Public Works Manual

Revised September 2015

Roads

2.13.4 Leakage Test

a. Definition: Leakage is the quantity of water that must be added to the pipeline to maintain pressure within 5 psig of the specified test pressure after the air has been expelled and the pipe is filled with water.

b. Maximum allowable leakage where:

L = maximum allowable leakage in gallons per hour over two hour test
S = length of pipe tested in feet
D = nominal pipe diameter in inches
P = average test pressure during the leakage test in psig

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

2.13.5 Passing

a. The contractor shall locate and repair defective materials and joints if the tests disclose pressure or leakage greater than that specified.

b. All visible leaks shall be repaired regardless of the amount of leakage.

The contractor shall submit manufacturer's certification that the hypochlorite materials (no tablets allowed) to be used in the disinfection conform to the AWWA B300 Standard for Hypochlorites.

3.00 ROAD AND STREET DESIGN AND LAYOUT

3.01 STREETS

The street system shall be designed to provide traffic safety, allow for alternate access and routing in emergencies, be practical to construct and maintain, provide access to all lots, tracts, parcels, adjoining public lands and private lands, and coordinate with existing or planned streets, as may be shown on the master plan. Intersections shall be located and designed to provide conditions optimizing traffic safety.

a. Streets shall bear a logical relationship to the topography.

b. Where two streets intersect a common street from opposite sides, the intersections shall be directly aligned on centerline, or shall be offset not less than 150 feet, centerline to centerline. Where two streets intersect a common street from the same side, the intersections shall be separated by no less than 150 feet centerline to centerline.

c. Intersections shall be designed as nearly to right angles as possible, with no intersecting angles of less than 75 degrees.

d. There shall be no less than two street rights-of-way accessing a subdivision or major land development, to minimize traffic congestion and/or blockage in times of emergency.

3.02 STREET NAMES

Street names shall comply with guidelines shown below, and shall not duplicate any previously platted street names within the Town, unless the new street is a continuation of an existing alignment. Gypsum Fire Protection and Eagle County 911 shall approve all proposed street names.

a. Road--this suffix should be applied to existing roads comprising the basic network throughout the Town. (ex. Valley Road)

b. Boulevard--this suffix should be used sparingly and applied only to Major collector streets with 4 lanes and a divided highway configuration. (ex. Lundgren Boulevard)

c. Avenue--this suffix may be used broadly. Generally "avenues" should run approximately at right angles to "streets". (ex. Railroad Avenue)

d. Street--this suffix may be used broadly. Generally "streets" should run approximately at right angles to "Avenues". (ex. First Street)

e. Drive--this suffix should be used for a minor roadway starting at one roadway or street and ending at another. (ex. Rangeview Drive)

f. Circle--this suffix should be used for roadways that start and end at the same roadway street or avenue. (ex. Quail Circle)

g. Place--this suffix should be used for relatively long roadways ending in a cul-de-sac or a turnaround. * (ex. Pine Place)

h. Court--this suffix should be used for relatively short roadways ending in a cul-de-sac or a turnaround. * (ex. Vista Court)

*--These suffixes should not be used where the turnaround or cul-de-sac is temporary and the roadway is expected to be extended in the future.

i. Mall, Terrace, Lane, and other suffixes are generally not appropriate and should not be used.

j. A logical, systematic pattern of street names should be developed for each subdivision or development. A name assigned to a "street" or "avenue" should not also be used for a "court" or "drive".

3.03 STREET NAME SIGNS

Street name signs shall be installed at all intersections in the subdivision, according to the street names approved on the Final Plat. Street name sign design, material, color and installation shall be in accordance with the Manual on Uniform Traffic Control Devices, and Town of Gypsum standards, which are as follows:

a. Color shall be reflective white letters on reflective green background. Sign shall be six inches in height.

b. Letter size shall be four inches (4").

c. Signs naming both streets shall be installed at intersections at the position of the STOP or YIELD sign, on steel posts. Street name signs shall be mounted at an elevation of not less than 7 feet or more than 11 feet above back of curb. (See MUTCD)

3.04 SPECIAL ROAD FEATURES

Circle drives, elephant/mouse ears, etc. shall be designed for fire trucks, trash trucks, snow storage and maintenance. Minimum inside radius shall be 35' minimum. Minimum snow storage shall be 10'x40'; location and number to be determined by Town of Gypsum Public Works Department.

3.04.1 Dead End Streets

Dead-end streets, shall be prohibited, unless they are designed as a cul-de-sac and serve no more than 20 dwelling units or designed to connect with future streets in which case a temporary turnaround shall be provided. Cul-de-sac or temporary turnaround right-of-way radius shall be 50 feet with 40-foot pavement radius. Minimum length of cul-de-sacs, as measured from the center point of the turn around, perpendicular to the nearest right-of-way line of the intersecting street, shall be sixty feet (60').

3.04.2 Half Streets

Half streets shall not be permitted. When a proposed half street in a subdivision adjoins another property the entire street shall be platted. Acquiring right-of-way from the adjoining property owner shall be the responsibility and expense of the developer.

3.04.3 Reserve Strips

Reserve strips, controlling access to streets, are permitted only when the control of such strip is given to the Town under conditions approved by the Planning Commission and Town Council.

3.05 ALL WEATHER ACCESS

All-weather access to the subdivision from Town, County or State roads shall be provided by the developer through public streets that conform to Town of Gypsum Street and Roadway Classification and Design Standards as illustrated in Table 3.07.1.

3.06 CONSTRUCTION ACCESS

Vehicle tracking control pad shall be located at every access point to the construction site. Additionally, a sign shall be placed next to the vehicle tracking control pad to designate the location as the construction entrance/exit.

3.07 DETERMINATION OF DESIGN CAPACITY - VEHICLES PER DAY (VPD)

10.0 VPD PER SINGLE FAMILY DWELLING UNIT
6.0 VPD PER MULTI FAMILY DWELLING UNIT
7.5 VPD PER FULL SERVICE RESTAURANT SEAT
22.0 VPD FAST-FOOD RESTAURANT SEAT
170.0 VPD PER 1,000 SQUARE FEET OF SUPER MARKET
160.0 VPD PER ACRE OF BUSINESS PARK
10.0 VPD PER MOTEL ROOM
31.0 VPD PER 1,000 SQUARE FEET BUILDING MATERIAL/LUMBER STORE

For uses not specified in the above noted factors, a traffic study, prepared by a registered professional engineer shall be submitted. The traffic study shall be based on "Trip Generation - –Current Edition", Published by the Institute of Transportation Engineers.

Table 3.07.I
TOWN OF GYPSUM
STREET AND ROADWAY CLASSIFICATION AND DESIGN STANDARDS

DESIGN CRITERIA	***MAJOR COLLECTOR STREET***	***MINOR COLLECTOR STREET***	***LOCAL COMMERCIAL STREET***	***LOCAL RESIDENTIAL STREET***
DESIGN CAPACITY VPD (3.07)	MORE THAN 10,000	10,000 TO 2,500	LESS THAN 2,500	LESS THAN 2,500
MINIMUM R.O.W.	80'	70'	70'	50'
PAVEMENT WIDTH, FLOWLINE TO FLOWLINE	52'	33'	33'	27'
DRIVING LANES NO. WIDTH	4 EA. 12'	2 EA. 15'	2 EA. 15'	2 EA. 12'
PARKING LANES	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
SHOULDER LANES (NO., WIDTH & USE)	2 @ 4' PAVED IF NO CURB & GUTTER	2 @ 4' PAVED IF NO CURB & GUTTER	NONE	NONE
CURB STYLE	VERTICAL	VERTICAL	VERTICAL	MOUNTABLE
GUTTER	24-INCH	18-INCH	18-INCH	18-INCH
PEDESTRIAN & BIKE PATH OR SIDEWALK (3.10)	1 EA. 8'	2 EA. 6'	2 EA. 5'	2 EA. 4'
LANDSCAPED SEPARATION BETWEEN PATH & STREET	8' MIN TO 10' MAX	10'	10'	7' MIN
MINIMUM CROSS SLOPE	2%	2%	2%	**3%**
DESIGN SPEED	45 MPH	35 MPH	30 MPH	25 MPH
K-VALUE (CREST CURVE)	110 MIN.	50 MIN.	30 MIN.	20 MIN.
K-VALUE (SAG CURVE)	70 MIN.	50 MIN.	40 MIN.	30 MIN. 167 MAX
TEMPLATE DESIGN	***MAJOR COLLECTOR***	***MINOR COLLECTOR***	***LOCAL COMMERCIAL STREET***	***LOCAL RESIDENTIAL STREET***
MIN. RADIUS	850'	475'	300'	200'
% GRADE	MAX. 6% MIN. 1%	MAX. 8% MIN. 1%	MAX. 8% MIN. 1%	MAX. 8% MIN. 1%
PAVEMENT & STABILIZATION SECTION (3.11)	MIN. 4" HBP MIN. 8" CL6 GEO FABRIC	MIN. 4" HBP MIN. 8" CL6 GEO FABRIC	MIN. 4" HBP MIN. 8" CL6 GEO FABRIC	MIN. 4" HBP MIN. 8" CL6 GEO FABRIC
EQUIVALENT DAILY LOAD APPLICATION(EDLA-18 KIP AXLES) (MINIMUM)	***350***	200	100	50

3.08 EXISTING DESIGNATED ROUTES

The following existing routes are designated as Major Collector Streets:

1) Cooley Mesa Road
2) Jules Drive
3) Cottonwood Pass Road
4) US Highway 6
5) Valley Road/Gypsum Creek Road

New Developments that will access Major Collector streets will do so via Minor Collector, Local Commercial or Residential Streets. Should the adjacent development cause the improvement of the Major Collector to a four-lane divided boulevard for the total contiguous length of the street and the development, other options may be appropriate. If the developer chooses only to access the Major Collector with other streets, then that developer must agree to pay their pro rata share of the cost of the ultimate road improvement based on traffic generation volume.

The following streets are designated as Minor Collector Streets:

1) Spring Creek Road
2) Buckhorn Valley Blvd
3) The first primary road paralleling Highway 6 between the Eagle River and the railroad right-of-way, and east of the wallboard plant.

3.09 ALTERNATIVE TO CURB AND GUTTER

Consideration will be given to the replacement of curb and gutter with paved shoulders and grass drainage swales separating the sidewalk/bike path from the street for:
1.) Low Density PUD conditions;
2.) Few intersections
3.) Council directed.

Drainage swales shall be designed for the velocities and hydraulic capacity of runoff flows generated by the 25-year storm event. All roads and streets shall be designed to maintain their physical integrity during runoff flows generated by the 100-year storm event. Where this configuration is used, right-of-way width shall be modified to accommodate both transportation and drainage facilities.

When the above alternatives to curb and gutter are used, delineator posts shall be installed on both sides of the street, with reflectors facing both traffic directions. Delineators shall conform to Colorado Department of Transportation, Typical Delineator Installation, Standard Plan #S612-1 sheets 1 through 5. Reflectors shall be in conformance with specifications listed in the Department of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction.

3.10 PEDESTRIAN/BIKE PATHS

Pedestrian/bike paths shall be separated from the street surface as illustrated on the typical sections and as noted in Table 3.07.1. In areas where development can only occur on one side of a street the pedestrian/bike path need only be constructed on that side of the street. In areas where a street will never have any development on either side, but only connects areas of development, a single pedestrian/bike path shall be constructed on only one side of the street. The determination of location for this path shall consider the parameters of topography, safety and ultimate convenience. The structural bike path section design including Hot bituminous pavement (HBP), Aggregate Base Course, Geotextile Fabric, and Subgrade Stabilization shall be prepared by a Professional Engineer Registered in the State of Colorado specializing in Geotechnical Engineering and based on site specific soil and groundwater conditions, with the heaviest load being a pickup-snowplow with a sand bin/spreader in the bed. If the bike path is in a location where it will be crossed by either commercial or residential driveways, then the structural section for the bike path must be consistent with the structural section of the adjacent road or street.

3.11 ROAD SECTION DESIGN BY GEOTECHNICAL ENGINEER

The Road Section Design including Hot bituminous pavement (HBP), Aggregate Base Course, Geotextile Fabric, and Subgrade Stabilization shall be prepared by a Professional Engineer Registered in the State of Colorado specializing in Geotechnical Engineering and based on site specific soil and groundwater conditions. The information provided in Table 3.07.1 above shall be considered the minimum allowable road section design. The subgrade stabilization shall be designed and constructed so that the prepared subgrade surface will comply with all of the Construction Specifications of the Town of Gypsum including compaction and proof-rolling, and shall also be designed to maintain the stabilized condition under all anticipated traffic loading and seasonal fluctuations of temperature and groundwater conditions. If the Geotechnical Engineer does not specify a specific geotextile fabric, then the geotextile used shall be Geogrid BX-1200 (or approved equal) for grid type functions and Mirafi 500X (or approved equal) for fabric functions or proposed approved alternate.

3.12 SUBGRADE STABILIZATION IN AREAS OF POTENTIALLY HIGH GROUNDWATER

Areas of potentially high groundwater will be defined as follows: Areas with evidence or a history of high groundwater with seasonal fluctuations which bring the groundwater level to within 3-feet of the surface at any time during the year. For the purposes of these design criteria, a fine-grained road subgrade material shall be defined as follows: Materials with more than 20% passing the #200 sieve. Based on these definitions, in areas of potentially high groundwater where the road subgrade consists of a fine-grained material, the road subgrade shall be stabilized with a minimum of 24-inches of Class 2 material or pit run material with a quality and gradation approved by the Town of Gypsum, placed over Mirafi 500X geotextile fabric. In any case, road section and subgrade stabilization designs shall be based on saturated conditions for both the subgrade and the aggregate base course in any areas with seasonal groundwater fluctuations where the groundwater level could potentially reduce the strength of the road structure.

3.13 ACCESS POINTS

Access points on to Major and Minor Collector streets may require accel/decel and left hand turn lanes. These shall be studied on a case-by-case basis.

No commercial or residential access point shall enter a Local Commercial or Local Residential street within a distance of 150 feet measured from the centerline of an intersecting Major/Minor Collector street.

3.14 INTERSECTIONS

Intersections of all streets with Major Collector streets shall be provided with right turn acceleration and deceleration lanes on the Major Collector Street.

At the intersection of a Minor Collector to a Major Collector or at the intersection of two Major Collector streets, both streets shall be provided with a left turn holding lane and a left turn acceleration lane in addition to right turn acceleration and deceleration lanes.

The vertical alignment of all road intersections for Collector streets shall have grades no less than 1.5% and no greater than 3% and for local streets no less than 1.5% and no greater than 4% in all four directions for a minimum distance of 100 feet as measured from the intersecting street right-of-way line.

In no case shall grade of the flow line of any asphalt paved drainage channel be less than 1.5% or the grade of any concrete paved drainage channel be less than 1.0%, including the drainage channels created in the course of intersecting two streets.

The length of the transition from road section with a typical centerline crown to a road section with a cross slope to match an intersected street shall not be more than 100 feet. All minimum grades as stated in this manual shall apply to the transition portion of roads.

3.15 INTERSECTION SIGHT DISTANCE

At intersections of roads and streets, clear zones shall be maintained to provide sight distance for the vehicle on the intersecting road (stop or yield) to observe a moving vehicle on the through or intersected road. The sight distance shall be measured from a point on the intersecting street (stop or yield), which is 20 feet from the edge of pavement on the through or intersected street. Assume that the height of the eye is 3.5 feet and height of the object is 4.5 feet. Nothing in the line of sight should be higher than these values. The minimum sight distance shall be in accordance with Table, 3.15.1.

The Director of Public Works or his/her designee may, where consistent with public safety, specify greater or lesser intersection sight distance. Sight distance adjustments and/or corrections for the purpose of public safety will be at the responsibility of the property owner.

DESIGN SPEED OF THROUGH STREET	MINIMUM CORNER INTERSECTION SIGHT DISTANCE (FEET)
20	210
25	260
30	310
35	365
40	415
45	465
55	515
60	650

TABLE 3.15.01

3.15.1 Private Signs at Intersections

All proposed signage at intersections shall conform to the restrictions set forth in the Town of Gypsum Municipal Code, Title 18.64 'Sign Regulations'.

3.15.2 Traffic Control Devices

The following represents a sampling of common signs used within the Town of Gypsum. For a more exhaustive list, please see the Manual on Uniform Traffic Control Devices for streets and Highways.

SIGN	MUTCD CODE	CONVENTIONAL ROAD SIZE	OVERSIZED ROAD SIZE
STOP	R1-1	30X30	36X36
Yield	R1-2	36x36x36	48x48x48
4-Way	R1-3	12x6	12x6
Yield for Pedestrians (Middle of Road)	R1-6	12x36	NA
Speed Limit	R2-1	24X26	36X48
Mandatory Mvmt Lane Control	R3-5	30x36	NA
Optional Lane Control	R3-5	30x36	NA
Mandatory Mvmt Lane Control (LLMTL/RLMTR)	R3-7	30x30	36x36
Advanced Intersection Lane Control	R3-8	60x30	NA
Advanced Intersection Lane Control	R3-8A/B	60x30	NA

3.16 UTILITIES AND STREET CONSTRUCTION

Street construction shall not proceed beyond subgrade preparation until all utilities, under any part of the street, are completed and inspected.

3.17 STREET LIGHTS

Streetlights shall be installed at all intersections and fire hydrants, at intervals of no greater than 400 feet along street alignments without intersections. Streetlights for residential areas shall be ELA COMPANY, L-180-4BH/P-3016-10'/MTG1874C, minimum 70W, high-pressure sodium/120V; finish-painted black or approved alternative by the Public Works Department. Lights shall have Lexan Lenses and be mounted with the photocell unit facing north.

Streetlights in commercial areas shall be installed at all intersections with an illumination level of 1.4 foot-candles throughout the intersection; at all fire hydrants providing an illumination level of 1.0 foot-candles within a 20 foot radius of the fire hydrant; in parking areas providing an illumination level of 1.0 foot-candles throughout the parking area. Lighting structure style and design shall be submitted to the Town of Gypsum for approval.

3.18 PAVEMENT MARKING

Street pavement marking shall be provided on all Major Collector, Minor Collector and Local Commercial Streets and at the intersections of all Local Residential Streets with Major and Minor Collector and Local Commercial Streets.

3.18.1 Scope

The work consists of all material, labor and equipment for the applications of the pavement marking of streets and highways in accordance with the design criteria for streets.

3.18.2 Striping Specifications

The work shall be accomplished in accordance with the Manual of Uniform Traffic Control Devices for Streets and Highways (MUTCD), the Colorado Supplement and Section 627 of the State Department of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction.

3.18.3 Materials

Paint materials used may be either of the following alternatives:

a. Epoxy Pavement Marking Material as called for in section 713.16, Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction;

b. Oil Base Pavement Marking Paint as called for in section 708.05, Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction.

3.18.4 Pavement Preparations and Application

Prior to application of pavement marking material, all ice, snow, sand and debris shall be removed from the surface of the pavement and said surfaces shall be as least 40 degrees F and rising. Application shall be accomplished in accordance with the specifications noted herein and the pavement-marking plan.

3.18.5 Crosswalks and In-Pavement Directional Arrows

Cross walks and in-pavement arrows shall NOT be painted onto asphalt. Rather, crosswalks and arrows shall be ground into the pavement. The actual arrow and crosswalk material shall be made of preformed thermoplastic.

3.19 GUARDRAIL

Guardrail shall be provided for streets and roads that do not have curb and gutter when conditions warrant the need for guardrail as defined in Chapter 5: ROADSIDE BARRIERS, in the most recent edition of Roadside Design Guide of American Association of State Highway and Transportation Officials. Specifications and design for materials and placement of guardrail shall be in compliance with Colorado Department of Transportation Standard Plan No. M-606-1 (12 sheets), and Section 606 of Standard Specifications for Road and Bridge Construction.

3.20 ROAD AGGREGATE

3.20.1 Scope

This work shall consist of furnishing and placing one or more courses of aggregate on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades, thickness, and typical cross-sections shown on the plans and/or called for in the specifications.

3.20.2 Materials

All aggregate shall consist of clean, hard, durable particles of crushed gravel or stone free from soft, thin, elongated, or laminated pieces or organic material, and the material retained on the #4 sieve shall show a percentage of wear of not more than 50 percent (50%) when subjected to 500 revolutions in the ASTM C-131-81 test.

Sub base aggregate shall meet the standards of Class 1 and base course aggregate shall meet the standards of Class 6 as called for in the most recent edition of Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction.

Geotextile fabric, when called for specifically or as an alternative shall be Mirafi 500X or approved equal.

All aggregate material shall be placed in a manner, which will minimize size segregation and disturbance of the sub-grade configuration. When geotextile fabric is used, it shall be laid on the sub-grade, and the gravel shall be bladed over it without running trucks or aggregate placement equipment directly on the fabric. If the required compacted depth of sub-base course exceeds six inches, the course shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness on any one layer shall not exceed six inches. When vibrating or other approved types of special compacting equipment are used, the depth of a single layer of the course may be increased upon approval by the Town of Gypsum.

3.20.3 Placing

Each layer shall be compacted to a density of not less than 95 percent of maximum density as determined in accordance with ASTM 1557, AASHTO T 180 (Modified Proctor) unless otherwise called for on the plans. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture and surface is produced and the aggregates firmly keyed. Water shall be uniformly applied over the materials before or during compaction in the amount necessary for proper consolidation.

3.20.4 Proof Rolling, Stability

Following the placement and compaction of the aggregate, the entire surface shall be proof rolled under the direction and observation of the geotechnical engineer. Proof rolling shall be accomplished using a pneumatic-tired tandem axle dump truck or water truck loaded to a minimum of 18 kips per axle. Surface that is pumping or is deformed by the proof roll vehicle shall be reworked and retested. If the pumping or deformation is the result of subgrade failure due to poor compaction or excessive moisture, the subgrade condition must be corrected and the aggregate replaced and compacted. Subsequent layers, such as hot bituminous pavement or concrete pavement shall not be placed on the aggregate surface until the Town of Gypsum has received compaction and proof rolling reports from the geotechnical engineer approving the aggregate section.

3.21 CURB, GUTTER & SIDEWALK

3.21.1 Scope

The work consists of the construction of concrete curbs, combined curbs and gutters, sidewalks, driveways, driveway approaches, curb turn fillets, valley gutters and miscellaneous concrete work related thereto.

3.21.2 Materials

(a) Portland Cement Concrete.

Portland cement concrete shall conform to the requirements for air-entrained Portland cement concrete as called for in section P.C.C., PORTLAND CEMENT CONCRETE, of the specifications and shall contain Fibrous Reinforcing Material as specified.

(b) Reinforcing Steel.

Reinforcing steel shall conform to the requirements of section P.C.C., PORTLAND CEMENT CONCRETE, of the specifications.

(c) Pre-formed Expansion Joint Material.

Pre-formed expansion joint material shall conform to the requirements of AASHTO M-213, ASTM D-994, ASTM D-1751, OR ASTM D-1752.

(d) Truncated Domes.

For all intersections, truncated domes shall be installed on all handicap ramps. Truncated domes shall meet ANSI requirements; however under no circumstances will rubber/plastic truncated domes be permitted. The following Vendors develop products that meet ANSI and ADA requirements, however this is not an exhaustive list. Other vendors may be used, with approval of Town Engineer.

Vendor Name	Product	Phone Number
East Jordan Iron Works	Cast Iron Warning Plates	800-874-4100
Neenah	Cast Iron Warning Plates	800-558-5075

3.21.3 Subgrade Preparation

The work shall include the excavation and preparation of subgrade for all concrete structures to the lines and grades shown on the plans, called for in the specifications and/or staked in the field by the Town of Gypsum in accordance with the specifications for EARTHFILL and ROAD AGGREGATE. All soft, yielding and otherwise unsuitable subsoil material shall be removed and replaced with suitable compacted backfill. Filled sections shall extend a minimum of one foot (1') outside structure limits and shall be compacted. The subgrade shall be compacted to 95% of maximum dry density as determined by ASTM D-698, AASHTO T-99, standard Proctor method. The subgrade shall be in a moist condition at the time that the concrete is placed.

3.21.4 Concrete Placement

The forms shall be of wood, metal or other suitable material that is straight and free from warp, having sufficient strength to resist the pressure of the concrete without displacement and sufficient tightness to prevent the leakage of mortar. Forms shall be placed and secured in the configuration necessary to construct the intended structure in close conformity to the plans and specifications. Forms shall extend for the full depth of the concrete and shall be braced and staked so that they remain in both horizontal and vertical alignment until their removal. The forms shall be cleaned and coated with an approved form-release agent before concrete is placed against them. Flexible forms or rigid forms of proper curvature may be used for curved structures. Low roll curbs may be formed without the use of a face form by using a straight edge and template to form the curb face. When curb face forms are used, they shall be removed as soon as possible to permit finishing. Reinforcing steel, as shown on the plans, shall be placed and secured in the forms prior to placement of concrete. Reinforcing steel shall be secured in the designed position in a manner that will prevent movement during the process of concrete placement and finishing. The concrete shall be deposited in the forms in a manner that will not cause segregation and then it shall be tamped and spaded or vibrated mechanically for thorough consolidation to a dense concrete free of air pockets. The concrete shall be worked until the coarse aggregate is forced down into the body of the concrete and no coarse aggregate is exposed. The surface shall then be floated with a wooden float to a smooth and uniform surface. When the concrete has hardened sufficiently, the appropriate finished surface shall be applied.

3.21.5 Finishing

Finishing of concrete structures shall be either "smooth" or "broomed" depending upon the primary function of the structure. Structures whose primary function is the transport of water shall be finished smooth. Structures whose primary function is for a walking and/or driving surface shall be given a broomed finish. Broom finish shall be accomplished with a broom of approved type. The strokes shall be square across the structure surface from edge to edge, perpendicular to the predominant traffic direction on the structure. Adjacent strokes shall overlap and shall produce regular corrugations not over one-eighth inch (1/8") in depth without tearing the floated concrete surface. Concrete that is adjacent to forms, and formed joints shall be edged with a suitable edging tool, which will produce an even, smoothly

rounded corner with a radius of less than one inch. The same radius shall be used throughout the work. If the work connects to pre-existing concrete work, the edging radius of the new work shall be matched as near as possible to that on the existing concrete work.

3.21.6 Stripping Forms

Forms shall be removed at such time as the concrete is sufficiently set that removal will be accomplished without danger of chipping or spalling. When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth, or sprayed with curing compound. All forms shall be cleaned, coated with an approved form-release agent and inspected for defects before they are used again.

3.21.7 Jointing

Transverse weakened-plane contraction joints shall be constructed at right angles to the long dimension of the structure. Joint depth shall average at least 1/4 of the cross-section depth of the structure. Contraction joints shall be no greater than 15 feet apart for curb and gutter, valley gutter, curb structures, driveways and streets; and shall be no greater than 6 feet apart for sidewalk sections. Expansion joints shall be placed in concrete structures using specified materials during placement of concrete. Expansion joints shall be constructed at right angles to the long dimension of the structure. Expansion joints for side-walk, curb and gutter and valley gutter shall be no farther apart than 200 feet. Expansion joints for streets, driveways and alleys shall be no farther apart than 500 feet. Additionally, expansion joints shall be constructed at all "cold" joints.

3.21.8 Curing

Immediately upon completion of the finishing, concrete shall be moistened and kept moist for a minimum of 72 hours. In lieu of wetting, use liquid membrane curing compound (white) conforming to ASTM C 309, or sheet material conforming to ASTM C171.

3.21.9 Tolerances

The work shall be performed in a manner, which results in the completed structure being true to design line and grade, uniform in appearance and structurally sound. Items found with unsightly bulges, ridges or other defects shall be removed and replaced to the satisfaction of the Town of Gypsum. When checked with a ten-foot straight edge, the structure shall not deviate from grade by more than one-quarter inch (1/4") and shall not deviate from alignment by more than one-half inch (1/2"). Surfaces of the sidewalk, curb and gutter that shall remain exposed after completion of adjacent backfilling and paving shall be free of any observable voids. Following the completion of the work, including asphalt pavement, if any, the concrete surfaces (and asphalt surfaces) shall be flooded with water for "flow testing". The flow testing shall be coordinated with and observed by the Town of Gypsum. Any puddles of water which remain, after all flow has stopped, which are greater than one-quarter (1/4) of an inch deep or cover more than six (6) square feet shall be corrected.

3.22 STREET CUT

3.22.1 Work Commencement and Permitting

Street cuts will only be allowed between April 15 and November 15 and only after issuance of a permit to construct in the public way from the Town of Gypsum. All street cuts will require the completion of a permit to construct in the right of way. This permit is required for existing town roads as well as new streets that have yet to be dedicated. A permit form may be found at http://www.townofgypsum.com. Street cuts may be allowed at other times of the year, weather permitting, when reviewed on a case by case basis, and approved by the Town of Gypsum with special procedures in place.

All bonds and permits must be in place before a street cut will be allowed. Street cuts shall be performed at the sole expense and responsibility of the owner and contractor.

3.22.2 Materials and Placement

Disturbed bedding around water and sewer main lines will be restored in accordance with existing construction specifications.

The existing asphalt pavement near the road cut shall be cut and removed over width as illustrated on the Road Cut Detail (see Appendix C-8). This may occur either before or after the trench excavation has been made and backfilled, however, the minimum cutback of asphalt shall be measured from the edge of the actual, final trench width.

Class 6 aggregate, shall be compacted to a density of not less than 95% standard proctor, plus or minus 2% moisture of O.M.C. and a 100% within the top two feet. Geotextile fabric, such as Tensar BX-1100, Mirafi 500X or approved equal shall be placed under the Class 6 aggregate backfill. When flow fill is used, geotextile fabric is not required.

A thickness of hot bituminous pavement shall be placed in accordance with current construction specifications and the road section design prepared by a geotechnical engineer. The minimum thickness shall be four (4) inches.

a.) Infrared Patch Option.

Hot bituminous pavement patch joints shall be sealed and secured by means of infrared heating systems applied by qualified operators, approved by the Town of Gypsum, with equipment specifically designed for the sealing of hot bituminous pavement patches. Documentation shall be submitted to the Town of Gypsum that verifies the qualifications of the equipment and operators for infrared sealing prior to commencement of work.

Equipment must be specifically built for INFRARED asphalt repairs, and capable of producing true INFRARED RAYS. Open flame heat sources such as weed burners and shop heaters are not acceptable methods.

Preparation of the areas to be patched requires the exposure of the full depth of the asphalt and cleaning of the edges to be contacted and repaired by infrared. Full depth penetration is required to soften the existing pavement in order to provide thermal bonding of the old and new surface. Asphalt is placed and compacted in lifts as needed while maintaining adequate temperature for bonding, therefore producing

a seamless asphalt repair. All asphalt repairs shall be sealed on the surface with CSS1H. The desired end result of the patch is to provide a surface over the patch that is equal to or better than adjacent undisturbed pavement.

b.) Roto-Mill and Overlay Option (Also Known as Tee Patch)

Asphalt shall be cut back from the trench edge as illustrated on the Street Cut Detail. A minimum width of 2 feet of additional asphalt, adjacent to the trench, shall be roto-milled to a depth of one-half the original asphalt thickness (minimum 1.5 inches). The roto-milled area shall be replaced in the final overlay of the entire trench area.

All excavated material shall be removed from the site and properly disposed.

3.22.3 Schedule

The street cut patch shall be completed within 48 hours (match municipal code) of completing the road cut.

3.22.4 Temporary Pavement Patch

When asphalt availability does not permit repair within 10 days, concrete flow fill, as specified in PORTLAND CEMENT CONCRETE shall be used as a temporary patch.

The owner and contractor shall be responsible for maintaining the road cut as needed until the hot bituminous pavement is permanently placed.

3.22.5. Roadway Usage Between Operations

When work is not actually in progress, Contractor shall make open, passable, and maintain to traffic such portions of the Project and temporary roadways or portions thereof as may be agreed upon between Contractor and District and all other authorities or parties having jurisdiction over properties involved.

3.23 PARKING LOT LAYOUT

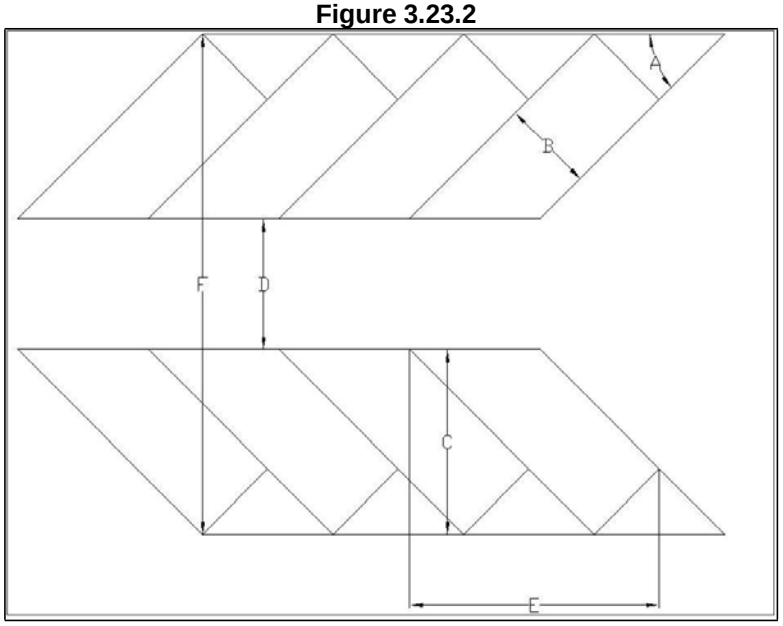
Table 3.23.1 and Figure 3.23.2 are to assist in the design of a parking lot. Information regarding how many spaces dependent upon business type is available in the Town of Gypsum Code and Regulations, section 17.24.120.

Table 3.23.1

A	B	C	D	E	F
0 deg	9’	9’	12’	22.4’	42’
	10’	10’	12’	21.9’	44’
45 deg	9’	16.8’	13’	15.8’	57.6’
	10’	17.1’	13’	15.5’	58.2’
90 deg	9’	20’	24’	9.0’	64’
	10’	20’	24’	10.0’	64’

A – Parking Angle
B – Stall Width
C – Length of Stall to Curb
D – Aisle Width
E – Curb Length per Stall
F – Width of Double Row with Aisle

Figure 3.23.2



3.24 ALLEYS

Alleys shall not be planned in residential subdivisions; however, alleys or other suitable means of service access shall be provided in commercial and industrial developments.

3.25 BLOCKS

Block lengths and widths shall be designed to allow convenient access and circulation for emergency vehicles and be practical and compatible with the overall design of the subdivision, topography, and natural features.

Where block lengths exceed 1,000 feet, pedestrian rights-of-way no less than 10 feet wide shall be provided through blocks, where needed for pedestrian circulation.

4.00 DRAINAGE ANALYSIS AND SYSTEMS DESIGN CRITERIA

4.01 GENERAL

Drainage systems for development shall be designed and constructed to insure that the public and private property and improvements within the development and downstream from the development are not adversely affected by storm water flow resulting from rainfall and snowmelt and associated hazards such as erosion, sedimentation and debris flow. Adequate positive drainage must be provided for all streets, gutters, ditches, culverts, storm sewers and other forms of drainage structures, which must drain to natural drainage ways, or other means of positive conveyance of runoff water. All drainage structures, road and street configurations and site grading shall be designed and constructed to carry the flow from a (Base Storm) 100 year frequency storm event with no damage to the drainage system or any public or private structures, improvements, infrastructure, or property.

The developer shall investigate and where appropriate, provide mitigation and adequate drainage capacity for storm flow as set forth in this section. Additionally, the developer shall investigate the potential for debris flow and provide detention storage with provisions for maintenance and cleanup following a debris flow event, as outlined in this section.

Drainage analysis and design of all systems related to drainage shall be prepared by a Colorado Registered Professional Engineer and submitted to the Town of Gypsum for review and approval. Analyses must be accomplished by methods acceptable to the Town of Gypsum.

4.02 OFF SITE DRAINAGE AND BASE STORM DISCHARGE

The major drainage system which serves as the primary drainage channel for the development and all drainage structures therein must safely convey the Base storm peak discharge and maintain it within the confines of public rights-of-way and easements.

The off-site Base storm event flow must be conveyed through the site in a manner which will not result in a peak flow at the discharge from the site which would be greater than the historic, pre-development peak flow. Street surfaces shall not be used to convey off-site Base storm event flow through the site, but these flows must be conveyed through the site in structures which do not result in an increase in flow rate from this off-site flow.