DESIGN STANDARDS

AND

ENGINEERING SPECIFICATIONS

FOR ROADWAYS

APACHE COUNTY, ARIZONA

AS APPROVED AND ADOPTED BY THE

BOARD OF SUPERVISORS

ADOPTED
(March 17, 1974)

AMENDED
(February 19, 1985)

AMENDED
(June 17, 1985)

AMENDED
(April 18, 1988)

AMENDED
(Nov. 1, 2005)

APACHE COUNTY DESIGN STANDARDS
AND ENGINEERING SPECIFICATIONS
FOR ROADWAYS

SEC. 100 The County Engineer is charged with the duty of administrating all subdivision design standards and construction specifications.

SEC. 101 The purpose of these specifications is to secure adequate traffic circulation and safety through properties; to secure adequate provisions for drainage and flood control, adequate design of all roads and streets; and to promote conveyance of land by accurate legal descriptions.

SEC. 102 REFERENCE TO SUBDIVISION REGULATIONS: Refer to Apache County Subdivision Resolution for general subdivision design, engineering specifications and definitions.

SEC. 200 GENERAL STANDARDS (STREETS): The arrangement, character, extent, width, grade, and location of all streets shall conform to the master plan, with due consideration to their relation to existing and other planned streets, to topographical conditions, to surface drainage in and through subdivisions, to public convenience and safety, and appropriate relation to the proposed uses of the land to be served by such streets. Where not shown in the master plan, arrangement and other features of the streets shall:

Sec. 200.01 Provide for appropriate continuation of existing principal streets in surrounding areas where essential for circulation and access to community facilities;

Sec. 200.02 Conform to a plan for a neighborhood approved or adopted by the commission to meet a particular situation where topographical or other conditions make continuance or conformance to such principal streets impractical;

Sec. 200.03 Provide sufficient right-of-way for local service or access streets along major streets and routes, and other treatment to protect residential properties by separation of through and local traffic;

Sec. 200.04 Along a railroad right-of-way or limited access highway right-of-way, provide a parallel street at a distance suitable for appropriate use of the intervening land, such as for park purposes in residential districts or for commercial or industrial purposes in appropriate locations; such distances also to be determined with due regard for their requirements of approach grades and future grades separation;

Sec. 200.05 Avoid street jogs with centerline offsets of less than 135 feet; (See Standard C-2.)

Sec. 200.06 Have property lines at street intersections rounded with a radius of 25 feet, or of a greater radius where necessary, to allow maintenance of sight distance, provided, however, comparable cut offs or chords may be used instead of rounded corners;

Sec. 200.07 When centerlines of connecting neighborhood streets deflect from each other at any one point by more than ten (10°) degrees, connect the same by a curve with a radius of not less than 150 feet; (See Standard C-3.)

Sec. 200.08 Half-streets or partial width rights-of-way shall not be permitted;

Sec. 200.09 Include no dead-end streets designed to be so permanently or longer than 500 feet, and provide the same at the closed end with a turn-around area which has a street property line radius of at least 50 feet and returns of the same radius; (See Standard C-4.)

Sec. 200.10 Names and numbers of streets to be consistent with natural alignment and extensions of existing streets; new street names to be used which will not duplicate in whole or in part, or to be confused with existing names; all road numbers will be provided by the Engineering Department; street signs shall be installed by the developer;

Sec. 200.11 Minor streets shall be so arranged as to discourage their use by through traffic;

Sec. 200.12 Between reverse curves there shall be a tangent section of centerline not less than one hundred (100') feet long; and (See Standard C-3.)

Sec. 200.13 All streets intersecting an arterial, shall do so at a ninety (90°) degree angle; intersections of collector and minor streets shall not vary from ninety (90°) degrees by more than fifteen (15°) degrees. (See Standard C-5.)

SEC. 201 RIGHT-OF-WAY WIDTHS: Provide street right-of-way widths of not less than as follows:

Street Type	Maximum Grade	Minimum Radius of Curvature	R/W Feet
Arterial Street	6%	530 feet	100
Collector Streets	10%	150 feet	80
Minor Streets	10%	150 feet	50
Alleys	-	-	20

NOTE: Additional Right-of-Way may be required if utilities or major drainage is used in conjunction with road Right-of-Way.

SEC. 202 ALLEYS: In blocks over 800 feet in length the subdivider may be required to dedicate an alley in the center of the block.

SEC. 203 EASEMENTS: Utility easements at least 16 feet wide shall be provided across lots and on or along rear side lot lines where necessary. Any blocks over 800 feet wide shall be provided with at least one cross easement for utilities. Each cul-de-sac shall have provisions for a utility easement extending therefrom to prevent dead-end mains.

Sec. 203.01 DRAINAGE DEDICATIONS: Drainage dedications and rights-of-way shall be provided conforming substantially with the lines of any major water course, drainage way, channel or stream and such further width or construction or both, as will be adequate for the purpose. Parallel streets, or parkways may be required in connection therewith.

SEC. 204 BLOCKS: Block lengths, widths, and spaces shall be determined with due regard to:

Sec. 204.01 Provisions of sites suitable to the type of use contemplated;

Sec. 204.02 Zoning requirements as to lot sizes and dimensions;

Sec. 204.03 Need for convenient access, circulation, control and safety of street traffic;

Sec. 204.04 Limitations and opportunities of topography;

Sec. 204.05 Circulation within the tract, and access to the community facilities; and

Sec. 204.06 Lengths as long as practicable but not to exceed 1300 feet.

SEC. 205 MINIMUM SURFACED WIDTHS: Surfacing of the streets shall not be less than as follows:

STREET TYPE	**SURFACED GRAVEL WIDTH**	**SHOULDER WIDTH**
Arterial Street	30 feet	2'
Collector Streets	28 feet	2'
Minor Streets	24 feet	2'
Alleys	16 feet	–

SEC. 206 MAXIMUM GRADE AT INTERSECTIONS: Maximum grade shall not be more than 2-3% for a minimum of 100 feet each side of intersections measured from the right-of-way line. (See Standard C-6.)

SEC. 207 DESIGN REPORT: An Engineering Roadway Design Report will be required with the preliminary plot plan and/or with the construction plans. The roadway design will be based on the following items.

1. A thorough survey of soil conditions shall be made. Test samples shall be taken along street lines, particularly where poor sub-grade conditions appear probable.

2. Sub-grade evaluations, with a gradation and P.I. Report.

3. Base aggregate material evaluation with a gradation and P.I. Report.

SEC. 208 REVISIONS TO PLANS: Any proposed revisions to the construction plans after County Engineer approval shall be submitted to the County Engineer in writing and with appropriate plans for consideration. No changes shall be made in the approved plans without the approval of the County Engineer. Any work completed which does not conform to the specifications or approved plans shall not be acceptable and shall be rejected.

SEC. 209 TEST REPORTS: Two copies of all laboratory tests and reports taken by an independent laboratory or engineer shall be submitted directly to the County Engineering Office, PO Box 238, St. Johns, AZ 85936, by the party conducting the investigation.

Unless otherwise specified, all tests shall be performed in accordance with the methods in use by the Arizona Department of Transportation or by nationally recognized testing organizations. Test reports shall be approved by the County Engineer before any additional work can proceed. Testing shall include those tests required by the County Engineer and in general may include the following:

1. Report specifying the optimum moisture content for compaction of sub-grade and base material.

2. Report verifying sub-grade compaction and minimum depth requirement of compacted sub-grade. A minimum of three (3) tests per mile or two (2) per street, whichever is greater shall be taken.

3. Report verifying that the base aggregate material is the same or equal to the base material set forth in the design criteria and that it complies with the requirements of the design report. Random samples or inspection of material as hauled to site will be required.

4. Report verifying the base material depth and compaction. A minimum of three (3) tests per mile or two (2) per street whichever is greater shall be taken.

SEC. 210 COST OF TESTING: The cost of all sampling and testing shall be borne by the subdivider or his authorized agent. Construction that does not meet the requirements of Apache County Subdivision Regulations and/or Construction Specifications are the subdivider's responsibility and will not be acceptable for County maintenance.

SEC. 211 DRAINAGE DESIGN CRITERIA: The minimum design storm for all improvements will be 25 years. This will include all new road construction as part of new subdivisions, Planned Unit Developments, and independent road construction.

Sec. 211.01 The classification and design of drainage ways and designation of design storm frequencies are based upon the Road Level Classification as follows:

Road Level	**Traffic Volume**	**Design Storm(Years)**
Minor-Local	0-250	25
Collector	250-500	25
Minor Arterial	500-1000	50
Major Arterial	1000+	50

Sec. 211.02 Drainage-way, channels, and road crossings shall be capable of safely passing lows resulting from the required Design Storm over the contributing drainage area.

Sec. 211.03 Inverted crowns, or similar street designs, that would cause the traveled roadway to function as a drainage channel shall not be permitted.

Sec. 211.04 Channel flow velocities for design storms shall not exceed that generally accepted as "non-erodible" for the type of soil and/or channel lining.

Sec. 211.05 All overflow, dip and valley gutter sections to be stabilized with cement or asphalt to prevent erosion and to maintain a stable roadbed under overflow conditions.

Sec. 211.06 Banks, slopes of channels and roadbeds are to be protected or stabilized at all locations where changes in direction of channel flows can result in excessive erosion or scour.

Sec. 211.07 Adjustments and modifications of these criteria will be considered, on a project basis, for road development in floodplains, or other similar areas with major or unusual drainage problems.

Sec. 211.08 Drainage ways, drainage easements, and channels shall be capable of safely passing flows resulting from a storm having a reoccurrence interval of 50 years whenever such drainage way, drainage easement, or channel shall be located at a place other than its natural water course.

Sec. 211.09 At the discretion of the County Engineer, a certified letter from a Registered Engineer showing size of drainage area, size, gauge and type of culvert and where inlet and outlet protection necessary to protect the roadway will be required. The drainage area culverts may be sized according to the rational method, the Arizona Department of Transportation or any other nationally approved method.

Sec. 211.10 The minimum size pipe shall not be less than eighteen (18") inches in diameter.

ROAD CONSTRUCTION REQUIREMENTS

SEC. 300 CLEARING AND GRUBBING: Clearing and grubbing shall consist of removing objectionable matter from the street roadway prism. No objectionable materials will be allowed in the roadway fill.

Cavities left below sub-grade elevation by removal of stumps, rock and other material, shall be carefully backfilled and compacted with a suitable material to a minimum of ninety (90%) percent of maximum density. All trees greater than six (6") inches in diameter can be cut off twenty-four (24") inches below sub-grade.

All debris removed in clearing and grubbing shall be removed and disposed of in the proper manner to the satisfaction of the County Engineer.

SEC. 301 EMBANKMENT

Sec. 301.01 Embankment material shall be approved in advance by the County Engineer. Leaves, grass, roots, stumps and other vegetable matter are not acceptable embankment material.

Sec. 301.02 Where the ground surface on which embankments are to be placed is in a loose, uncompacted condition the ground surface shall be compacted to ninety (90%) percent of maximum density, based on a standard proctor test.

Sec. 301.03 Embankment of earth material shall be placed in horizontal layers not exceeding eight (8") inches in loose measurement and shall be compacted as specified before the next layer is placed. Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compacting. As the compaction of each layer progresses, continuous leveling and manipulating shall be required to insure uniform density.

Sec. 301.04 Embankment, constructed in layers of the depths specified herein, shall be compacted by means of rollers, hauling equipment, mechanical tamping and vibrating equipment or by other suitable means. Equipment shall be routed to distribute travel over the entire area of each layer of material, insofar as is practicable, and separate pieces of equipment shall not follow in the immediate tracks of preceding equipment.

Sec. 301.05 Embankment material shall be compacted to a density of not less than ninety (90%) percent of maximum density.

Sec. 301.06 When the embankment material is composed predominately of rock such that compaction control procedures will not indicate the density achieved, the engineer will determine the amount of compaction required and the adequacy of equipment used in obtaining the required compaction.

SEC. 302 BORROW: Borrow to be used on roadways in the subdivision must come from approved borrow pits that are located such that they will not degrade in any way the appearance of the subdivision. There are not to be any borrow

areas located inside the roadway right-of-way unless approved by the County Engineer. All cut sections are to be dressed as shown in the typical section sheet and are not to be widened to provide extra borrow unless approved by the County Engineer. All borrow pits are to be approved by the County Engineer prior to the removal of any material.

SEC. 303 SUB-GRADE: The sub-grade of the street shall be thoroughly compacted to a depth of not less than six (6") inches and a minimum of ninety-five (95%) percent of maximum density. In fill areas, fill shall be constructed on eight (8") inch layers and each layer compacted to ninety-five (95%) percent. See Section 209 for Compaction Reports.

All soft and unstable materials and other portions of the sub-grade that will not compact readily shall be removed as directed. All boulders of ledge rock appearing in the sub-grade shall be broken off, or removed, to an elevation equal to or below finished sub-grade elevation. The resulting low areas shall be filled with approved material and compacted to a minimum of ninety-five (95%) percent.

SEC. 304 SELECT BASE MATERIAL: Select material shall be sand and gravel, crushed rock and/or decomposed granite with enough binder material so that it can be tightly compacted and shall have a plasticity index not in excess of ten (10) and shall conform to gradation as required by the County Engineer or as shown on the following table:

SIEVE SIZE	**PERCENT PASSING**
4" inch (slotted)	100
¼" inch	30-75
No. 200	0-15

Select material shall be placed in uniform layers not to exceed eight (8") inches in depth. Each layer shall be bladed to a smooth surface conforming to the cross section shown on the plans satisfactory to obtain a minimum compaction of ninety-five (95%) percent of maximum density, based on a standard proctor.

Any laboratory reports showing gradation and plasticity index shall be submitted to the office of the County Engineer.

The depth of select base required shall be established after analysis of the sub-grade soil and shall be in accordance with the chart attached, or as approved by the County Engineer. (See Standard C-1)

SEC. 305 AGGREGATE BASE COURSE: The base material shall be sand and gravel, crushed rock and/or decomposed granite with a minimum of thirty (30%) percent crushed faces and with enough binder material so that it can be tightly compacted and shall have a plasticity index not in excess of six (6) and shall conform to gradation as required by the County Engineer and shown on the following table:

SIEVE SIZE	**PERCENT PASSING**
1½" inch	100
¾" inch	65-90
No. 4 Sieve	30-90
No. 40 Sieve	12-30
No. 200 Sieve	3-12

Base material shall be placed in uniform layers not to exceed six (6") inches in depth. Each layer shall be bladed to a smooth surface conforming to the cross section shown on the plans and shall be watered and thoroughly rolled in a manner satisfactory to obtain a minimum compaction of ninety-five (95%) percent maximum density, based on a standard proctor. Any laboratory reports showing gradation and plasticity index shall be submitted to the office of the County Engineer.

The depth of the base material required shall be established after analysis of the sub-grade soil and shall be in accordance with the chart attached, or as approved by the County Engineer. (See Standard C-1)

Cinder material may be used as select base material as described in Section 304.

No cinder material may be used per this section as aggregate base-course material. The depth of the base material required shall be established after analysis of the proposed base material and shall be in accordance with the chart attached or as approved by the County Engineer. (See Standard C-1)

SEC. 306 DRAINAGE STRUCTURES: Drainage structures are to be installed in the following manner:

Sec. 306.01 A minimum cover of twelve (12") inches will be required over the top of all structures except concrete.

Sec. 306.02 All pipe is to be properly sloped for drainage, material placed around the pipe is to be watered and hand packed.

Sec. 306.03 All material placed around the pipe is to be a select material and is to be watered and hand compacted to ninety-five (95%) percent density.

Sec. 306.04 Corrugated metal pipe shall be installed in reasonably close conformity to the lines, grades and dimensions established or shown on the plans.

The width of any trench in which the pipe is placed shall be sufficient to permit thorough tamping of the backfill under the haunches and around the pipe. The pipe shall be firmly and uniformly bedded in the trench with the separate sections firmly jointed together and with outside laps of circumferential joints pointing up stream and with longitudinal laps on the sides.

SEC. 307 CATTLE GUARDS: Steel and concrete cattle guards with gates shall be placed by the subdivider at all fence lines on access roads entering the subdivision. Cattle guards shall not be required if back fencing exists or if it is otherwise demonstrated by the developer there is no need for a cattle guard. Final judgement is at the discretion of the County.

Amended 6/17/85

SEC. 308 APPROVALS: Subdivider shall obtain necessary approval from the proper authorities for any turn-outs to or from State or Federal Highways.

SEC. 309 INSPECTIONS: Inspections shall be made as follows:

Sec. 309.01 The developer or contractor shall notify the County Engineer for the following inspections at least one week prior to inspection.

Sec. 309.02 Preliminary Inspection- After sub-grade and drainage structures are in place, but before any aggregate base has been applied.

Sec. 309.03 Final Inspection- After aggregate base has been completed and surfacing is in place ready for use.

Sec. 309.04 It will be the responsibility of the subdivider to directly supervise at all times all construction on the roadways in the subdivision and it will be the responsibility of the subdivider to set control stakes as required to make certain that all design features, such as location of drainage structures, roadway widths, roadway grades, thicknesses of roadway materials, etc., are followed exactly as approved for this subdivision and that the roadway is located in the center of the roadway right-of-way unless approved otherwise by the County Engineer, and that all work is finished in a business-like manner.

Sec. 309.05 The costs of all inspections by county officials shall be borne by developer and/or the contractor and will be billed at cost by the county for inspection.

SEC. 310 ACCEPTANCE OF STREETS: Subdivision streets will be accepted for maintenance by Apache County only when they meet, or exceed the requirements of the minimum standards as set forth in these specifications and the Apache County Subdivision Regulations and have been recommended in writing by the County Engineer and approved by the Board of Supervisors.

SEC. 311 ENFORCEMENT: The Subdivision Improvement Design and Engineering Specifications shall be enforced in accordance with the provisions of Section XI of the Subdivision Resolution.

SEC. 400 THE FOLLOWING STANDARDS WILL NOT BE REQUIRED BY APACHE COUNTY. HOWEVER, WHEN THE SUBDIVIDER AT HIS OPTION INTENDS TO USE ANY OF THE FOLLOWING ITEMS, COMPLIANCE TO THESE STANDARDS WILL BE REQUIRED FOR ACCEPTANCE BY APACHE COUNTY.

SEC. 401 MINIMUM SURFACED PAVING WIDTH: Paving of the streets shall not be less than as follows:

STREET TYPE	**PAVED WIDTHS**	**SHOULDERS**
Arterial Streets	28 Feet	2'-6'
Collector Streets	26 Feet	2'-6'
Minor Streets	24 Feet	2'-6'

SEC. 402 SOIL CEMENT: Soil cement may be used for a roadway base when the following minimum requirements have been or will be adhered to.

The minimum depth of soil cement base that will be acceptable to Apache County is a full four (4") inches with a tack coat applied after the soil cement base has properly cured and the surface thoroughly cleaned. A minimum of one and one-half (1½") inches of road mix will then be placed over the tack coat, with said road mix being sealed with an emulsion and rock chips.

A predetermined schedule of testing and proposed field controls shall be submitted to the Apache County Engineer. A laboratory test of the particular soils must be made to determine adequate cement content and a copy submitted to the Apache County Engineer. In addition, qualified personnel from either County forces, Consultant Engineers or commercial laboratories shall be at the construction site prior to and during the construction period to ensure proper field control and adherence to sound construction practices.

The specifications and data concerning soil cement submitted to the County Engineer may be, at the County Engineer's request, submitted to the Portland Cement Association for review and comment.

SEC. 403 CONCRETE PAVING: Concrete may be used for streets when the following requirements have been or will be adhered to.

A minimum of five (5") inches of poured concrete will be accepted to Apache County.

Drawings, specifications and laboratory reports will be submitted to the Apache County Engineer for approval. The drawings will include the spacing and type of joints, with details, to be used in the concrete pavement, along with a typical section.

All transverse joints must extend continuously across pavement, except tied transverse construction joints. Extension joints will not be required except at structures or as shown on plans.

Maximum transverse joint spacing shall be accordance with the following table:

MAXIMUM SPACING IN FEET	TYPE OF COURSE AGGREGATE
25	Crushed Granite
20	Crushed Limestone
20	Calcareous Gravel
15	Siliceous Gravel
15	Gravel smaller than ¾"
15	Slag

All soft and yielding material and other portions of the sub-grade which will not compact readily when rolled or tamped shall be removed as directed and replaced with suitable material and compacted.

The sub-grade shall be thoroughly compacted with suitable equipment so as to have uniform density and moisture contents of not less than standard optimum (AASHTO T98).

All excavated trenches and structures shall be backfilled to natural or finished grade as soon as conditions permit. All backfill shall be compacted with mechanical tampers in layers of not over six (6") inches loose material. In order to prevent differential heave the backfill material shall be the same material as that of the sub-grade adjacent to the trench.

The minimum cement content shall not be less than 6.0 sacks (94 lbs per sack) per cubic yard of concrete. The maximum size aggregate shall not exceed ¼" of slab thickness. The maximum slump shall not exceed three (3") inches. All concrete shall be air entrained in accordance with the following table.

MAXIMUM SIZE OF COURSE AGGREGATE INCHES	AIR CONTENT PERCENT BY VOLUME
1½ - 2	5 ± 1
¾ - 1	6 ± 1
3/8 - ½	7½ ± 1

The above cement pavement requirements are minimum standards only and shall be verified by laboratory reports from recognized commercial laboratories.

Plans and specifications submitted to Apache County may be, at the County Engineer's request, submitted to the Portland Cement Association for review and comment.

SEC. 404 HOT MIXED ASPHALT: Hot Mixed Asphalt (HMA) will adhere to the specifications found in the Arizona Department of Transportation Standard Specification fro Road and Bridge Construction 2000 section 409 and all applicable sections in conjunction therewith.

SEC. 405 MINERAL AGGREGATE: The compacted depth of the bituminous mix required for surfacing shall not be less than two (2") inches. (Minimum of 1½" compacted depth acceptable for soil cement.) The aggregate shall be sand and gravel or crushed rock (not decomposed granite or cinders,) and shall conform to gradations as required by the Apache County Engineer and shown on the table below:

SIEVE SIZE SQ. OPENING	PERCENT PASSING
1 Inch	100
¾ Inch	90-100
No. 8	40-75
No. 200	0-75

Plasticity index not to exceed five (5). Sufficient representative samples of the mineral aggregate shall be taken to reasonably determine uniform gradation for a proper mix. Laboratory reports showing gradation and the plasticity index shall be submitted to the office of the County Engineer.

SEC. 406 BITUMINOUS OIL MIX: Bituminous material satisfactory to the County Engineer (MC 250, penetration Asphalt 120-150 or SMS-25 or SH-10 or equivalent) shall be used at the rate specified by the laboratory in its mix design, a copy of which shall be submitted to the County Engineer. Bituminous oil shall be applied at a heated temperature as recommended by the laboratory or the oil distributor. Material shall be thoroughly mixed to provide a uniform coating and adequate cementation and stability. Mixing may be by field or plant methods. All emulsion mixes shall be plant mixed. After spreading the surface shall be rolled with a roller weighing not less than five (5) tons.

SEC. 407 B.S.T.: Bituminous material satisfactory to the County Engineer shall be used (MC 250 or CMS-25, SH-10 or equivalent) at a rate of not less than 0.40 gallons per square yard and no more than 0.60 gallons per square yard. The specific rate of application shall be determined by the County Engineer.

Penetration shall be applied at a heated temperature as recommended by the laboratory or the oil distributor.

Blotting shall be done wherever and whenever necessary with a material specified by the County Engineer. All excess blotter material shall be swept away and surface of the bituminous roadway shall be reasonably clean and free of all loose material before the seal coat may be applied. No penetration surfacing will be acceptable to Apache County unless prior written approval has been given by the Apache County Engineer.

SEC. 408 SEAL COAT: The seal coat shall consist of emulsified asphalt (or equivalent) applied at the rate of 0.25 to 0.35 gallons per square yard and d" chip cover aggregate. Emulsified asphalt shall be applied to the surface of the road in the opinion of the Engineer, such that will permit satisfactory adhesion to the asphalt base.

Seal coat shall be required at a heated temperature as recommended by the laboratory or the oil distributor.

A seal coat will be required on all street paving projects.

SEC. 409 COVER MATERIAL: The cover material shall conform to the following gradation and shall be non-plastic.

	PERCENT BY WEIGHT PASSING SIEVES		
SIEVE SIZE	**Type B**	**Type C**	**Type E**
3/8" Inch	100	100	100
¼" Inch	65-100	65-100	65-100
No. 10	0-15	0-20	5-30
No. 40	0-5	0-5	0-7
No. 200	0-2	0-2	0-2

For Type B cover material, a minimum of 30% by weight of the material retained on the No. 10 Sieve shall have at least one rough angular face produced by crushing.

For Type C cover material, a minimum of 85% by weight of the material retained on the No. 10 Sieve shall have at least one rough angular face produced by crushing.

For Type E cover material, a minimum of 85% by weight of the material retained on the No. 10 Sieve shall have all surfaces which are rough and angular and have been produced by crushing.

The type used shall be specified by the County Engineer.

Cover material shall be produced from clean, hard gravel or rock, and shall be applied at the rate of twenty (20) pounds per square yard. Following the spreading of the cover material, the surface shall be rolled with a tandem powered and/or pneumatic tired roller. After curing all loose chips shall be swept and removed from the paved roadway.

SEC. 410 TURNOUTS: Construction for existing turnouts will be provided for during construction of the road and to the same standards. Said turnouts construction shall be of sufficient size as to protect the road shoulder and shall be designed as per Arizona Department of Transportation requirements as shown on their roadway Construction Standards. Culverts shall be placed under turnouts if necessary.

The above cement pavement requirements are minimum standards only and shall be verified by laboratory reports from recognized commercial laboratories.

Plans and specifications submitted to Apache County may be, at the County Engineer's request, submitted to the Portland Cement Association for review and comment.

SEC. 411 CURBS AND GUTTERS: If curbs and gutters are to be installed, a detailed cross section of the proposed curb and gutter is to be submitted to the County Engineer for approval before construction. (See Cross Section attached.)

Curbs and gutters shall be constructed of Class A Portland Cement Concrete, properly formed, true to alignment and grade and given a workmanlike finish.

Expansion joints, consisting of one-half (½) inch thick per-formed fillers of approved type, shall be installed at the end of all returns and at intervals not exceeding twenty-five (25') feet.