

Town of Buena Vista
Development Standards and Specifications
(Adopted by Reference, Municipal Code Section 17-58)

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I. General

All construction of streets, curb, gutter, sidewalks, water distribution system, sanitary sewer system, drainage system, landscaping and other public utilities and improvements shall be in accordance with the specifications and Town ordinances where cited, also in accordance with the current "Standard Specifications for Road and Bridge Construction" of the State Department of Highways, Division of Highways, hereafter referred to as the "Colorado Standard Specifications."

a. **Protection of Public and Private Property, Utilities and Existing Structures.** Prior to removal or excavation operations for streets, utilities or other structures, owners of affected utilities shall be notified to verify the location of such utilities. The contractor shall take all measures necessary to protect utilities from damage and shall make immediate arrangements for repair or replacement of utilities damaged in the course of the work. All other public and private property within or adjacent to the right-of-way and not designated for excavation or removal shall be protected and shall be immediately repaired or replaced should damage occur. Furthermore, the contractor shall protect adjoining properties from damages due to storm drainage accumulation.

b. **Clearing and grubbing.** All trees, shrubs, stumps, shrub, fences, walls and other obstructions within the limits of the right-of-way shall be removed. However, trees and shrubs which do not fall within pavement and driveway areas shall be retained and carefully protected during construction operations. Removal of trees, shrubs and stumps shall include the removal of the root system to a depth sufficient to deter the future growth of such vegetation.

c. **Excavation and embankment.** To bring the subgrade to the proper elevation necessary for the construction of base course, sidewalk, curb and gutter, driveways, crossspans and other related work as shown on the plans. Where excavation to the finished graded section results in a subgrade of unsuitable soil, such unsuitable materials shall be removed and replaced with approved material backfilled to the finished graded section. All topsoil removed through excavation shall be stockpiled within the development and shall be used in the landscaping of lots or rights-of-way. Embankment outside of pavement and driveway areas but within the right-of-way shall consist of topsoil spread to the lines and grades shown on the plans. Topsoil shall consist of loose friable loam reasonably free of admixtures of subsoil refuse, stumps, roots, rock, brush, weeds or other material which would be detrimental to the proper development of vegetative growth. All excavation and embankment shall be performed in accordance with Section 203 of the "Colorado Standard Specifications", except as altered by this specification.

d. **Blasting.** Should blasting be required, a permit shall be obtained from the Town and the services of a licensed explosives expert shall be enlisted. Should any blasting methods endanger persons or property, the use of explosives shall be discontinued or limited by the Town's representative. Should any property be damaged as a result of blasting, that property shall be replaced or restored to its original condition by the party causing the damage.

e. **Seeding and Planting.** All seeding, planting, and landscape plans shall conform to the standards and specifications contained in the Town of Buena Vista Planting Guide.

f. **Concrete.** All concrete to be placed in sidewalks, driveways, curb and gutter, crossspans

and elsewhere indicated shall be Class B (3750 psi) batched, mixed, formed, placed, finished and cured in accordance with Section 601 of the "Colorado Standard Specifications."

(1) **Materials.** Type II Portland cement shall be used with an air-entraining admixture such that the total air content of the resultant concrete shall be between four percent (4%) and six percent (6%). Aggregates shall be a blend of local sand and gravel with coarse aggregate conforming to the following grading requirements:

<u>Sieve Designation</u>	<u>% by Weight Passing</u>
1 inch	100
1/2 inch	65-90
No. 4	45-70
No. 8	35-55
No. 16	20-45
No. 30	5-25
No. 100	0-5

Water for concrete shall be free from objectionable amounts of oil, acid, alkali, organic matter or other deleterious materials.

(2) **Subgrade Treatment and Basecourse.** The subgrade shall be excavated a minimum of six (6) inches and to a width at least twelve (12) inches wider than the concrete width, which will permit adequate bracing of the forms. The subgrade shall be smoothed and compacted to form a firm, even foundation for the basecourse. Soil in the subgrade shall be removed and replaced with Class 6 granular base course material, which shall extend a minimum of six (6) inches beyond each side of the curb, gutter, valley gutter and/or sidewalk.

(3) **Forms.** The forms shall be either a steel form or straight grain, well-oiled wood form of two (2) inches nominal width of a height not less than five (5) inches. Flexible forms shall be used for curves having radii of less than two hundred (200) feet. Forms shall be set accurately to line and grade, and shall be held firmly in place by adequate stakes and bracing. No damage or warped forms will be permitted.

(4) **Sidewalk Construction.** In accordance with Section 608 of the "Colorado Standard Specifications", sidewalks in commercial developments shall be a minimum width of five (5) feet and have a minimum depth of five (5) inches of concrete, while sidewalks in residential developments shall not be less than five (5) feet wide and have not less than four (4) inches depth of concrete. Wherever a sidewalk crosses a residential driveway the minimum thickness shall be six (6) inches of concrete, and at alleys and commercial driveways the sidewalk concrete thickness shall be eight (8) inches. All shall have 4000 lb compressive fiber-mesh reinforcing or equivalent.

All sidewalks shall be ramped at all street intersections or other pedestrian crossing areas. The design and construction of sidewalk ramps must meet the applicable requirements of the "Americans With Disabilities Act" (ADA).

(5) **Concrete curb and gutter.** Concrete curb and gutter or concrete gutter shall be constructed in all places indicated on the plans, and in accordance with Section 609 of the "Colorado Standard Specifications".

(6) **Concrete driveways.** Six (6) inch thick concrete driveways shall be constructed in all places indicated on the plans and in the manner specified for concrete sidewalk above, and Section 17-82 above. In addition, driveways shall be reinforced per the requirements of AASHTO Specification M55. Special care shall be taken to construct surface grades of the crosspans accurately to ensure positive drainage.

(7) **Placing concrete.** Just prior to the placement of concrete, the subgrade shall be thoroughly moistened. As the concrete is placed, it shall be thoroughly consolidated and spread by means of mechanical vibrators and other measures necessary to achieve proper compaction. Segregation of the aggregate and formation of lattices or "honeycomb" shall be avoided. Any section of concrete found to be defective shall be repaired or replaced as directed by the Town staff. Concrete shall not be placed in freezing weather or on frozen surfaces.

(8) **Finishing.** Finishing of concrete surfaces shall be with a wooden or magnesium float followed by the application of a broomed or brushed finish. No plastering of the surface will be permitted. All edges shall be rounded with a one-quarter (1/4) inch radius edging tool. Following finishing, deviations in the surface will be checked, and any irregularity of more than one-quarter (1/4) inch in ten (10) feet shall be corrected.

(9) **Joints.** Expansion joints shall be required between the sidewalk and the curb and gutter and any other concrete structures, extending into, through or adjacent to the sidewalk. In addition, expansion joints will be required every fifty (50) lineal feet in the sidewalk, curb and gutter, and crosspans. Expansion joints shall be filled with one-half (1/2) inch thick premolded expansion joint filler. The curb and gutter, sidewalk, driveways and crosspans shall be divided into ten (10) foot sections by dummy joints formed by a jointing tool or other acceptable means as approved by the Town. These dummy joints shall extend into the concrete for at least one and one-half (1 1/2) inches and shall be at least one-eighth (1/8) inch wide.

(10) **Curing and protection.** Immediately upon completion of finishing, the concrete shall be moistened and kept moist for three (3) days, or cured by the use of membrane forming curing compound. In freezing weather, a sufficient supply of straw or other suitable materials shall be spread and held on the concrete to prevent freezing. During the curing period, all pedestrian and vehicular traffic shall be excluded from the concrete surfaces. Vehicular traffic shall be excluded from driveways and crosspans for an additional seven (7) days or as directed by the Town staff. It shall be the responsibility of the contractor to keep all traffic (including children and dogs) from curing concrete surfaces and to repair any damage resulting from a failure to do so.

(11) **Ready-mixed concrete.** Ready-mixed concrete conforming with the requirements of this Section will be acceptable for any concrete application. However,

any concrete standing in trucks on the job site for more than sixty (60) minutes or in the truck itself for more than ninety (90) minutes will be rejected.

(12) **Inspection.** The developer is responsible for ensuring that all sidewalks remain structurally sound and free of damage throughout the construction of all infrastructure, residential homes, and any other building activities related to the approved development plan. All repairs to sidewalks to be finished prior to certificate of occupancy, final inspection and bond release.

g. **Asphalt** All street construction shall be in conformance with engineered plans for the work as approved by the Board of Trustees and with the following specifications:

(1) **Base course.** Base course shall conform with Article 703.03 of the "Colorado Standard Specifications" for Class VI material, and shall meet the following gradation:

<u>Standard Sieve Designation</u>	<u>% by Weight Passing Class 6 Material</u>
3/4 inch	100
No. 4	30-65
No. 8	25-55
No. 200	3-12

Embankment within pavement areas shall consist of suitable excess excavation or of imported borrow material, placed in layers not to exceed eight (8) inches and compacted to ninety-five percent (95%) of minimum relative compaction however no embankment material shall contain rock over six (6) inches in diameter within two feet of subgrade. Base course material meeting the specified gradations shall be placed and compacted in a single layer, except where base exceeds six (6) inches in depth in which case multiple lifts not exceeding six (6) inches each shall be placed and compacted. Each layer shall be compacted until a density determined in accordance with AASHOT 180 Method C or D has been achieved. Water shall be uniformly applied during compaction to achieve proper consolidation. The prepared surface, ready to receive the prime coat, shall be uniformly graded to design elevation, as specified on the plans, so if tested with a ten (10) foot straight edge, the variance above or below the testing edge, between any two (2) contact points with the surface, shall not exceed one-fourth (1/4) inch. Areas not complying with these tolerances shall be reworked to obtain conformity. Should the base course be opened to traffic, it shall be regularly sprinkled so that excessive dust is not created.

(2) **Prime coat.** If asphalt is not installed to basecourse surface within fourteen (14) days of basecourse completion, bituminous material conforming to Section 702 of the "Colorado Standard Specifications", shall be applied to the graded base course at the rate of thirty-five hundredths (0.35) to forty hundredths (0.40) gallons per square yard of surface area during daylight hours. Prime coat shall not be applied under the following conditions:

a. When the base course surface is wet

b. When the temperature is below sixty degrees Fahrenheit (60F), or below fifty degrees Fahrenheit (50F) if applied before 2:00 p.m. MDT.

(3) **Asphalt concrete surface course.**

a. Design. Pavement design and justification shall be included in an Engineering Design Report, if requested by the Town during preliminary plat approval. Base thickness and pavement thickness (pavement sections) are to be determined by an Engineer's report on soils analysis (CBR or "R" values) and asphalt thickness based on anticipated traffic loads including truck traffic during the period when buildings are being constructed in the development, thereby generating concrete redi-mix trucks, rock and gravel delivery trucks, building block delivery trucks, lumber delivery trucks, utility installation equipment, furniture delivery vans, etc. Solid Waste collections trucks must be considered throughout the service life of any street.

b. Application. Asphaltic concrete material, meeting State Department of Highway job mix formula for the pit and gradation, shall be placed and compacted in a single three (3) inch layer or the thickness shown on the plans on the prime coated base course in conformity with the lines, grades and typical cross sections shown on the plans on properly constructed and accepted base courses that are free from water, snow or ice. The bituminous mixture shall have a minimum ambient temperature of two hundred eighty degrees Fahrenheit (280F) in the truck at the point of delivery. Contact surfaces of curb and gutter, manholes and other structures shall be painted with a thick uniform coating of RC bituminous material proper to placement of the asphalt concrete adjacent to their surface. Care should be taken to avoid spreading any bituminous material on exposed surfaces of any such structures, and the bituminous material shall be immediately removed from the structure should such event occur. The asphalt concrete surface course shall be constructed to within two-hundredths (.02) of a foot of the elevations called for on the plan. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture shall be dumped, spread and screened to give the required compacted thickness. No raking, which will result in separation of the material, will be allowed. Unless otherwise indicated above or on the plans, all work and equipment necessary for mixing, hauling, spreading and compacting the asphalt concrete surface course shall be in accordance with Section 401 of the "Colorado Standard Specification".

c. Materials. All aggregate and bituminous materials necessary for the asphalt concrete surface course shall conform to Section 702 of the "Colorado Standard Specification".

For local and collector streets, the structural section shall consist of a minimum six (6) inch Class 6 aggregate base course, prime coat, and a

minimum of three (3) inch asphaltic concrete surface course. The recommended method for pavement thickness design shall be per the current "Thickness Design, Asphalt Pavements for Highways and Streets" Manual Series No. 1 (MS-1) published by the Asphalt Institute. Comparable pavement design methods acceptable to the Town may be used.

Asphalt paving mix shall be "S" as defined by CDOT requirements. For unusual soil conditions and for arterial streets, the structural sections shall be designed based on anticipated traffic loadings, including traffic loadings associated with the build-out of the project, and existing or anticipated subgrade conditions.

h. **Water Distribution System.** All construction of water mains and related appurtenances shall be in accordance with Chapter 13 of this Code.

i. **Sewage Collection System.** The sewage collection system, including the sewer and all appurtenances and connections, shall be constructed in accordance with the specifications of the Buena Vista Sanitation District.

j. **Storm Drainage.** The storm drainage system shall be constructed as shown on the plans and in accordance with Article IV of the Municipal Code.

(1) **General.** It shall be unlawful for any person to construct, install, place or attempt to construct, install or place any storm drainage system extension or related subsurface structure or facility within any public street, avenue, alley or other public way or to discharge into a public right-of-way or easement, without first having procured Town approval in accordance with Town Code.

(2) **Permits.** It shall be the responsibility of the applicant to obtain any permits required for the construction, placement or installation of the proposed drainage facilities under Section 404 of the Clean Water Act or any other applicable federal or state statutes, rules or regulations. It shall be the responsibility of the applicant to obtain any FEMA floodplain map amendments or revisions required as the result of the construction, placement or installation.

(3) **Construction.** Storm drainage structures shall be constructed as follows:

a. **Ditches and channels.** Drainage ditches and channels shall be excavated as specified for streets in Section 17-58 and with side slopes not greater than 4:1. Ditches and channels shall be planted with grass or other low vegetation to protect channel sides and bottom from erosion. Should design velocities be such that vegetation cannot be supported, such channels shall be lined with rock with a diameter greater than six (6) inches as may be required, per drainage plan and/or report.

b. **Culverts.**

i. **Materials** Culverts shall be designed to withstand AASHTO H-20

loadings and shall be constructed of either corrugated steel pipe conforming with the requirements of the "Colorado Standard Specifications" Section 707.02, or reinforced concrete pipe Class III or greater conforming with the requirements of the "Colorado Standard Specifications" Section 706.02, or smooth-interior, high density polyethylene (HDPE) AASHTO M294, Type S, with silt-tight, non-rated water tight joints as manufactured by Hancor or ADS, unless other materials are specifically allowed by the Town.

Pipe shall be installed and backfilled in accordance with the manufacturer's recommendations and specifications. Joints for concrete pipe shall be made with pipe joint sealing compound. Headwalls, sidewalls, end sections and aprons shall be constructed of concrete in accordance with Section 17-58.. Reinforcing steel for such structures shall conform with the requirements of ASTM A615 (Grade 60) detailed and supported in accordance with the latest American Concrete Institute (ACI) detailing manual.

- ii. **Minimum Sizes** Storm sewer laterals should not be less than twelve (12)inch diameter. Culverts and storm sewer mains should be eighteen (18) inches or larger.
- iii. **End Treatment** Flared end sections or headwalls with wingwalls are required. Inlets are to be designed to minimize head losses. Approved erosion control is to be provided at all culvert outlets. For all riprap protection, Type L riprap, having a median size (D_{50}) of 9-inches, should be used as a minimum.
- iv. **Slopes** Culvert slopes shall prevent silting, yet avoid excessive velocities. The minimum culvert slope is half a percent (0.50%). Minimum barrel velocity is 3 feet per second (fps) and maximum is 12 feet per second (fps).
- v. **Separation and Cover.** The minimum vertical separation to a water or sanitary sewer line is two feet. Lesser clearance requires a concrete encasement or approved support for the affected utility. Minimum cover on all storm sewer is eighteen (18) inches.
- vi. **Manholes.** Manholes are required wherever there is change in size, direction, elevation, grade, or at lateral storm sewer junctions. Manholes may be waived for a lateral which has a diameter of less than half of the storm sewer trunkline. Manhole spacing shall not exceed 400' for all pipe sizes. Manholes should be sized based on CDOT standard details. Precast manhole sizes are based on the largest pipe size into or out of the manhole, assuming only one pipe in and one pipe out of the manhole. Increase precast manhole diameter to next available size for each additional pipe entering the manhole.

II. CONSTRUCTION TESTING AND ACCEPTANCE REQUIREMENTS

a. Responsibilities of the Developer

(1) **General.** The Developer shall provide at his expense the required testing services. All retesting shall be at the Developer's expense.

The use me of the testing agency's services does not relieve the Developer of the responsibility to furnish the required materials and to perform the required construction in full compliance with the specifications. Passing test results do not constitute acceptance of the work or materials represented by the test. The Developer is responsible for quality control of his work.

The Town's Representative may inspect or test, on-site or at its source, any completed work or material to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples for testing and further inspection.

(2) **Testing Agency Access and Assistance.** The Developer shall: allow the testing agency access to the job site at all times; furnish any labor required to assist the testing agency in obtaining and handling samples at the source of material and at the project; provide and maintain, for the sole use of the testing agency, adequate facilities for safe storage and proper curing of concrete test specimens on the project site as required by AASHTO T23.

(3) **Mix Designs.** When requested by the Project Manager, the Contractor or Developer shall furnish asphalt mix designs or concrete mix designs meeting the requirements of these specifications. Concrete mix designs shall be performed according to the provisions of ACI-211 or ACI-304. A separate mix design shall be provided if pumped concrete is used.

(4) **Construction Observation/Materials Testing of Projects.** To assure the quality of construction, a Registered Professional Engineer (Consultant) shall provide construction observation and materials testing services for all projects under the category of public streets, driveways, fire lanes, parking lots, utilities and other public improvements work. This Consultant shall be knowledgeable in civil works construction, street and roadway construction, paving techniques, material sampling and testing, and shall be familiar with the Town Municipal Code and Construction Specifications and the design of the project. Construction observers and materials testing technicians shall be under the direct supervision of the consultant. Periodic construction observation and materials testing services shall be performed daily when significant work is in progress. These services shall be sufficient in scope to determine the quality and adequacy of the construction. The consultant shall insure compliance with the Town Standards and Specifications.

Prior to acceptance of Public Improvements the consultant shall prepare a written statement and shall submit it to the Town in the following format:

**STATEMENT OF CONSTRUCTION OBSERVATION
AND MATERIALS TESTING FOR PROJECT IMPROVEMENTS**

(Name of Project)

Our firm was retained to provide construction observation and materials testing services for the above named project. Services were performed daily during the construction of (list type of construction: asphalt parking lot; concrete parking lot; curb and gutter, walks; etc.). Testing was performed for (list type of testing: soils subgrade moisture/density control; base course gradation, moisture/density; asphalt extraction and compaction; concrete slump, air and strength; etc.). Copies of observation logs and materials testing reports are available upon request. It is our professional opinion that the level of testing services and construction observation performed and testing results were adequate to show construction was in compliance with the Town Standards and Specifications.

Company Name
Company Address

(Printed Name), P.E.
(Seal Over Name)

b. Construction Observations

(1) **Authority of the Public Improvement - Town Representative:** A Public Improvement Town Representative is assigned periodically/observe construction compliance with the approved project drawings and the Town Code. The Town's Representative has the authority to reject inferior materials or defective workmanship and to suspend work not in accordance with the Town Standards and Specifications until such time as corrections are made and approved.

(2) **Construction Observations:**

- a. The Developer shall obtain the Town's approval of any material before placement and before beginning any work.
- b. The Developer shall call for periodic at intervals identified herein, giving forty-eight (48) hours minimum notice. Observation may be requested from the Town Hall. For utility company observation, call Public Works Department, the Sanitation District or Utility Provider, at 695-7300.

- c. In the event that any of the work or material fails to meet any of the requirements of the Specifications, written notice of the rejection shall be given to the Developer and work shall be halted until collective action is taken.
 - d. Periodic construction observation is only an aid to the Contractor and in no way reflects any responsibility on the part of the Town for quality or quantity control, and in no way implies acceptance of the work, or any part thereof, by the Town.
- (3) **Defective Materials and Work:** Whenever materials and/or work are found to be defective, the Developer, at his expense, shall promptly remove such defective materials and construction from the job site and replace all defective portions to the satisfaction of the Town's Representative. In the event the Contractor fails to remove defective items from the job site within 10 days of written notice, the Town may arrange for such removal at the expense of the Developer. Work performed or covered without observation as required herein or as stipulated by utility providers is subject to rejection.

c. Materials Testing

- (1) **Responsibilities of the Testing Agency:** All materials and operations shall be tested in accordance with the Town Code and referenced criteria therein.

A trained and properly qualified representative of the testing agency shall observe, sample, and test the materials and work on the project as required herein and as required by the Town Code. If any materials, furnished or the work performed by the Developer fails to fulfill the requirements, such deficiencies shall be reported to the Town and the Developer immediately. Preliminary written field reports of all tests and observation results shall be given to the Developer immediately after they are performed. Field reports shall be made available to the Town by the testing agency within twenty-four (24) hours. Final reports shall be forwarded to the Town no later than one (1) week following the testing. Results of all tests taken, including failing tests, shall be reported.

Reports shall bear the seal and signature of a Professional Engineer registered in the State of Colorado and competent in the required testing practice. All test reports shall show the location where the test was performed or at which the work or batch represented by the test was placed. Improperly completed reports will not be accepted. Acceptance will not be considered until all Final reports indicating compliance with these requirements are reviewed and placed on file by the Town. The testing agency personnel are not authorized to stop work, to revoke, alter, relax, enlarge, or release any requirements of the Town Code, nor to approve, accept, or reject any portion of the work.

- (2) **Test and Inspection Procedures:**
- a. **General.** All testing methods, and procedures performed by the testing agency personnel shall be in accordance with the applicable

AASHTO and ASTM requirements and procedures. Test reports shall include the AASHTO and ASTM test designations of all tests taken. All testing and retesting services shall be at the expense of the Developer. All retesting due to failing tests shall be at the Developer's expense.

When changes in materials or proportions are encountered during construction, or when the work fails to pass tests or fails to meet the Town Specifications, additional tests shall be taken as directed by the Town. Failure of the Developer to furnish satisfactory test data shall be sufficient cause for rejection of the work in question.

b. **Taking Specimens.** Unless otherwise indicated, all specimens and samples for testing will be taken by testing and inspections agency personnel, either at the source of the material or at the site for work in progress as applicable for the test method or procedure.

c. **Delivery of Specimens.** Unless otherwise indicated, pick-up and delivery of specimens or samples to the testing and inspections agency's laboratory will be done by the agency's personnel. This includes concrete test cylinders that have been stored onsite for the initial curing period.

d. **Re-Testing.** When initial tests or inspections indicate non-compliance of the work or any portion thereof, the non-complying portion shall be removed, replaced, or reworked (re-compacted in the case of subgrade, fill or backfill material), and re-tested by the same agency performing the initial test or inspection. Do not proceed with additional work until the non-complying work has been retested and found to be in compliance.

e. **Additional or Alternative Tests.**

- i. The Town reserves the right to require additional or alternative tests or inspections of materials or work for which the Town has reason to believe may not be in compliance with the requirements of the Town Code.
- ii. Examples of such additional tests may include, but are not limited to, additional sieve analysis of aggregates or granular fill material; additional field density tests of subgrade, fill, or backfill materials; additional core tests of asphaltic concrete paving; additional slump tests of concrete as it is being placed; core tests of in-place concrete.
- iii. Payment for additional or alternative tests will be the Developer's responsibility.

(3) **Schedule of Quality Assurance Tests and Inspections**

a. **General Notes.** Failure to include any test or inspection in this schedule does not relieve the Developer of his responsibility for timely

notification of the testing and inspections agency for quality assurance tests or inspections that may be listed.

b. Soils Testing:

- i. All testing shall be according to AASHTO or ASTM as designated.
- ii. When density and moisture content are determined by a nuclear device, a sand cone density test shall be taken daily or at the discretion of the Town. If the sand cone tests do not agree with the nuclear tests, use of the nuclear device shall be immediately discontinued until the cause of the disagreement is determined and corrected.
- iii. Moisture and Density Analysis: Prepare not less than one (1) optimum moisture and maximum density curve for each type of existing or imported soil proposed for use in filling or backfilling, including structural fill and base courses for paving.
- iv. All reports shall include elevation depth below finish grade at which test was taken. Results shall report densities (maximum dry and relative) to nearest 0.1 pound per cubic foot (lb/ft³), moisture content (optimum and in place) to nearest 0.1%, and compaction (relative and required) to nearest 0.1%.
- v. Slabs-on-Grade and Pavements:
 - (1) Subgrade: One (1) test for every 2000 square feet of compacted subgrade or major fraction thereof, but in no case less than three (3) tests for each days work.
 - (2) Compacted Base Coarse and Fill: One (1) test for every 2000 square feet of each compacted fill layer or lift, or major fraction thereof, but in no case less than three (3) tests per layer or lift for each days work.
- vi. Trenching:
 - (3) Perform one (1) field density and moisture test for every 100 linear foot or major fraction thereof, of trench backfill, taken at the trench bottom and at two (2) feet vertical intervals in the compacted fill depth. In no case will less than eight (8) tests be made.
 - (4) Where underground utility lines penetrate foundations, perform field density tests at the trench bottom and at every two (2) feet of vertical rise in compacted rill elevation, at points two (2) feet and ten (10) feet in horizontal distance from the foundation wall.
- vii. Site Grading and Miscellaneous Fills: One (1) test for every 400 cubic yard of fill and for every foot of vertical rise in compacted fill elevation, but in no case less than two (2) tests for each days work.
- viii. Failings: If, based on the testing and inspection agency reports and inspections, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with the "Re-Testing" provisions of this document.

c. Asphalt Testing:

- i. Job Mix: At least two (2) weeks prior to paving, the Developer, at his expense, shall submit suitable samples of all materials proposed for use on the project to an independent materials testing laboratory. The Testing Laboratory shall, at the Developer's expense, test all materials for compliance with Town Specifications and establish a job mix formula for each mixture proposed for use on the Project. The Testing Laboratory shall submit to the Town for approval two (2) copies of a report containing legible copies of all test data, graphs, tables, and charts used to establish the job mix formula. The report shall bear the seal and signature of a Professional Engineer, licensed in the State of Colorado, and competent in asphalt concrete mix design and construction. The Testing Laboratory shall report that the proposed materials and job mix meet or exceed the Town requirements.
- ii. All testing shall be according to AASHTO or ASTM as designated.
- iii. All reports shall include densities to the nearest 0.1 lb/ft³ and compaction to the nearest 0.1%. If a nuclear device is used, the report shall contain the method used (i.e. back scatter, direct transmission, etc.).
- iv. At the discretion of the Town, in-place pavement thickness shall be determined as follows: The pavement shall be cored at 500-foot intervals, or fraction thereof, in each 12 foot lane (nominal), with a minimum of three (3) cores in any area. The Town may require additional cores to define deficient areas.
- v. Test Intervals: Asphaltic Concrete test in-place base course and asphaltic concrete at randomly selected locations at the rate of one (1) test for each 2000 square foot per lift, but not less than three (3) test per day, unless otherwise directed. Record locations where samples are taken to correlate with subsequent testing.

d. Concrete Testing:

- i. Mix Design: The Developer shall submit design mix proportions, laboratory trial mix, and aggregate data for each class of concrete being placed on the project. The test data shall show the mix design proportions, slump, air content, unit weight, water/cement ratio, and twenty-eight (28) day compressive strength results, as tested under laboratory conditions. The design mix proportions must produce at least 100% of the required twenty-eight (28) day laboratory compressive strengths. Each design shall establish the mix proportions and sources of all ingredients. Aggregate test data shall include gradations, #200, sand equivalent, fineness modulus, specific gravities, absorptions, and LA Abrasion test results. The Developer shall be responsible for the design mix proportions and all subsequent adjustments necessary to produce the specified concrete.

The Developer shall submit a new design mix based on the above requirements when a change occurs in the mix proportions, source or type of cement, fly ash, or aggregate, or failure of field tests to meet Town Specifications.

Review of the design mix by the Town does not constitute acceptance of the concrete. In accordance with ACI 301, Standard Supplier design mixes may be approved in lieu of the above. Submittal of appropriate test data will be required. Acceptance will be based solely on test results of the concrete placed on the project.

- ii. All testing shall be according to AASHTO or ASTM as designated in Table 32. 1.
- iii. Portland Cement Concrete: Inspect and verify size, grade, and placement of reinforcing steel.
- iv. Sampling and testing shall be required on all concrete work including curb, sidewalk, pans, pavement, slope paving, retaining walls, inlet manholes, or any other structures.
- v. Maximum time between sampling and casting cylinders shall not exceed forty-five (45) minutes. If the concrete cannot be taken to the laboratory and cylinders cast within forty-five (45) minutes, the cylinders shall be cast in the field. Cylinders shall be transported to the laboratory within twenty-four (24) hours of casting but after the concrete has hardened (see AASHTO T23).
- vi. Test Specimen Quantity:
 - (1) Compressive Strength Tests:
 - (a) For each 100 cubic yards or major fraction thereof of each type or category of general concrete placed in any one (1) day, gather one (1) set of not less than four (4) test cylinders. Gather at least one (1) set of four (4) cylinders for each days work if less than 50 cubic yards of concrete is placed.
 - (b) When more than 50 cubic yards of concrete is placed in any one (1) day, the interval between test samples shall be at least 30 cubic yards in order to be representative of the entire days operation.
 - (c) Take samples at the point of discharge from the truck chute. For pumped concrete, take samples of pumped concrete at the point of deposit in the field. Accurately mark all cylinders with date, reference to location in structure from which they were taken, and batch ticket number.
 - (2) Slump Tests: Test each truckload of concrete delivered to the site.
 - (3) Air Content: Test each truck-load of air-entrained concrete delivered to the site.

- (4) Town testing and inspection agency may require additional slump tests or cylinders should there be reasonable cause to suspect that concrete being placed does not comply with specified concrete quality.
- vii. **Hardened Concrete Tests:**
 - (1) If the twenty-eight (28) day cylinder tests indicate specified design strength have not been met, the concrete represented by such tests will be considered unacceptable and subject to removal pending testing of final cylinder at fifty-six (56) days or additional testing of hardened concrete in place.
 - (2) All costs of additional testing of hardened concrete, plus the removal and replacement of concrete is the responsibility of the Contractor.
- viii. **Test Reports:** Reports of cylinder tests shall be submitted in writing to the Town, and the Developer within twenty-four (24) hours of laboratory testing. Test reports shall, as a minimum, include:
 - (1) Project data including project name and address, concrete supplier, supplier's delivery ticket number and mix identification number, testing agency's test or cylinder identification number, and location of pour.
 - (2) Results of field-testing at time of sampling including date and time of sampling, ambient air temperature and concrete temperature, concrete slump and air content, and concrete wet unit weight. Include time concrete was batched and time when placement was finished. Include specification limits for concrete temperature, slump, air content, and indicate whether the sample conforms to these limits.
 - (3) Results of laboratory testing including date test specimens were transported to laboratory, date and age of cylinder tested, average compressive strength of each cylinder tested, and specified design strength of concrete represented by the test.
 - (4) All reports shall include: the type of structure; data on obtaining, transporting, storing, curing time between sampling and casting cylinders; supplier, batch ticket I.D., finisher and Contractor.

d. Development Approvals

- (1) **Completion Inspection.** Forty-eight (48) hours prior to the completion of an item or segment of work, the Contractor will notify the Town's Public Works Representative, who will verify that the segment of work is substantially complete, all inspection and tests have been completed, submitted, and the results are acceptable. The purpose of this inspection is to allow further corrective work upon, or integral to, the completed segment of work.

Should any items be determined deficient, needing correction or nonconforming, a

Deficiency List will be prepared and issued to the Developer for correction, repair or replacement of any deficient or nonconforming items. The Developer, with the Town Representative, will verify the correction of the deficient and/or nonconforming items, prior to the start of the next operation.

(2) **Initial Acceptance.** When the final clean-up has been performed, the Developer will notify the Town that all work has been completed and schedule an inspection. The Town will perform all necessary final inspections and notify the Developer of any noted defects. Until the NOTICE OF INITIAL ACCEPTANCE is issued, the Town may direct that the newly constructed Public Improvements shall be barricaded to prevent public use of the improvements.

The "NOTICE OF INITIAL ACCEPTANCE OR SUBSTANTIAL COMPLETENESS," which begins the warranty period, will be issued when the following items are completed:

- a. The Town has accepted all major work elements.
- b. A "Release and Indemnification" statement has been delivered to the Town.
- c. Certified Compaction and Materials Testing Reports, in compliance with the applicable specifications and the requirements of the Town Code and herein, have been delivered to and approved by the Town.
 - i. Preliminary Acceptance Inspection: Prior to requesting a Preliminary Acceptance Inspection of the completed improvements by the Town, all work shall be completed and inspected. The Developer's written request for this inspection shall be made seventy-two (72) hours in advance. With the request shall come a list of any known deficiencies and when they will be corrected. If the list is too large or contains too many significant items, in the opinion of the Town Representative, no inspection will be held because of the incompleteness of the work. The Town will schedule the Preliminary Acceptance, Inspection and will prepare a list of deficient items (punch list) discovered during the inspection. If during the inspection the list becomes too large or too many significant items are on the list, the inspection will be canceled. The deficiency list will be transmitted to the Developer for correction of the deficient items.
 - ii. Final Acceptance Inspection: After the Developer has completed all items on the deficiency list (generated from the Pre-Final Acceptance Inspection) he shall request a Final Acceptance Inspection. The request shall be made by calling Public Works at least seventy-two (72) hours in advance of the inspection. All areas must be cleaned and ready for turnover prior to this inspection. The Representatives of the Town, the Design Consultant, and other interested parties will inspect the subject work to assure that all deficiencies have been satisfactorily attended to and that no new (subsequent) deficiencies have appeared and that all improvements are complete.

- d. Certified test results and acceptance letters from Utility Providers are required at each applicable segment of work. Following is the minimum segments of work for Public Improvements.
- i. Utilities: Water, sanitary, storm, telephone, gas, electric. If a utility provider cannot work within the construction schedule as acceptable to the Town, an agreement between the Developer and the Town can be made to proceed to the next segment of work.
 - ii. Subgrade Preparation for Curb and Gutter, Concrete Pans
 - iii. Curb and Gutter, Concrete Pan Placement
 - iv. Subgrade Preparation for Asphalt
 - v. Asphalt Placement
 - vi. Final Grading, Top Soil and Landscaping
 - vii. Asphalt Striping and Signage
 - viii. Boundary and Monument Placement

Upon mutual agreement between the Town and the Developer, phasing of the development can be established for the work segments.