TOWN OF WEST HARTFORD
ENGINEERING DIVISION
DEPARTMENT OF COMMUNITY DEVELOPMENT

SECTION B-1

TECHNICAL SPECIFICATIONS

FOR SIDEWALKS

B-1 TECHNICAL SPECIFICATIONS – SIDEWALKS

1. State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction, hereafter referred to as Standard State Specifications shall govern in all cases, not covered by these specifications or any other documents included in a Town Contract.

2. MATERIALS

   a. Portland Cement--Portland cement shall conform to "Specifications for Portland Cement" (ASTM Designation*: C-150), and must be manufactured in the United States.

   a.1 Type II cement only shall be used.

   a.2 Laboratory test reports made by the cement manufacturer are to be made available to the Town upon request.

   b. Aggregates--aggregates shall conform to Standard State Specifications.

   b.1 Coarse aggregates--crushed trap rock or Coarse Aggregate as defined in Section M.03.01 of the Standard State Specifications shall be used as course aggregate in the concrete mix. A minimum of two sizes of stone shall be blended at the time of batching to meet the gradation requirements as set forth in "Specifications of Concrete Aggregates" (ASTM Designation: C-33)*

   b.2 Fine aggregate shall conform to section M.03.01 of the Standard State Specifications.

   b.3 Laboratory tests of all proposed aggregates are to be made in accordance with ASTM C-33* prior to placing any concrete. Also, materials are to be tested and approved on an annual basis or when the source of materials is changed, or at the Town's request.

   c. Water--water used in mixing concrete shall be clean, and free from deleterious amounts of acids, alkalies, or organic materials.

   d. Air-Entraining Materials--The entrainment of air in concrete can be accomplished by adding an air-entraining admixture at the time of batching. Admixtures added to the sand or water shall conform with "Specifications for Air-Entraining Admixtures for Concrete" (ASTM Designation: C-260). *

e. Water Reducing and Set Retarding Admixtures which meet ASTM specifications for chemical admixtures for concrete-ASTM C-494* may be used in concrete mixes, only with prior approval of the Town of West Hartford, and their use shall not reduce the minimum cement content as specified.

f. Mesh reinforcement shall be used in all sidewalks and apron construction exposed to vehicular traffic. Material shall be 6 x 6 -- #8 wire mesh conforming to ASTM A-185.*

g. Preformed expansion joint filler to be of the non-extruding type and shall meet ASTM Specification D 1751-65* or AASHO Specification M-213-65.*

h. Concrete suppliers shall submit upon request by the Town certification by an independent laboratory that all materials have been tested and conform to these specifications.

NOTE: *Copies of these standards and specifications for review will be made available in the Bureau of Engineering, Construction Inspection Division.

3. CONCRETE QUALITY

a. Minimum Strength 4000 PSI.

b. Minimum cement content shall not be less than 6.75 bags per cubic yard.

c. Maximum size of aggregate shall not exceed 1 inch.

d. Maximum water content shall not exceed 5.3 gal. per bag of cement.

e. Slump shall not be less than 2” and not more than 4 inches.

f. The amount of entrained air (per cent by volume) shall be:

For 3/4 or 1 inch maximum size aggregate –

6 ± 1 Per Cent Air

Test for air content of fresh concrete shall be made during construction. Because of the effects of mixing and vibration, samples for air content preferably should be taken from concrete after it has been placed by qualified technicians per ASTM C-231 or C-233, periodically or at any time as requested by the owner.

4. TEST AND INSPECTION

The Town is authorized to conduct or have conducted such tests, as are deemed necessary, of concrete used in work under these specifications. The contractor shall furnish representatives of the Town with concrete under job conditions for making of standard test cylinders. The Town shall base its approval of methods and details of proportioning, batching, mixing, and placing of concrete upon the results of these tests.

The contractor shall forward daily to the Town a copy of each concrete delivery slip for each truck load of concrete which will include all data as required in ASTM C-94,* Paragraph 14 Certification.

The Town at any time may require batch plant inspection to certify the weights of all materials as batched into trucks serving projects within the Town.

All cost of testing shall be borne by the contractor.

5. BATCH PLANT APPROVAL

Any concrete producer will be required to show that his plant and equipment meet all requirements as established by ASTM Designation C 94-67, * and shall also be currently approved by the State of Connecticut Department of Transportation.

6. FOUNDATIONS AND FORMS

a. All top soil, deleterious matter and unacceptable sub soil shall be excavated to depth directed by the Town. Generally the depth of excavation will be fifteen (15") inches below the proposed finished grade of the walk. Should this depth be exceeded, the excavation will be brought to sub-base grade with bank-run gravel as specified in the Standard State Specifications in compacted layers of 6 inch maximum. The remaining excavation shall be filled with 10" of Processed Aggregate, for 5" thick concrete and 7" thick for 8" reinforced concrete walk compacted in two equal lifts by rollers or other suitable machinery weighing not less than 500 lbs. Prior to placement of the processed aggregate base the sub-base shall always be leveled and compacted properly, Processed Aggregate shall meet the Connecticut Department of Transportation specifications for crusher run stone, or bank-run crushed gravel as specified in the Standard State Specifications.

b. FORMS -- Forms shall be in good condition, with not more than one-fourth (1/4) inch variation in horizontal and vertical alignment for each ten (10) feet in length. Forms shall be set true to line and grade and shall be adequately supported to remain in position while depositing and compacting concrete. Forms shall be designed to permit their removal without damage to the concrete; and prior to depositing of concrete, the forms shall be adequately oiled.

Forms shall be steel or wood, in good condition, be equal in depth to the depth of sidewalk, and acceptable to the Town. Walks, when poured, shall be at least four (4) feet wide and laid on the following inclinations: From outer edge of concrete walk to inner edge of concrete walk a rise of one-quarter (1/4) of an inch to the foot. There shall be half (1/2) inch pitch on all grassed areas rising from the top of curb.

c. SLAB THICKNESS:

A. Pedestrian Traffic only – 5" minimum.

B. Pedestrian and vehicular traffic – 8" minimum with 6x6 #8 wire mesh.

7. PLACING OF CONCRETE

a. Before the concrete is placed, the base shall be thoroughly dampened so that it is moist throughout, but without puddles of water.

b. Concrete shall be placed as near to its final position as practicable. Precautions shall be taken not to overwork the concrete while it is still plastic.

c. The concrete shall be thoroughly spaded along the forms or screeds to eliminate voids or honeycombs at the edges.

d. With each delivery of concrete, the contractor shall furnish a copy of the delivery ticket indicating the proportions of the mix and stamped by a time clock showing time of batching. Mixes over 1 ½ hours old shall be rejected.

e. Concrete shall not be placed when the temperature exceeds 90° F. Pozzolith retarders shall be used at the direction of the inspector should conditions require.

8. PLACING OF REINFORCEMENT

a. Reinforcement shall be placed 3 inches above the base of the slab and abutting the inside faces of the forms. A minimum of 6-inch overlap shall be made whenever

more than one piece of wire mesh is used. However, no more than two pieces shall be allowed in any 10-foot section of sidewalk.

9. FINISHING

a. No finishing operation shall be performed while free water is present. Finishing operations shall be delayed until all water and water sheen has left the surface and the concrete has started to stiffen. Re-tempering of concrete shall not be allowed.

b. 1/4" expansion joints will be placed every 10' feet maximum or as directed by the Town. They shall be placed perpendicular to the longitudinal axis of the walk. Expansion joint material shall be placed at the joint located between handicap ramps and walks, between driveways and walks and between sidewalks and any fixed structure where necessary.

c. Contraction joints shall generally be spaced at 5 foot intervals. Contraction joints may be formed by cutting a slot in the concrete approximately 1 1/4 inch deep for 5 inch thick slabs and 2 inches deep for 8 inch thick slabs. The slot may be cut by a T-bar forced into the fresh concrete for a depth as noted above. After the concrete has partially hardened, the bar shall be withdrawn and the joint edged with a jointer, held against a straight edge to make a clean, straight joint. The jointer shall have a 3/4 inch bit. When the bar is removed, run a trowel along the joint for the full depth of the concrete to remove all aggregate from the joint area.

d. After screeding, floating and initial tooling has been done and the watersheen has disappeared, the concrete may then be troweled with a magnesium or wood float. If necessary, tooled edges and joints shall be rerun after floating to maintain uniformity. The surface shall not be over-troweled which may result in a weakened surface.

e. After floating, the surface shall be brushed by drawing a soft-bristled pushbroom with a long handle over the surface of the concrete to produce a nonslip surface.

f. Any person who shall construct such walks shall stamp his name and date of construction upon same so that it shall be clear and visible, and where ordered by the engineer.

10. <u>CURING</u>

a. Concrete shall be protected so that little or no moisture is lost during the early stages of hardening. Newly placed concrete shall not be permitted to dry out too fast and must be protected from the sun and drying winds. This may be done with dampened burlap, sisalkraft paper, or canvas coverings. No polyethelene will be allowed at any time.

b. As soon as the concrete has hardened enough so that the surface will not be marred, curing of concrete shall be accomplished by the following method:

Horn-Cure 30-D curing compound or approved equal, conforming to "Specification for Liquid Membrane-Forming Compounds for Curing Concrete" (ASTM Designation: C-309) *will be used. The curing

compound shall be applied by hand-operated or power driven spray equipment immediately after the concrete has been given its final finish. The concrete surface shall be moist when the coating is applied. Two smooth and even textured coats to ensure complete coverage shall be applied. The second coat, shall be applied at right angles to the first. Such compounds shall be applied in accordance with the recommendations of the manufacturer.

c. Under to condition shall the forms be removed during the first 24 hours after concrete has been poured.

d. Pedestrian traffic shall be kept off the walk for 24 hours. Vehicular traffic shall be kept off the walk for a period of 72 hours.

e. Security measures to prevent vandalism shall be the responsibility of the contractor.

11. COLD WEATHER CONCRETING

a. The official cut-off date for placement of concrete sidewalks is October 15. Any sidewalks placed after this date must be accompanied with a two year guarantee bond.

b. Cold weather concrete shall be used only when absolutely necessary and when the delay of work to the following construction season is not possible.

c. Adequate protection shall be provided where temperatures of 40 degrees F or lower occur during the placing and during the early curing period. The concrete may be placed between 32° and 40° F provided the mix includes the addition of Pozzolith High Early added in liquid form at the plant. Calcium chloride shall not be added to the mix.

d. The minimum temperature of fresh concrete after placing and for the first 4 days shall be maintained above 55 degrees F for Type II cement. Concrete made with Type III cement, if approved by the Town, must be maintained above 55 degrees F for the first 3 days. In addition to the above requirements, an additional 3 days of protection from freezing shall be maintained.

e. Generally the concrete must be protected for a period of not less than seven (7) days by the following:

A layer of burlap, nine (9) inches of hay and a covering layer of burlap. Sisalkraft or tar paper may be used in lieu of burlap provided it is placed in such a manner as to exclude the contact of the insulating hay directly with the atmosphere.

f. Sidewalks will not be placed when there exists more than three (3) inches of frost in the ground.

12. ANTI-SPALLING COMPOUND

After a twenty eight (28) day curing period, the sidewalk will be coated with an anti-spalling compound approved by the Town and applied as directed by the manufacturer.

13. PROCEDURES FOR SLAB REMOVAL OR RELAYING AND RESTORATION

Prior to removing or relaying slabs, the turf or sod will be cut neatly and salvaged if possible or replaced with no extra cost to the Town.

Bituminous concrete cuts at driveway and treebelt areas will be neatly cut with gas powered saw prior to slab removal. When bituminous restoration is to be done, it will be placed on a 6" compacted process stone base and all cut edges shall have a tack coat of asphalt emulsion painted on before the bituminous repairs are made.

Restoration of grassed areas and driveways shall be completed no later than seven (7) calendar days from placement of concrete at any section.

14. RELAYING SIDEWALK

a. A strip of turf or bituminous paving, one foot wide and the full length and depth of the slab shall be cut on both sides.

b. Each side of the slab shall be raised to a height of approximately one foot in order to uniformly place the necessary amount of stone or sand base. The slab shall then be rocked from side to side with the aid of steel bars in order to uniformly spread the base.

c. The contractor must take precautionary actions to prevent the slabs from being damaged.

15. SAFETY

Safety shall be maintained at all times when the contractor's equipment is on the paved portion of the street, adjacent to working on removal and replacement of sidewalks and restoration.

Barricades shall be placed at each end of the work area surrounding the equipment. Lighted barricades shall be placed along the construction area at the end of each work day to avoid pedestrian or vehicular accidents.

At no time shall the contractor work on both sides of the street simultaneously in a manner to create a hazard to pedestrians. The location of all signs shall be recorded by the inspector before their removal. All removed signs shall be protected and reinstalled as soon as the work has been completed on any single street. Damaged signs shall be replaced by the contractor with no cost to the Town. Under no condition may a stop sign be removed before it can be replaced with a portable sign.

BITUMINOUS CONCRETE SIDEWALK
(One Course)

16. These walks shall consist of a dense graded bituminous concrete surface, 2 inches thick after compaction, constructed on a 6-inch processed gravel base, thoroughly compacted with a roller weighing not less than 500 pounds. The width of the walk shall be 4 feet. The sides of the walk shall be backfilled with suitable material thoroughly compacted and finished flush with the top of the walk. All surplus shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer. In sections inaccessible to the roller, the base course, surface course and backfill shall be hand tamped with tampers weighing not less than 12 pounds, the face of which shall not exceed 50 square inches in area.

MATERIALS. The materials for this work shall conform to the following requirements.

ASPHALT CEMENT. The asphalt cement shall be homogeneous, free from water, shall not foam when heated to a temperature of 347° F and shall conform to the following requirements:

Tests	Min.	Max.
Penetration at 77° F., 100 gms., 5 secs.	85	100
Flash point, (open cup method) °F	347	
Loss on heating at 325° F., 50 gms., 5 hrs.		1.0%
Penetration of Residue at 77° F., 100 gms., 5 secs. in % of original Penetration	60%	
Ductility at 77°F., in centimeters	100	
Bituminen soluble in carbon disulphide	99.5%	

COARSE AGGREGATE. The coarse aggregate shall consist of clean, hard, tough, durable fragments of broken stone or gravel of uniform quality throughout. It shall not contain more than 1 percent of materials such as crusher dust, sand, elongated or soft disintegrated pieces. It shall be free of mud, dirt, organic or other injurious materials. When gravel is used, at least 50% must be crushed.

LOSS ON ABRASION. When tested by means of the Los Angeles Rattler using A.A.S.H.O. Method T-96, the loss shall not exceed 40%.

FINE AGGREGATE. The fine aggregate shall consist of sand or a mixture of a minimum of 50% sand and a maximum of 50% stone screenings, and shall be composed of clean, tough, rough-surfaced and angular grains. The fine aggregate shall be limited to material 95% of which passes a No. 4 sieve having square openings and not more than 8% of which passes a No. 200 sieve. The material shall be free from clay, loam and foreign materials. When screenings are blended, they shall be free from coatings of fine dust after drying.

MINERAL FILLER. Mineral filler shall be Portland Cement, ground limestone or other material approved by the Engineer, free from lumps or balls or any foreign material, and conforming to the following gradation requirements.

Passing No. 200 sieve	-	not less than 75%
Total Passing No. 80 sieve	-	not less than 95%
Total Passing No. 30 sieve	-	not less than 100%

SOURCES OF SUPPLY. Approval of sources of supply of course and fine aggregate, sand, mineral filler and asphalt cement, shall be obtained from the Engineer prior to delivery of material and samples of each shall be submitted as directed by the Engineer.

CONSTRUCTION METHODS. The methods employed in performing the work and all equipment, tools, machinery and other plant used in handling material and executing any part of the work, shall be subject to the approval of the Town Engineer before the work is started and, whenever found unsatisfactory, shall be changed and improved as required by the Town Engineer. All equipment, tools, machinery and plant used must be maintained in a satisfactory working condition.

GENERAL COMPOSITION OF THE MIX. The mineral aggregate shall be graded and combined to meet the following limits by weight:

Proportionate Amount (Square Mesh Sieves)	Per Cent
Aggregate Passing 1/2”	100
Pass 3/8”	80-100
Pass No. 4	50-75
Pass No. 10	30-55
Pass No. 20	20-40
Pass No. 40	10-30
Pass No. 80	5-15
Pass No. 200	3-8

The proportion of bitumen soluble in Cs2 to total mixture by weight shall be between 5 and 7%. The fraction actually retained between any two consecutive sieves shall be not less than 4%. At least 1/2 of the fraction passing 200-mesh sieve shall meet the requirements for mineral filler. The temperature of the mixture as it is dumped from the

mixer must be between 250 and 325° F. The required temperature shall depend on the type of material used and shall be determined by the Engineer.

FORMULA FOR JOB MIX. The general composition limits prescribed above are master ranges of tolerance to govern mixtures made from any raw materials meeting specifications and they are maximum and minimum for all cases. A closer control appropriate to the job materials is required for the specific project in accordance with the job mix formula as follows:

No work shall be started on the specific project nor any mixtures accepted therefore, until the Contractor has submitted and received approval of his intended job mix formula, indicating in writing the single definite percentage for each sieve fraction of aggregate, and for bitumen, which he chooses as the fixed mean in each instance, and also the intended temperatures of completed mixture taken as it is dumped from the mixer and as it is delivered to the paver on the project.

The submission of such job mix formula shall, upon approval and thereafter, bind the manufacturer to furnish paving mixture not only within the above master ranges, but, as a further requirement, also meeting the exact formula thus set up for the project, within the following allowable tolerances:

Job Mix Tolerances	Plus or Minus
Aggregate passing sieve No. 4 and larger	5%
Aggregate passing sieves No. 10 thru #80	4%
Aggregate passing sieve No. 200	2%
Bitumen	0.5%
Temperature of Mixture when dumped from mixer	25° F.
Temperature of Mixture at delivery to Paver	25° F.

The paving plant, preparation, transportation, placing and compaction of the mixture shall conform to the Specifications of the Connecticut Highway Department.

BITUMINOUS CONCRETE SIDEWALK
(Two Course)

17. These walks shall consist of a dense graded bituminous concrete surface course, one inch thick after compaction, and a bituminous concrete binder course, 2 inches thick after compaction, constructed on a 6-inch processed gravel base, thoroughly compacted with a roller weighing not less than 500 pounds. The width of the walk shall be 5 feet. The sides of the walk shall be backfilled with suitable material thoroughly compacted and finished flush with the top of the walk. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer. In sections inaccessible to the roller, the base course, binder course, surface course and backfill shall be hand tamped with tampers weighing not less than 12 pounds, the face of which shall not exceed 50 square inches in area.

The dense graded bituminous concrete surface course shall conform to the requirements as specified for a one course walk.

MATERIALS. The materials for this work shall conform to the following requirements:

ASPHALT CEMENT. The asphalt cement shall be homogeneous, free from water, shall not foam when heated to a temperature of 347° F., and shall conform to the following requirements:

Tests	Min.	Max.
Penetration at 77° F., 100 gms., 5 sec.	85	100
Flash point, (open cup method) ° F.	347	
Loss on heating at 325° F., 50 gms., 5 hrs.		1.0%
Penetration of Residue at 77° F., 100 gms. 5 secs. in % of original Penetration	60%	
Ductility at 77° F., in centimeters	60	
Bitumen soluble in carbon disulphide	99.5%	

COURSE AGGREGATE. The coarse aggregate shall consist of clean, hard, tough, durable fragments of broken stone or gravel of uniform quality throughout. It shall not contain more than 1 percent of materials such as crusher dust, sand, elongated or soft disintegrated pieces. It shall be free of mud, dirt, organic or other injurious materials. When gravel is used at least 50% must be crushed.

LOSS ON ABRASION. When tested by means of the Los Angeles Rattler using A.A.S.H.O. Method T-96, the loss shall not exceed 40%.

GRADING. The course aggregate shall conform to the following gradation:

Sq. Testing Sieve in Inches	Percent Passing Testing Sieves
1	100
3/4	90-100
5/8	-
1/2	10-40
3/8	0-20
No. 4	0-5
No. 8	-
No. 100	-

FINE AGGREGATE. The fine aggregate shall be sand composed of clean, tough, rough-surfaced and angular grains, free from clay, loam or other foreign materials.

Sand shall meet the following gradation requirements:

Sieves	Min.	Max.
Passing No. 4	95%	100%
Passing No. 200	0%	6%

SOURCES OF SUPPLY. Approval of sources of supply of course and fine aggregate, sand, mineral filler and asphalt cement shall be obtained from the Engineer prior to delivery of material and samples of each shall be submitted as directed by the Engineer.

CONSTRUCTION METHODS. The methods employed in performing the work and all equipment, tools, machinery and other plan used in handling material and executing any part of the work shall be subject to the approval of the Town Engineer before the work is started and, whenever found unsatisfactory, shall be changed and improved as required by the Town Engineer. All equipment, tools, machinery and plan used must be maintained in a satisfactory working condition.

GENERAL COMPOSITION OF THE MIX. The mineral aggregate, prepared as detailed hereinafter, shall be graded and combined to meet the following limits by weight:

	Proportionate Amount (Square Mesh Sieves) Percent
Aggregate retained on 1”	0-5
Aggregate passing 1”	90-100
Aggregate passing 1/2"	45-75
Aggregate passing #10	15-35

The fraction actually retained between any two consecutive sieves shall not be less than 4%.

The proportion of bitumen to total mixture by weight shall be:

Bitumen (Sol. in solvent) 3.5-6%

Temperature shall be so controlled that the temperature of the asphalt cement shall not exceed 325° F. and that of the aggregate at the dryer outlet shall be between 300 and 350° F. The temperature of the mixture as it is dumped from the mixer must be between 265 and 325° F.

The paving plant, preparation, transportation, placing and compaction of the mixture shall conform to the Specifications of the Connecticut Highway Department.

METHOD OF EXAMINATION FOR CONCRETE SIDEWALK CONTRACTORS

All Contractors shall construct a sample of concrete sidewalk at a designated location according to the Town of West Hartford's specifications for approval prior to the commencement of construction

If accepted, the Town shall require the contractor to maintain this standard of workmanship throughout the entire project.

NOTE: This sample will consist of (3) three standard size (4' x 5') concrete slabs.