.
- When constructing the terrace system, follow proper vegetation/stabilization practices.

Limitations

Gradient terraces are inappropriate for use on sandy or shallow soils, or on steep slopes. If too much water permeates a terrace system's soils, sloughing could occur, potentially increasing cut and fill costs.



GRADIENT TERRACE INSTALLATION

BEST MANAGEMENT PRACTICE
GRASS SWALES AND CHANNELS

A grass-lined channel conveys stormwater runoff through a stable conduit. Vegetation lining the channel slows down concentrated runoff. Because grassed channels are not usually designed to control peak runoff loads by themselves, they are often used with other BMPs, such as subsurface drains and riprap stabilization.

Where moderately steep slopes require drainage, grassed channels can include excavated depressions or check dams to enhance runoff storage, decrease flow rates, and improve pollutant removal. Peak discharges can be reduced by temporarily holding them in the channel. Pollutants can be removed from stormwater by filtration through vegetation, by deposition, or in some cases by infiltration of soluble nutrients into the soil. The degree of pollutant removal in a channel depends on how long the water stays in the channel and the amount of contact with vegetation and the soil surface. Local conditions affect the removal efficiency.

If grassed channels are not properly installed, they can change the natural flow of surface water and adversely affect downstream waters. And if the design capacity is exceeded by a large storm event, the vegetation might not be adequate to prevent erosion and the channel might be destroyed. Clogging with sediment and debris reduces the effectiveness of grass-lined channels for stormwater conveyance.

Installation Guidelines

The first choice of lining should be grass or sod because this reduces runoff velocity and provides water quality benefits through filtration and infiltration. If the velocity in the channel would erode the grass or sod, riprap, concrete, or gabions can be used. Geotextile materials can be used in conjunction with either grass or riprap linings to provide additional protection at the soil-lining interface. Use grassed channels in areas where erosion-resistant conveyances are needed, including areas with highly erodible soils and moderately steep slopes (though less than 5 percent). Install them only where space is available for a relatively large cross section. Grassed channels have a limited ability to control runoff from large storms, so do not use them in areas where flow rates exceed 5 feet per second.

Site grass-lined channels in accordance with the natural drainage system. They should not cross ridges. The channel design should not have sharp curves or significant changes in slope. The channel should not receive direct sedimentation from disturbed areas and should be sited only on the perimeter of a construction site to convey relatively clean stormwater runoff. To reduce sediment loads, separate channels from disturbed areas by using a vegetated buffer or another BMP.

Basic design recommendations for grassed channels include the following:

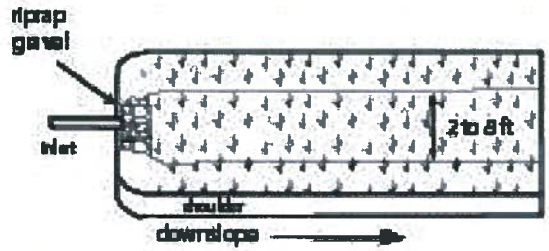
- Construct and vegetate the channel before grading and paving activities begin.

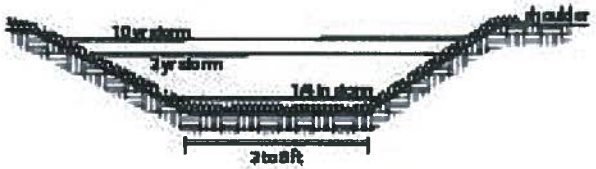
APPLICATIONS

- Permanent stabilization

- Make sure design velocities are less than 2 feet per second.
- Consider using geotextiles to stabilize vegetation until it is fully established.
- Consider covering the bare soil with sod or geotextiles to provide reinforced stormwater conveyance immediately.
- Use triangular channels with low velocities and small quantities of runoff; use parabolic grass channels for larger flows and where space is available; use trapezoidal channels with large, low-velocity flows (low slope).
- Install outlet stabilization structures if the runoff volume or velocity might exceed the capacity of the receiving area.
- Slope the sides of the channel less than 2:1; slope triangular channels along roads 2:1 or less for safety.
- Remove all trees, brushes, stumps, and other debris during construction.

Limitations





GRASS SWALE INSTALLATION

BEST MANAGEMENT PRACTICE
ROCK-LINED CHANNEL

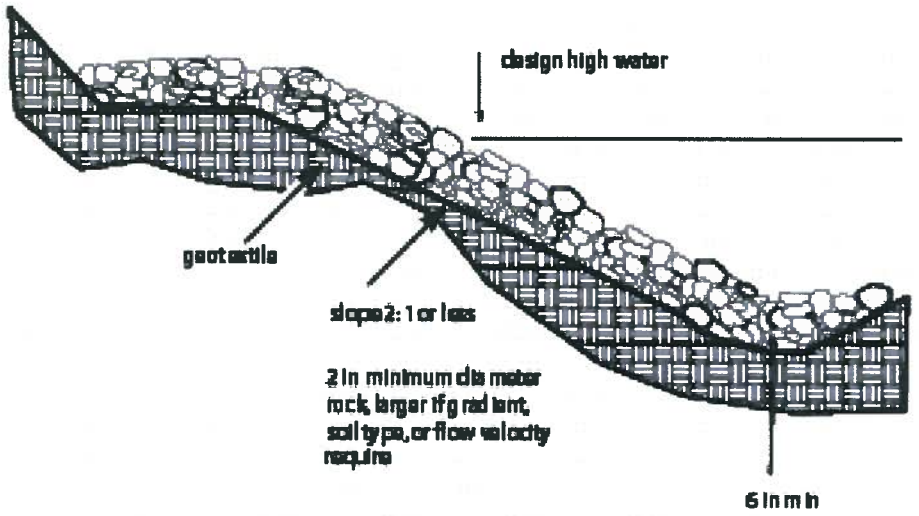
A rock-lined channel conveys stormwater run off through a stable conduit that is armored to further prevent erosion of steep banks or the channel bottom. In general, rock-lined channels should be used when the roadside slope exceeds a two percent grade or when velocity is greater than two feet/second. Rock-lined channel may also be required in located where erosion of the channel bottom will down-cut to the level of an outlet.

Installation Guidelines

- Design capacity should before for a 10-year storm
- Side slope should be less than 2:1.
- Rock should be a minimum of 2-inch diameter
- Thickness of the rock should be no less than 1.5 times the diameter
- Geotextiles should be used to line the channel

APPLICATIONS

- Permanent stabilization
- Erosion control



ROCK-LINED CHANNEL TYPICAL SECTION

HOUSEKEEPING PRACTICES

Pollution prevention begins with maintaining a clean work site. This applies to staging areas, stockpiles, and the construction site itself. Daily cleanup should be a part of the regular routine. Litter control, wind-blown construction waste monitoring and cleanup, and stockpile management should be on-going tasks on the construction site.

Construction vehicles should be included in a pollution prevention scheme. Vehicle maintenance should be carefully monitored and all fluids properly disposed of. Sediment tracked on vehicles should be kept on the work site. And waste water from concrete washout should be ponded and residue properly removed and disposed in a landfill or recycled.

BEST MANAGEMENT PRACTICE STABILIZING CONSTRUCTION ENTRANCES

The prevention of sediment transport stuck to vehicles can go a long way to reducing sediment transport from construction sites, staging areas, and other areas of disturbance. Typically, stabilized construction entrances are installed where construction traffic leaves or enters an existing paved road. From a public relations point of view, stabilizing construction site entrances can be worth the effort. If the site entrance is the most noticeable part of a construction site, stabilizing the entrance can improve both the appearance and the public perception of the construction project.

Objective

The purpose of stabilizing entrances to a construction site is to minimize the amount of sediment leaving the area as mud and sediment attached to vehicles. Installing a pad of gravel over filter cloth where construction traffic leaves a site can help stabilize a construction entrance. As a vehicle drives over the pad, the pad removes mud and sediment from the wheels and reduces soil transport off the site. The filter cloth separates the gravel from the soil below, keeping the gravel from being ground into the soil. The fabric also reduces the amount of rutting caused by vehicle tires. It spreads the vehicle's weight over a soil area larger than the tire width.

Installation Guidelines

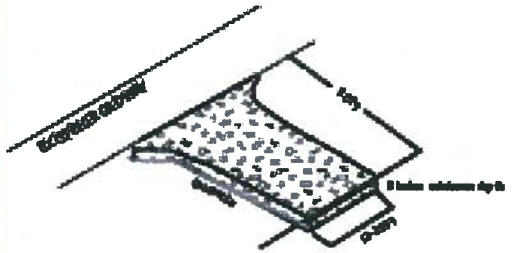
- Make sure the stabilized site entrances are long and wide enough to allow the largest construction vehicle that will enter the site to fit through with room to spare.
- Site entrance stabilization should be extended to any roadway or entrance where vehicles enter or leave the site.
- Make sure stone and gravel used to stabilize the construction site entrance are large enough so that they are not carried offsite by vehicles. Avoid sharp-edged stone to reduce the possibility of puncturing tires. Install stone or gravel at a depth of at least 6 inches for the entire length and width of the stabilized construction entrance.

Limitations

Some soil might still be deposited from vehicle tires onto paved surfaces. To further reduce the chance of these sediments polluting stormwater runoff, sweep the paved area adjacent to the stabilized site entrance.

APPLICATIONS

- Housekeeping
- Sediment Control



BEST MANAGEMENT PRACTICE
CONCRETE WASTE MANAGEMENT

Concrete waste from construction projects should be carefully contained to avoid transmittal into watercourses. Washout basins are used to contain concrete when the chutes of concrete mixers and hoppers are rinsed out after delivery. Prefabricated concrete washout containers are available commercially. The prefabricated containers resist damage and protect well against spills and leaks. Additionally, some companies offer prefabricated washout containers with ramps to accommodate concrete pump trucks.

Objective

Washouts consolidate solids for easier disposal and prevent the runoff of liquids. The wash water is alkaline and contains high levels of chromium, which can leach into the ground and contaminate groundwater. Washout can also migrate to storm drains, which can increase the pH of area waters and harm aquatic life. Solids that are improperly disposed of can clog storm drain pipes and cause flooding. Installing concrete washout facilities not only prevents pollution but also is a matter of good housekeeping.

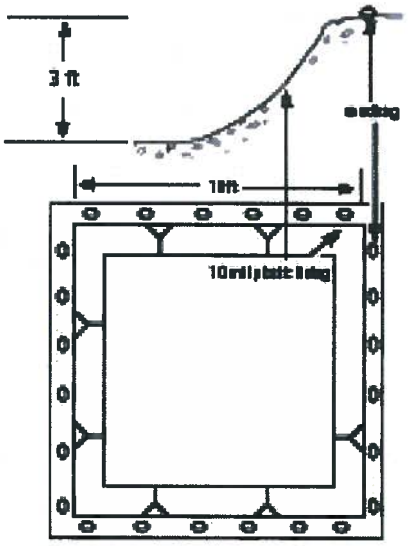
Installation Guidelines

- Most importantly, concrete washouts should be placed in a location convenient to trucks, as close to the work site as possible.
- Concrete washouts should be more than 50 feet of storm drains, open ditches, or waterbodies.
- Appropriate gravel or rock should cover paths to concrete washout facilities if the facilities are located on undeveloped property.
- On large sites with extensive concrete work, washouts should be placed in multiple locations for ease of use by concrete truck drivers.
- To prevent leaks on the jobsite, ensure that prefabricated washout containers are watertight.
- Materials should be removed when the washout is 75 percent full.
- Remove hardened solids whole or break them up. Reuse the solids onsite or haul them away for recycling.

APPLICATIONS

- Housekeeping

- Educate all employees on the importance of the appropriate disposal of concrete waste.
- Although approved above-grade container may be used, below-grade washout facilities are preferred.



Note: Concrete washout sign installed within 20 feet.

BEST MANAGEMENT PRACTICE
VEHICLE MAINTENANCE

Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. However, if these activities must occur on site, operators should follow appropriate BMPs to prevent untreated nutrient-enriched wastewater or hazardous wastes from being discharged to surface or ground waters.

Vehicle maintenance and washing BMPs prevent construction site spills of wash water, fuel, or coolant from contaminating surface or ground water.

Guidelines

- Use a covered, paved area dedicated to vehicle maintenance and washing
- Ensure that the areas are properly connected to a storm drain system
- Develop a spill prevention and cleanup plan
- Prevent hazardous chemical leaks by properly maintaining vehicles and equipment
- Properly cover and provide secondary containment for fuel drums and toxic materials
- Properly handle and dispose of vehicle wastes and wash water
- Inspect construction vehicles daily and repair any leaks immediately. Dispose of used oil, antifreeze, solvents and other chemicals according to manufacturer instructions. These wastes require special handling and disposal. Used oil, antifreeze, and some solvents can be recycled at designated facilities, but other chemicals must be disposed of at a hazardous waste disposal site.

APPLICATIONS

- Housekeeping

12.5 TERRAIN MANAGEMENT PLAN CHECKLIST

- ❑ Existing and proposed contours are shown.
- ❑ Temporary erosion control during construction, construction access, and materials storage sites are shown.
- ❑ Historical flows are shown.
- ❑ All drainage is directed to the Right of Way or to a designated drainage easement
- ❑ There are no cut nor fill slopes exceeding 3horizontal: 1vertical. Cut and fill slopes at 3:1 have water checks or dams at 25' intervals.
- ❑ Retaining walls exceeding 3 ft. above finish grade are designed and stamped by a Professional Engineer licensed in the State of New Mexico
- ❑ Natural tuff slopes are shown cut at 1horizontal: 6vertical and soil over burden is shown cut at 3horizontal: 1vertical.
- ❑ All areas of concentrated flow, including gutter and swale outlets, are shown with erosion control.
- ❑ Calculations are shown to determine required detention area capacity. Detention area or combinations of detention areas are shown, including dimensions.
- ❑ The plan includes an acknowledgement box for required and suggested inspections on the site plan.
- ❑ Utility and Drainage Encroachment papers are included, as necessary.

12.6 TERRAIN MANAGEMENT PLAN

As part of the building permit for any new project, the plan set shall include a terrain management plan. This requirement is in conformance with New Mexico State Law 119(2).

A landowner cannot collect surface water into an artificial channel and precipitate it in unnatural quantities upon the land of his neighbor to the injury of the latter, notwithstanding that no more water is collected than would have naturally flowed upon the property in a diffused condition.

The terrain management plan shall contain all of the following:

1. Both existing and proposed contour lines shall be shown. Contours shall be 2' minimum.

2. Drainage shall be directed to the right of way or a designated drainage easement. Drainage shall not cross private property lines except in easements designated for drainage. Runoff shall be detained and drained onto rights of way or easements at the pre-development rate. Detention ponds must release the detained water within a 24-hour period

3. No erosion is allowed off-site; not into rights of way, not into easements, and not into adjacent properties.

4. Retaining walls or alternative engineered solutions are required to prevent any cut or fill slopes steeper than 3 horizontal: 1 vertical final slope. The length of slopes at 3:1 shall not exceed 25'. When the length exceeds 25' check dams or water breaks shall be installed at not more than 25' intervals. Alternatively, slopes may be covered with 2" of approved compost or erosion control mat.

5. Walls shall be shown on the site plan with a top of wall spot elevation and a bottom of wall spot elevation. Retaining walls exceeding 3' above finish grade and alternatives to retaining walls shall be engineered and stamped by a Professional Engineer licensed in the state of New Mexico.

6. Where natural tuffs cut walls are proposed, the tuff shall be cut not steeper than 1 horizontal: 6 vertical slope. The soil overburden shall be cut not steeper than 3 horizontal: 1 vertical slope.

7. The terrain management plan shall include a plan for erosion control during construction. The plan shall include the following:
   - Disturbed areas shall be protected form erosion during construction by diverting storm water around the disturbed area, energy dissipation of storm water adequate to prevent erosion, retention of sediment on the disturbed area, and/or other means adequate to retain soil on site.

- Except as necessary to install temporary erosion and sediment control devices, land shall not be graded or cleared of vegetation until all such temporary devices have been properly installed and inspected. Temporary erosion and sediment control devices

- Construction access with erosion control such as rock or gravel.

- Storage areas identified for construction materials including excavated material. Excavated material cannot encroach onto rights of way or open spaces.

Temporary erosion control and construction access shall be installed and inspected prior to any land disturbance. The applicant is responsible for calling for inspection, as described in item #9 below. If upon inspection the site conditions do not conform to the approved plan, an amended plan and re-inspection will be required.

Temporary erosion control shall remain in place and maintained throughout the construction phase. Further, temporary erosion control must remain in place and must be maintained until 70% vegetation is established.

The applicant is responsible for requesting an inspection prior to removing temporary erosion control. Removal will not be approved before all permanent erosion control, including landscaping, is established.

It is suggested that the temporary erosion control designer refer to the New Mexico State Department of Transportation recommended Best Management Practices. These can be found at www.NMSHTD.STATE.NM.US. Click on Best Management Practices.

8. Any residential development is required to detain runoff from impervious areas in on-site detention areas. Applicants shall use following calculations to determine the detention area capacity:

- Impervious area = paved areas (s.f.) + building footprint (s.f.)
- Rainfall = .29 ft.
- Runoff coefficient = .95
- Volume of detention area in cubic feet = (impervious area) x (.29) x (.95)

The calculations shall be shown on the Terrain Management Plan. A combination of small detention areas with capacities that equal the total calculated volume is acceptable. Detention areas shall not exceed 2' in depth and detention areas' side slopes shall not exceed 2:1. All detention areas shall include outlets that will drain the detention areas in 24 hours.

The County Engineer must approve alternatives to the standard

detention areas. Alternatives must be designed and stamped by a professional engineer registered in the State of New Mexico.

9. The following inspections are required. The terrain management plan shall include acknowledgements that the applicant is responsible for scheduling these inspections. The terrain management plan must be available at the site for all inspections.

   i. Pre-grading inspection – This inspection and sign –off is required after installation of temporary erosion control and prior to any land disturbance. The inspector will document historical flows.

   ii. Pre-final inspection – This is a recommended inspection 4 weeks prior to final inspection.

   iii. Final Drainage Inspection – This inspection must be passed prior to requesting a final building inspection, as necessary for Certificate of Occupancy.

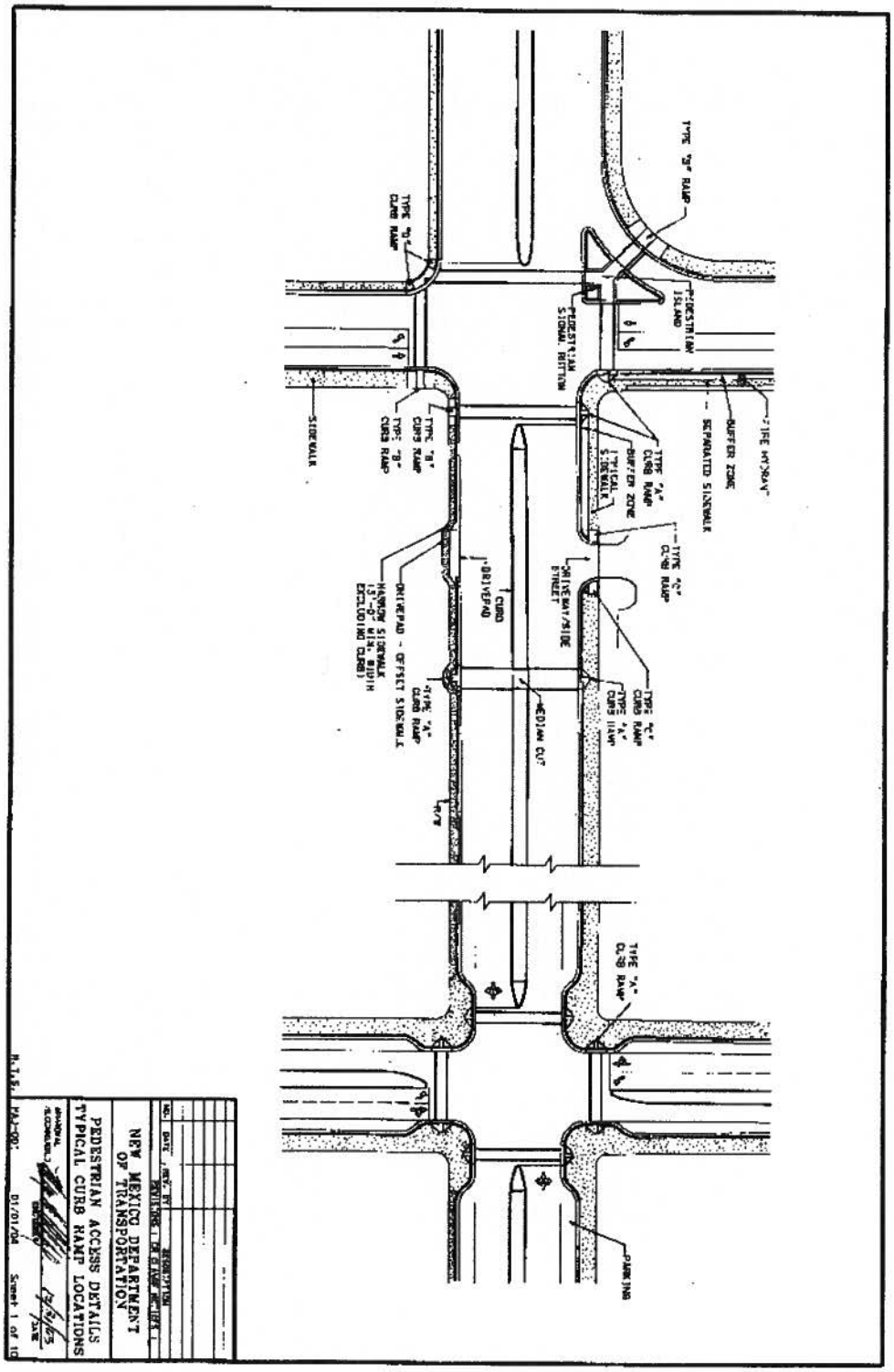
   iv. Temporary Erosion Control Removal

10. Private driveways shall not exceed a grade of 15% nor shall the inside-turning radius of any private driveway be less than 15 feet.

11. Natural slopes greater than 30% shall remain undisturbed, except for isolated occurrences. These occurrences are limited to driveways and utility placement where disturbance would not exceed 1,000 square feet total.

12. Activities permitted by this section may also require notification or permitting by other agencies, including but not limited to written approval from the Federal Environmental Protection Agency, the United States Army Corps of Engineers, the Santa Fe National forest, the Federal Emergency Management Agency (FEMA), and the New Mexico Environment Department. It is the responsibility of each applicant to determine whether additional notification or permitting is required.

12.7 PEDESTRIAN ACCESS DETAILS



NEW CONSTRUCTION - GENERAL NOTES:

1.) THESE DRAWINGS PROVIDE GUIDANCE FOR COMPLIANCE WITH THE CURRENT AMERICANS WITH DISABILITIES ACT (ADA) AND STATE CODE. THESE STANDARDS SHALL APPLY TO ALL NEW AND ALTERED SIDEWALKS.

2.) ANY DESIGN DEVIATION FROM THESE STANDARDS SHALL BE APPROVED BY THE NMDOT ADA COMPLIANCE COMMITTEE.

3.) SURFACES SHALL BE STABLE, FIRM, AND SLIP RESISTANT. SIDEWALK AND CURB RAMP SURFACES SHALL PROVIDE CONSISTENT SLOPES WITHIN EACH SECTION.

4.) ALL BROOM FINISHES SHALL BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.

5.) A VERTICAL CHANGE OF 1/4 INCH (6mm) OR LESS IS ALLOWED. IF BETWEEN 1/4 INCH AND 1/2 INCH (6mm AND 13mm), THEN IT NEEDS TO BE BEVELED 2:1. CHANGES GREATER THAN 1/2 INCH SHALL BE RAMPED.

6.) OPENINGS OR CRACKS IN SIDEWALK SURFACES SHALL NOT EXCEED 1/2 INCH (13mm). ELONGATED OPENINGS SHOULD BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR OR DIAGONAL TO THE DOMINANT DIRECTION OF TRAVEL.

SIDEWALKS

7.) SIDEWALKS, CURB AND GUTTER CONSTRUCTION SHALL BE IN ACCORDANCE WITH SDRIAL DSCD-001. (SWCD-001).

8.) THE LEAST POSSIBLE SLOPES SHALL BE USED FOR SIDEWALKS. SIDEWALK RUNNING SLOPE SHALL NOT EXCEED 5% (20:1). AT LOCATIONS WHERE THE RIGHT-OF-WAY IS RESTRICTIVE, THE SIDEWALK RUNNING SLOPE MAY FOLLOW THE ROAD PROFILE.

9.) SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2% (50:1).

10.) SIDEWALKS SHALL HAVE A MINIMUM WIDTH OF 60". EXCLUDING THE CURB. EXCEPTION: A 36" WIDE SIDEWALK MAY BE USED WHERE THE RIGHT-OF-WAY IS RESTRICTED. WHERE THE SIDEWALK IS LESS THAN 60" WIDE, A PASSING SPACE SHALL BE PROVIDED EVERY 200 LINEAR FEET, WHEREVER FEASIBLE. PASSING SPACES SHALL BE A MINIMUM OF 60"X60" WITH 45 DEGREE TRANSITION TAPERS. 5% (20:1) MAXIMUM RUNNING SLOPES. AND 2% (50:1) MAXIMUM CROSS SLOPES.

11.) ANY SIGN POSTS, UTILITY POLES, FIRE HYDRANTS, TRAFFIC SIGNAL STANDARDS, LIGHT POLES, ETC. IN THE SIDEWALK SHALL NOT REDUCE THE CLEAR WIDTH TO LESS THAN 32" FOR MORE THAN 24" LENGTH.

CURB RAMPS

12.) THE LEAST POSSIBLE CURB RAMP SLOPE SHALL BE USED. FOR COMPLIANCE WITH NMDOT PEDESTRIAN ACCESS DETAILS, CURB RAMP RUNNING SLOPE SHALL NOT EXCEED 8.3% (12:1). WHERE EXISTING TERRAIN IS STEEP, CURB RAMPS NEED NOT EXCEED 15 FEET IN LENGTH.

13.) PROVIDE A FLUSH TRANSITION BETWEEN RAMPS, SIDEWALKS, GUTTER, AND EDGE OF PAVEMENT. FREE OF DRAINAGE LIP, ABRUPT GRADE CHANGES, DROP-OFFS, OR ANY SURFACE IRREGULARITIES. A 5% (20:1) OR FLATTER TRANSITION TAPER SHALL BE PROVIDED FROM THE STREET TO THE GUTTER FOR CURB RAMP LOCATIONS (THIS MAY REQUIRE SPECIAL TREATMENT OF THE EDGE OF D.G.F.C.) WHEN DIAGONAL (NOT IN LINE WITH CROSSWALKS) RAMPS ARE NECESSARY, A 2% (50:1) TRANSITION OR "LOWER LANDING" SHALL BE PROVIDED. THE GUTTER RUNNING SLOPE (FLOW LINE) SHALL NOT EXCEED 2% MEASURED ALONG THE BOTTOM OF THE RAMP.

14.) CURB RAMPS SHALL BE LOCATED TO PROVIDE THE MOST DIRECT ROUTE OF TRAVEL ACROSS THE TRAFFIC LANES.

15.) TWO DIRECTIONAL (IN LINE WITH THE CROSSWALKS) RAMPS PER CORNER ARE USED IN ORDER TO PROVIDE SHORT AND DIRECT CROSSINGS FOR THE USER.

16.) SIGN POSTS, UTILITY POLES, FIRE HYDRANTS, TRAFFIC SIGNAL STANDARDS, LIGHT POLES, PULL BOXES, METERS, VALVES, ETC., SHALL NOT BE LOCATED IN THE CURB RAMP INCLUDING SIDE FLARES AND LANDINGS.

17.) IN ORDER TO BETTER ACCOMMODATE CONDITIONS IN THE FIELD, THE CONTRACTOR SHALL OBTAIN FINAL APPROVAL OF CURB RAMP LOCATIONS FROM THE PROJECT MANAGER AND THE DISTRICT TRAFFIC ENGINEER. WHEN NECESSITATED BY EXISTING PHYSICAL CONDITIONS, ALTERNATE CURB RAMPS MUST BE SUBMITTED TO THE PROJECT MANAGER FOR APPROVAL BY THE DISTRICT TRAFFIC ENGINEER.

LANDINGS

18.) LANDINGS SHALL BE A MINIMUM OF 60"X60". SLOPES SHALL NOT EXCEED 2% (50:1) IN ALL DIRECTIONS.

CROSSWALKS

19.) ACCESSIBLE PEDESTRIAN CROSSINGS SHALL BE WITHIN THE MARKED CROSSWALK.

DETECTABLE WARNINGS

20.) DETECTABLE WARNINGS ARE REQUIRED AT ALL STREET INTERSECTIONS, SIGNALIZED DRIVEWAYS, COMMERCIAL DRIVEWAYS 30' WIDE OR GREATER, AND MARKED MID-BLOCK CROSSWALKS.

PEDESTRIAN SIGNALS

21.) A PARALLEL OR FORWARD APPROACH OF 30" WIDE BY 48" LONG WITH SLOPES IN ALL DIRECTIONS NOT EXCEEDING 2% (50:1) SHALL BE PROVIDED FOR ACCESS TO THE PEDESTRIAN SIGNAL BUTTON(S).

22.) PEDESTRIAN SIGNAL BUTTONS SHALL BE CENTERED EITHER IN FRONT OF OR ADJACENT TO THE APPROACH AREA DESCRIBED ABOVE.

23.) PEDESTRIAN SIGNAL BUTTONS SHALL BE LOCATED IN ACCORDANCE WITH ACCESSIBILITY REQUIREMENTS OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES WITHIN A HORIZONTAL REACH OF 9" TO 10" AND SHALL BE WITHIN 36" TO 48" ABOVE THE SIDEWALK SURFACE.

ALTERATIONS TO EXISTING FACILITIES - GENERAL NOTES:

ADDITIONS OR ALTERATIONS TO ANY FACILITY SHALL COMPORM TO THE REQUIREMENTS OF THE NEW CONSTRUCTION STANDARDS WITHIN THE NMDOT PEDESTRIAN ACCESS DETAILS. ADDITIONS OR ALTERATIONS SHALL NOT BE MADE TO AN EXISTING FACILITY WHICH WILL CAUSE THE EXISITNG FACILITY TO BE IN VIOLATION OF ANY PROVISION OF THE NMDOT PEDESTRIAN ACCESS DETAILS. WHERE IT IS TECHNICALLY INFEASIBLE TO COMPLY WITH NEW CONSTRUCTION STANDARDS OF THE NMDOT PEDESTRIAN ACCESS DETAILS THE FOLLOWING OPTIONS MAY BE USED:

24.) WHERE IT IS NOT FEASIBLE TO INSTALL TWO CURB RAMPS PER CORNER, A SINGLE DIAGONAL CURB RAMP MAY BE USED AFTER RECEIVING APPROVAL FROM THE NMDOT ADA COMPLIANCE COMMITTEE.

25.) WHERE RIGHT-OF-WAY IS RESTRICTED, CURB RAMP LANDINGS MAY BE 4' X 4'.

26.) DEFINITION OF TECHNICALLY INFEASIBLE: IN THE CONTEXT OF THESE DRAWINGS, WITHIN A ROADWAY OR IMMEDIATE ROADSIDE ENVIRONMENT, MEANS WITH RESPECT TO AN ALTERATION OF A FACILITY, THAT IT HAS LITTLE LIKELIHOOD OF BEING ACCOMPLISHED BECAUSE EXISTING SITE CONDITIONS WOULD REQUIRE SUBSTANTIALLY ALTERING EXISTING DRAINAGE PATTERNS, TRAFFIC FLOW OR SAFETY; OR BECAUSE OTHER EXISTING PHYSICAL INFRASTRUCTURE OR SITE CONSTRAINTS PROHIBIT MODIFICATION OR ADDITION OF ELEMENTS, SPACES, OR FEATURES WHICH ARE IN FULL AND STRICT COMPLIANCE WITH THE MINIMUM REQUIREMENTS FOR NEW CONSTRUCTION AND WHICH ARE NECESSARY TO PROVIDE ACCESSIBILITY.

27.) WHERE RIGHT-OF-WAY IS RESTRICTED, CURB RAMP SLOPES MAY BE 12:1.

RAMP TO LANDING TRANSITION

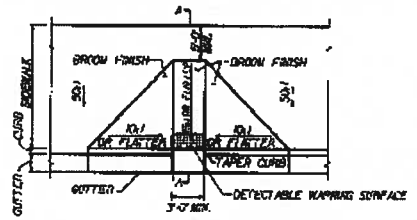
NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS (SEE CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION

PEDESTRIAN ACCESS DETAILS
TYPICAL CURB RAMPS

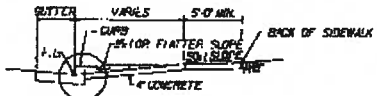
APPROVAL RECOMMENDED [signature] 3/9/04
ENGINEER DATE

N.T.S. PAD-001 03/19/04 Sheet 2 of 10



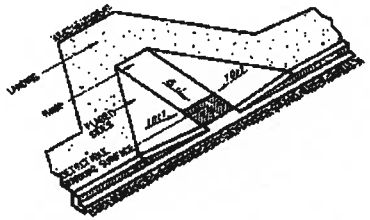
PLAN

ELEVATION



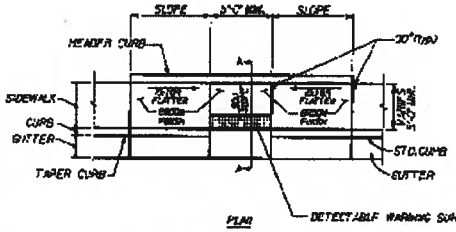
SEE RAMP TO LANDING TRANSITION ON SHEET 10F 9

SECTION "A-A"

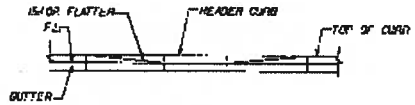


ISOMETRIC

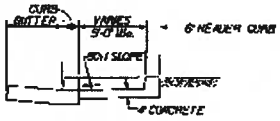
TYPE A
CURB RAMP



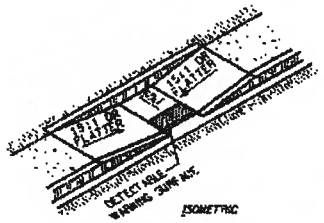
PLAN



ELEVATION

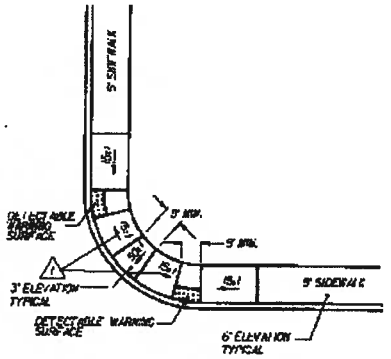


SECTION "A-A"



ISOMETRIC

TYPE B
PARALLEL CURB RAMP



TYPE B
PARALLEL CURB RAMP, TWO DIRECTIONS

METRIC CONVERSIONS		
5'-0"	=	1525mm
4'-0"	=	1220mm
3'-0"	=	915mm
2'-0"	=	610mm
6"	=	150mm
4"	=	100mm
10:1	=	11.0
15:1	=	11.5
22:1	=	11.22
50:1	=	11.50

NO.	DATE	BY	DESCRIPTION
1	8/30/04	R.GARCIA	REVISED FIGURES

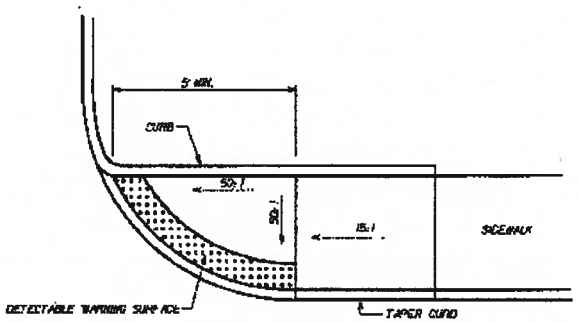
REVISIONS | 28 CFR 35.151(e)

NEW MEXICO DEPARTMENT OF TRANSPORTATION

PEDESTRIAN ACCESS DETAILS
CURB RAMP DETAILS
TYPE "A" & TYPE "B"

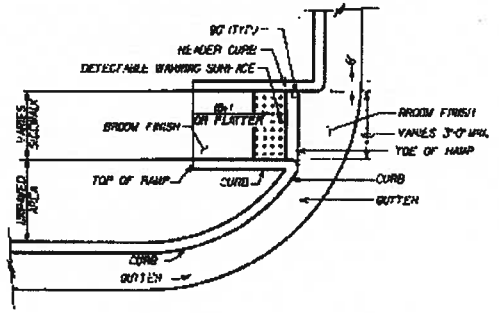
APPROVED: RECOMMENDED — ENGINEER — DATE 8-09-04

N.T.S. PAR-001 01/01/05 Sheet 3 of 10



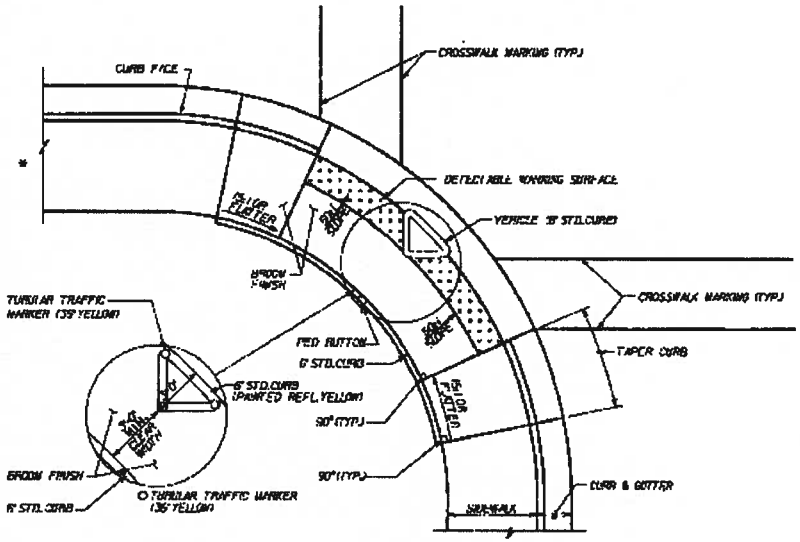
TYPE C

N.T.S.



TYPE C
WITH BUFFER

N.T.S.



TYPE D
PARALLEL CURB RAMPS W/LARGE BOTTOM LANDING

*TRANSITION TO EXISTING SIDEWALK AS FIELD CONDITIONS PERMIT.

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS / OR CHANGE NOTICES

NEW MEXICO DEPARTMENT OF TRANSPORTATION

PEDESTRIAN ACCESS DETAILS
CURB RAMP DETAILS
TYPE C AND TYPE D

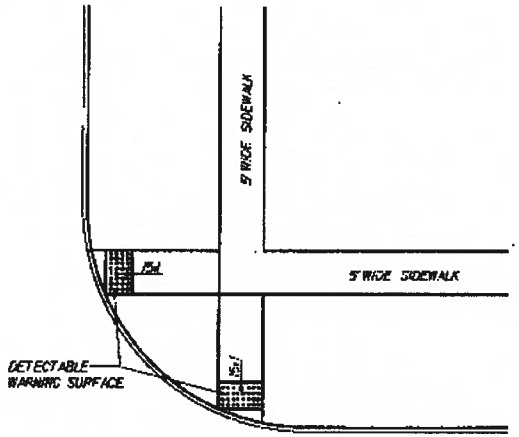
METRIC CONVERSIONS	
6'-0"	1829mm
3'-0"	915mm
6"	50mm
10:1	1:10
12:1	1:12
15:1	1:15
50:1	1:50

APPROVAL RECOMMENDED

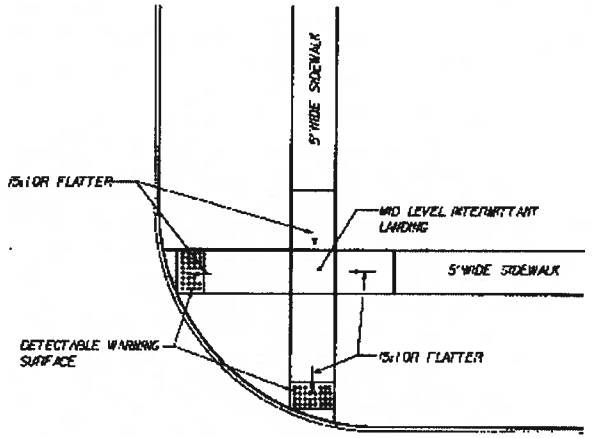
ENGINEER

DATE

PAD-001 01/01/04 Sheet 4 of 10



TYPE E
PERPENDICULAR CROSSINGS TWO DIRECTIONS



TYPE F
PERPENDICULAR CURB RAMPS W/INTERMEDIATE LANDING

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS (OR DRAWING NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION

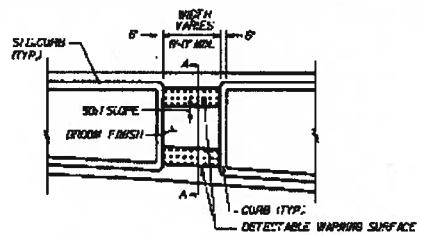
PEDESTRIAN ACCESS DETAILS
TYPICAL RAMPS

APPROVAL RECOMMENDED _____ ENGINEER _____ DATE 12/21/03

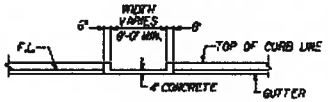
PAD-001 01/01/04 Sheet 4 of 10

METRIC CONVERSIONS

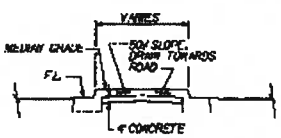
3"-0"	=	915mm
12:1	=	1:12
48:1	=	1:48
50:1	=	1:50



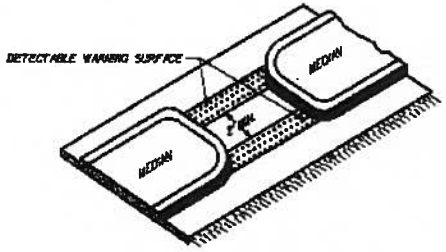
PLAN



ELEVATION



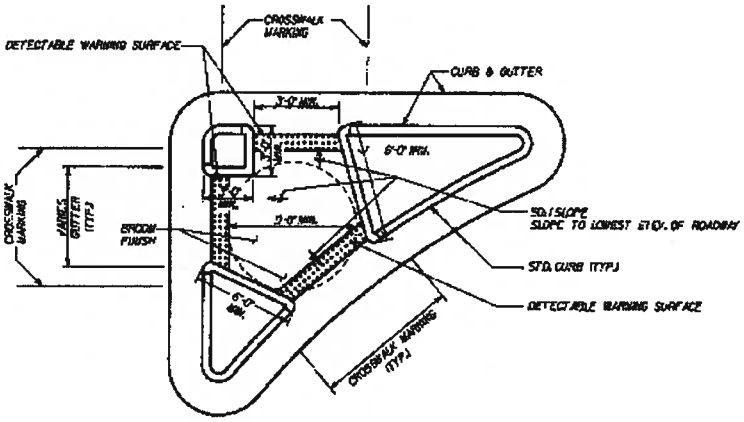
SECTION "A-A"



ISOMETRIC

MEDIAN CUT

N.T.S.



PEDESTRIAN ISLAND

N.T.S.

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION

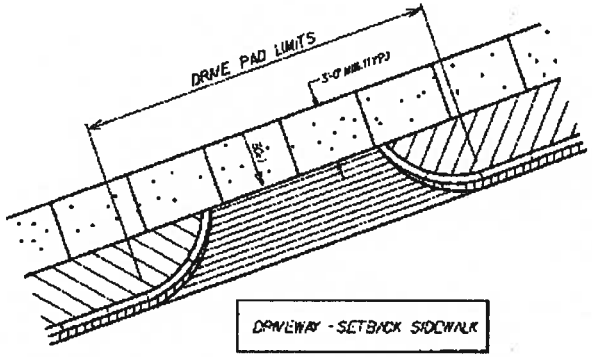
PEDESTRIAN ACCESS DETAILS
MEDIAN CUT DETAILS
PEDESTRIAN ISLAND

APPROVAL RECOMMENDED ENGINEER 12/3/03 DATE

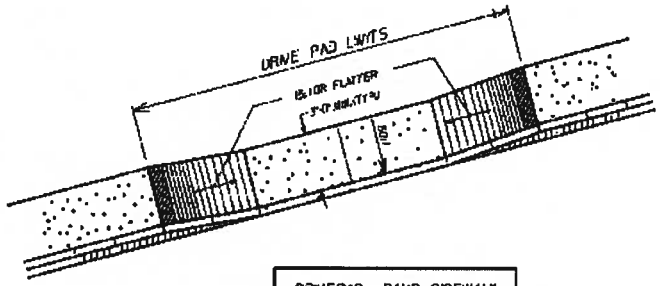
PAD-001 01/01/04 Sheet 6 of 10

METRIC CONVERSIONS

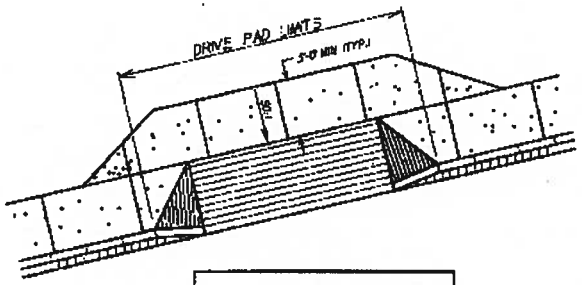
2'-0"	=	610mm
3'-0"	=	915mm
4'-0"	=	1220mm
5'-0"	=	1525mm
36"	=	915mm
6"	=	150mm
1241	=	1412
8011	=	1180



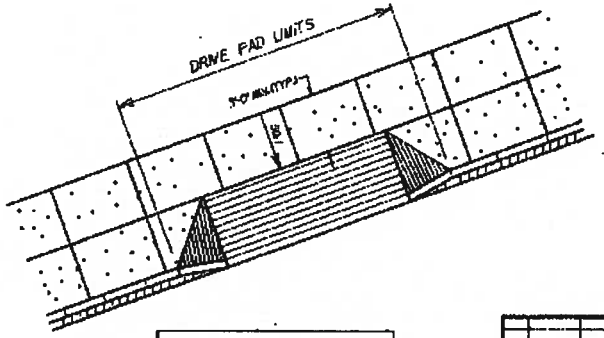
DRIVEWAY - SETBACK SIDEWALK



DRIVEPAD - RAMP SIDEWALK



DRIVEPAD - OFFSET SIDEWALK



DRIVEPAD - WIDE SIDEWALK

N.T.S.

NO.	DATE	REV. BY:	DESCRIPTION
			(REVISIONS / OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION

PEDESTRIAN ACCESS DETAILS
TYPICAL
DRIVEWAY / DRIVEPAD APRONS
ISOMETRIC VIEWS

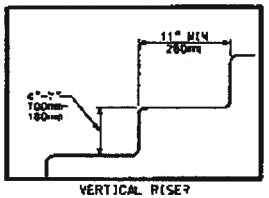
APPROVAL RECOMMENDED — ENGINEER — DATE

METRIC CONVERSIONS	
3'-0"	915mm
12:1	8.33%
48:1	2.08%
50:1	2.00%

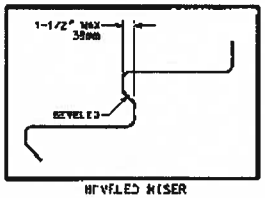
PAD-031 01/01/04 Sheet 7 of 10

STAIRWAY REQUIREMENTS

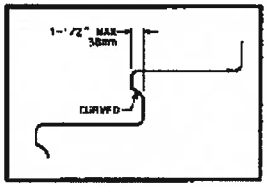
1. STAIRWAYS SHALL BE 36 INCHES (915 mm) WIDE MINIMUM BETWEEN HANDRAILS.
2. ALL STEPS ON A FLIGHT OF STAIRS SHALL HAVE UNIFORM RISER HEIGHTS AND UNIFORM TREAD DEPTH. RISERS SHALL BE 4 INCHES (100 mm) HIGH MINIMUM AND 7 INCHES (180 mm) MAXIMUM. TREADS SHALL BE 11 INCHES (280 mm) DEEP MINIMUM MEASURED FROM RISER TO RISER.
3. OPEN RISERS SHALL NOT BE PERMITTED.
4. STAIR TREADS SHALL BE STABLE, FIRM, AND SLIP RESISTANT.
5. THE RADIUS OF CURVATURE AT THE LEADING EDGE OF THE TREAD SHALL BE ½ INCH (13 mm) MAXIMUM. NOSINGS THAT PROJECT BEYOND RISERS SHALL HAVE THE UNDERSIDE OF THE LEADING EDGE CURVED OR BEVELED. RISERS SHALL BE PERMITTED TO SLOPE UNDER THE TREAD AT AN ANGLE OF 30 DEGREES MAXIMUM FROM THE VERTICAL. THE PERMITTED PROJECTION OF THE NOSING SHALL BE 1½ INCHES (38 mm) MAXIMUM BEYOND THE TREAD BELOW.
6. HANDRAILS SHALL BE PROVIDED ON BOTH SIDES OF STAIRS.
7. OUTDOOR STAIRS AND OUTDOOR APPROACHES TO STAIRS SHALL BE DESIGNED SO THAT WATER WILL NOT ACCUMULATE ON WALKING SURFACES.



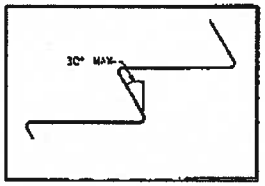
VERTICAL RISER



BEVELED RISER



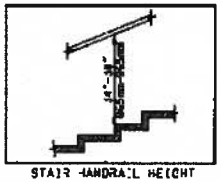
CURVED RISER



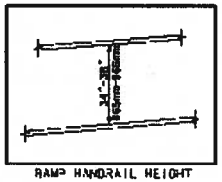
ANGLED RISER

HANDRAIL REQUIREMENTS

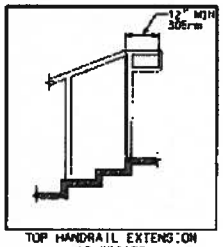
1. HANDRAILS SHALL BE PROVIDED ON BOTH SIDES OF STAIRS AND RAMPS.
2. HANDRAILS SHALL BE CONTINUOUS WITHIN THE FULL LENGTH OF EACH STAIR FLIGHT OR RAMP RUN. INSIDE HANDRAILS ON SWITCH BACK OR DOGLEG STAIRS OR RAMPS SHALL BE CONTINUOUS BETWEEN FLIGHTS OR RUNS.
3. TOP OF GRIPPING SURFACE OF HANDRAILS SHALL BE 34 INCHES (865 mm) MINIMUM AND 38 INCHES (965 mm) MAXIMUM VERTICALLY ABOVE STAIR NOSINGS AND RAMP SURFACES. HANDRAILS SHALL BE AT A CONSISTENT HEIGHT ABOVE STAIR NOSINGS AND RAMP SURFACES.
4. CLEAR SPACE BETWEEN HANDRAIL AND WALL SHALL BE 1½ INCHES (38 mm) MINIMUM.
5. GRIPPING SURFACES SHALL BE CONTINUOUS, WITHOUT INTERRUPTION BY NEWEL POSTS, OTHER CONSTRUCTION ELEMENTS, OR OBSTRUCTIONS.
   EXCEPTION:
   HANDRAIL BRACKETS OR BALUSTERS ATTACHED TO THE BOTTOM SURFACE OF THE HANDRAIL SHALL NOT BE CONSIDERED OBSTRUCTIONS PROVIDED THEY COMPLY WITH THE FOLLOWING CRITERIA:
   A. NOT MORE THAN 20 PERCENT OF THE HANDRAIL LENGTH IS OBSTRUCTED.
   B. HORIZONTAL PROJECTIONS BEYOND THE SIDES OF THE HANDRAIL OCCUR 2½ INCHES (64 mm) MINIMUM BELOW THE BOTTOM OF THE HANDRAIL, AND
   C. EDGES HAVE A ⅛ INCH (3.2 mm) MINIMUM RADIUS.
6. HANDRAILS SHALL HAVE A CIRCULAR CROSS SECTION WITH AN OUTSIDE DIAMETER OF 1¼ INCH (32 mm) MINIMUM AND 2 INCHES (51 mm) MAXIMUM, OR SHALL PROVIDE EQUIVALENT GRASPABILITY.
   EXCEPTION: HANDRAILS WITH OTHER SHAPES SHALL BE PERMITTED PROVIDED THEY HAVE A PERIMETER DIMENSION OF 4 INCHES (100 mm) MINIMUM AND 6¼ INCHES (160 mm) MAXIMUM, AND PROVIDED THEIR LARGEST CROSS-SECTION DIMENSION IS 2¼ INCHES (57 mm) MAXIMUM.
7. HANDRAILS, AND ANY WALL OR OTHER SURFACES ADJACENT TO THEM, SHALL BE FREE OF ANY SHARP OR ABRASIVE ELEMENTS. EDGES SHALL HAVE ⅛ INCH (3.2 mm) MINIMUM RADIUS.
8. HANDRAILS SHALL NOT ROTATE WITHIN THEIR FITTINGS.
9. HANDRAILS FOR STAIRS AND RAMPS SHALL HAVE EXTENSIONS.
   EXCEPTIONS:
   A. EXTENSIONS ARE NOT REQUIRED FOR CONTINUOUS HANDRAILS AT THE INSIDE TURN OF STAIRS AND RAMPS.
   B. IN ALTERATIONS, FULL EXTENSIONS OF HANDRAILS SHALL NOT BE REQUIRED WHERE SUCH EXTENSIONS WOULD BE HAZARDOUS OR IMPOSSIBLE DUE TO PLAN CONFIGURATION.
10. RAMP HANDRAILS SHALL EXTEND HORIZONTALLY 12 INCHES (305 mm) MINIMUM BEYOND THE TOP AND BOTTOM OF RAMP RUNS. SUCH EXTENSIONS SHALL RETURN TO A WALL, GUARD, OR THE WALKING SURFACE, OR SHALL BE CONTINUOUS TO THE HANDRAIL OF AN ADJACENT RAMP RUN.
11. AT THE TOP OF A STAIR FLIGHT, HANDRAILS SHALL EXTEND HORIZONTALLY ABOVE THE LANDING FOR 12 INCHES (305 mm) MINIMUM BEGINNING DIRECTLY ABOVE THE FIRST RISER NOSING. SUCH EXTENSIONS SHALL RETURN TO A WALL, GUARD, OR THE WALKING SURFACE, OR SHALL BE CONTINUOUS TO THE HANDRAIL OF AN ADJACENT STAIR FLIGHT.
12. AT THE BOTTOM OF A STAIR FLIGHT, HANDRAILS SHALL EXTEND AT THE SLOPE OF THE STAIR FLIGHT FOR A HORIZONTAL DISTANCE EQUAL TO ONE TREAD DEPTH BEYOND THE LAST RISER NOSING. SUCH EXTENSIONS SHALL CONTINUE WITH A HORIZONTAL EXTENSION OR SHALL BE CONTINUOUS TO THE HANDRAIL OF AN ADJACENT STAIR FLIGHT OR SHALL RETURN TO A WALL, GUARD, OR THE WALKING SURFACE. THE HORIZONTAL EXTENSION OF A HANDRAIL SHALL BE 12 INCHES (305 mm) LONG MINIMUM AND A HEIGHT EQUAL TO THAT OF THE SLOPING PORTION OF THE HANDRAIL, AS MEASURED ABOVE THE STAIR NOSINGS. SUCH EXTENSIONS SHALL RETURN TO A WALL, GUARD, OR THE WALKING SURFACE, OR SHALL BE CONTINUOUS TO THE HANDRAIL OF AN ADJACENT STAIR FLIGHT.



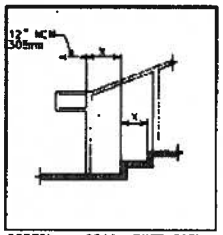
STAIR HANDRAIL HEIGHT



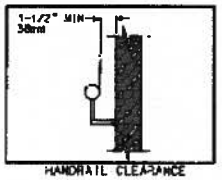
RAMP HANDRAIL HEIGHT



TOP HANDRAIL EXTENSION AT STAIRS



BOTTOM HANDRAIL EXTENSION AT STAIRS



HANDRAIL CLEARANCE

NO.	DATE	BY. AP	DESCRIPTION (REVISION OR "ISSUED WITH")

NEW MEXICO DEPARTMENT OF TRANSPORTATION

PEDESTRIAN ACCESS DETAILS

STAIRWAY & HANDRAIL REQUIREMENTS

APPROVAL RECOMMENDED "ENGINEER" — DATE

H.I.S.

PAD-001 01/21/04 Sheet 8 of 10

ACCESSIBLE ROUTES:

ACCESSIBLE EXTERIOR ROUTES SHALL BE PROVIDED FROM TRANSPORTATION STOPS, ACCESSIBLE PARKING AND ACCESSIBLE PASSENGER LOADING ZONES AND PUBLIC SIDEWALKS TO THE ACCESSIBLE BUILDING ENTRANCE THEY SERVE.

ACCESSIBLE PARKING REQUIREMENTS:

1. EACH LOT SHALL PROVIDE ACCESSIBLE PARKING SPACES IN COMPLIANCE WITH THE FOLLOWING TABLE:

NUMBER OF ACCESSIBLE PARKING SPACES

TOTAL PARKING SPACES	TOTAL REQUIRED ACCESSIBLE PARKING SPACES	NUMBER REQUIRED TO BE VAN ACCESSIBLE
1-25	1	1
26-50	2	1
51-75	3	1
76-100	4	1
101-300	8	1
301-500	12	2
501-800	16	2
801-1,000	20	3
OVER 1,000	20 SPACES PLUS 1 SPACE FOR EVERY 100 SPACES, OR FRACTION THEREOF, OVER 1,000	1 OF EVERY 8 ACCESSIBLE PARKING SPACES, OR FRACTION THEREOF

2. CAR AND VAN PARKING SPACES SHALL BE 96 INCHES (2440 mm) WIDE MINIMUM AND SHALL HAVE AN ADJACENT ACCESS AISLE.

3. ACCESS AISLES SERVING PARKING SPACES SHALL CONNECT TO THE BUILDING OR FACILITY ENTRANCE BY AN ACCESSIBLE SIDEWALK. TWO PARKING SPACES SHALL BE PERMITTED TO SHARE A COMMON ACCESS AISLE. THE VAN ACCESS AISLE IS PREFERRED TO BE AT THE RIGHT SIDE (PASSENGER SIDE) OF THE PARKING SPACE. (AN ACCESSIBLE SIDEWALK IS 36 INCHES (915mm) MINIMUM CLEAR WIDTH, 5011 MAXIMUM CROSS SLOPE WITH A RUNNING SLOPE OF 2011 MAXIMUM OR THE RUNNING SLOPE MAY FOLLOW THE ADJACENT ROAD PROFILE GRADE.) PARKED VEHICLE OVERHANGS SHALL NOT REDUCE THE MINIMUM 36 INCH (915mm) CLEAR WIDTH OF AN ACCESSIBLE ROUTE.

4. ACCESS AISLES SERVING CAR PARKING SPACES SHALL BE 60 INCHES (1525mm) WIDE MINIMUM. ACCESS AISLES SERVING VAN PARKING SPACES SHALL BE 96 INCHES (2440mm) WIDE MINIMUM.

5. ACCESS AISLES SHALL EXTEND THE FULL LENGTH OF THE PARKING SPACES THEY SERVE.

6. ACCESS AISLES SHALL BE MARKED.

7. PARKING SPACES AND ACCESS AISLES SHALL HAVE SURFACE SLOPES NOT STEEPER THAN 5011. ACCESS AISLES SHALL BE AT THE SAME LEVEL AS THE PARKING SPACES THEY SERVE.

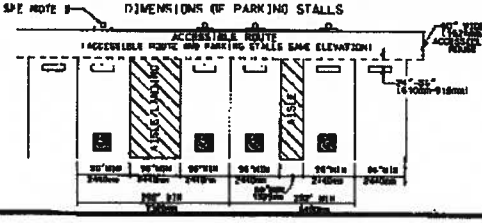
8. PARKING SPACES FOR VANS SHALL HAVE A VERTICAL CLEARANCE OF 98 INCHES (2490mm) MINIMUM AT THE SPACE AND ALONG THE VEHICULAR ROUTE THERETO.

9. EACH ACCESSIBLE PARKING SPACE SHALL BE IDENTIFIED BY A SIGN ON A POST. SIGNS SHALL INCLUDE THE INTERNATIONAL SYMBOL OF ACCESSIBILITY. THE CLEARANCE TO THE BOTTOM OF THE SIGN (R7-8) SHALL BE AT LEAST 7 FEET (2100mm). LOCATED AT THE HEAD OF THE PARKING SPACE, VAN ACCESSIBLE PARKING SPACES SHALL HAVE AN ADDITIONAL SIGN (R7-8A) MOUNTED BELOW THE INTERNATIONAL SYMBOL OF ACCESS IDENTIFYING THE SPACE AS "VAN ACCESSIBLE."

10. PARKING SPACE AND ACCESS AISLES SHALL HAVE OSHA SAFETY BLUE STRIPING. STRIPING SHALL BE 4 INCHES (120mm) WIDE. ACCESS AISLES STRIPING SHALL BE 30 INCHES (750mm) ON CENTER.

11. EACH ACCESSIBLE PARKING SPACE SHALL INCLUDE, CENTERED AT THE FOOT, A PAVEMENT MARKING OF THE INTERNATIONAL SYMBOL OF ACCESSIBILITY.

DIMENSIONS OF PARKING STALLS



ACCESSIBLE PASSENGER LOADING ZONE REQUIREMENTS:

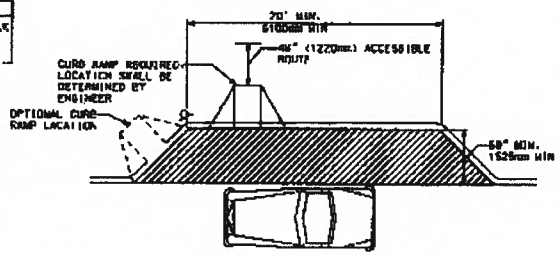
1. PASSENGER LOADING ZONES SHALL PROVIDE A 60 INCH (1525mm) WIDE ACCESS AISLE ALONGSIDE AND PARALLEL TO A VEHICLE PULL-UP SPACE. ACCESS AISLES SHALL BE 20 FEET (6100mm) LONG MINIMUM.

2. ACCESS AISLES SHALL BE PART OF THE ACCESSIBLE ROUTE TO THE BUILDING OR FACILITY ENTRANCE.

3. VEHICLE PULL-UP SPACES IN PASSENGER LOADING ZONES AND ACCESS AISLES SHALL HAVE SURFACE SLOPES NOT STEEPER THAN 5011. ACCESS AISLES SHALL BE AT THE SAME LEVEL AS THE VEHICLE PULL-UP SPACE THEY SERVE.

4. VERTICAL CLEARANCE OF 114 INCHES (2895mm) MINIMUM SHALL BE PROVIDED AT PASSENGER LOADING ZONES AND ALONG VEHICLE ACCESS ROUTES TO SUCH AREAS FROM SITE ENTRANCES.

5. EACH ACCESSIBLE PASSENGER LOADING ZONE SHALL BE IDENTIFIED BY A SIGN ON A POST. SIGNS SHALL INCLUDE THE INTERNATIONAL SYMBOL OF ACCESSIBILITY.



ACCESSIBLE PASSENGER LOADING ZONE
PLAN VIEW

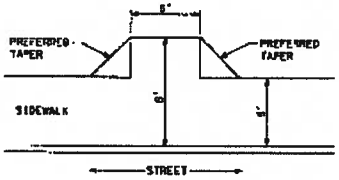
BUS STOP PAD REQUIREMENTS:

1. BUS STOP PADS SHALL HAVE A STABLE, FIRM, AND SLIP RESISTANT SURFACE.

2. THE MINIMUM CLEAR LENGTH SHALL BE 96 INCHES (2440mm), MEASURED PERPENDICULAR FROM THE CURB OR EDGE OF THE VEHICLE ROADWAY. THE MINIMUM CLEAR WIDTH SHALL BE 60 INCHES (1525mm), MEASURED PARALLEL TO THE CURB OR EDGE OF THE VEHICLE ROADWAY.

3. THE SLOPE OF THE PAD PARALLEL TO THE ROADWAY SHALL BE THE SAME AS THE ROADWAY. THE SLOPE OF THE PAD PERPENDICULAR TO THE ROADWAY SHALL NOT BE STEEPER THAN 5011.

4. PADS SHALL ADJOIN AN ACCESSIBLE SIDEWALK.



BUS STOP PAD
PLAN VIEW

RAMP REQUIREMENTS:

1. WALKING SURFACE ON ACCESSIBLE ROUTES WITH A RUNNING SLOPE STEEPER THAN 20:1 ARE RAMPS.

2. RAMP RUNS SHALL HAVE A RUNNING SLOPE NOT STEEPER THAN 12:1. EXCEPTIONS: RAMPS IN OR ON EXISTING BUILDINGS OR FACILITIES SHALL BE PERMITTED TO HAVE SLOPES STEEPER THAN 12:1 AND SHALL COMPLY WITH THE FOLLOWING TABLE WHERE SUCH SLOPES ARE NECESSITATED BY SPACE LIMITATIONS. A SLOPE STEEPER THAN 8:1 SHALL NOT BE PERMITTED.

TABLE FOR EXISTING SITES, BUILDINGS AND FACILITIES

SLOPE	MAXIMUM RISE
STEEPER THAN 10:1 BUT NOT STEEPER THAN 8:1	3 INCHES (75mm)
STEEPER THAN 12:1 BUT NOT STEEPER THAN 10:1	5 INCHES (150mm)

3. CROSS SLOPE OF RAMP RUNS SHALL NOT BE STEEPER THAN 5011.

4. FLOOR OR GROUND SURFACES OF RAMP RUN SHALL BE STABLE, FIRM, AND SLIP RESISTANT.

5. THE CLEAR WIDTH OF A RAMP RUN SHALL BE 36 INCHES (915mm) MINIMUM MEASURED BETWEEN HANDRAILS.

6. THE RISE FOR ANY RAMP RUN SHALL BE 30 INCHES (760mm) MAXIMUM.

7. RAMPS SHALL HAVE LANDINGS AT THE BOTTOM AND TOP OF EACH RUN. LANDINGS SHALL COMPLY WITH THE FOLLOWING:
   A. LANDINGS SHALL HAVE A SLOPE NOT STEEPER THAN 5011.
   B. CLEAR WIDTH OF LANDINGS SHALL BE AT LEAST AS WIDE AS THE WIDEST RAMP RUN LEADING TO THE LANDING.
   C. LANDING LENGTH SHALL BE 60 INCHES (1520mm) MINIMUM CLEAR.
   D. RAMPS THAT CHANGE DIRECTION AT LANDINGS SHALL HAVE A 60 INCH BY 60 INCH (1525mm) MINIMUM LANDING.
   E. WHERE DOORWAYS ARE ADJACENT TO A RAMP LANDING, MANEUVERING CLEARANCES REQUIRED BY ANSI SECTIONS 404.2.4 AND 404.3.2 SHALL BE PERMITTED TO OVERLAP THE LANDING AREA.

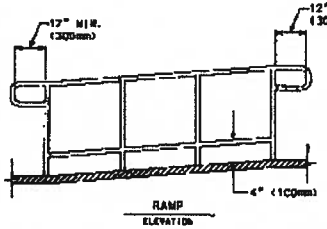
8. RAMPS WITH A RISE GREATER THAN 6 INCHES (150mm) SHALL HAVE HANDRAILS. HANDRAILS SHALL NOT REDUCE THE REQUIRED CLEARANCES OF A RAMP RUN OR LANDINGS.

9. EDGE PROTECTION SHALL BE PROVIDED ON EACH SIDE OF RAMP RUNS AND AT EACH SIDE OF RAMP LANDINGS.

   EXCEPTIONS:
   A. RAMPS NOT REQUIRED TO HAVE HANDRAILS WHERE SIDE FLARES ARE PROVIDED.
   B. SIDES OF RAMP LANDINGS SERVING AN ADJOINING RAMP RUN OR STAIRWAY.
   C. SIDES OF RAMP LANDINGS HAVING A VERTICAL DROP-OFF OF ½ INCH (13mm) MAXIMUM WITHIN 10 INCHES (255mm) HORIZONTALLY OF THE MINIMUM LANDING AREA.

10. EDGE PROTECTION MAY BE PROVIDED BY EXTENDING A FLOOR OR GROUND SURFACE, OF THE RAMP RUN OR LANDING, 12 INCHES (305mm) MINIMUM BEYOND THE INSIDE FACE OF A HANDRAIL OR AN EDGE PROTECTION CURB OR BARRIER SHALL BE PROVIDED THAT PREVENTS THE PASSAGE OF A 4-INCH (100mm) DIAMETER SPHERE BELOW A HEIGHT OF 4 INCHES (100mm).

11. OUTDOOR RAMPS AND APPROACHES TO RAMPS SHALL BE DESIGNED SO THAT WATER WILL NOT ACCUMULATE ON WALKING SURFACES.



RAMP
ELEVATION

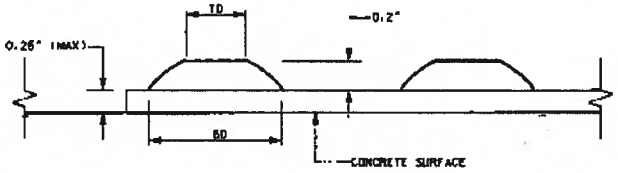
NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION

PEDESTRIAN ACCESS DETAILS
ACCESSIBLE PARKING, PASSENGER LOADING, BUS STOP AND RAMP REQUIREMENTS

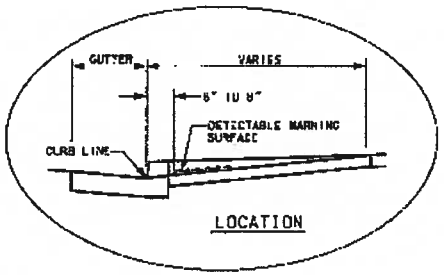
APPROVAL RECOMMENDED — ENGINEER — DATE

H.T.S.

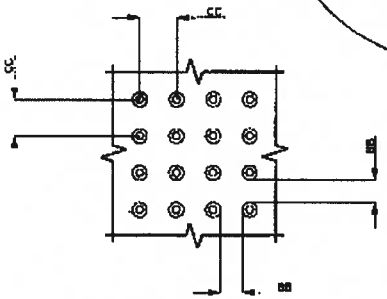


DOME SECTION

BC - BASE DIAMETER
0.9" MIN TO 1.4" MAX
TD - TOP DIAMETER
50% OF BD MIN TO 65% OF BC MAX



LOCATION



DOME SPACING

CC - CENTER TO CENTER SPACING
1.6" MIN TO 2.4" MAX
BB - BASE TO BASE SPACING
0.65" MIN

DEFINITIONS:

DETECTABLE WARNINGS. A SURFACE FEATURE BUILT IN OR APPLIED TO WALKING SURFACES OR OTHER ELEMENTS TO WARN OF HAZARDS ON A CIRCULATION PATH TO AID PERSONS WITH VISUAL IMPAIRMENTS.

CURB LINE. A LINE AT THE FACE OF THE CURB THAT MARKS THE TRANSITION BETWEEN THE SIDEWALK AND THE GUTTER OR ROADWAY.

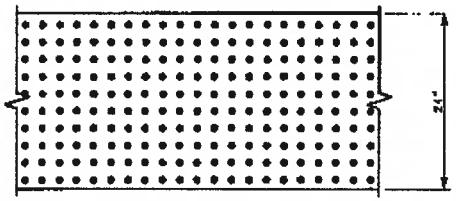
LOCATION:

1. DETECTABLE WARNING SURFACES SHALL BE PROVIDED WHERE A CURB RAMP OR LANDING CONNECTS TO A CROSSWALK AND OR PEDESTRIAN ROUTE CROSSING A ROADWAY.
2. DETECTABLE WARNING SURFACE SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS 6 INCHES (150 MM) MINIMUM AND 8 INCHES (205 MM) MAXIMUM FROM THE CURB LINE.
3. MEDIAN AND REFUGE ISLANDS SHALL HAVE DETECTABLE WARNINGS. DETECTABLE WARNINGS AT CUT THROUGH ISLANDS SHALL BE SEPARATED BY A 24 INCH (610 MM) MINIMUM LENGTH OF WALKWAY WITHOUT WARNINGS.

EXCEPTION: DETECTABLE WARNINGS SHALL NOT BE REQUIRED ON CUT THROUGH ISLANDS WHERE THE CROSSINGS ARE CONTROLLED BY SIGNALS AND ARE TIMED FOR FULL CROSSING ON MEDIANS LESS THAN 7' WIDE.

NOTES:

1. DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION OR RECONSTRUCTION OF STREETS, CURBS, OR SIDEWALKS BY ALL PUBLIC AGENCIES AND BY ALL PRIVATE ORGANIZATIONS CONSTRUCTING FACILITIES FOR PUBLIC USE.
2. SIDEWALKS RAMPS ARE TO BE LOCATED AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
3. THE TOP OF THE JOINT FILLER FOR ALL RAMP TYPES SHALL BE FLUSH WITH THE ADJACENT CONCRETE.
4. ALL PRODUCTS USED FOR DETECTABLE WARNING SURFACES SHALL BE ON THE DEPARTMENT'S APPROVED PRODUCT LIST.



DOME ALIGNMENT

DETECTABLE WARNING SURFACES SHALL EXTEND 24" MIN. IN THE DIRECTION OF TRAVEL AND FULL WIDTH OF THE CURB RAMP, LANDING, OR TRANSITION. DOMES SHALL BE ALIGNED ON A SQUARE GRID IN THE PREDOMINANT DIRECTION OF THE CROSSWALK TO PERMIT WHEELS TO ROLL BETWEEN DOMES.

N.T.S.

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS I.A.W. CURRENT MUTCD

METRIC CONVERSIONS

0.2"	5.1 MM
0.25"	6.4 MM
0.65"	16.5 MM
0.9"	22.9 MM
1.4"	35.6 MM
1.6"	40.6 MM
2.4"	6" MM
24"	610 MM

NEW MEXICO DEPARTMENT OF TRANSPORTATION

DETECTABLE WARNING SURFACE

APPROVAL RECOMMENDED — ENGINEER — DATE

CAD 001 01/01/04 Sheet 10 of 10