2/10/2026

The Town of Superior allows the installation of chase drains in sidewalks to address issues of excess runoff. In these cases, the property owner is responsible for performing the work, including obtaining prior approval from the Town, securing the appropriate Town permits, coordinating with a contractor, and paying for the work to be completed in accordance with Town standards.

To be eligible for reimbursement, Town approval must be obtained before any work begins. Residents may be eligible for reimbursement of up to 50% of eligible costs, not to exceed $2,000.00.

In most cases, a Town of Superior Right of Way & Utility Construction Permit will be required, and the resident's chosen contractor will be the permit applicant. Superior's Public Works & Utilities Department will review the application and work with the contractor to ensure compliance with the Town's Design Standards for work within the public right-of-way.

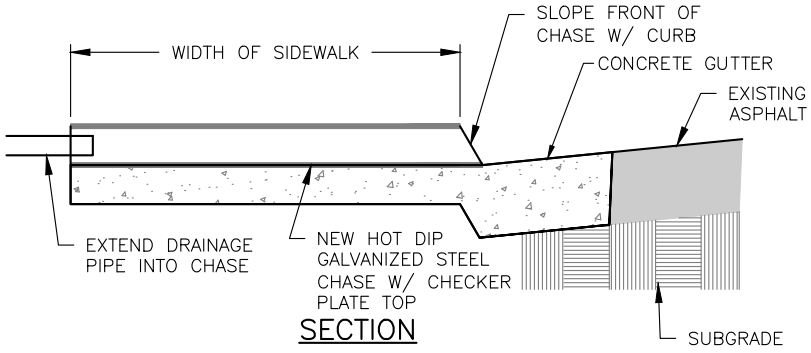
The following pages include applicable excerpts from the Town's Design Standards for construction of a sidewalk chase drain and re-pour of public sidewalk panels.

To obtain Town approval, reach out to the Public Works & Utilities Department at the link below:

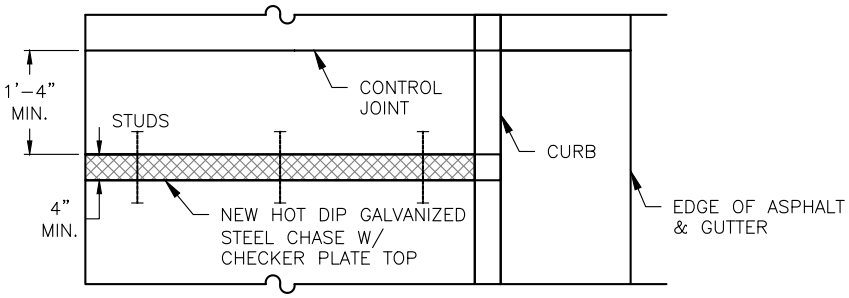
https://us.openforms.com/Form/96f2be9c-4224-4874-acf1-65a6b3d637c4

To apply for a Right-of-Way & Utility Construction Permit, use the link below:

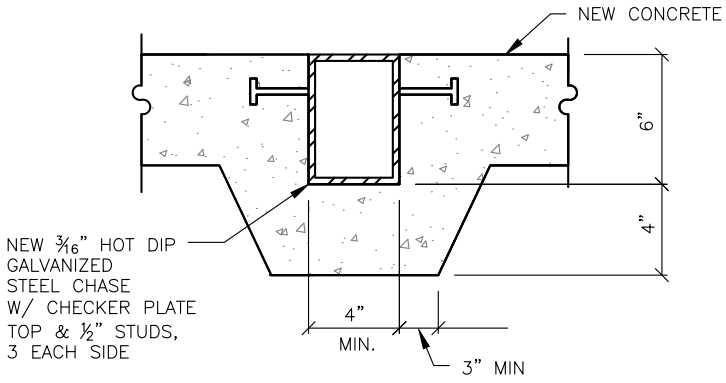
https://us.openforms.com/Form/58a95653-c859-4840-8b08-44931fcdd5bf



SECTION



PLAN



CROSS SECTION

NOTE:

CONCRETE TO BE CDOT CLASS B/D 4,500 PSI

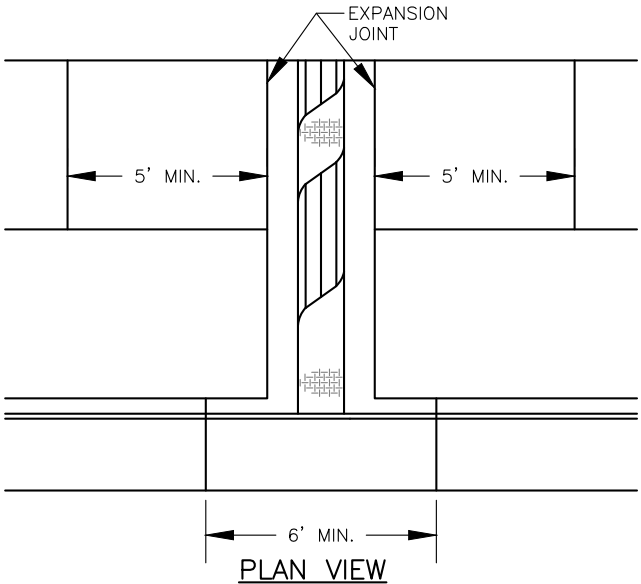
THESE DETAILS ARE PROVIDED FOR STANDARDIZATION PURPOSES ONLY. THIS DETAIL REPRESENTS MINIMUM DESIGN STANDARDS WHICH MAY REQUIRE UPGRADING FOR SPECIFIC APPLICATIONS. N.T.S.

Town of Superior℠

Gateway to Boulder Valley©

DRAINAGE CHASE IN EXISTING ATTACHED SIDEWALK

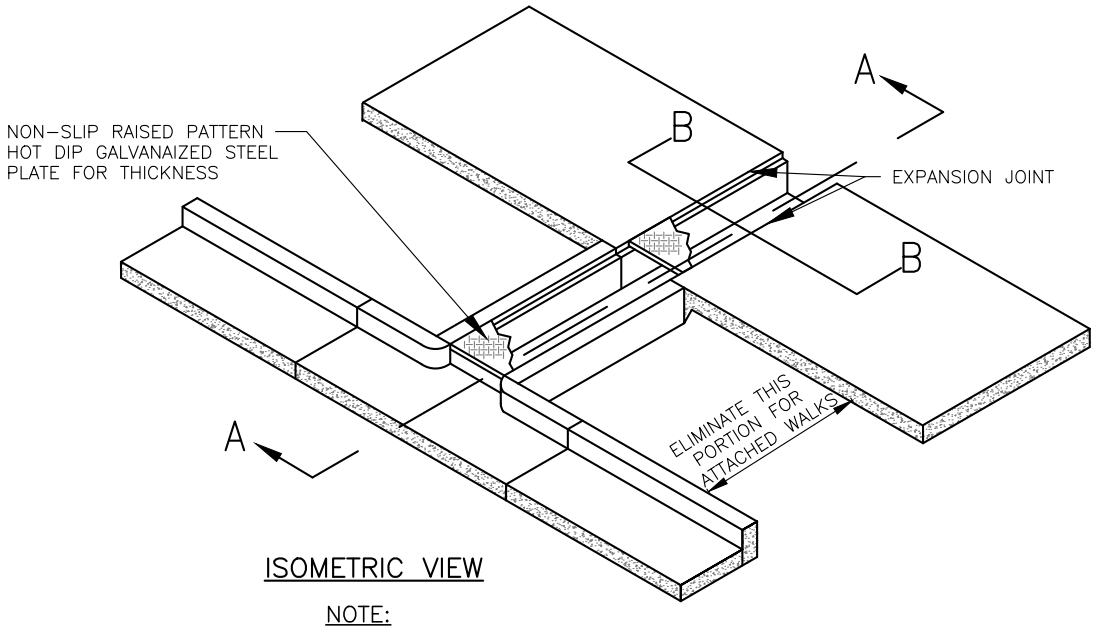
DATE: JANUARY 2019 | SHEET 800–15



PLAN VIEW

NOTE:

CHASE NOT PERMITTED IN 4" CURB SECTION UNLESS TRANSITIONED INTO 6" VERTICAL



ISOMETRIC VIEW

NOTE:

CONCRETE TO BE CDOT CLASS B/D 4,500 PSI

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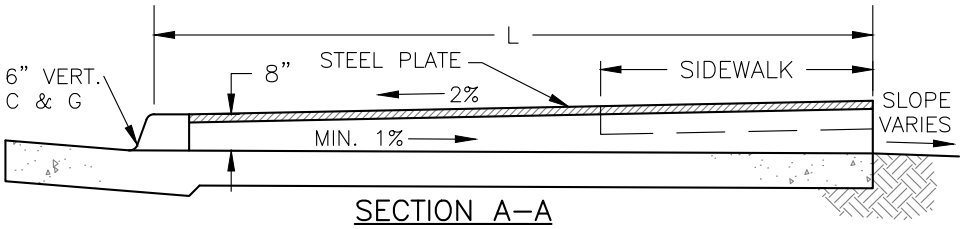
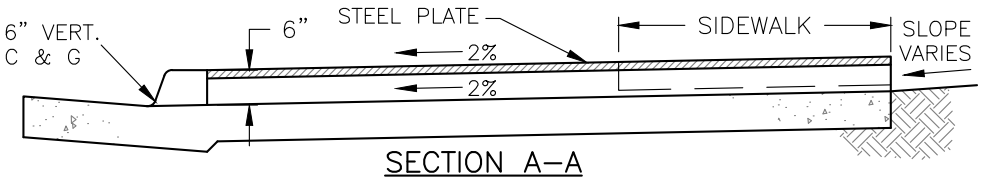
SIDEWALK CHASE IN DETACHED SIDEWALK (1 OF 2)

DATE: JANUARY 2019

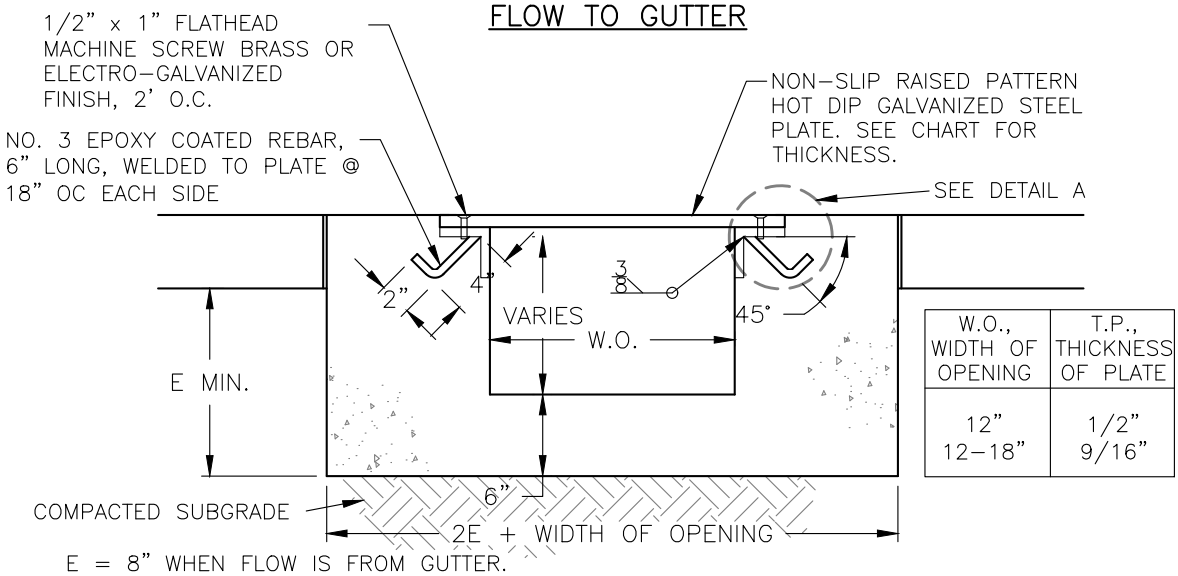
SHEET 800-16



SECTION A–A
FLOW FROM GUTTER



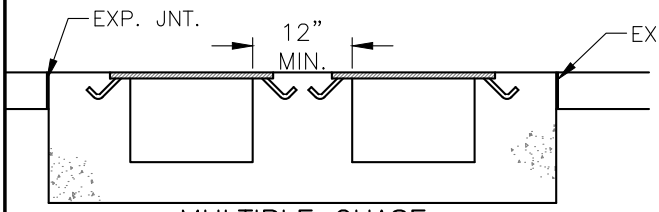
SECTION A–A
FLOW TO GUTTER



W.O., WIDTH OF OPENING	T.P., THICKNESS OF PLATE
12"	1/2"
12–18"	9/16"

E = 8" WHEN FLOW IS FROM GUTTER.
E = 6" WHEN FLOW IS TO GUTTER.

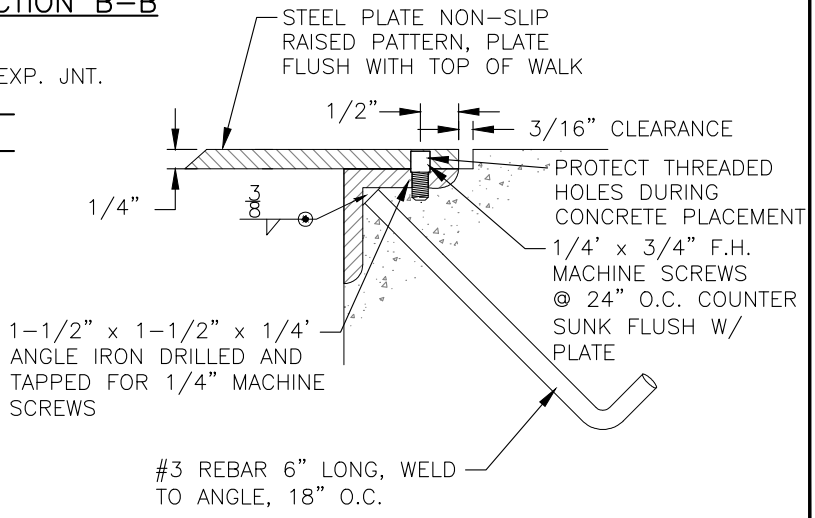
SECTION B–B



MULTIPLE CHASE
WHEN OPENINGS ARE LARGER THAN
18"

NOTE:

CONCRETE TO BE CDOT CLASS B/D 4,500 PSI
WITH FIBERMESH



DETAIL A

THESE DETAILS ARE PROVIDED FOR STANDARDIZATION PURPOSES ONLY. THIS DETAIL REPRESENTS MINIMUM DESIGN STANDARDS WHICH MAY REQUIRE UPGRADING FOR SPECIFIC APPLICATIONS. N.T.S.

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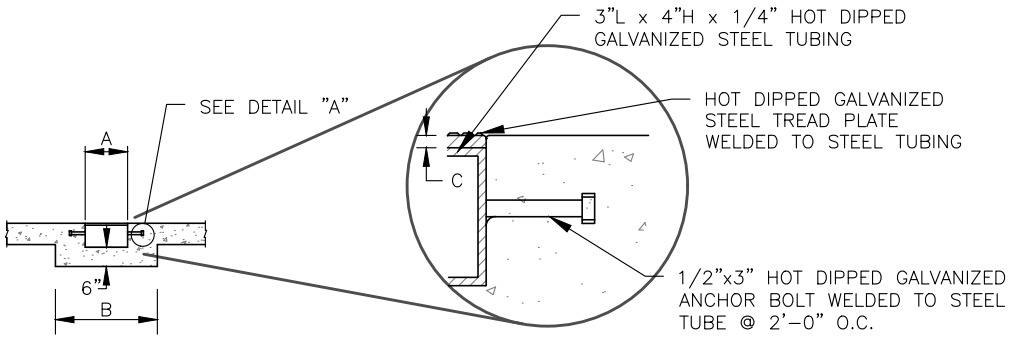
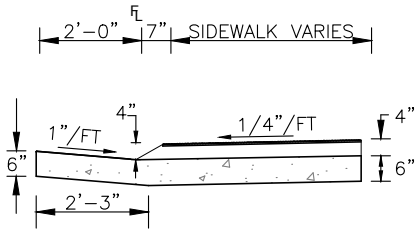
SIDEWALK CHASE IN DETACHED SIDEWALK (2 OF 2)

DATE: JANUARY 2019 | SHEET 800–17

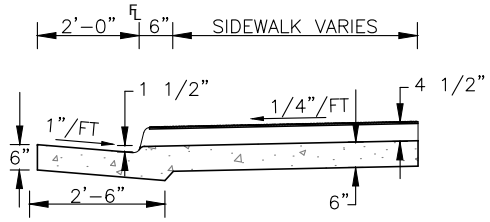


SECTION A–A

DETAIL "A"
NOT TO SCALE

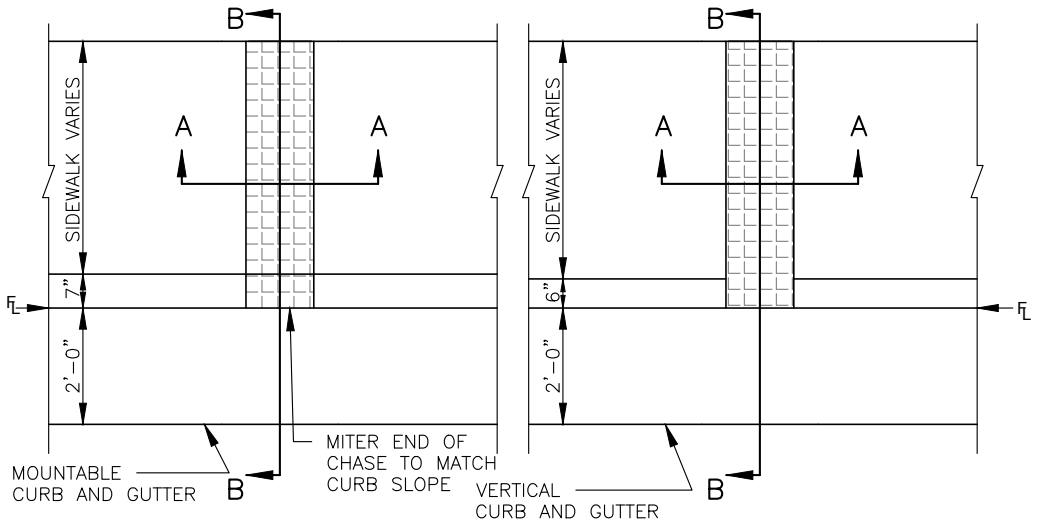


SECTION B–B
MOUNTABLE CURB



SECTION B–B
VERTICAL CURB

TYPE	A	B	C
SC	4"	18"	3/8"



PLAN VIEW

NOTE:

CONCRETE TO BE CDOT CLASS B/D 4,500 PSI.

THESE DETAILS ARE PROVIDED FOR STANDARDIZATION PURPOSES ONLY. THIS DETAIL REPRESENTS MINIMUM DESIGN STANDARDS WHICH MAY REQUIRE UPGRADING FOR SPECIFIC APPLICATIONS. N.T.S.

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SIDEWALK CHASE SECTIONS

DATE: JANUARY 2019 | SHEET 800–18

SECTION 800 CONCRETE MIX DESIGN AND CONSTRUCTION

801.00 GENERAL CONDITIONS

Refer to Section 100 TITLE, SCOPE, AND GENERAL CONDITIONS of these DESIGN STANDARDS AND SPECIFICATIONS for additional requirements that apply to all projects within the Town.

810.00 SCOPE

All Portland cement concrete work within any street, parking lot, or ROW or in any part of the water system, reuse water system, sanitary sewer system, or storm drainage system of the Town shall meet the requirements of these DESIGN STANDARDS AND SPECIFICATIONS.

811.00 INSPECTIONS

Refer to Section 153.00 INSPECTIONS and Section 931.00 ROADWAY INSPECTIONS of these DESIGN STANDARDS AND SPECIFICATIONS.

Adequate inspections ensure compliance to the Town requirements and are the basis for the Town's recommendation that improvements be accepted for maintenance and/or for release of performance guarantees. It is the responsibility of the Contractor to contact the Town a minimum of one (1) full working day (twenty-four [24] hours) in advance of the required inspections. Required inspections shall include:

A. Subgrades: Verify that material on which concrete shall be placed is to the line, grade, and cross-sections shown on the approved plans is not frozen or excessively dry at the surface and meets all moisture and compaction requirements.

B. Forms/Reinforcing Steel: Verify that forms are set to proper grade and alignment, adequately braced, and set for proper thickness of concrete. Epoxy coated rebar is properly placed and spaced, at least fifty (50) percent of intersections are tied, and proper distances from surface grade and forms are maintained.

C. Concrete Delivery and Testing: Confirm that mix design submittals are approved by the Town, and testing/sampling frequency, slump, air, and minimum/maximum air and concrete temperatures comply with these DESIGN STANDARDS AND SPECIFICATIONS.

D. Cure and Finish: Verify that finished concrete complies with approved grades and alignment and is properly cured. If required by the Town, verify that concrete pavement surfaces comply with the smoothness requirements of Section 412.17 Surface Smoothness Test of the CDOT *Standard Specifications for Road and Bridge Construction*.

E. General Items:
   1. All temporary structures, debris, mud, and waste materials shall be removed from public property.
   2. Remove and replace all areas of broken concrete. Subgrade failures shall be corrected before pouring back.

F. Construction Acceptance into Warranty: Refer to Section 211.00 PROBATIONARY ACCEPTANCE INTO WARRANTY PERIOD of these DESIGN STANDARDS AND SPECIFICATIONS.

G. Final Acceptance/Release from Warranty: Refer to Section 212.00 FINAL ACCEPTANCE AND RELEASE FROM WARRANTY BY THE TOWN of these DESIGN STANDARDS AND SPECIFICATIONS.

820.00 CONCRETE MIX DESIGN

Concrete shall be composed of Portland cement, aggregate, and water, and shall be reinforced with steel bars or steel wire fabric where required.

Concrete mix design information shall be prepared in accordance with ACI 301, Section 4.2, and submitted to the Town for approval. At least two (2) sets of certified twenty-eight (28) day strength test results shall also be submitted. No concrete shall be placed until the concrete mix design has been approved by the Town.

A separate mix design submittal shall be required for concrete to be pumped. Mix designs shall be prepared in accordance with ACI 211 and 304, as applicable.

821.00 MATERIALS

821.01 Cement

The cement used in concrete work shall depend upon the sulfate content of the surrounding soil. Refer to the table below and CDOT *Standard Specifications for Road and Bridge Construction* for appropriate sulfate resistant design.

TABLE 800.01 REQUIREMENTS TO PROTECT AGAINST DAMAGE TO CONCRETE BY SULFATE ATTACK FROM EXTERNAL SOURCES OF SULFATE

Severity of Sulfate Exposure	Water-Soluble Sulfate (SO_4) in Dry Soil, %	Sulfate (SO_4) in Water, ppm	Maximum Water-to-Cementitious Material Ratio	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1,500	0.45	Class 1
Class 2	0.21 to 2.00	1,501 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,000 or greater	0.40	Class 3

All cement used in concrete work shall be Portland cement that complies with ASTM C150, Type I or Type II, except where Type V cement is required for sulfate-resistant concrete. In general, Type II cement that complies with ASTM C150 shall be used in concrete in contact with the soil, unless otherwise allowed or directed by the Town. Cement for any reason that has become partially set or which contains lumps shall be rejected.

The Contractor shall be responsible for proper storage of all cement until it is used. When requested by the Town, the Contractor shall furnish the Town with a certificate from the manufacturer or an acceptable testing laboratory stating that the cement meets the requirements of these DESIGN STANDARDS AND SPECIFICATIONS for Portland cement.

821.02 Fly Ash

Fly ash may be utilized in the concrete mix design when permitted by the Town. Fly ash shall be Class F and shall comply with ASTM C618. The pozzolanic index shall be eighty-five (85). Fly ash may replace a maximum of twenty (20) percent of the amount of Portland cement that otherwise is required to produce concrete of the specified compressive strength. Class C fly ash shall not be permitted where sulfate resistant cement is required.

The Contractor shall notify the Town of the source of the fly ash prior to the fly ash being used in the project. When required by the Town, the Contractor shall provide the fly ash analysis performed by the fly ash supplier along with the concrete mix proportions. The Town may require a certificate from an approved testing laboratory stating that the fly ash meets the requirements of these DESIGN STANDARDS AND SPECIFICATIONS.

821.03 Water

Water for concrete shall be clean and free from sand, oil, acid, alkali, organic matter, or other deleterious substances; it shall meet the requirements for mix water, as published in ASTM C94. Water from public supplies or water that has been proven to be suitable for drinking is satisfactory.

821.04 Admixtures

The following requirements apply for admixtures:

A. The Contractor shall use air-entraining admixtures for all surfaces of exposed concrete. Air entraining admixtures shall comply with ASTM C260.

B. When weather restraints, site conditions, or project requirements require the ability to place concrete at a lower temperature, produce accelerated concrete setting time, or increase early and ultimate compressive strengths, an accelerating admixture may be utilized in the design mix when allowed by the Town.

C. Calcium chloride may be utilized in the design mix when allowed by the Town.

D. Type C accelerating admixtures and Type E water reducing and accelerating admixtures shall meet ASTM C494.

E. When concrete is to be used with reinforcing steel, a non-chloride/non-corrosive admixture shall be used.

F. Dosage rates shall be determined by recommendation of the ready mix company and shall be specified for daily site conditions.

821.05 Fine Aggregate

The fine aggregate shall be clean, hard, durable, uncoated particles of sand free from injurious amounts of clay, dust, soft or flaky particles, loam, shale, alkali, organic matter, or other deleterious matter. Fine aggregate shall be well graded and when tested by means of laboratory sieves shall comply with ASTM C33.

The fine aggregate gradation shall comply with CDOT Fine Aggregate.

821.06 Coarse Aggregate

The coarse aggregate shall consist of broken stone or gravel that is clean, hard, tough, and durable and free from soft, thin, elongated, or laminated pieces, disintegrated stone, clay, loam, vegetable, or other deleterious matter.

Coarse aggregate shall be well graded and when tested by means of laboratory, sieves shall comply with ASTM C33. The coarse aggregate gradation shall comply with CDOT' Coarse Aggregate Gradation #467.

821.07 Fibrous Reinforcing

Fibrous reinforcing shall be used in Portland cement concrete used for all curb, gutter, median splash guards, sidewalks, trails, curb returns, fillets, cross pans, concrete alleys, concrete roadways, trickle channels, and valley gutters.

The following shall be submitted to the Town:

A. One (1) copy of manufacturer's printed product data, clearly marked, indicating proposed fibrous concrete reinforcement materials. Printed data should state one and one-half (1½) lbs of fiber to be added to each cubic yard of each type of concrete.

B. One (1) copy of manufacturer's printed batching and mixing instructions.

C. One (1) copy of a certificate prepared by the concrete supplier stating that the approved fibrous concrete reinforcement materials at the rate of one and one-half (1½) pounds per cubic yard were added to each batch of concrete delivered to the project site. Each certificate shall be accompanied by one (1) copy of each batch delivery ticket indicating amount of fibrous concrete reinforcement material added to each batch of concrete.

Fibrous concrete reinforcement shall consist of:

A. 100% virgin polypropylene fibrillated fibers specifically manufactured for use as concrete reinforcement containing no reprocessed olefin materials. Fibrous concrete reinforcement shall be as manufactured by Fibermesh Company, Buckeye Ultra Fiber 500, or approved equal.

B. Physical characteristics:
   1. Specific gravity = 0.905 grams per cubic centimeter
   2. Tensile strength: 70 to 110 psi
   3. Fibrous concrete reinforcement materials provided by this subsection shall produce concrete conforming to the requirements for each type and class of concrete required as indicated
   4. Construction methods:

i. Add fibrous concrete reinforcement to concrete materials at the time concrete is batched in amounts in accord with approved submittals for each type of concrete required.
ii. Mix batched concrete in strict accord with fibrous concrete reinforcement manufacturer's instructions and recommendations for uniform and complete dispersion.

5. Concrete placing and finishing: Place and finish concrete materials as specified in subsections 831 and 838.

822.00 MIX PROPERTIES

Mix properties of Portland cement concrete for flatwork shall comply with the following:

TABLE 800.02

PROPERTY	MIX DESIGN
Minimum compressive strength - 28 days*	4,500 psi
Maximum water/cement ratio - by weight	0.45
Slump - inches	1-5
Air entrainment - % by volume	5-8

* When tested in accordance with ASTM C31

The grading and composition requirements for coarse and fine aggregate for concrete shall be in accordance with the CDOT *Standard Specifications for Road and Bridge Construction*. Additional concrete mix designs may be approved for decorative, non-structural concrete at the discretion of the Town.

822.01 Colored Patterned Concrete

Color shall be noted on the approved drawings or as approved by the Town. Concrete splash block in medians shall be Davis Color Spanish Gold (1 lb 160) or approved by the Town.

Where required on the approved plans, colored patterned concrete shall comply with the following:

A. Minimum twenty-eight (28) day compressive strength of concrete shall be 4,500 psi.

B. Air entrainment shall be six and one half (6.5) percent ± [1%] for maximum aggregate size of three-quarter (¾) inch or one (1) inch and shall be seven and one-half (7 ½) percent [± 1%] for a maximum aggregate size of three-eight (⅜) inch or one-half (½) inch.

C. Normal set or retarded set water reducing admixture shall comply with ASTM C494.

D. No calcium chloride shall be added to the concrete mix.

E. Matching integral color shall be used as a supplement but not as a color hardener.

F. Color hardener shall be specially formulated for installation of patterned concrete, grade "Heavy Duty".

G. Color curing compound shall comply with ASTM C309 and with all applicable air pollution regulations.

822.02 Controlled Low Strength Materials

Controlled low-strength materials (CLSMs), a flowable-fill material, is a self-leveling, low strength concrete material composed of cement, fly ash, aggregates, water, chemical admixtures, and/or cellular foam for air-entrainment. Flow-fill shall have a slump of seven (7) to ten (10) inches when tested in accordance with ASTM C143 or a minimum flow consistency of six (6) inches when tested in accordance with ASTM D6103. Flow-fill shall have a minimum compressive strength of fifty (50) psi after twenty-eight (28) days when tested in accordance with ASTM D4832. Foamed flash fill, a rapid setting flow-fill that may be used when approved by the Engineer.

CLSM mix designs shall be submitted to the Town for approval prior to placement. CLSMs used as structure backfill, as backfill for pipelines and service lines, or to fill abandoned pipelines and appurtenances shall have a twenty-eight (28) day compressive strength between fifty (50) and one hundred and fifty (150) psi, as tested by ASTM D4832.

CLSMs shall be placed in confined areas and under pipe haunches with methods approved by the Town. When backfilling pipelines and service lines, CLSMs shall be properly layered to prevent pipe from floating. The maximum layer thickness for CLSMs shall be three (3) feet, unless otherwise approved by the Engineer. The Contractor shall not place CLSMs in layers that are too thick to cause damage to culverts, pipes, and other structures or that will cause formwork or soil failures during placement. CLSMs shall have an indention diameter less than three (3) inches and the indention shall be free of visible water when tested in accordance with ASTM D6024 by the Contractor prior to placing additional layers of CLSMs. Testing CLSMs in accordance with ASTM D6024 will be witnessed by the Engineer. Damage resulting from placing CLSMs in layers that are too thick or from not allowing sufficient time between placements of layers shall be repaired at the Contractor's expense.

The Contractor shall submit a CLSM mix design for approval prior to placement. The mix design shall include the following laboratory test data:

(1) ASTM C231 (Air Content)
(2) ASTM D6023 (Unit Weight)
(3) ASTM C143 (Slump) or ASTM D6103 (Flow Consistency)
(4) ASTM D4832 (28-Day Compressive Strength)
(5) Removability Modulus

Submittal of test sections and a placement plan may be required to receive approval by the Town.

When foamed flash fill is used, it shall be batched with a volumetric mixing truck. Volumetric mixing trucks to produce flow fill and foamed flash fill shall have a computer batching system capable of producing the approved mix design and printing tickets. For foamed flash fill, the batch weights of cement and/or fly ash per cubic yard shall be with two (2) percent of the mix design batch weights and the batch weight of water per cubic yard shall be within 2% of the mix design batch weight.

CLSMs shall conform to CDOT Standard 206.02 for structural backfill (flow-fill).

823.00 READY-MIXED CONCRETE

The use of ready-mixed concrete shall in no way relieve the Contractor or Developer of the responsibility for proportion, mix, delivery, or placement of concrete. All ready-mixed concrete shall comply with ASTM C94.

Concrete shall be continuously mixed or agitated from the time the water is added until the time of use, and discharge from the truck shall be completed within ninety (90) minutes after the concrete comes in contact with the mixing water or with the aggregates. In accordance with ASTM C94, water may be added to ready-mix concrete one time in order to get slump within range, as long as the specified water-cement ratio is not exceeded and approval is given by the Town. No water may be added after concrete testing is performed and test cylinders cast.

The Town shall have free access to the ready mix plant at all times. The organization supplying the concrete shall have sufficient plant and transportation facilities to ensure the continuous delivery of the concrete at the required rate.

The Contractor shall collect batch tickets from the driver for all concrete used on the project and shall deliver them to the Town. All concrete delivered without a batch ticket will be rejected. Batch tickets shall provide the following information, in accordance with ASTM C94:

A. Name of ready-mix batch plant

B. Serial number of ticket

C. Date

D. Truck number

E. Name of purchaser

F. Specific designation of job (name and location)

G. Mix # or specific class or designation of the concrete

H. Amount of concrete, in cubic yards

I. Time loaded or of first mixing of cement and aggregates

J. Water added by receiver of concrete and his initials

K. Weights of fine and coarse aggregates

L. Type, brand, and amount of cement

M. Types, brands, and amounts of admixtures

N. Volume (in gallons) of water, including surface water on aggregates

Concrete loads arriving without a batch ticket shall be rejected.

824.00 STEEL REINFORCING AND FORMS

824.01 Steel Reinforcing

The placement, fastening, splicing, and supporting of reinforcing steel or bar mat reinforcement shall comply with the plans and the latest edition of *CRSI Recommended Practice for Placing Reinforcing Bars*. Unless otherwise designated, bars conforming to AASHTO M31 and M53 shall be furnished in Grade 60, and all bars shall be epoxy coated. Before being positioned, all reinforcing steel shall be thoroughly cleaned of mill and rust scale and of coatings that may destroy or reduce the bond. Where there is delay in depositing concrete, reinforcement shall be reinspected and cleaned if necessary.

Reinforcement shall be carefully formed to the dimensions indicated on the approved plans by the cold bending method. Cold bends shall be made so that the inside diameter of the bend measured on the inside of the bar shall be as follows:

TABLE 800.03

BAR SIZE	GRADE 60
#3 through #8	6 bar dia.
#9, #10, and #11	8 bar dia.
#14 and #18	10 bar dia.

The inside diameter of bend for stirrups and ties shall not be less than four (4) bar diameters for sizes #5 and smaller, and five (5) bar diameters for #6 and #8. Reinforcement shall not be bent or straightened in a manner that may injure the material. Bars with kinks or bends shall not be used except where shown on the plans. Heating of reinforcement shall not be permitted.

Reinforcing steel shall be accurately placed and secured against displacement by using plastic or epoxy coated annealed iron wire of not less than No. 18 gauge, or by suitable clips at intersections. A minimum of fifty (50) percent of intersections shall be secured. Where necessary, reinforcing steel shall be supported by adequate plastic or epoxy coated metal chairs or spacers or metal hangers. Splicing of bars except where shown on the plans, shall not be allowed without approval of the Town.

The use of welded wire fabric is prohibited.

Contractor shall submit shop drawings of the reinforcement to the Town for approval. Unless otherwise shown on the plans, the minimum clear cover and reinforcement drawings shall match CDOT.

824.02 Forms and Form Setting

Forms shall not be placed until the subgrade extending one (1) foot outside of the forms is within one (1) inch of grade. Forms shall have sufficient strength to withstand, without deformation, the pressure resulting from the placement and vibration of the concrete. Forms shall be constructed so that the finished concrete shall conform to the shapes, lines, grades, and dimensions indicated on the approved plans. Any form which is not clean and which has not had the surface prepared with commercial form oil to effectively prevent bonding, staining, and softening of concrete surfaces shall not be used.

Forms may generally be wood or metal and shall have a depth equal to or greater than the slab thickness. Plywood forms, plastic coated plywood forms, or steel forms shall be used for all surfaces requiring forming which are exposed to view – whether inside or outside any structure. Surfaces against backfilled

earth, interior surfaces of covered channels, or other places permanently obscured from view may be formed with forms having sub-standard surfaces.

Forms that have become worn, bent, or broken shall not be used. Each section of form shall be straight and free from warps. The Contractor shall set a minimum length of three hundred (300) feet of forms to grade prior to placing concrete. In cases where the length of one run is less than three hundred (300) feet, the Contractor shall set forms to grade for the entire run.

The face of curbs shall be formed, unless otherwise permitted by the Town. Forms shall be secured to resist the pressure of the poured concrete without springing or settlement. The connection between sections shall be performed by a method in which the joint shall be free from movement in any direction.

Forms shall not deviate more than one-quarter (¼) inch from the design line and grade.

When concrete pavement is constructed on a curve, flexible forms shall be used having a radius of two hundred (200) feet or less, unless otherwise directed by the Town. Face forms shall be pre-formed to the proper radius. Care shall be exercised to ensure the required cross section is maintained the entire radius.

The Contractor shall provide an approved metal straight edge, ten (10) feet in length, to check the alignment of the forms prior to placing the concrete and to check the concrete surface during the finishing operation.

Forms shall not be disturbed until the concrete has hardened sufficiently to permit removal without damaging the concrete – or until forms are not required to protect the concrete from mechanical damage. The minimum duration of time before removal of forms after placing concrete shall be one (1) day for footings and two (2) days for all other concrete. Crowbars or other heavy tools shall not be used against green concrete when removing forms. Forms shall be thoroughly cleaned before re-oiling and reused.

825.00 CONCRETE TESTING

The requirements of this section shall apply to testing services for all concrete curb and gutter, sidewalk, pavement, slope paving, retaining walls, structures, and for all miscellaneous concrete testing.

A representative of the concrete testing agency shall inspect, sample, and test material and production of concrete as required by the Town. Minimum testing frequency shall be as specified in Section 311.02 *Minimum Testing Requirements* of these DESIGN STANDARDS AND SPECIFICATIONS. When it appears that any material furnished or work performed by the Contractor fails to fulfill specification requirements, the testing agency shall report such deficiency to the Town and the Contractor.

The concrete testing agency shall report all test and inspection results to the Town and Contractor immediately after they are performed. All test reports shall include the exact location of the work at which the batch represented by a test was deposited. The report of the strength test shall include detailed information on storage and curing of specimen prior to testing, the project number and the location of the concrete (curb, manhole, inlet, sidewalk, paving, etc.).

The concrete testing agency or its representative is not authorized to revoke, alter, relax, expand, or release any requirements of these DESIGN STANDARDS AND SPECIFICATIONS, nor to approve or accept any portion of the work.

830.00 CONCRETE CONSTRUCTION

831.00 PLACING CONCRETE

Before placing concrete, debris shall be removed from the space to be occupied by the concrete. Soft, yielding, or otherwise unsuitable material shall be removed and replaced with suitable material. Filled sections shall be compacted and compaction shall extend a minimum of one (1) foot outside of the form lines. The forms and all concrete subgrade surfaces shall be thoroughly wetted. The concrete shall be placed on damp but not wet or muddy subgrade. Concrete shall be placed and vibrated so that it is free from honeycomb and free from pockets of segregated aggregate. Sections of segregation or honeycomb revealed by removal of the forms shall be removed and replaced or otherwise repaired as approved by the Town.

Concrete shall not be placed until all forms and reinforcing steel have been inspected and approved by the Town. Concrete shall be handled from the mixer to the place of final deposit as rapidly as possible by methods that prevent separation or loss of ingredients. The concrete shall be deposited in the forms as close as practicable in its final position to avoid re-handling. It shall be deposited in continuous layers, the thickness of which generally shall not exceed twelve (12) inches. Concrete shall be placed in a manner to avoid segregation and shall not be dropped freely more than five (5) feet. If segregation occurs, the Town Construction Inspector may require the concrete to be removed and replaced at the Contractor's expense.

Concrete shall be placed in one continuous operation, except where keyed construction joints are shown on the plans – or as approved by the Town. Delays in excess of thirty (30) minutes may require removal and replacement of concrete by the Town. At the end of the work day, or in case of an unavoidable interruption of more than thirty (30) minutes, a transverse construction joint shall be placed at the point of stopping work, provided that the section on which work has been suspended shall not be less than five (5) feet long. Sections less than five (5) feet in length shall be removed. Concrete shall not be placed when the weather is stormy, dusty, windy, or inclement to a degree that precludes good workmanship.

831.01 Vibrating

All concrete shall be compacted by internal vibration using mechanical vibrating equipment. Concrete in floor slabs, sidewalks, or curb and gutter which is not placed against form linings shall be either tamped or vibrated. Care shall be taken to vibrate only long enough to bring a continuous film of mortar to the surface. Vibration shall stop before any segregation of the concrete occurs. Mechanical vibrators shall be an approved type as specified in ACI 309, Chapter 5. Vibrators shall not be used to move or spread the concrete.

Any evidence of lack of consolidation or over-consolidation shall be regarded as sufficient reason to require removal and replacement of concrete at the Contractor's expense. The Contractor shall be responsible for any defects in the quality and appearance of the concrete.

831.02 Workability

The consistency of concrete shall be kept uniform and shall be checked by means of certified slump tests. The workability of the concrete shall be varied as directed by the Town. At all times concrete shall have a consistency such that it can be worked into corners and angles of the forms and around joints, dowels, and tie-bars by the construction methods which are being used without excessive spading, segregation or undue accumulation of water or laitance on the surface. If concrete fails to conform to the proportions of the approved mix design for any reason, such concrete shall not be incorporated in the work but shall be

discarded from the project site as waste material at the Contractor's expense. **No water may be added at the job site without the Town's permission.**

If approval is obtained and water is added at the job site, entrained air, slump, unit weight, and temperature tests shall be performed and test cylinders cast at the Contractor's expense.

831.03 Service Line and Dry Utility Sleeve Markings

Water, sanitary sewer, reuse irrigation service line locations shall be marked in the curb face using a four (4) inch metal stamp in the curb face. Water service lines shall be marked on the curb face with a "W." Sanitary sewer service lines shall be marked on the curb face with an "S," and reuse-irrigation service lines shall be marked on the curb face with an "*IR*."

Dry utility sleeve crossings shall be stamped on the top of the curb head with a "C."

831.04 Installation of Colored, Patterned Concrete

Special concrete mix with integral color shall be placed and screeded to the proper grade, and floated to a uniform surface in the normal manner for slabs on grade. While the concrete is still, the plastic imprinting tools shall be applied to make the desired patterned surface. The pattern shall be matched at imprint edges and joints.

Color curing compound – thinned in the proportion of one (1) part curing compound to one (1) part mineral spirits (i.e., paint thinner) – shall be applied uniformly with a roller or sprayer. The coverage shall be approximately six hundred (600) to six hundred and fifty (650) square feet per gallon of unthinned curing compound. At times when the air temperature is at or near freezing, the slab shall be cured using suitable curing blankets. The slab shall later be sealed with the color curing compound when the air temperature is above freezing.

Use of blankets and/or heaters may be necessary to maintain the concrete at or above fifty (50) degrees Fahrenheit for three (3) days after placement. The cured surface shall then be cleaned to remove any residual materials.

831.05 Weather Limitations

831.05.01 Cold Weather Concrete Placement

During extreme weather conditions, placement of concrete shall be allowed only when the temperature of the concrete placed in the forms is between sixty (60) degrees Fahrenheit and ninety (90) degrees Fahrenheit. Cold weather placement of concrete shall comply with ACI 306.

Concrete may be placed when the air temperature in the shade is forty (40) degrees Fahrenheit, and rising. No concrete shall be placed, regardless of the present temperature, when the weather forecast predicts freezing weather before final set of the concrete unless special means of heating and protection are used and approved by the Town. Protection against freezing is the Contractor's responsibility, regardless of the weather forecast or climatic conditions at the time of placement.

Small structures and slabs shall be protected by completely covering fresh concrete with suitable curing blankets to prevent freezing. Large structures and vertical walls shall be protected against freezing by enclosing the structure with blankets and using heating devices capable of providing uniform and even

heat throughout the structure. Heaters shall be vented so that combustion gases are exhausted outside the enclosure in order to avoid carbonation of the fresh concrete.

Cold weather is defined as a period when, for more than three (3) consecutive days, the following conditions exist:

A. The average air temperature is less than forty (40) degrees Fahrenheit.

B. The air temperature is not greater than fifty (50) degrees Fahrenheit for more than twelve (12) hours in any twenty-four (24) hour period.

Concrete placed in cold weather shall be protected from extreme temperatures as follows:

A. A temperature of at least 50 degrees F for the first seventy-two (72) hours shall be maintained.

B. After the first seventy-two (72) hours and until the concrete is seven (7) days old, it shall be protected from freezing temperatures.

C. Concrete adjacent to heating devices shall be insulated from direct heat of the unit that may dry it out prior to being properly cured.

D. Temperatures shall be measured by maximum and minimum thermometers furnished by the Contractor and installed adjacent to the concrete.

Concrete slabs shall not be placed, regardless of temperature conditions, if the supporting ground is frozen or contains frost. Use of salt or other additives to prevent concrete from freezing is not allowed. Concrete which has been frozen shall be removed and replaced, as required by the Town.

TABLE 800.04 MINIMUM CONCRETE PLACEMENT TEMPERATURE

Air Temperature	**Section Thickness**	
	< 12 inches	12-36 inches
Above 30°F	60°F	55°F
0°F-30°F	65°F	60°F
Below 0°F	70°F	65°F
Minimum Concrete Curing Temperature		
--	55°F	50°F

TABLE 800.05 MINIMUM EXPOSURE TEMPERATURE FOR CONCRETE FLATWORK (FOR PORTLAND CEMENT CONCRETE = 500 lb./CY)

Slab Thickness (inches)	**Minimum Ambient Air Temperature Allowable for Values of Thermal Resistance (R), hr*ft*°F/BTU**		
	R = 2	R = 4	R = 6
4	**	**	**
8	**	**	**
12	42°F	36°F	30°F
18	30°F	12°F	-6°F
24	21°F	-5°F	-31°F

** > 50°F. Additional heat required.

831.05.02 Hot Weather Concrete Placement

Except by written authorization, concrete shall not be placed if the temperature of the plastic concrete cannot be maintained at ninety (90) degrees Fahrenheit or lower. Placement of concrete in hot weather shall comply with ACI 305.

832.00 CONCRETE PAVEMENT AND FLATWORK

The installation of Portland cement concrete pavement, including materials, equipment, foundation and construction methods, shall comply with Section 412 of the CDOT' *Standard Specifications for Road and Bridge Construction* and these DESIGN STANDARDS AND SPECIFICATIONS.

Concrete pavements shall be installed as shown on the approved plans or as approved by the Town. The Contractor shall furnish steel pins to use in setting grades for concrete pavement. The subgrade shall conform to the specified cross section. Immediately prior to placing concrete, the subgrade shall be tested for adequate compaction and moisture to a minimum depth of six (6) inches, or as specified in the approved Geotechnical Report. Concrete shall not be placed on any portion of the subgrade that has not been inspected by a Town Construction Inspector. There shall be no puddles or pockets of mud when the concrete is placed, and the subgrade shall be cleared of any loose material.

Curb, curb ramps, gutter, sidewalk, cross pan, and driveway construction shall conform to all applicable provisions and the Detail Drawings of these DESIGN STANDARDS AND SPECIFICATIONS.

832.01 Portland Cement Treated Base

In those instances where deemed necessary by the project Geotechnical Engineer and approved by the Town, Portland cement treated base may be required.

832.02 Curb and Gutter

The section to be constructed shall be as identified on the approved plans and as shown on the Detail Drawings of these DESIGN STANDARDS AND SPECIFICATIONS.

832.03 Sidewalks

Detached sidewalks and attached sidewalks shall be a minimum of six (6) inches thick, and shall be constructed as shown on the approved plans.

832.04 Crosspans and Curb Return Fillets

Typical crosspan sections are shown in the Detail Drawings found in these DESIGN STANDARDS AND SPECIFICATIONS. Where unusual conditions exist, additional reinforcing steel and special joints may be required by the Town.

832.05 Curb Cuts and Driveways

Curb cuts in six (6) inch vertical curbs shall be constructed at all driveway locations and at additional locations, as shown on the approved plans and in the Detail Drawings found in these DESIGN STANDARDS AND SPECIFICATIONS.

832.06 Curb Ramps

Curb ramps shall be installed at locations designated by the Town and as shown on the approved plans. Directional curb ramps, rather than diagonal or corner curb ramps, shall be installed unless site conditions or constraints prohibit their placement; or their placement creates an unsafe or undesirable condition for pedestrians or wheelchair travel along the sidewalk. The curb ramps shall be constructed with slopes, landings, jointing, and detectable warnings (cast iron truncated domes) shown as in the Detail Drawings found in these DESIGN STANDARDS AND SPECIFICATIONS. Specific installation details shall be per the manufacturer. All panels shall be ADA/Title 24 compliant.

832.07 Joints

Joint materials shall comply with the following specifications:

TABLE 800.06

Concrete joint sealer, hot-poured elastic	M173
Preformed expansion joint filler (bituminous type)	M33
Preformed sponge-rubber and cork expansion joint fillers	M153
Preformed expansion joint fillers (fiberboard)	M213

Non-bituminous type materials shall be placed in widths shown on the approved plans or three-eighths (⅜) inch wide when not specified. Bituminous type materials shall be used for concrete paving and structural construction where joint sealers are not required.

All joints shall be constructed straight and plumb and shall extend through the entire section from edge to back and to the depths specified.

832.07.01 Expansion Joints

Expansion joint material shall be provided at the following locations and shall be in place prior to placement of concrete:

A. Every 100 ft of sidewalk

B. Each end of curb return

C. Between back of sidewalk and driveway slab or service walk

D. Between new concrete and existing masonry buildings

E. At other unyielding structures

F. As shown on the approved plans

G. As directed by the Town

Epoxy coated reinforcing steel bars (minimum #4, 24” long) shall be used to tie together new and existing concrete pavements and flatwork. Refer to the Detail Drawings found in these DESIGN STANDARDS AND SPECIFICATIONS for expansion joints.

Expansion joint filler, which is one-half (½) inch thick, preformed, non-extruding bituminous-treated fiber board conforming to AASHTO Specification M213 shall be used to form transverse expansion joints. Concrete tie-ins shall have epoxy coated reinforcing steel bars (#4 minimum) extending a minimum of twelve (12) inches into the concrete in each direction.

832.07.02 Contraction Joints

Transverse joints shall be placed at maximum intervals of ten (10) feet to control random cracking. Joints shall be formed, sawed, or tooled to a minimum depth of one-third (⅓) of the total thickness of the pavement or flatwork (no less than two (2) inches). If divider plates are used, the maximum depth of plates shall not be greater than one-half (½) depth at the finished surface and shall be no less than fifteen-sixteenths (15/16) inch thick. Refer to the Detail Drawings found in these DESIGN STANDARDS AND SPECIFICATIONS for contraction joint details.

The curb and gutter or sidewalk shall be divided into stones not less than five (5) feet or more than ten (10) feet long using metal templates not less than one-sixteenth (1/16) inch or more than one-quarter (¼) inch thick. Templates shall be a minimum of four (4) inches deep. Templates shall be designed to attach securely to the forms in such a manner as to prevent movement while the concrete is being placed and consolidated. Templates shall be removed prior to the concrete taking its initial set.

If a curbing machine or other method not requiring the use of templates is approved, dummy joints formed by a jointing tool, or other approved means shall be used. Dummy joints shall extend into the concrete for at least one-third (⅓) of the depth (no less than two [2] inches) and shall be approximately one-eighth (⅛) inch wide.

832.07.03 Tooled Joints

Tooled joints shall be spaced as follows:

A. Not more than ten (10) feet or less than five (5) feet apart in curb and gutter, sidewalk, and combination curb-walk

B. Joints in both directions, equally spaced at not greater than ten (10) foot intervals, as applicable in driveways

C. Joints in handicap ramps shall be spaced nine (9) inches on center from the cast iron truncated domes to the top of the handicap ramp section

D. As directed by the Town

832.08 Ponding

Ponding of water in concrete pavement and flatwork shall not exceed one-eighth (⅛) inch in depth. Where ponding exceeds one-eighth (⅛) inch in depth, pavement or flatwork shall be removed and replaced at the Contractor's expense.

833.00 APPURTENANT CONCRETE STRUCTURES

833.01 Forms

All exposed corners of concrete structures shall have three-quarter (¾) inch chamfer edge. Refer to Section 824.02 *Forms and Form Setting* of these DESIGN STANDARDS AND SPECIFICATIONS for requirements for appurtenant concrete structures

833.02 Concrete Placement

Refer to Section 831.00 PLACING CONCRETE of these DESIGN STANDARDS AND SPECIFICATIONS for requirements for appurtenant concrete structures.

833.03 Expansion Joints

Expansion joint filler, which is one-half (½) inch thick, preformed, non-extruding bituminous-treated fiber board conforming to AASHTO Specification M-213, shall be used to form transverse expansion joints. Concrete tie-ins shall have epoxy reinforcing steel bars (#4 minimum) extending a minimum of twelve (12) inches into the concrete in each direction. Epoxy setting shall be done as directed by the Town.

833.04 Curing

Curing shall comply with Section 838.00 FINISHING, CURING, AND PROTECTION of these DESIGN STANDARDS AND SPECIFICATIONS.

834.00 CLEAN UP

The exposed surfaces of concrete shall be thoroughly cleaned upon completion of the work. Within forty-eight (48) hours after forms are removed, the area behind the sidewalk or curb shall be cleaned, backfilled, and graded to provide a smooth, even surface.

835.00 BACKFILL OF CONCRETE WORK

When forms are removed and the concrete has achieved minimum 75% strength, or minimum strength specified by the Engineer or Architect, the space adjoining the concrete shall be promptly backfilled with suitable material, properly moisture conditioned and compacted, and brought flush with the surface of the concrete and adjoining ground surface. In embankments, the backfill shall be level with the top of the concrete for at least two (2) feet and then sloped as shown on the approved plans or as directed by the Town.

836.00 PROTECTION AGAINST VANDALISM

It shall be the responsibility of the Contractor to protect all concrete work against damage or vandalism. When required, a guard shall be stationed over fresh work until the concrete is sufficiently set to prevent damage. Concrete damaged in any way by vandals shall be removed and replaced at the Contractor's expense.

Anti-graffiti materials shall be installed as shown on the approved plans or as required by the Town. Prior to installation, technical information regarding proposed anti-graffiti materials shall be submitted to the Town for approval.

837.00 REPAIRS

After stripping concrete forms, any concrete found to be inconsistent with the approved plans, is out of alignment, not level, or showing a defective surface shall be removed and replaced at the Contractor's expense, as directed by the Town. The Town may give written permission to patch the defective area. Ridges and bulges may be removed by grinding if approved by the Town. Chamfered edges shall be stoned smooth. Honeycombed and other defective concrete that does not affect the integrity of the structure may be chipped out, and the vacated areas filled in a workmanlike manner, if approved by the Town. All bolt holes, tie-rod holes, and minor imperfections shall be filled and smoothed in a workmanlike manner.

The repaired area shall be patched with a non-shrink, non-metallic grout with a minimum compressive strength of five thousand (5,000) psi in twenty-eight (28) days. All repair areas treated with an epoxy bonding agent shall have the approval of the Town before the repair filling is placed.

837.01 Flatwork Repairs and Replacement

All edges of the existing flatwork to remain shall be saw cut from joint to joint. Flatwork repairs and replacement shall be as directed by the Town and at the Contractor's expense

837.02 Concrete Structure Repairs

Bolt-holes, tie-rod holes, and minor imperfections as approved by the Town, shall be filled smooth and flat with non-shrink dry-patching mortar composed of approximately one (1) part Portland cement to two (2) parts of regular concrete sand (volume measurement) and only enough water so that after the ingredients are mixed thoroughly, the mortar sticks together when molded. Mortar repairs shall be placed in layers and thoroughly compacted by suitable tools. Care shall be taken in filling rod and bolt holes so that the entire depth of the hole is completely filled with compacted mortar. The surface shall be finished smooth in a workmanlike manner.

838.00 FINISHING, CURING, AND PROTECTION

838.01 Finishing

Where applicable, finishing shall be performed with a metal screed designed to give proper shape to the section, as detailed. Particular care shall be used to finish the gutter flowline to a true uniform grade. Face forms shall be left in place until the concrete has hardened sufficiently so that they can be removed without injury to the curb.

The Contractor shall use at all times, a ten (10) foot straightedge for finishing curb and gutter sections. Irregularities shall be corrected by adding or removing concrete. All disturbed places shall be floated with a wooden or metal float that is not less than thirty-six (36) inches long and not less than six (6) inches wide, and screeded. No water, curing compound, or cement shall be added to the surface of the concrete to aid in finishing. Edges of the concrete in contact with the forms, structures, and joints shall be carefully finished with an edger having a three-eighths inch (⅜3/8) inch radius prior to the concrete reaching initial set. Concrete shall be finally finished with a wood float and lightly broomed to a slightly roughened

surface. On grades less than one (1) percent, the Contractor shall check for depressions before final finish so that no ponding exists.

Exposed faces of curbs and sidewalks shall be finished to the line and grade shown on the plans. The surface shall be floated to a smooth but not slippery finish. Sidewalk and curb shall be broomed or combed and edged, unless otherwise indicated by the Town. After completion of brooming and before concrete has initial set, all edges in contact with the forms shall be tooled with an edger having a three-eighths (⅜) inch radius.

No dusting or topping of the surface to facilitate finishing shall be permitted.

Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or are not to be waterproofed. On all surfaces, the cavities produced by form ties, honeycomb spots, broken corners or edges, and other defects, shall be thoroughly cleaned, moistened with water and carefully pointed and trued with a mortar consisting of cement and fine aggregate. The surface shall be left sound, smooth, even, and uniform in color. Mortar used in pointing shall not be more than thirty (30) minutes old. All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

838.02 Curing and Protection

Fresh concrete shall be adequately protected from weather damage and mechanical injury during the curing periods. Curing processes described herein may be used at the option of the Town. The selected curing process shall be started as soon as it can be performed without injury to the concrete surface. The use of a white membrane-curing compound is required. The following curing procedures may be used, subject to the approval of the Town:

A. Ponding (for slabs or footings)

B. Spraying

C. Placing wet burlap, earth, or cotton mats

D. Covering with waterproof paper or polyethylene plastic

E. Using a liquid membrane curing compound

Membrane curing compound shall not be used when the concrete surface shall be painted. The membrane curing compound shall not permanently discolor the concrete surface. Where membrane curing compound is not used, the curing process shall be as follows:

A. Surfaces being wetted by ponding, spraying, or wetted material shall be kept completely wetted, with an excess of free water on the surface, at all times for the first seventy two (72) hours. After this period, but for the remaining four (4) days, a wetting schedule shall be followed whereby the concrete is wetted on a schedule approved by the Town.

B. Surfaces being protected by waterproof paper or polyethylene plastic cover shall receive special attention during the first seventy-two (72) hours to ensure there is actually free moisture on the surface of the concrete under the waterproof surface. The Town Engineer or Town Construction Inspector may require the removal of the cover and a wetting of

the surface when, in his judgment, there is insufficient moisture for curing. After the first seventy-two (72) hours the cover shall be kept tightly in place for the remainder of the curing period.

C. Surfaces being protected by liquid curing membrane, immediately after the surface water has disappeared from the concrete surface, shall be sprayed with the liquid membrane curing compound (white pigmented) under pressure to the concrete surface at a rate not less than one (1) gallon per one hundred fifty (150) square feet with a spray nozzle, or nozzles, so that it covers the entire pavement with a uniform, water-impermeable film. If the forms are removed within seven (7) days, the exposed sides and edges shall be sprayed in the above described manner or the backfill completed immediately.