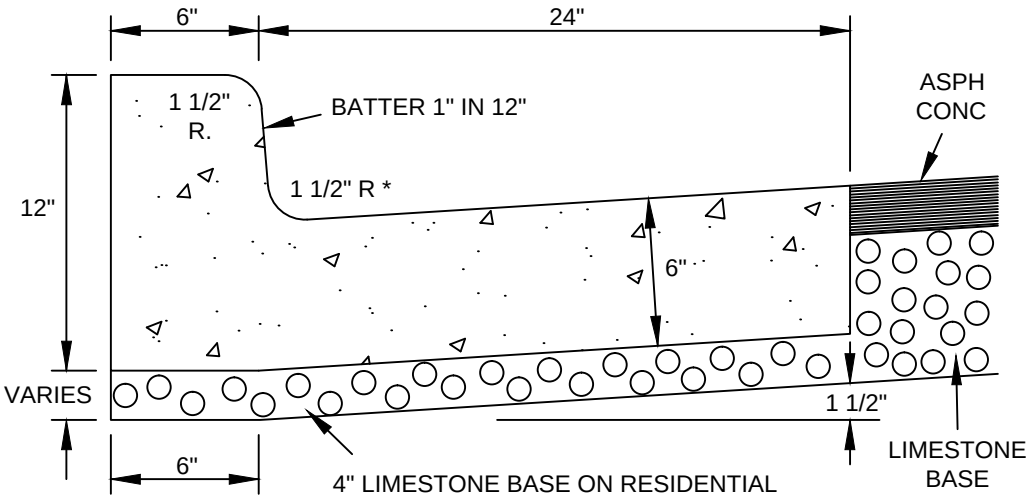
DIVISION 3000

CONCRETE

* = OPTIONAL WITH APPROVAL BY CITY ENGINEER.



4" LIMESTONE BASE ON RESIDENTIAL
& COLLECTOR STREETS.
6" LIMESTONE BASE ON ARTERIAL STREETS

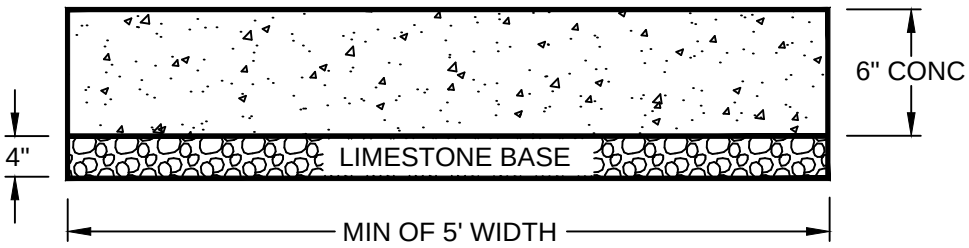
NOTES:

1. CONSTRUCT EXPANSION JOINTS AT THE START & END OF EVERY DRIVEWAY & CURB INLET.
2. CONSTRUCT CONTRACTION JOINTS EVERY 10' MAXIMUM.
3. JOINT MATERIAL TO EXTEND THRU C & G, FRONT TO BACK, & NEATLY TRIMMED TO MATCH C0NC SURFACE.
4. FLOAT GROUT TO SURFACE ON EXPOSED SURFACES.
5. ALL POURED CONCRETE SHALL BE CLASS 'B1'.

STD UPRIGHT C & G

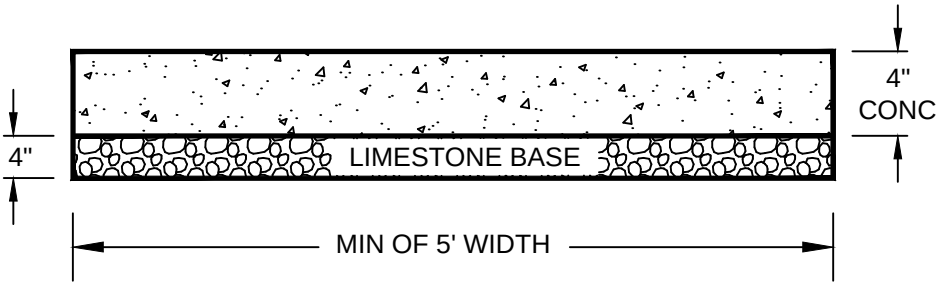
N.T.S.

CITY OF Joplin	CITY OF JOPLIN, MO	CKD BY: SALISBURY	PROJECT
	PUBLIC WORKS DEPT	DATE: 1/2017	STD UPRIGHT CURB & GUTTER
	ENGINEERING DIVISION	ENGINEER: HEATHERLY	
	602 S MAIN ST 64801	FILE: CURBDET	



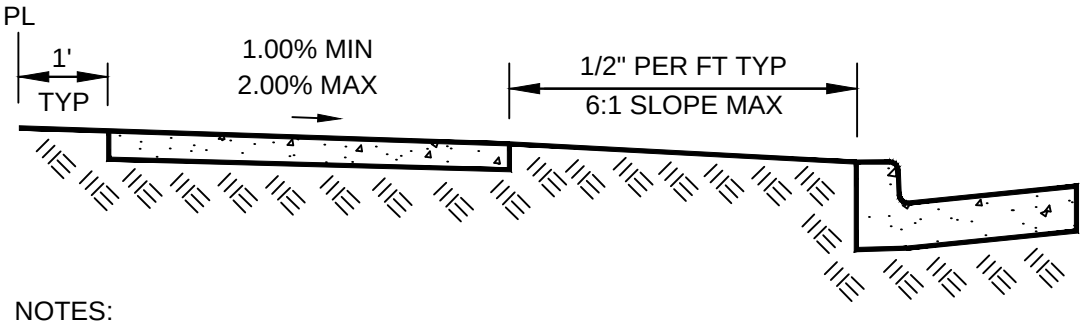
CLASS 'B1' CONC
SIDEWALK (BUSINESS)

NTS



CLASS 'B1' CONC
SIDEWALK (RESIDENTIAL)

NTS



NOTES:

1. CONSTRUCT EXPANSION JOINTS EVERY 30' MAXIMUM & CONTRACTION JOINTS EVERY 10' MAXIMUM.
2. USE CLASS 'B1' CONCRETE.
3. REINFORCEMENT IS OPTIONAL.
4. CROSS SLOPE OF WALK & DIRT BACKSLOPE CAN SLOPE AWAY FROM CURB IN FILL.

CITY OF Joplin	CITY OF JOPLIN, MISSOURI	CKD BY: SALISBURY	PROJECT
	DEPT OF PUBLIC WORKS	DATE: 1/2017	CONC
	DIVISION OF ENGINEERING	ENGINEER: HEATHERLY	SIDEWALK DETAILS
	602 S MAIN ST 64801	FILE: SIDEWALK	

LEGEND:

Ⓒ PERMISSIBLE CONSTRUCTION JOINT. IF CONSTRUCTED IN THIS MANNER TIE BARS MUST BE USED.

Ⓓ #4 TIE BAR AT 24" CENTERS. LENGTH OF THE TIE BARS EQUALS THICKNESS OF PAVEMENT PLUS HEIGHT OF CURB, LESS 3".

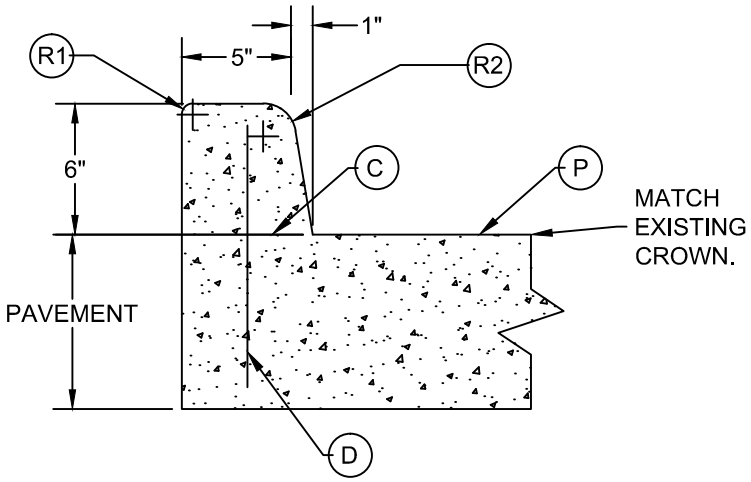
Ⓟ TOP OF PAVEMENT OR CONCRETE BASE.

Ⓡ1 ROUND TO 1/2" RADIUS. (EXCEPT FOR SAWED JOINTS)

Ⓡ2 ROUND TO 1 1/2" RADIUS.

TYPE A INTEGRAL CURB

NOT TO SCALE

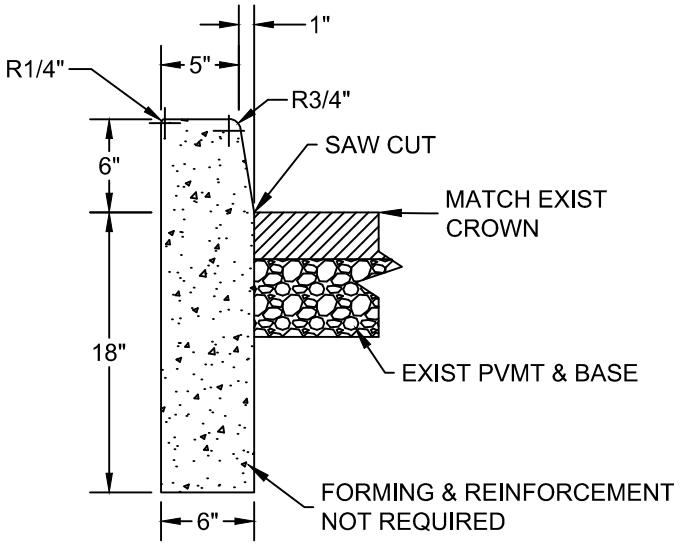


NOTES:

1. ALL POURED CONCRETE SHALL BE REINFORCED CLASS "B1".
2. STEEL REINFORCEMENT IN PAVEMENT SLAB IS OPTIONAL.
3. BID PRICE FOR ALL CURB & PAVEMENT SHALL INCLUDE ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONSTRUCT CURB & PAVEMENT.

TYPE S CONCRETE CURB

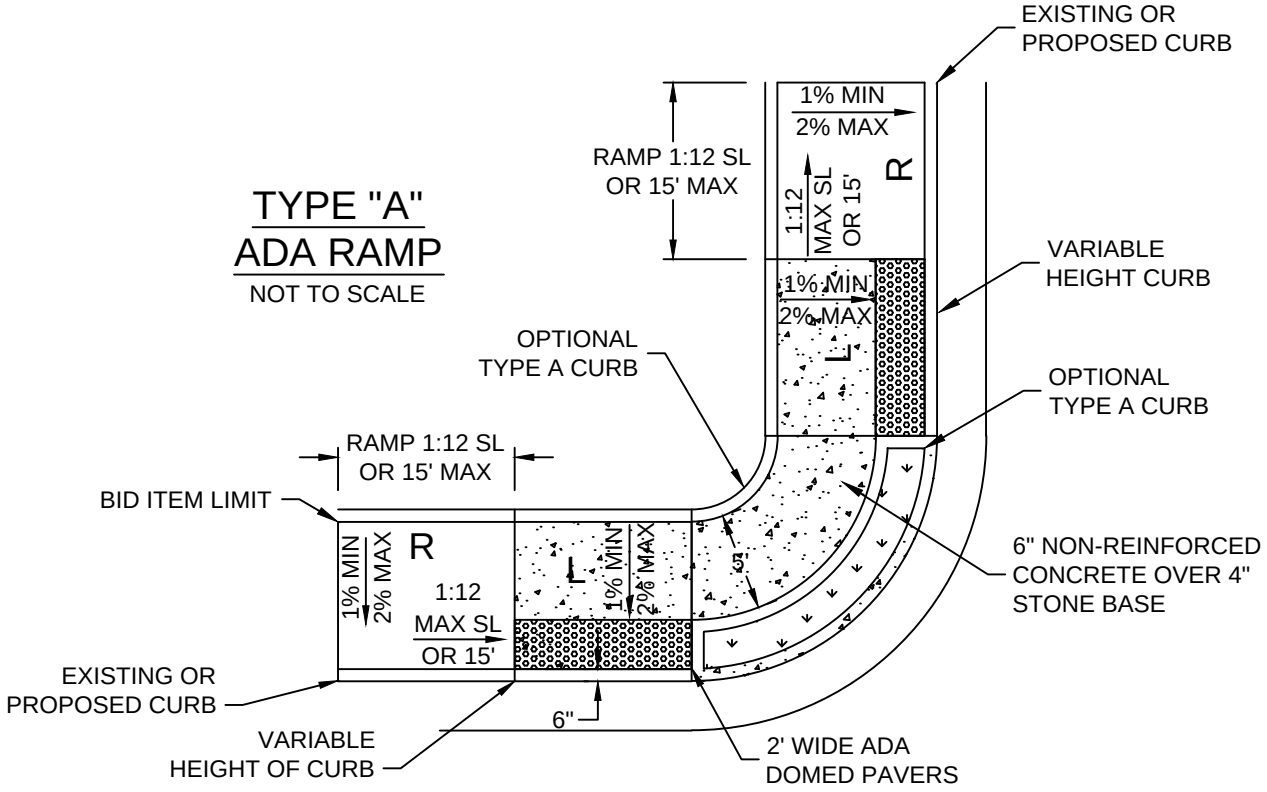
NOT TO SCALE



CITY OF Joplin	CITY OF JOPLIN, MO	CKD BY: SALISBURY	PROJECT
	PUBLIC WORKS DEPT	DATE: 1/2017	TYPE "A" & TYPE "S" CURB
	ENGINEERING DIVISION	ENGINEER: HEATHERLY	
	602 S MAIN ST 64801	FILE: TYPEA&SCURB	

TYPE "A" ADA RAMP

NOT TO SCALE



NOTES:

1. ALL GUTTER CONSTRUCTED IN FRONT OF RAMP & ALL CURB & GUTTER IN RAMP TRANSITIONS SHALL BE INCLUDED IN THE BID PRICE OF THE CURB & GUTTER.
2. BID PRICE FOR ALL RAMPS SHALL INCLUDE ALL EXCAVATION, LABOR & MATERIALS REQUIRED TO CONSTRUCTED RAMP.
3. ALL POURED CONCRETE SHALL BE FIBER REINFORCED CLASS "B1".
4. RAMP WIDTH MAY BE REDUCED TO 4' WITH APPROVAL OF THE ENGINEER.
5. TYPE A CURB & ADA DOMED PAVERS SHALL BE INCLUDED IN PRICE OF RAMP.
6. CROSS SLOPE OF LANDING AREAS DO NOT EXCEED 2% IN ANY DIRECTION.

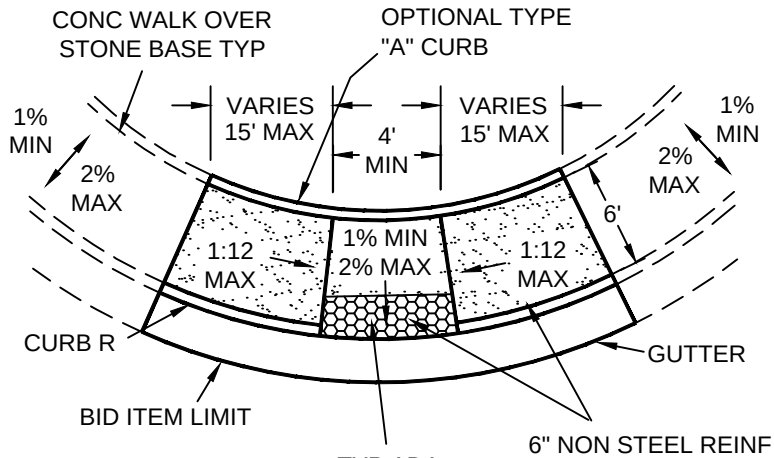
CITY OF Joplin	CITY OF JOPLIN, MO	CKD BY: SALISBURY	PROJECT
	PUBLIC WORKS DEPT	DATE: 1/2017	TYPE "A" ADA RAMP
	ENGINEERING DIVISION	ENGINEER: HEATHERLY	
	602 S MAIN ST 64801	FILE: TYPE A ADA RAMP	

NOTES:

1. ALL GUTTER CONST IN FRONT OF RAMP & ALL C&G IN RAMP TRANSITIONS SHALL BE INCL IN THE BID PRICE OF THE C&G.
2. BID PRICE FOR ALL RAMPS SHALL INCL ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONST RAMP.
3. ALL POURED CONCRETE SHALL BE CLASS 'B1' FIBER REINFORCED.

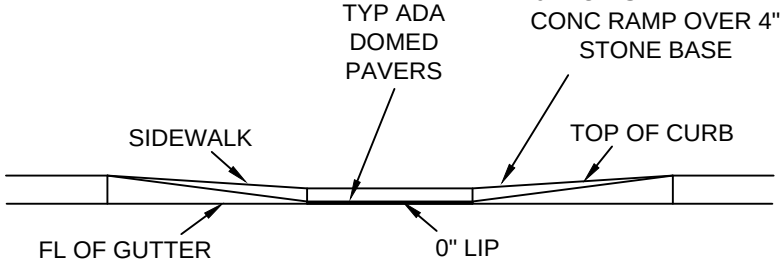
TYPE 'B' ADA RAMPS

N.T.S.



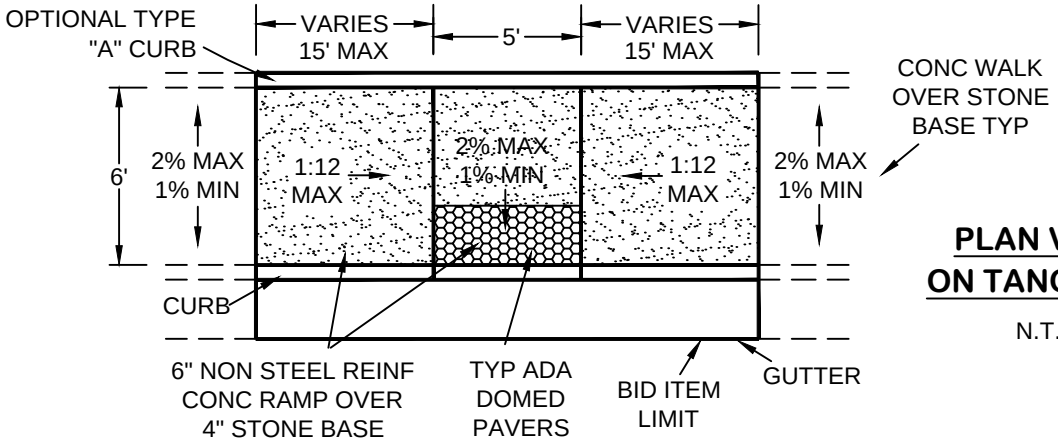
PLAN VIEW AT CORNERS

N.T.S.



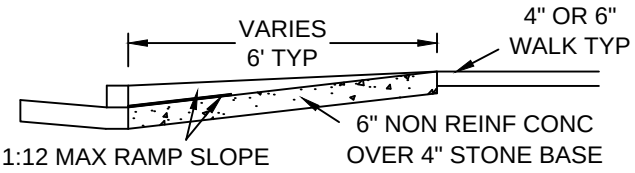
SECTION

N.T.S.



PLAN VIEW ON TANGENTS

N.T.S.



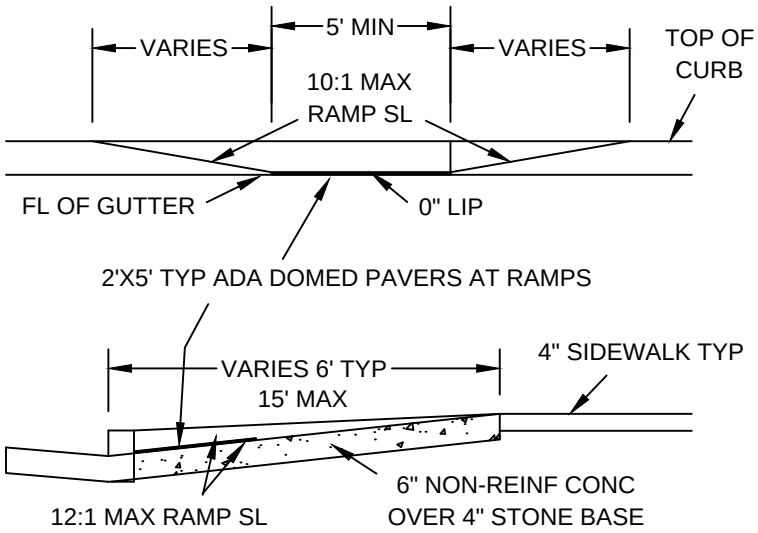
SECTION

N.T.S.

CITY OF Joplin	CITY OF JOPLIN, MO	CKD BY: SALISBURY	PROJECT
	PUBLIC WORKS DEPT	DATE: 1/2017	**TYPE 'B' ADA RAMP**
	ENGINEERING DIVISION	ENGINEER: HEATHERLY	
	602 S MAIN ST 64801	FILE: TYPEBADARAMP	

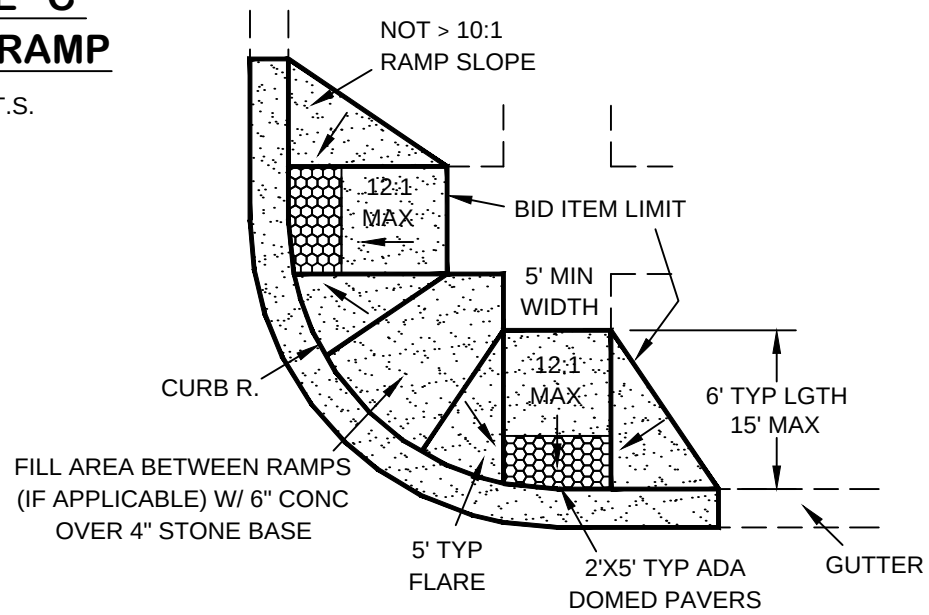
NOTES:

1. ALL GUTTER CONST IN FRONT OF RAMP & ALL C&G IN RAMP TRANSITIONS SHALL BE INCL IN THE BID PRICE OF THE C&G.
2. BID PRICE FOR ALL RAMPS SHALL INCL ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONST RAMP.
3. ALL POURED CONC SHALL BE CLASS 'B1' FIBER REINFORCED.



TYPE 'C' ADA RAMP

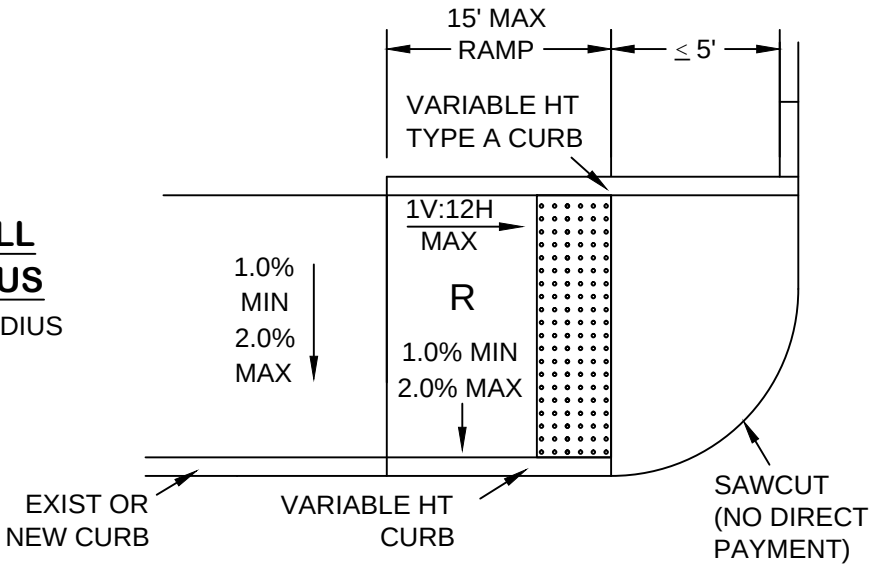
N.T.S.



CITY OF Joplin	CITY OF JOPLIN, MO PUBLIC WORKS DEPT ENGINEERING DIVISION 602 S MAIN ST 64801	CKD BY: SALISBURY DATE: 1/2017 ENGINEER: HEATHERLY FILE: TYPECADARAMP	PROJECT **TYPE 'C' ADA RAMP**

SMALL RADIUS

< 15' RADIUS



TYPE 'D' ADA RAMP

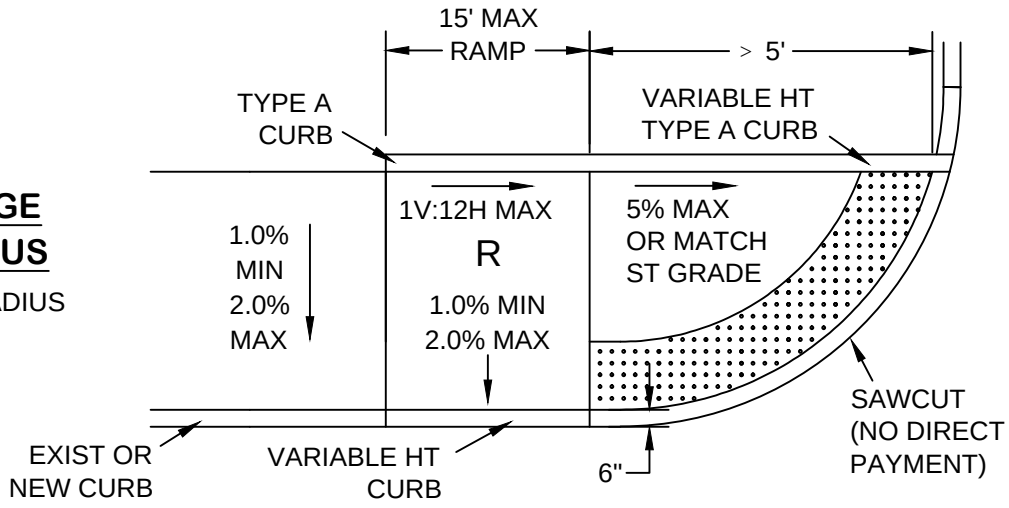
N.T.S.

NOTES:

1. BID PRICE FOR ALL RAMPS SHALL INCLUDE ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONSTRUCT RAMP.
2. ALL POURED CONCRETE SHALL BE CLASS 'B1', 4" THICK, & FIBER REINFORCED WITH 4" COMPACTED STONE BASE.
3. DETECTABLE WARNING DEVICES REQUIRED AT PUBLIC STREET & SIGNALIZED ENTRANCES.
4. RAMP WIDTH MAY BE REDUCED TO 4' WITH APPROVAL OF THE ENGINEER.

LARGE RADIUS

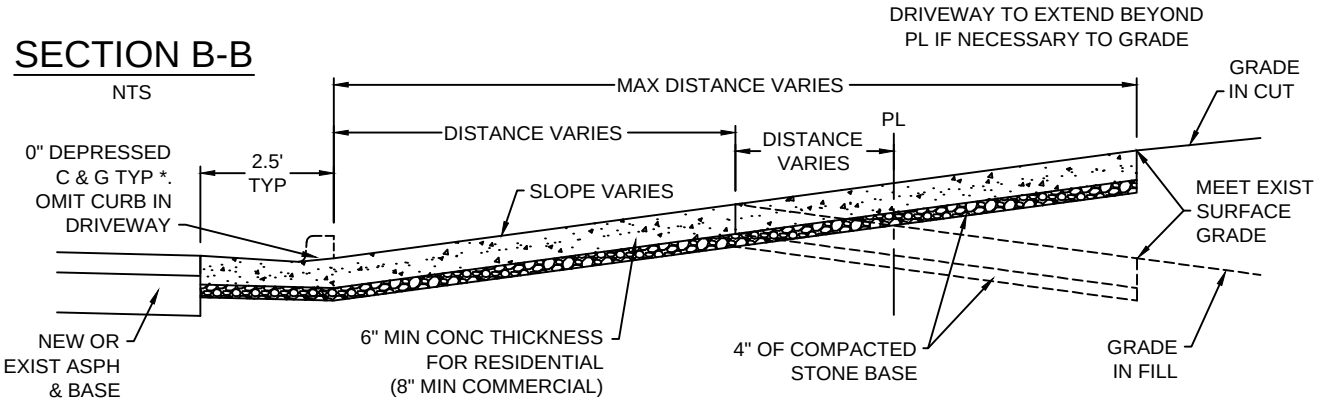
≥ 15' RADIUS



CITY OF Joplin	CITY OF JOPLIN, MO PUBLIC WORKS DEPT ENGINEERING DIVISION 602 S MAIN ST 64801	CKD BY: SALISBURY DATE: 1/2017 ENGINEER: HEATHERLY FILE: TYPEDADARAMP	PROJECT **TYPE 'D' ADA RAMP**

SECTION B-B

NTS

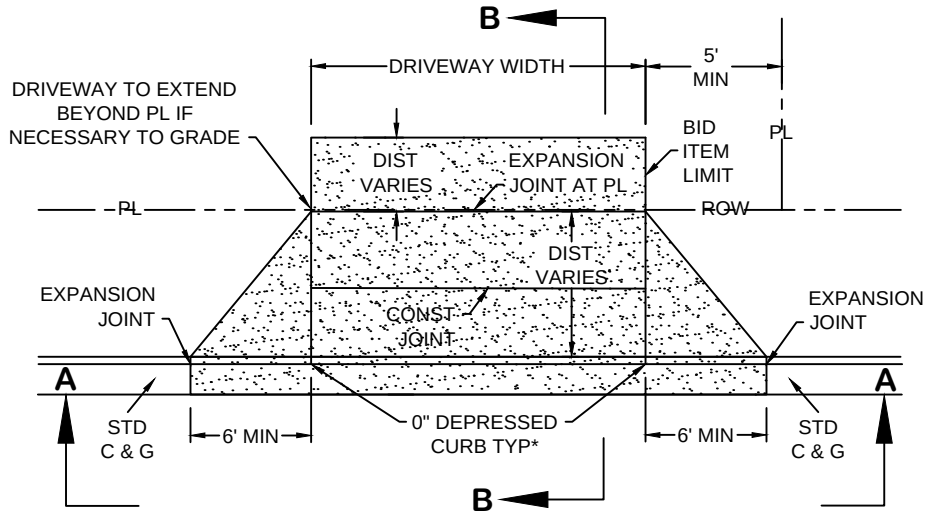


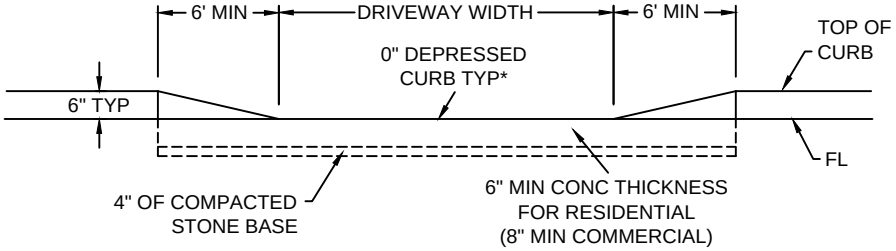
NOTES:

1. ALL POURED CONCRETE SHALL BE CLASS 'B1'.
2. STEEL REINFORCEMENT IS NOT ALLOWED.
3. ALL GUTTER CONST IN FRONT OF DRIVEWAY & ALL C & G IN DRIVEWAY TRANSITIONS SHALL BE INCLUDED IN THE BID PRICE OF THE DRIVEWAY.
4. BID PRICE FOR ALL DRIVEWAYS SHALL INCLUDE ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONSTRUCT DRIVEWAY.
5. * = 1.5" DEPRESSED CURB ALLOWED WHEN NEEDED FOR DRAINAGE OR SIDEWALK GRADE.
6. 5' INCREMENTS FOR GRADE CHANGES IN DRIVEWAY ARE ALLOWED TO MEET EXIST GRADE.
7. ALGEBRAIC DIFFERENCE AT GRADE CHANGES ARE NOT TO EXCEED 13%.
8. EXPANSION JOINTS SHALL BE CONSTRUCTED NEAR PROPERTY LINE & THROUGH C & G ADJACENT TO DRIVEWAY.
9. OPTIONAL CONSTRUCTION JOINTS MAY BE USED AT GRADE CHANGES IN DRIVEWAY.

PLAN VIEW

NTS





SECTION A-A

NTS

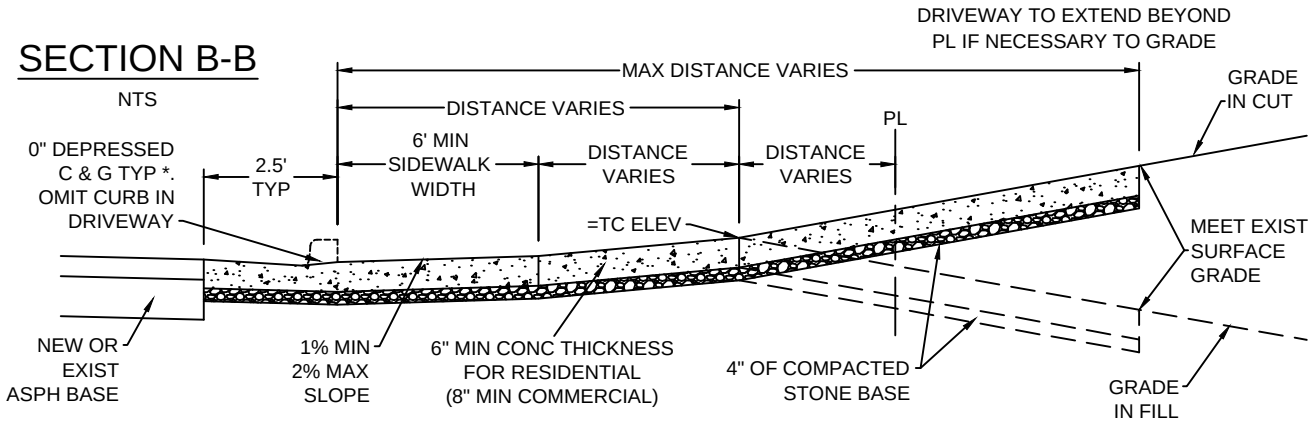
CITY OF JOPLIN	CITY OF JOPLIN, MO	CKD BY:	SALISBURY
	PUBLIC WORKS DEPT	DATE:	1/2017
	ENGINEERING DIVISION	ENGINEER:	HEATHERLY
	602 S MAIN ST 64801	FILE:	TYPEADRIVE

PROJECT

DRIVEWAY WITH NO SIDEWALK

SECTION B-B

NTS

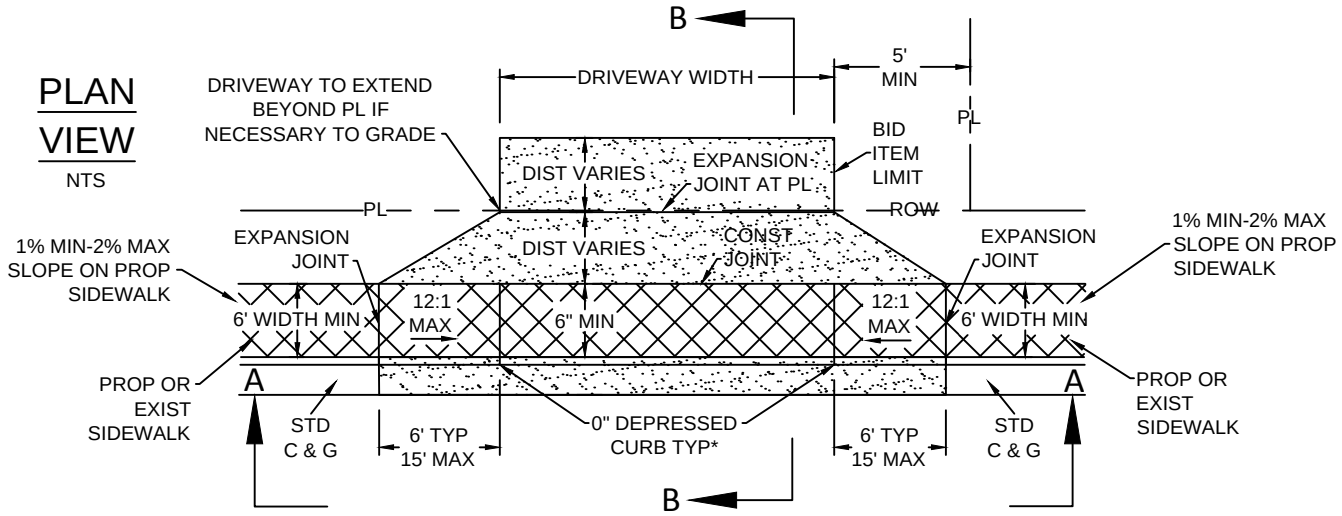


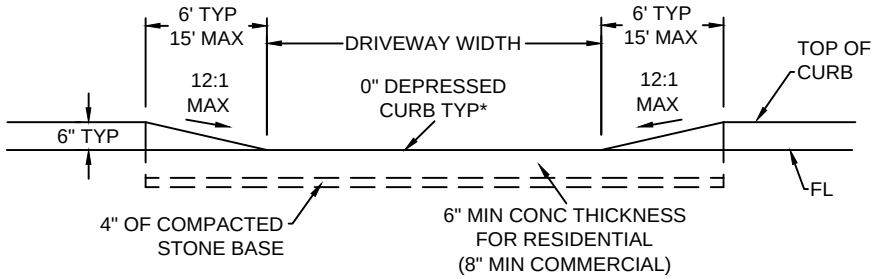
NOTES:

1. ALL POURED CONCRETE SHALL BE CLASS 'B1'.
2. STEEL REINFORCEMENT IS NOT ALLOWED.
3. ALL GUTTER CONST IN FRONT OF DRIVEWAY & ALL C & G IN DRIVEWAY TRANSITIONS SHALL BE INCLUDED IN THE BID PRICE OF THE DRIVEWAY.
4. BID PRICE FOR ALL DRIVEWAYS SHALL INCLUDE ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONSTRUCT DRIVEWAY.
5. * = 1.5" DEPRESSED CURB ALLOWED WHEN NEEDED FOR DRAINAGE OR SIDEWALK GRADE.
6. 5' INCREMENTS FOR GRADE CHANGES IN DRIVEWAY ARE ALLOWED TO MEET EXIST GRADE.
7. ALGEBRAIC DIFFERENCE AT GRADE CHANGES ARE NOT TO EXCEED 13%.
8. EXPANSION JOINTS SHALL BE CONSTRUCTED NEAR PROPERTY LINE & THROUGH C & G ADJACENT TO DRIVEWAY.
9. OPTIONAL CONSTRUCTION JOINTS MAY BE USED AT GRADE CHANGES IN DRIVEWAY.

PLAN VIEW

NTS





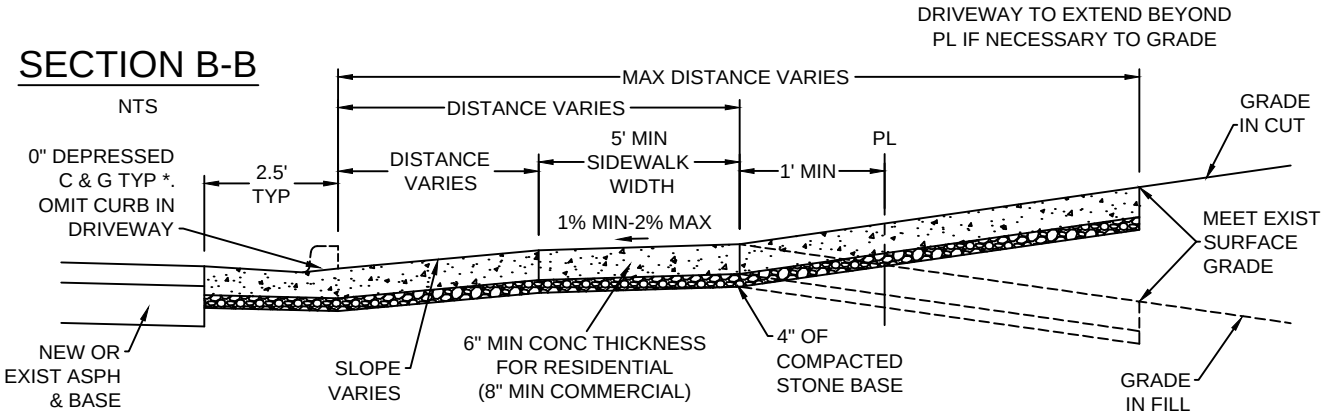
SECTION A-A

NTS

CITY OF JOPLIN, MO	CKD BY:	SALISBURY	PROJECT
PUBLIC WORKS DEPT	DATE:	1/2017	DRIVEWAY WITH SIDEWALK AGAINST CURB
ENGINEERING DIVISION	ENGINEER:	HEATHERLY	
602 S MAIN ST 64801	FILE:	TYPEBDRIVE	

SECTION B-B

NTS

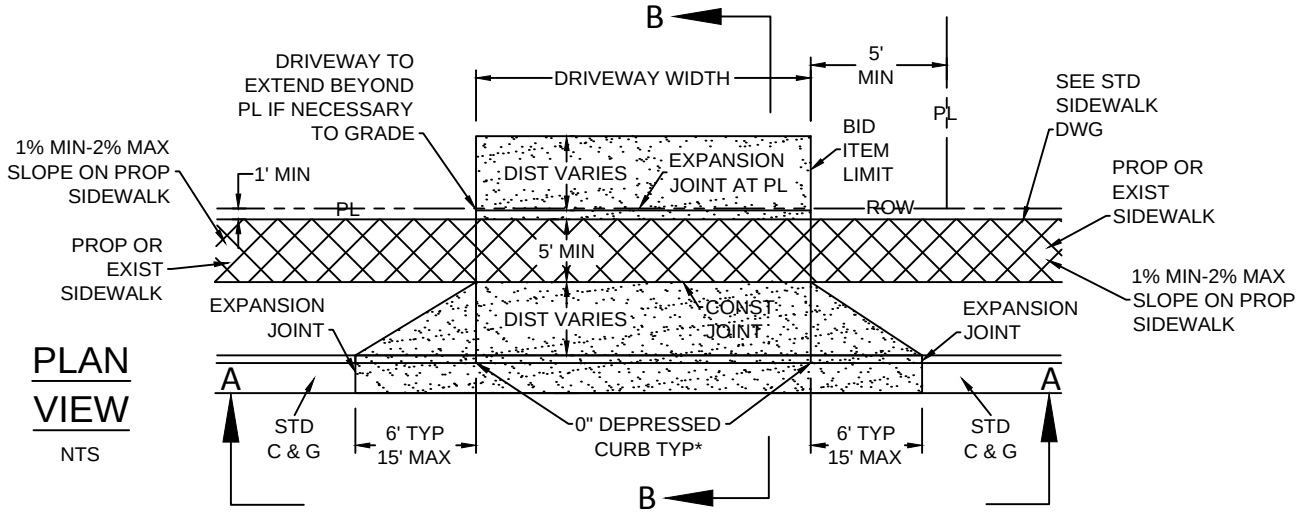


NOTES:

1. ALL POURED CONCRETE SHALL BE CLASS 'B1'.
2. STEEL REINFORCEMENT IS NOT ALLOWED.
3. ALL GUTTER CONST IN FRONT OF DRIVEWAY & ALL C & G IN DRIVEWAY TRANSITIONS SHALL BE INCLUDED IN THE BID PRICE OF THE DRIVEWAY.
4. BID PRICE FOR ALL DRIVEWAYS SHALL INCLUDE ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONSTRUCT DRIVEWAY.
5. * = 1.5" DEPRESSED CURB ALLOWED WHEN NEEDED FOR DRAINAGE OR SIDEWALK GRADE.
6. 5' INCREMENTS FOR GRADE CHANGES IN DRIVEWAY ARE ALLOWED TO MEET EXIST GRADE.
7. ALGEBRAIC DIFFERENCE AT GRADE CHANGES ARE NOT TO EXCEED 13%.
8. EXPANSION JOINTS SHALL BE CONSTRUCTED NEAR PROPERTY LINE & THROUGH C & G ADJACENT TO DRIVEWAY.
9. OPTIONAL CONSTRUCTION JOINTS MAY BE USED AT GRADE CHANGES IN DRIVEWAY.

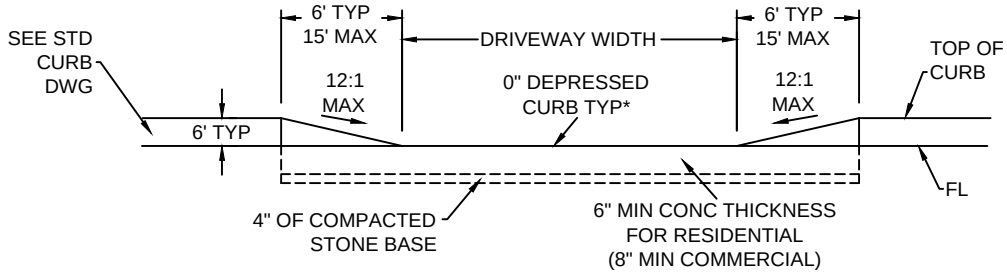
PLAN VIEW

NTS



SECTION A-A

NTS



CITY OF Joplin	CITY OF JOPLIN, MO	CKD BY:	SALISBURY
	PUBLIC WORKS DEPT	DATE:	1/2017
	ENGINEERING DIVISION	ENGINEER:	HEATHERLY
	602 S MAIN ST 64801	FILE:	TYPECDRIVE

PROJECT

DRIVEWAY WITH SIDEWALK OFFSET FROM CURB

SECTION 3100 - PORTLAND CEMENT CONCRETE

3100.1 **SCOPE**: Furnish all labor, materials, equipment, and appliances and perform all operations in connection with the installation of concrete work, complete, in strict accordance with the specifications and drawings, and subject to the terms and conditions of the contract.

3100.2 **DESCRIPTION** This work shall consist of a pavement composed of Portland cement concrete, with or without reinforcement as specified, constructed on a prepared sub-grade in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer. All work shall be done under the supervision of a qualified superintendent experienced in concrete construction.

3100.3 MATERIALS, DEFINITIONS AND EQUIPMENT

3100.3.1 ***Portland Cement***: Portland Cement shall conform to the standard specifications for Portland Cement, ASTM Designation C-l50, Type I.

3100.3.2 ***Coarse Aggregate:*** All coarse aggregate for concrete shall consist of sound, durable rock particles, free from objectionable coatings and frozen and cemented lumps. The percentage of deleterious substances shall not exceed the following values and the sum of percentages of all deleterious substances, exclusive of Items 5 and 6, shall not exceed six (6) percent. The below requirements apply to each size or fraction of aggregate produced.

	Item	**Percent By Weight**
1.	Deleterious Rock	6.0
2.	Shale	1.0
3.	Chert in Limestone	4.0
4.	Other foreign material	0.5
5.	Material passing No. 200 sieve	
5a	Coarse Fraction, Limestone, Gradation A	1.5
5b	Fine Fraction, Limestone, Gradation A	2.5
5c	Limestone, Gradations B, D, and E	2.0
5d	Other aggregates	1.0
6	Thin or Elongated Pieces	5.0

3100.3.3 ***Crushed Stone:*** Crushed stone shall be obtained from rock of uniform quality and when tested in accordance with AASHO 1 96-721 (Los Angeles Abrasion), the percentage of wear shall not exceed 50.

3100.3.4 ***Gravel:*** Gravel shall be washed and when tested in accordance with AASHO T 96-721 (Los Angeles Abrasion), the percentage of wear shall

not exceed *45*.

3100.3.5 ***Coarse Aggregate Classifications***: Coarse aggregate for concrete pavement or base course shall be divided into three classifications as follows:

Aggregate No.2. Any gravel of essentially glacial origin similar in character to that found in deposits in Missouri at LaGrange and Sampsel.

Aggregate No.3 . Crushed limestone or any other accepted aggregate not falling under the designations for Aggregate No. 1 or Aggregate No. 2.

NOTE: Aggregate No. 3 shall be used unless otherwise specified.

3100.3.6 ***Coarse Aggregate Gradation:*** Coarse aggregate, except as hereinafter provided, shall be furnished, handled, and batched in two separate sizes or fractions. One fraction shall consist of material retained on the 3/4-inch sieve, and the other fraction shall consist of material passing the 3/4-inch sieve. A tolerance not to exceed 15 percent may be permitted on the 3/4-inch sieve for each fraction. The two fractions will be combined in a ratio as near as possible to the proportions in which the two fractions are furnished by the contractor to make a uniformly well-graded coarse aggregate graded within the following limits:

Gradation A	Percent
Passing 2-inch sieve	100
Passing 1-1/2 inch sieve	95-100
Passing 3/4-inch sieve	35-70
Passing 3/8-inch sieve	10-30
Passing No. 4 sieve	0-5

Coarse aggregate may be divided into more than two fractions if approved by the Engineer.

3100.3.7 ***Proper Balance***: The contractor shall be responsible for maintaining the proper balance in the quantities for each fraction and for securing the final quantities of each fraction in such proportions as to minimize wastage.

3100.3.8 ***Separation of the Aggregate***: The separation of the aggregate into two sizes or fractions will not be required if: (1) the contractor is permitted by special provisions to use concrete paving mixers having a rated capacity of less than either a 27E single drum mixer or a 1 6E dual drum mixer; or (2) if hand finishing methods of the pavement are permitted; or (3) if the design pavement thickness is six (6) inches or less.

If the aggregate is not separated into two sizes or fractions, it shall be graded to meet the following requirements:

Gradation B	**Percent**
Passing 1-1/2 inch sieve	100

Passing 1-inch sieve	95-100
Passing 1/2-inch sieve	25-60
Passing No. 4 sieve	0-8
Passing No. 10 sieve	0-3

3100.3.9 ***Coarse aggregate for Class A concrete***: Coarse aggregate for Class A concrete may be gravel or crushed stone and shall meet the following gradation requirements:

Gradation E	**Percent**
Passing 3/4-inch sieve	100
Passing 1/2-inch sieve	80-100
Passing 3/8-inch sieve	40-70
Passing No. 4 sieve	0-10
Passing No. 10 sieve	0-3

3100.3.10 ***Fine Aggregate***: Fine aggregate for Portland cement concrete shall be a fine granular material naturally produced by the disintegration of rock of a siliceous nature, except that by specific approval of the Engineer, chat sand produced from flint chat in the Joplin area or fines manufactured from igneous rock or chert gravel may be used. Fine aggregate shall be free from cemented or conglomerated lumps and shall not have any coating of injurious material. The quantity of deleterious substances shall not exceed the following limits:

Item	**Percent by Weight**
Clay lumps	0.25
Lightweight aggregate particles, including coal and lignites	0.25
Material passing No. 200 sieve	
(a) Natural sand	2.0
(b) Manufactured sand	4.0
Other deleterious substances	0.10

3100.3.11 ***Mortar Strength:*** Fine aggregate subjected to the mortar strength test shall produce a mortar having a tensile strength at the age of seven (7) days at least 90 percent of that developed at the same age by mortar of the same proportions and consistency made of the same cement and Standard Ottawa sand. Tests shall be made in accordance with procedures set out in ASTM C-190. Cement used in the tests shall be Type I meeting the requirements of AASHO M85-721.

3100.3.12 ***Colorimetric Test:*** Fine aggregate subjected to the colorimetric test for organic impurities and producing a color darker than the standard will be

rejected unless it passes the mortar strength test specified above.

3100.3.13 ***Fine Aggregate Gradation***: All fine aggregate, except angular chert sand and manufactured sand, shall meet the following gradation requirements:

	Percent Passing
Passing 3/8-inch sieve	100
Passing No. 4 sieve	95-100
Passing No. 20 sieve	40-75
Passing No. 50 sieve	5-30
Passing No. 100 sieve	0-10

3100.3.14 ***Manufactured Sand:*** Manufactured sand shall be the product of grinding flint chat, igneous rock or chert gravel and shall meet the following gradation requirements:

	Percent Passing
Passing No. 4 sieve	100
Passing No. 10 sieve	80-100
Passing No. 20 sieve	*50-75*
Passing No. 50 sieve	5-30
Passing No. 100 sieve	2-10

3100.3.15 ***Mixing Water:*** Water for mixing and curing concrete shall be clean, and free from injurious amounts of sewage, oil, acid, alkali, salt or organic matter. (Only potable water will be acceptable without testing.)

3100.3.16 ***Air-Entraining Agent:*** Air Entraining Agents when specified and used to produce specified amounts of air entrainment shall be neutralized Vinsel Resin, Darex AEA, Protex AEA or an approved equal conforming to the applicable requirements of ASTM Designation C-260.

3100.3.17 ***Admixtures:*** Admixtures shall not be used unless specifically approved by the Engineer.

3100.3.18 ***Reinforcing Steel***: Reinforcing steel, if specified, shall conform to the latest ASTM Specification as follows:

Type	**ASTM Designation**
Bars and rods	A-15 or A-16
Steel wire fabric	A-185

NOTE: The bars which are to bent after one end is encased in concrete shall be structural grade.

3100.3.19 ***Expansion Joints***: Expansion joints shall be non-extruding preformed

joint fillers of one of the following types: bituminous material or other approved material , and shall conform to MODOT Standards.

3100.3.20 ***Joint Sealing Compound***: Material for sealing expansion joints and for filling dummy contraction joints and longitudinal center joints shall be any material meeting either the AASHTO Standard Specifications for Mixed Asphalt and Mineral Filler or Asphalt Filler (Designations N89 or Ml 8, respectively) or the ASTM Specifications for Joint Sealing Compounds, D-l850, and D-l 190.

3100.3.21 ***Premolded Joint Material***: Premolded parting strips when called for on the plans, shall be 3/16-inch thick or more and of the width shown on the plans. They shall consist of strips which have been formed from layers of felt or shredded felt, cane, wood, or other suitable fibers securely bound together and uniformly impregnated with a suitable binder. They shall be of such character that they will not be permanently deformed by ordinary handling during hot weather or become hard and brittle in cold weather.

3100.3.22 ***Metal Supports***: Metal chairs used to support tiebars or reinforcing bars shall be channel shaped pressed out of sheet steel of not less than twelve (12) gauge (U.S. Standard) metal, and conforming to details shown on the plans.

3100.3.23 ***Expansion Tubes***: Metal dowel caps or tubes shall be manufactured from thirty-two (32) gauge sheet metal, shall be indented to provide a limiting stop for the dowel bar, and shall provide unobstructed expansion space of not less than one (1) inch to permit movement of the dowel bar. They shall be of proper size to fit the specified bars tightly and the closed end shall be watertight.

3100.3.24 ***Storage of Materials***:

1.Cement in packages shall be stored in a weathertight, dry, well-ventilated building with the floor raised a minimum of one (1) foot from the ground. Each shipment shall be identified and arranged for easy access and inspection and used in sequence of receipt. Cement which has hardened in packages shall not be used. Bulk cement shall be used direct from cars to bins.

2. Aggregates obtained from different sources and those having different gradations shall be stored separately and batched by weight. Mixing in the stockpile or alternating layers in one stockpile will not be permitted. Stockpiles shall be placed on sites properly prepared to prevent inclusion of foreign materials. Stockpiles shall be constructed in horizontal layers or lifts to prevent segregation of sizes and shall be free-draining. During severe weather, they shall be protected from freezing and inclusion of frost.

3100.3.25 ***Mix Design***:

1. The proportions of cement, fine aggregate, and coarse aggregate for Portland cement concrete shall be as specified by the Engineer within the applicable limits of the specifications for the class of concrete designated in the contract. The Engineer assumes no responsibility for the volume of concrete produced or furnished for the week.

2. The proportions for any mixture of materials obtained from established and approved commercial sources may be obtained by the contractor from the Engineer upon request. If the contractor desires to ascertain the mix for a certain combination of aggregates obtained from commercial sources before construction work starts, he/she shall advise the Engineer in writing of the specific course of materials which he/she desires to use, and the Engineer will supply him with the mix for each combination of coarse and fine aggregates for which a specific request is made.

3. If mix design information is desired for bidding, requests for such information may be made to the Department of Public Works, Division of Engineering, at Joplin, Missouri. The contractor shall make the request as far in advance of the letting as possible to allow the Engineer sufficient time to furnish a reply. The mix set by the Engineer will be based upon the material designated by the contractor as intended for use in the work and, if sources of supply are changed, the mix may be revised if necessary.

4. For simplicity of design, the various fine aggregates are grouped into four classes, and a minimum and maximum cement factor has been established for each class. The cement factor for the individual job may vary within the maximum and minimum limits, depending upon the gradation of the coarse aggregate, the quantity of mixing water used, the quantity of entrained air when air-entrained concrete is specified, and upon changes in proportions which may be necessary to produce satisfactory workability, strength, or entrained air content. The engineer will make such changes in proportions, within the limits of these specifications, as necessary to produce concrete of satisfactory workability and strength.

Class A sand shall include all sand weighing 109 pounds or more per cubic foot.
Class B sand shall include all chert, river, and Crowley Ridge sand weighing from106 pounds to 108 pounds inclusive per cubic foot, or glacial sand weighing less than108 pounds per cubic foot.
Class C sand shall include all chert, river, and Crowley Ridge sand weighing from 101 pounds to 105 pounds inclusive per cubic foot.
Class D sand shall include all sand weighing 100 pounds or less per cubic foot and any sand which is produced by the process of grinding and pulverizing large particles of aggregate, or which contains more than 50 percent of material produced by the reduction of coarser particles.

5. The cement factor or the quantity of cement used in any cubic yard of concrete shall be the cement content in sacks per cubic yard of concrete as determined from a summation of the absolute volumes of all the ingredients and, when air-entrained concrete is specified, the volume of air. The cement requirements in sacks per cubic yard of concrete for the various classes of sand are as follows:

Class of Sand	Class A-1 Concrete		Class B Concrete		Class B-1 Concrete		Pavement Concrete	
Max Slump	3.5 inches		4 inches		4 inches		2.5 inches	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
A	6.40	8.00	5.75	6.00	6.50	7.00	6.00	6.40
B	6.80	8.00	6.00	6.40	6.80	7.20	6.20	6.60
C			6.20	6.60	7.00	7.40	6.40	6.80
D			6.60	7.00	7.40	7.80	6.80	7.20

NOTE: The weight per cubic foot means the dry rodded weight per cubic foot of the aggregate.

3100.3.26 ***Consistency***: The slump of concrete shall be from 1 to 3 inches, as determined by the Engineer. The consistency shall be measured as described in the current ASTM Standard Method of Slump Test for Consistency of Portland Cement Concrete (Designation C-143), or the method of test for bail penetration for Portland Cement Concrete ASTM Designation C-360.

3100.3.27 ***Workability***: Concrete shall at all times be of such consistency that it can be worked into corners and angles of the forms and around joints, dowels, and tiebars by the construction methods used without excessive spading, segregation or undue accumulation of water of latency on the surface.

3100.3.28 ***Ready-Mixed Concrete***: Ready-Mixed Concrete shall be mixed and transported in accordance with the current ASTM specifications for Ready-Mixed Concrete (Designation C-94). Any concrete which is not plastic and workable when it reaches the sub-grade shall be rejected. When construction conditions are such that it is absolutely necessary for trucks hauling concrete to operate on the grade between forms they shall not back over previously deposited concrete.

3100.3.29 ***Measuring Air Content***: The air content of freshly mixed air-entrained concrete shall be **5.5%, ±1.5% and shall be** checked at least twice daily. Concrete with air contents above or below the amount specified shall be corrected by adjustments in the mix design or quantities of air entraining admixture being used. The air content shall be measured in accordance with ASTM Tentative Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method (Designation*C-175)*. **Air entrainment may be added one time per production day at delivery. If more than one load fails to meet requirements operations**

shall cease until corrective measures are taken at mixing plant.

3100.3.30 ***Compressive Strength:*** Concrete shall reach 3000 psi before being opened to traffic. Standard 28 day tests shall reach a minimum of 4000 psi for both structural and non-structural concrete.

3100.3.31 ***MoDOT Mix Designs*****.** In lieu of the previously defined mix designs. Similar mix designs from the Missouri Standards Specifications for Highway Construction may be utilized with approval of the engineer.

3100.3.32 ***Concrete Suppliers*****:** Suppliers of concrete for all work on the public right-of-way in the City of Joplin shall provide a copy of their MODOT plant certification obtained within the previous six months. Each truck shall have a mixer rating plate on each drum that defines how much that truck is rate to. Any trucks with worn out fins shall be rejected.

3100.3.33 ***Delivery Tickets***. Batch weights shall be furnished on the delivery tickets with each load of concrete accepted for the project. Concrete without this shall be rejected.

3100.4 CONSTRUCTION DETAILS

3100.4.1 ***Forms***:

1. Forms shall be made of metal and shall have a depth equal to or greater than the prescribed edge thickness of the pavement slab. Forms shall have a base width of not less than four (4) inches for all forms eight (8) inches or more in height. All side forms less than eight (8) inches in height shall have a base width of not less than four (4) inches. The minimum length of each section of form used shall be ten (10) feet. Each section or form shall be straight and free from bends or warps.

2. The maximum deviation of the top surface of any section shall not exceed one-eighth (1/8) inch, or the inside face not more than one-fourth (1/4) inch from a straight line. The method of connection between sections shall be such that the joint thus formed shall be free from movement in any directions.

3. Forms shall be of such cross-section and straight and so secured as to resist the pressure of the concrete when planed, and the impact when planed, and the impact and vibration of any equipment which they support, without springing or settlement.

4. Each ten (10) foot length of form shall have at least three (3) form braces and pin sockets which shall be spaced at intervals of not more than five *(5)* feet, having the end brace and socket not more than six (6) inches from the end of the form. Approved flexible forms shall be used for

construction where the radius is 150 feet or less.

3100.4.2 ***Setting Forms***: The sub-grade under the forms shall be compacted and cut to grade so that the form when set will be uniformly supported for its entire length at the specified elevation. Forms shall be joined neatly and in such a manner that the joints are free from play or movement in any direction. The supply of forms shall be sufficient to permit their remaining in place for at least 12 hours after the concrete has been placed. All forms shall be cleaned and oiled each time they are used.

3100.4.3 ***Grade and Alignment***: The alignment and grade elevations of the forms shall be checked by the contractor and the necessary corrections made by the contractor immediately before placing the concrete. When any form has been disturbed or any sub-grade there under has become unstable, the form shall be reset and rechecked.

3100.4.4 ***Placing Concrete***: The concrete shall be mixed in quantities required for immediate use and shall be deposited on the sub-grade to the required depth and width of die construction lane in successive batches and in a continuous operation without the use of intermediate forms or bulkheads. The concrete shall be placed as uniformly as possible in order to minimize the amount of additional spreading and compacted with suitable tools so that the formation of voids or honeycomb pockets is prevented.

The concrete shall be vibrated and tamped against the forms and along all joints. Care shall be taken in the distribution of the concrete to deposit a sufficient volume along the outside form lines so that the curb section can be consolidated and finished simultaneously with the slab. No concrete shall be placed around manholes or other structures until they have been brought to the required grade and alignment.

3100.4.5 ***Consolidating and Finishing*** .General: The pavement shall be struck off and consolidated with a mechanical finishing machine or by hand-finishing methods. When a mechanical finishing machine is used, the concrete shall be struck off at such a height that after consolidation and final finishing it shall be at the exact elevations as shown on the plans. A depth of at least two (2) inches of concrete shall be carried in front of the strike-off screed for the full width of the slab, whenever the screed is being used to strike off the pavement. The finishing machine shall be provided with a screed which will consolidate the concrete by pressure. The concrete shall, through the use of this machine, be brought to a true and even surface, free from rock pockets, with the fewest possible number of passages of the machine. The edge of the screeds
along the curb line may be notched out to allow for sufficient concrete to form the integral curb. Hand-finishing tools shall be kept available for use in case the finishing machine breaks down.
When hand finishing is used, the pavement shall be struck off and consolidated by a vibrating screed to the exact elevation as shown on the plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off it shall not be allowed to idle on the concrete.

Internal mechanical vibration shall be used along side all formed surfaces. **Additional water shall not be used unless approved by the Engineer or his/her representative.**

3100.4.6 ***Longitudinal Floating***: After the concrete has been struck off and consolidated, it may be further smoothed by means of a mechanical longitudinal float or float finishers using a longitudinal hand float. If a longitudinal hand float is used, it shall be operated from foot bridges spanning the pavement and shall be worked with a wiping motion parallel to the centerline, and passing from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than one-half (1/2) of the length of the float. The float shall not be less than twelve (12) feet in length and six (6) inches in width, and shall be properly stiffened and provided with handles of each end. This operation may be eliminated if specified tolerances can be attained by some other approved method.

3100.4.7 ***Scraping***: In cases where the longitudinal floating operation has been eliminated, the pavement shall be scraped with a straightedge ten (10) feet long, equipped with a handle to permit it to be operated from the edge of the pavement. The straightedge shall be operated so that any excess water and latency are removed from the surface of the pavement. After the scraping operation, the surface of the pavement shall be within the specified tolerances.

3100.4.8 ***Straightedging***: While the concrete is still plastic, the slab surface shall be tested for smoothness with a 10-foot straightedge swung from handles three (3) feet longer than one-half the width of the slab. The straightedge shall be placed on the surface parallel to the centerline of the pavement and at not more than 5-foot intervals transversely. After each test the straightedge shall be moved forward one-half its length and the operation repeated. When irregularities are discovered, they shall be corrected by adding or removing concrete. All disturbed places shall be floated with a wooden float not less than three (3) feet long and not less than six (6) inches wide, and again straightedged. The pavement surface shall have no depression in which water will stand.

3100.4.9 ***Edging:*** Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab and curb shall be carefully finished with an edger of the radius shown on the plans.

3100.4.10 ***Final Surface Finish***: A burlap drag or a broom finish shall be used as the final finishing method. When a drag is used it shall be at least three (3) feet in width and long enough to cover the entire pavement width. It shall be kept clean and saturated while in use. It shall be laid on the surface of the pavement and dragged in the direction in which the pavement is being laid. When broom finishing, a hard bristle broom shall be used. The broom shall be kept clean and used in such a manner as to provide a uniform textured surface. The curb shall have the same final finish as the

pavement. The final surface of the concrete pavement and curb shall have a uniform gritty texture free from excessive harshness and true to the grades and cross section shown on the plans. The engineer may require changes in the final finishing procedure as required to produce the desired final surface texture.

3100.4.11 ***Integral Curb***:

1. Integral curbs shall be required along the edges of all street pavements as indicated on the plans, except at such locations as the Engineer may direct. Depressed curbs shall **be in compliance with ADA specifications shall** be provided at all driveway entrances if shown on the plans.

2. The integral curb shall be constructed immediately following the finishing operation unless otherwise shown on the plans. Special care shall be taken so that the curb construction does not lag the pavement construction and form a "Cold Joint".

3. Steel curb forms shall be required to form the backs of all curbs except where street returns of small radius or other special sections make the use of steel forms impractical.

4. In placing curb concrete, sufficient spading shall be done to secure adequate bond with the paving slab and eliminate all voids in the curb.

5. Curbs shall be formed to the cross section as shown on the drawings with a mule or templates supported on the side forms and with a wood float not less than four feet in length.

6. The finished surface of the curb and gutter shall be checked by the use of the 10-foot straightedge and corrected if necessary. Where grades are flat and while the concrete is still plastic, the drainage of the gutter should be checked by pouring water at the gutter summit and observing its flow to the inlet. In order to prevent damage to the concrete surface, water should be poured onto a piece of burlap or curing paper.

3100.4.12 ***Curing.*** Immediately after the finishing operations have been completed and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be covered and cured in accordance with one of the following methods. The concrete shall not be left exposed for more than one-half (1/2) hour between stages of curing or during the curing period.

3100.4.13 ***White Pigmented Membrane:*** After the free water has left the pavement surface, the entire surface shall be sealed by hand or machine spraying with a uniform application of white-pigmented membrane curing material. The contractor shall provide satisfactory equipment to insure uniform coverage of curing material, without loss, on the pavement at the rate of one gallon for each 150 square feet. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the

film is damaged in any other way, the contractor will be required to apply additional curing material to the affected portions. All areas cut by finishing tools subsequent to the application of the curing material shall immediately be given new applications at the rate specified above. If hair checking develops before the membrane can be applied, the concrete shall be initially cured with wet burlap as specified in Section 3100.4.6 before the membrane is placed.

3100.4.14 ***Waterproofed Paper, Polyethylene Sheeting, and Polyethylene-Burlap Sheeting***: As soon as the concrete has set sufficiently to prevent marring, the top surface of the pavement shall be covered with units of waterproofed paper, white polyethylene sheeting, or white polyethylene-burlap sheeting, which shall be lapped not less than 18 inches. If polyethylene-burlap sheeting is used, the burlap shall be thoroughly dampened prior to placing and shall be placed next to the concrete. All coverings shall be so placed and weighted that they remain in contact with the pavement surface and edges for not less than 72 hours after the concrete has been placed. If hair checking develops before the covering can be applied, the concrete shall be initially cured with wet burlap as specified in Section 3100.4.6 before the covering is placed.

3100.4.15 ***Mats of Jute or Cotton***: New mats of jute or cotton, and any such mats that have been used for purposes other than the curing of concrete, shall be thoroughly washed before being used. The use of mats contaminated with earth or other deleterious substances will not be permitted. The top surface of the pavement shall be completely covered with mats as soon as the concrete has set sufficiently to prevent marring of the surface. Prior to being placed, the mats shall be damp throughout and shall be placed with the wettest side down. The mats shall be handled in such manner that contact with earth or other deleterious substances is avoided, and they shall be so placed that they remain in contact with the pavement surface and edges. The covering shall be kept wet and maintained in position for not less than 72 hours after the concrete has been placed. If hair checking develops before the mats can be applied, the concrete shall be initially cured with wet burlap as specified in Section 3100.4.6 before the mat covering is placed.

3100.4.16 ***Burlap:*** The top surface of the pavement shall be temporarily covered with thoroughly damp burlap after the concrete has set sufficiently to prevent marring of the surface. Burlap shall be handled in such manner that contact with earth or other deleterious substances will be prevented. All new or contaminated burlap and all burlap that has been used for purposes other than the curing of concrete shall be thoroughly washed before being used. The burlap shall be kept thoroughly wet until removed for application of the final curing material. Neither the top nor the edge of the pavement shall be left unprotected for more than one-half (1/2) hour. When the burlap is removed, curing shall be continued by one of the approved methods.

3100.4.17 ***Straw***: The pavement shall be initially cured with wet burlap. As soon as

the burlap is removed, the surface shall be covered with not less than six (6) inches of straw, the thickness being measured after wetting. The straw shall be kept saturated for not less than 72 hours after the concrete has been placed. When removed, the straw shall be disposed of so as to leave the road in a sightly condition, but shall not be burned on the pavement or in close proximity to the edges.

3100.4.18 ***Joints***:

1. Longitudinal and transverse joints shall be constructed as shown on the plans.

2. Longitudinal joints are those joints parallel to the lane of construction. They may be either intermediate center joints or the construction joints between construction lanes.

3. Transverse joints shall be contraction joints or construction joints. Construction joints are put in transversely whenever construction operations require them.

4. Expansion joints may be either longitudinal or transverse. They are used only where specifically shown on the plans.

5. The edges of the pavement and those joints where such edging is shown on the plans shall be rounded with an edger having a radius of not larger than one-eighth (1/8) inch. Transverse joints, except keyed and tied construction joints, shall be continuous across the entire paved area including the curb.

3100.4.19 ***Transverse Joints***: Transverse joints shall be contraction, expansion or construction joints. Contraction and expansion joints shall be placed as indicated on the plans and construction joints wherever construction may require them. They shall make a right angle with the centerline of the pavement and with the surface of the sub-grade.

3100.4.20 ***Transverse Expansion Joints***: Expansion joints, where shown on the plans, shall conform to the specification in Section 3100.3.2 entitled "Expansion Joints". They shall extend the entire width of the pavement and from the sub-grade to one (1) inch below the surface of the pavement. They shall be of the dimensions and spacing as shown on the plans. The filler shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a metal channel cap or other approved method. Under no circumstances shall any concrete be left above the expansion material or across the joint at any point. Any concrete spanning the ends of the joint next to the forms shall be carefully cut away after the forms are removed. Before the pavement is opened to traffic, the groove above the filler shall be cleaned and sealed with specified joint sealing material covered under Section 3100.3.22 entitled "Joint Sealing Compound".

3100.4.21 ***Transverse Contraction Joints***: Transverse contraction joints shall be of the sawed, formed dummy groove or pre-molded strip type, one quarter the thickness of concrete unless otherwise shown on the plans.

3100.4.22 ***Transverse Sawed Contraction Joints***: When transverse contraction joints are to be formed by sawing, care must be taken to saw the grooves soon after placing to prevent the formation of cracks due to contraction of the slab. All transverse joints shall be sawed at least one-fourth *(1/4)* of the slab depth. Any procedure for sawing joints that results in premature and uncontrolled cracking shall be revised immediately by adjusting the time interval between the placing of the concrete and the cuffing of the joints.

3100.4.23 ***Transverse Formed Dummy Groove Joints***: Transverse dummy groove joints shall be formed by a groove or cleft in the top of the slab of the dimensions shown on the plans. The groove made in the plastic concrete by a suitable tooling device shall extend vertically downward one-fourth *(1/4)* of the slab depth from the surface and shall be true to line.

3100.4.24 ***Transverse Pre-Molded Strip Joints***: Transverse pre-molded strip joints shall be of the proper dimensions as shown on the plans. The pre-molded filler is placed in a vertical groove formed to receive it. The top of the filler shall be flush with the pavement surface.

3100.4.25 ***Transverse Construction Joints***: Transverse construction joints of the type shown on the plans shall be placed wherever the placing of the concrete is suspended for more than 30 minutes. A butt type joint with dowels shall be used if the joint occurs at the location of a construction joint. Keyed joints with tiebars are used if the joint occurs at any other location.

3100.4.26 ***Dowels***: If joints are to be equipped with dowels, they shall be of the dimension and at the spacing and location indicated on the plans. They shall be firmly supported in place, accurately aligned parallel to the pavement grade and the centerline of the pavement by means of a dowel support that will remain in the pavement and will insure that the dowels are not displaced during construction. One-half of each dowel shall be painted and greased and in an expansion joint, one end shall be equipped with a tight-fitting sleeve of the dimensions shown on the plans conforming to Section 3100.3.25 entitled “Expansion Tubes”.

3100.4.27 ***Longitudinal Joints***: Longitudinal joints shall be placed as shown on the plans. They shall be of the sawed, dummy groove, pre-molded strip, or the keyed construction type, unless otherwise shown on the plans. Joints between construction lanes shall be the keyed construction type, unless otherwise shown on the plans.

3100.4.28 ***Longitudinal Center Joint***: Longitudinal center joints shall be of the sawed or premolded strip type, unless otherwise shown on the plans.

3100.4.29 ***Sawed Longitudinal Center Joints***: Sawed longitudinal center joints shall be sawed grooves made with a concrete saw after the concrete has hardened. The saw cut shall be at least one-fourth (1/4) of the slab depth. The joint may be sawed at any time prior to the time the pavement is open to traffic. These joints are otherwise formed in the same manner as the transverse sawed joints in Section 3100.4.21 entitled "Transverse Contraction Joints".

3100.4.30 ***Longitudinal pre-molded strip joints***: Longitudinal pre-molded strip joints are formed in the same manner described for transverse pre-molded strip joints in Section 3100.4.24 entitled "Transverse Pre-Molded Strip Joints".

3100.4.31 ***Longitudinal Construction Joints***: Longitudinal construction joints (i.e., joints between construction lanes) shall be of the dimensions shown on the plans. The key shall be constructed by placing an approved key against the form when the first slab adjacent to the joint is placed. When placing the second slab, care must be taken that no concrete is left to overhang the lip formed in the first slab by the edging tool.

3100.4.32 ***Tiebars:*** Tiebars or tiebolts when shown on the plans shall be of deformed steel and of the dimensions and of the spacing specified. Tiebars shall be firmly supported by sub-grade chairs or so installed as not to be displaced during construction operation.

3100.4.33 ***Joint Sealer***: After the curing period, all sawed and dummy groove joints in the pavement shall be cleaned and sealed with material meeting the requirements in Section 3100.3.22 entitled "Joint Sealing Compounds". All foreign materials, joint sawing residue, dirt and curing membrane shall be removed. Joints shall be lightly underfilled (about 1/4 inch) to prevent extrusion of sealer. Any excess material should be removed from the pavement surface as soon after sealing as possible.

3100.4.34 ***Integral Curb Joints***: In the construction of transverse joints of concrete integral curb pavement, special care must be taken to see that all transverse joints extend continuously through the pavement and curb.

3100.4.35 ***Structures***: All manholes, catch basins, or structures of a permanent nature encountered in the area to be paved shall be raised or lowered as the case may be, to the surface of the new pavement, and the necessary expansion material as specified in Section 3100.3.21 entitled "Expansion Joints" placed around each structure for the full depth of the slab and of the thickness shown on the plans.

3100.4.36 ***Weather Limitations and Protection***:

1. Unless otherwise authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending ambient **air** temperature away from artificial heat reaches 40 degrees F. and not resumed until an ascending ambient **air** temperature away from artificial heat reaches 35 degrees F.

2. If approval has been granted for the contractor to place the concrete while the ambient **air** temperature is at or lower than 40 degrees F., the contractor shall take precautionary measures to prevent damage by freezing, such as heating mixing water, heating aggregates, or applying heat directly to the contents of the mixer. Aggregates shall not be heated higher than 150 degrees F., and the temperature of the aggregates and mixing water combined shall not be higher than **90** degrees F., when the cement is added. Unless otherwise authorized, the temperature of the mixed concrete when heating is employed shall not be less than 50 degrees f. and not more than 80 degrees F. at the time of placement. Cement or fine aggregate containing lumps or crusts of hardened material or frost shall not be used. Concrete shall not be placed upon a frozen sub-grade except with written approval of the Engineer.

3. All concrete shall be effectively protected from freezing for a period of at least five (5) days after it has been placed and until a minimum compressive strength of 3000 psi has been attained. Protection will be required for not more than ten (10) days. Regardless of precautions taken, the contractor shall assume all risks, and all frozen concrete shall be replaced at his/her expense.

3100.4.37 ***Protection and Opening to Traffic***: The contractor shall protect the pavement against all damage prior to final acceptance of the work by the Engineer. Traffic shall be excluded from the pavement by erecting and maintaining barricades and signs until the street is opened for traffic as authorized by the Engineer.

3100.4.38 ***Slip-form Paver***: In lieu of the construction methods described in the preceding section of the specifications, the contractor may use a slip-form paver. When the slip-form paver is used, all reference in the preceding sections of this specification referring to forms shall be deleted. Slip-form pavers shall be equipped with vibratory and tamping bar assemblies that are effective over the full width of the pavement. The paver shall also have a metal float with a bullnosed front end for the full width of the pavement, excluding curbs, which will extrude the concrete under pressure.

Behind the float shall be a rubber belt, mechanically operated and with a lateral movement of four (4) to eight (8) inches. The curb shall be formed by extrusion plates or mules mounted at the rear of the machine. The requirement for longitudinal floating in Section 208.26 entitled "Longitudinal Floating" shall be deleted.

3100.4.39 ***Slip-form Paver Subgrade Preparation***: The sub-grade shall be brought to the proper grade and cross section by means of a properly designed and operated machine. The sub-grade shall
comply with applicable sections of this specification. If any traffic is allowed to use the prepared sub-grade, some device, satisfactory to the Engineer, shall be provided for checking and correcting the sub-grade immediately ahead of placing the concrete.

The sub-grade work, especially the path on which the tracks of the paver ride must be done carefully and accurately as its degree of precision greatly affects the resulting smoothness of the pavement surface.

3100.4.40 ***Slip-form Paver Concrete Placing***: Concrete shall be of uniform slump and adequately supplied in front of the paver. The rate of progress shall be controlled so that the forward movement
of the paver will be as nearly continuous as practicable. If it is necessary to stop the forward movement of the paver, the vibrator and tamping elements shall also be stopped immediately. Care must be taken to see that a sufficient supply of concrete passes around the float and the belt along the form line to form the integral curb where shown on the plans.

3100.4.41 ***Final Finishing***: Final finishing operations shall conform to the applicable sections of this specification.

3100.4.42 ***Surface Tolerances***: Pavements shall have the following surface tolerances when checked longitudinally with a 10-foot straightedge:

Residential Streets	1/4 inch in 10 feet
Collector (minor)	1/4 inch in 10 feet
Collector (major)	1/8 inch in 10 feet
Arterial	1/8 inch in 10 feet

3100.4 **MEASUREMENT AND PAYMENT:** Portland Cement Concrete pavement shall be measured in square yards of the design thickness shown on the plans. The width for measurement shall be the width from outside edge of completed pavement or, when integral curbs are included, from back to back of completed curb. The length shall be the actual length measured along the centerlines.

Concrete Pavement	S.Y.

END OF SECTION

SECTION 3200 - CONCRETE CURB AND GUTTER

3200.1 SCOPE: This section governs the furnishing of all labor, equipment, tools, and materials, and the performance of all work necessary to construct curb, or curb and gutter, complete, including all necessary incidental work done in accordance with the applicable requirements of Sections entitled "Grading", and "Sub-Grade Preparation", at the locations shown on the plans, as provided for in the Special Provisions, and by authorized Change Orders.

3200.1.1 Curb and gutter shall be required of all public improvement street projects.

3200.2 MATERIALS, EQUIPMENT, AND DEFINITIONS:

3200.2.1 **General**: All items of material included in this section shall conform to the requirements in Section 3100 unless otherwise specified in special provisions or shown on the plans.

3200.2.2 **Mix Design**: All concrete used in curb and gutter shall be a Class B1 with a minimum 28 day compressive strength of 4000 psi or Pavement Mix as specified in Section 3100. Similar MoDOT approved mixes may be substituted with approval of the Engineer.

3200.2.3 **Air Entrainment**: Air entrainment for curb shall be 4.5 to 7.5 percent. Air entraining admixture shall conform to the requirements of ASTM C260.

3200.2.4 **Fiber Mesh Reinforcement**: Fiber reinforcement, if specified, shall comply with the material specifications and performance requirements set forth in ASTM C1116, for Type III Synthetic-Fiber Reinforced Concrete, and as follows. Synthetic reinforcing fibers shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and be specifically manufactured to an optimum gradation for use as concrete reinforcement. Provide a minimum of 1.5 pounds fiber reinforcement per cubic yard of concrete. Fibers shall be added at the batch plant.

3200.3 CONSTRUCTION DETAILS:

3200.3.1 General: The incidental work of clearing, grubbing, demolition, grading, and sub-grading preparation shall be carried well in advance of the construction herein specified. The curb, or curb and gutter shall be constructed to the configuration and to the lines and grades shown on the plans. The curb, or curb and gutter section shall be placed prior to placement of pavement or sidewalk sections, except when curb and gutter is integral with pavement, and as ordered by the Engineer.

3200.3.2 **Grading and Sub-Grade Preparation:** All excavation required in he/she grading and sub-grade preparation shall be considered as "Unclassified

Excavation" as defined in the Section entitled "Grading" and "Sub-grade Preparation".

3200.3.3 **Forms:** All forms shall be in good condition, with not more than one-fourth (1/4) inch variation in horizontal and vertical alignment for each ten (10) feet in length. A face form shall be required for all upright curbs. The forms shall be set true to line and grade and shall be adequately supported to stay in position while depositing and consolidating the concrete. They shall be designed and constructed so as to permit their removal without damages to the concrete.

3200.3.4 **Joints:** The joints shall be formed at right angles to the alignment of the curb, or curb and gutter and to the depths as specified and as shown on the plans.

3200.3.5 **Expansion Joints:** Expansion joints are required at the radii of driveways and at 200 foot intervals. Expansion joints shall be formed by a one-half (1/2) inch thick pre-formed joint filler, cut to the configuration of the full size of the curb, or curb and gutter section, being secured at the location shown on the plans, so that they are not moved by depositing and compacting the concrete of these joints. The edges of these joints shall be rounded with an edging tool of one-eighth (1/8) inch radius. The joints do not require a joint sealer when constructed as shown on the plans. Expansion joint shall be used when installing concrete next to existing surfaces and as directed by the engineer.

3200.3.6 **Contraction Joints:** Contraction Joints shall be formed by a one-quarter (1/4) inch thick template, cut to the configuration of the curb section to the extent shown on the plans. The maximum length between contraction joints shall be 12.5 feet unless approved by the Engineer. These templates shall be secured at the locations shown on the plans, so that they are not moved by depositing and compacting the concrete. Unless otherwise shown on the plans, and as soon as the concrete has hardened sufficiently, the templates shall be removed from all contraction joints. The edges of the joint shall be rounded with an edging tool of one-eighth (1/8) inch radius.

3200.3.7 **Forms:** These items shall be placed on a prepared sub-grade of uniform density. Forms shall be metal, sound, straight, free from warp, of sufficient strength to resist springing during construction, and of a height equal to the full depth of the item to be constructed. Wood forms shall have a minimum nominal thickness of two (2) inches except where flexible forms are used. Flexible forms will be required for all curved form lines, except that straight steel form sections ten (10) feet or less in length may be used for form lines having a radius greater than 200 feet. Straight steel form sections five (5) feet in length will be acceptable for form lines having a radius of not less than 100 feet. The forms shall be thoroughly cleaned, well oiled, securely staked, braced, and held to the required line and grade.

3200.3.8 **Slipforming:** In lieu of the forming requirements specified in Section 3100, slip form methods may be used for placement of concrete curb,

concrete gutter, curb and gutter, and paved ditch providing proper lines, grades and typical sections are maintained.

3200.3.9 **Reinforcement:** Required reinforcement and tie bars shall be held in the designated position during the placing of concrete by bar chairs or other approved devices. Joint shall be constructed at intervals and locations shown on the plans or as directed by the Engineer.

3200.3.10 **Placement:** Concrete shall be placed on the prepared and sprinkled sub-grade, compacted and struck off to the required thickness. Concrete shall be vibrated sufficiently to eliminate all voids and to bring mortar to the top, after which the surface shall be finished smooth and even. All edges shall be rounded with an edging tool having a 1/4-inch radius. Faces of curb shall be rounded at the top and bottom, by means of an approved tool, to the radius shown. After finishing, concrete shall be cured in the same manner as required for concrete pavement except that transparent membrane shall be used in lieu of pigmented membrane. After the concrete has set sufficiently, the forms shall be removed, and where necessary, the contractor shall backfill adjacent to the concrete with suitable material, compacted and finished in a satisfactory manner.

3200.3.11 **Finishing:** The curb shall be tooled to the required radii as soon as possible after the concrete takes its initial set. After the forms and templates are removed, the joints shall be tooled and the curb surface finished with a wood or cork float to remove all imperfections without additional mortar or dryer. In all cases the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed. The finished curb shall have a true surface, free from sage, twists, or warps, and shall have a uniform appearance, and shall be true to the specified lines, grades, and configurations shown on the plans.

3200.3.12. **Curing:** Shall conform to the requirements of Section 3100.

3200.3.13 **Protection:** The Contractor shall protect the concrete work against damage or defacement of any kind until it has been accepted by the City. Concrete which is not acceptable to the Engineer because of damage of defacement, shall be removed and replaced, or repaired to the satisfaction of the Engineer, at the expense of the Contractor.

3200.3.14 Weather Limitations and Protection:

1. Weather Limitations. Unless otherwise authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending ambient air temperature away from artificial heat reaches 40 degrees F. and not resumed until an ascending ambient temperature away from artificial heat reaches 35 degrees F. If approval has been granted for the contractor to place the concrete while the ambient air temperature is at or lower than 40 degrees F., the contractor shall take precautionary measures to prevent damage by freezing, such as heating mixing water, heating aggregates, or applying heat directly to the contents of the mixer.

Aggregates shall not be heated higher than 150 degrees F., and the temperature of the aggregates and mixing water combined shall not be higher than 100 degrees F., when the cement is added. Unless otherwise authorized, the temperature of the mixed concrete when heating is employed shall not be less than 50 degrees F. and not more than 80 degrees F. at the time of placement. Cement or fine aggregates containing lumps or crusts of hardened material or frost shall not be used. Concrete shall not be placed upon a frozen sub-grade except with written approval of the Engineer.

2. Protection. All concrete shall be effectively protected from freezing for a period of at least five (5) days after it has been placed and until a minimum compressive strength of 3000 psi has been attained. Protection will be required for not more than ten (10) days. Regardless of precautions taken, the contractor shall assume all risks, and all frozen concrete shall be replaced at his/her expense.

3200.4 **MEASUREMENT:** Measurement will be made to determine the number of linear feet of each type of Portland cement concrete curb, or curb and gutter that are constructed in accordance with the specified Standard Drawings and the plans.

3200.5 **PAYMENT:** The cost of furnishing all labor, equipment, tools and materials, and the performance of all work necessary to construct curb, or curb and gutter, complete including all necessary incidental work done in grading and sub-grade preparation as specified herein shall be included in the lump sum bid price, or in the unit bid price per foot for items listed in the Proposal:

Curb	per linear foot
Curb and Gutter	per linear foot
Curb & Gutter, Fiber Reinforced	per linear foot

END OF SECTION

SECTION 3300 CONCRETE SIDEWALK

3300.1 SCOPE: This section governs the furnishing of all labor, equipment, tools, and material, and the performance of all work necessary to construct sidewalks, complete, including all necessary incidental work done in accordance with the applicable requirements of the Sections entitled "Grading", and "Sub-Grade Preparation" respectively, at the locations shown on the plans, as provided for in the Special Provisions, and by authorized Change Orders.

3300.1.1 **General:** This section governs the design and the furnishing of all labor, equipment, tools, and material, and the performance of all work necessary to construct sidewalks, complete, including all necessary incidental work done in accordance with the applicable requirements of the Sections entitled "Grading", and "Sub-Grade Preparation" respectively, at the locations shown on the plans, as provided for in the Special Provisions, and by authorized Change Orders.

3300.1.2 **Design**. Sidewalks are required on at least one side of residential streets and both sides of collector and arterial streets (see Subdivision Regulations). The sidewalks shall be constructed on a minimum of four inches of base rock. The thickness of the sidewalks shall be a minimum of four inches in residential areas and six inches in commercial areas. Sidewalks across residential drives shall be constructed with a six inch thickness and an eight inch thickness across commercial drives. The additional thickness at driveways shall extend a minimum of 18 inches beyond the drive and curb tapers. All new sidewalks shall meet the requirements of the most current ADA Standards for Accessible Design and Public Right of Way Accessibility Guidelines and city standards. Variance from the requirements in this section shall require a written design exception.

3300.1.3 **Location.** The outside edge of sidewalk shall be placed a minimum of one foot inside the street right of way line.

3300.1.4 **Width**. Sidewalks shall be a minimum width of five feet when offset from the back of curb by a minimum of one foot and six feet when immediately adjacent to the back of curb.

3300.1.5 **Sidewalk Cross-Section Grade.** The minimum cross slope for sidewalks shall be 1% and the maximum cross slope shall be 2%. Driveway grade shall be adjusted to meet this maximum. Written design exceptions for a lesser width will be considered in some situations. Joint lines shall delineate the portion of the sidewalk that crosses the driveway so it is clear where the sidewalk crosses the entrance.

3300.1.6 **Longitudinal Grade.** The longitudinal grade of the sidewalk shall not exceed the grade of the adjacent roadway within the right of way. For sidewalks and trails not built adjacent to a street the maximum grade is 5%.

3300.1.7 **Drainage.** Drainage from properties adjacent to the sidewalk shall not drain across the surface of the sidewalk nor shall the grade of the sidewalk be constructed that water would pond on the surface of the sidewalk.

3300.1.8 **Obstructions.** All obstructions shall be removed or relocated off of the sidewalk.

3300.1.9 **Grade Breaks.** Grade breaks shall not be permitted across curb ramps, landings or gutter areas within the pedestrian access route.

3300.2 **MATERIALS, EQUIPMENT, AND DEFINITIONS:** All items of material included in this section shall conform to the requirements of Section 3100 unless otherwise specified in the special provisions or shown on the plans.

3300.2.1 **Aggregates:** Coarse aggregate for use in wet bonded topping work shall consist of basalt, granite, trap rock, or other approved materials well graded within the limits for a nominal 3/8-inch size.

3300.2.2 **Concrete Mix**: Concrete for use in the construction of sidewalks shall conform to the requirements of Section 3100, "Mix Design". Mix design shall be a Class B1 Portland Cement Concrete with a compressive strength of 4000 psi or Pavement Mix. Comparable MoDOT mixes may be substituted with the permission of the Engineer.

3300.2.3 **Fiber Mesh:** Concrete for use in the construction of sidewalks if specified shall conform to the requirements of Section 3200.2.4, "Fiber Mesh Reinforcement".

3300.3 **CONSTRUCTION DETAILS:** The incidental work of clearing, grubbing, demolition, grading, and sub-grade preparation shall be carried on well in advance of the sidewalk construction as herein specified. The sidewalks have been constructed after the curb and gutter, if any, have been done or completed.

3300.3.1 **Grading and Sub-Grade Preparation:** All excavation required in the grading and sub-grade preparation shall be considered as "Unclassified Excavation" as defined in Sections entitled "Grading". All grading shall be done in conformance with Sections entitled "Grading" and "Sub-Grade Preparation" respectively.

3300.3.2 **Forms:** Forms shall be steel or wood, in good condition, and acceptable to the Engineer. ~~All forms shall not have more than one-fourth (1/4) inch variation in horizontal and vertical alignment for each ten (10) feet in length.~~ The forms shall be set true to line and grade shall be adequately supported to stay in position while depositing and compacting the concrete. They shall be designed and constructed so as to permit their removal without damage to the concrete.

3300.3.3 ***Expansion Joints***: Expansion joints constructed at ~~50 feet intervals or as shown on the plans, shall be formed one-half (1/2) inches wide and shall extend the full depth of the slab.~~ 100 feet intervals, on each side of driveways, between the sidewalk and all structures within the limits of the sidewalk or shown on the plans, shall be constructed by installing ½ thick bituminous material for the full depth of the concrete slab to within one quarter of an inch of the surface of the sidewalk slab. Edges of the slab shall be edged with an edging tool that has a ¼ inch radius. Expansion joints shall be placed between the sidewalk and all structures such as light standards, traffic light standards, traffic poles, and columns on each side of driveways and any other locations when against a

substantial structure. All of the joint except the top one quarter inch below the surface shall be filled with the expansion material. The Contractor when applying sealer shall follow the manufacturer's instructions for applying the joint sealer. He/she shall use the equipment that is suitable for the purpose. The compounded sealer material shall be poured into the joint to the level of the adjacent concrete surfaces. Joints must be clean and dry before the sealer is poured.

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3300.3.4 **C*ontraction Joints***: The sidewalk surface shall be marked off into square stones by contraction joints as shown on the plans. The joints shall be one-eighth (1/8) inches wide by depth of one quarter the thickness of the concrete, ~~one (1) inch deep,~~ and may be formed either by inserting a fiber strip, tooling, or by use of a concrete saw. The maximum distance between contraction joints shall be six feet feet and a minimum of four feet unless otherwise approved by the Engineer.

3300.3.5 **Curb Ramps.** Curb ramps shall be installed at all intersections with streets, alleys, and mid-block pedestrian crossings in accordance with ADA Standards for Accessible Design and Public Right of Way Accessibility Guidelines. The running slope shall be 12:1 maximum except that the length of the curb ramp shall not exceed fifteen feet. The cross slope shall be two percent maximum. A minimum landing of five feet by five feet shall be provided at the top and bottom of the curb. Brick red truncated domes shall be placed at the end of all ramps to public streets and alleys.

3300.3.6 **Truncated Domes.** Truncated domes shall be placed prior to a public street or alley and shall have a diameter of 0.9 inches at the bottom, a diameter of 0.4 at the top, a height of 0.2 inches and a center to center spacing of 2.35 inches measured along diagonal of a square arrangement. There shall be a 70% contrast in light reflectance between the detectable warning and the adjoining surface. The color shall be brick red and homogenous and made of an integral part of the detectable warning surface.

3300.3.7 **Concrete Work**: Concrete shall be placed in accordance with the requirements of Section 3100.

3300.3.8 **Joints**: Joints shall be constructed at the locations shown on the plans. The pre-molded joint filler shall be supported so as to prevent its displacement while depositing concrete at the expansion joints. Pre-molded joint filler shall be positioned in true alignment at right angles to the Line of the sidewalk and be normal to the surface of the concrete.

3300.3.9 ***Finishing***: After the concrete has been thoroughly consolidated and leveled, and the initial set has taken place, the surface shall be finished with a soft wood or cork float and ~~either burlap or~~ a broom finish~~ed~~ with no other mortar than that contained in the concrete. The resulting surface shall be uniform in color with all imperfections removed. The edges shall be rounded with an edging tool having a radius as shown on the plans. Special care shall be taken to insure a straight, neat appearance along the edges of the sidewalk and at the joints. In general, finishing shall conform to the requirements of MCIF Bulletin No. "10" Finishing.

3300.3.10 ***Curing***: See Section 3100.

3300.3.11 ***Protection:*** The Contractor shall protect the concrete work against damage or defacement of any kind until it has been accepted by the City. Concrete which is not acceptable to the Engineer because of damage or defacement, shall be removed and replaced, or repaired to the satisfaction of the Engineer, at the expense of the Contractor.

3300.3.12 ***Weather Limitations and Protection***: See Section *3100.*

3300.13 **MEASUREMENT**: Measurement will be made to determine the number of square ~~feet~~ yards of Portland cement concrete sidewalk placed and accepted, for the purpose of making payments.

3300.14 **PAYMENT**: The cost of furnishing all labor, equipment, tools, and materials, and the performance of all work necessary to construct sidewalk, complete, including all incidental work necessary in grading and sub-grade preparation at the locations specified herein, shall be included in the lump sum bid price, or in the unit bid price per square ~~foot~~ yard, listed in the Proposal as:

Sidewalk Construction	Per Square Yard

END OF SECTION

SECTION 3400 DRIVEWAYS

3400.1 **General**: Driveway approaches are located to serve the operation of automobiles and other vehicles from the street pavement to the garage, parking area, building entrance, structure, or other approved use located on the property.

3400.2 **Residential Design:** Residential driveway approaches shall be constructed using Class B1 Portland Cement Concrete with a minimum 28-day compressive strength of 4000-psi in accordance with Section 3100. All driveway pavement shall be constructed on a minimum of 4" inches of base rock. When a driveway approach intersects an existing 4-inch thick sidewalk, the area of the sidewalk within the driveway are including both sides of the sidewalk transition sections to

meet the drive elevation or 18 inches, whichever is greater, shall be removed and reconstructed with 6 inch thick concrete. The cross slope of the sidewalk area shall not to exceed 1:50 (2%). The grade of the driveway approach from the gutter line shall rise on a constant grade to the front edge (side street0 of the sidewalk area. The algebraic difference of longitudinal grade changes of the driveway approach shall not exceed 13% . The maximum grade for a driveway shall be 15%. The width of residential driveway approaches shall not exceed 36 feet without permission from the City Traffic Engineer and shall not be less than 11 feet for new construction. The Width of a driveway is measured at the Right-of-Way line.

3400.3 **Commercial Design:** Commercial/non-residential driveway approaches shall be constructed 8 inches thick using Class B1 Portland Cement Concrete with a minimum 28 day compressive strength of 4,000-psi in accordance with Section 3100. All driveway pavement shall be constructed on a minimum of four inches of base rock. . When a driveway approach intersects an existing 4 inch sidewalk, the area of the sidewalk within the driveway area, including both sides of the sidewalk transition sections to meet the drive elevation or a minimum of 18 inches shall be removed and reconstructed with 8-inch concrete. The cross slope of the sidewalk section is not to exceed 1:50 (2%). The grade of the driveway approach from the gutter line shall rise on a constant grade to the front edge (side street) of the sidewalk area. The algebraic difference of longitudinal grade changes of the driveway approach shall not exceed 13%. The maximum grade of the drive shall be 15%. The width of commercial driveway approaches shall not exceed 35 feet. Provided, however driveway widths shall be between 30 feet and 55 feet for those driveways exiting and entering upon arterial and collector streets. The specific width shall be established by the City Engineer based upon traffic volume and the proposed sign design. One-Way driveways shall be a minimum of 12 feet and a maximum of 22 feet wide. The width of driveways is measured along the Right-of-Way line

3400.4 **Approach Location:** Driveway spacing is restricted by the city Subdivision Regulations and the City Code. Zoning cases, planned developments and subdivisions are subject to the access restrictions as set forth in the city Subdivision Regulations and city Code.

3400.4.1 No driveway approach shall be permitted which will interfere with any existing parking meters, signs, traffic control devices, planting, cables, poles, guys, water mains, gas mains, or other public utilities.

3400.4.2 No part of any driveway approach shall be located within 4 feet of a drop inlet or other drainage structure of pedestrian ramp.

3400.4.3 **Shared Driveways**. Shared driveway approaches shall be permitted only if there is a perpetual mutual access agreement approved by the City Attorney and filed of record in the Jasper County Recorder's Office.

3400.4.5 Edges of the driveway approach may be skewed so that the angle between the street right-of-way line and the edge of the driveway approach is not less than 60 degrees.

3400.4.6 Radius of the driveway approach shall not, in any case, extend beyond the projection of the adjacent property line, extended perpendicularly to the right-of-way line.

3400.4.7 **Radius.** The radius of a driveway return shall not extend beyond the right-of-way line or 15 feet, whichever is smaller.

3400.5 **Expansion Joints**. The plans shall show bituminous ½ inch thick performed expansion joints to be placed at the right-of-way and sidewalk connections and connections at the curb and gutter radius

3400.6 **Existing Curb and Gutter**. The plans shall show the existing curb and gutter section in front of a driveway (radius point to radius point) shall be saw cut full depth and removed before the driveway is constructed. The entire curb and gutter section would then be reconstructed the same concrete and depth as the driveway approach.

3400.7 Concrete shall be placed in accordance with the provisions of Section 3100.

3400.8 **MEASUREMENT:** Measurement will be made to determine the number of square yards of Portland cement concrete driveway placed and accepted, for the purpose of making payments.

3400.9 **PAYMENT:** The cost of furnishing all labor, equipment, tools, and materials, and the performance of all work necessary to construct driveway, complete, including all incidental work necessary in grading and sub-grade preparation at the locations specified herein, shall be included in the lump sum bid price, or in the unit bid price per square yard, listed in the Proposal as:

Driveway Construction	**Per Square Yard**

END OF SECTION