

CITY OF MEMPHIS

SIDEWALK ORDINANCES



DIVISION OF ENGINEERING

John E. Cameron, P.E.

City Engineer

2013 Revision

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CITY OF MEMPHIS

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<http://www.cityofmemphis.org/Government/EngineeringDivision/CivilStandards.aspx>

- 1) Residential Curb Cut..... Drawing #38
- 3) Multi-Family/Office/Commercial/Industrial Curb Cut Drawing #39
- 4) Radius Curb Cut Drawing #45
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- 7) Commercial Curb Cut (Example)..... Drawing #39

CITY HALL PHONES

1. City Inspectors	2599 Avery Avenue	636-2462
2. Permits	2599 Avery Avenue	636-2462
3. Bond Information	2599 Avery Avenue	636-2462
4. Residential Curb Cut Approvals	2599 Avery Avenue	636-2462
5. Commercial Curb Cut Approvals	125 N. Main Street, Room 668	576-6710

Should you have questions regarding the City's specifications, or desire additional information, please call the Sidewalk Department, City of Memphis, Tennessee: 636-2462.

Chapter 34

STREETS AND SIDEWALKS

- Art. I. In General, §§ 34-7
- Art. II. Street Concrete Work, §§ 34-31--34-50
- Art. VI. Sidewalks, §§ 34-116--34-201
 - Div. 1. Generally, §§ 34-116-34--150
 - Div. 2. Administration §§ 34-151--34-170
 - Div. 3. Technical Requirements, §§ 34-171--34-190

ARTICLE I. IN GENERAL

Sec. 34-7. Defacing, injuring, etc., streets; painting house numerals on curb.

It shall be unlawful for any person to disturb, deface, injure, damage or alter the face of any street, thoroughfare or public place unless he shall have first obtained a permit from the city engineer as provided for by section 34-51 of this Code; provided, further, that, painting of numerals of the legally assigned house number on the curb immediately in front of a building or structure shall not be an act prohibited in this section when conforming to the following specifications: No deviation shall be allowed from use of standard block arabic numerals, and no other embellishments, background coloring other than white, immediately beneath numerals in an area not to exceed five (5) inches in height and twenty-four (24) inches in length, nor any script lettering shall accompany the numerals.

In the event the city should inadvertently or advertently remove or deface numerals so placed on street curbs, the city assumes no responsibility for the replacement or maintenance of such numbering and all maintenance or replacement remains the responsibility of the owner/occupant.

(Ord. No. 3164, § 1, 10-6-81; Code 1967, § 36-6; Ord. No. 3590, § 1(1), 9-2-86)

Cross references-Public property use regulations, § 20-136 et seq; street numbers for buildings and lots, § 34-96 et seq.

ARTICLE II. STREET CONCRETE WORK

Sec. 34-31. Compliance with article.

It shall be unlawful for any person to engage in the business of laying, constructing or building concrete sidewalks, steps, coping or other forms of concrete work in or upon the streets, alleys, highways or public places of the city, except in compliance with the terms of this article.

(Code 1967, § 36-20)

Sec. 34-32. Worker's bond--Required; amount; conditions.

Any person desiring to engage in the business described in section 34-31 shall file with the city a bond in the amount of fifteen thousand dollars (\$15,000.00), with a surety company authorized to do business in this state, as surety, conditioned as follows:

(See Page 12 for Cement Worker's Bond)

(Ord. No. 3047, § 1(2), 8-12-80; Code 1967, § 36-21)

Sec. 34-33. Same--Renewal.

The bond required by this article shall be renewed annually. This renewal shall be filed within three (3) days of the expiration of any bond on file with the City Engineer.

(Code 1967, § 36-22)

Sec. 34-34. Same--Breach of conditions.

Upon the failure to abide by the terms and conditions of the bond required by section 34-32, the person engaged in such business shall pay to the city such sum as is necessary to repay any injuries done by the nonobservance of the bond and shall immediately place the work in such condition as shall be directed and approved by the city engineer. The city attorney shall, in case of a failure to comply with this section, at once institute proceedings against the principal and surety upon the bond.

(Code 1967, § 36-23)

Sec. 34-35. Job Permit.

(a) Any person desiring to do concrete work governed by this article shall, after having filed the

required plans and bond, apply, in such instance in which it is desired to do work, to the city engineer for a permit so to do. This permit shall be issued, provided the bond of the person has not been impaired by previous breaches of the conditions therein contained, and provided, further, that, no sidewalk permits shall be issued for streets or parts thereof until the area proposed to be covered shall have been graded to the true and lawful grade established for such street. The permit shall be posted in plain sight at the job location and be maintained until said work is completed, inspected and approved by the city engineer or his representative.

b) Whenever any person engaged in concrete work shall have, by breaches of the conditions of the bond required by this article, incurred an obligation to the city, to the extent that the bond has been impaired to the sum of one hundred dollars (\$100.00), such person in default shall not be granted any further permit to do concrete work until a satisfactory bond has been filed conditioned as provided in section 34-32 for the full penalty therein prescribed.

(Code 1967, § 36-24)

Cross reference-Taxes and licenses generally, Ch. 36.

Sec. 34-36. When work to be commenced and concluded.

When a permit is granted under this article, the work therein specified shall be commenced within three (3) days from the date of the permit, and carried to conclusion in a reasonable time.

(Code 1967, § 36-25)

Sec. 34-37. Inspection of work; certificate of approval.

(a) When concrete work governed by this article has been completed, it shall be inspected by the city engineer or his representative. If such work is found to meet the requirements of all city ordinances regulating such work, the city engineer, on application, shall issue his certificate that the work has been inspected and approved as in accordance with provisions of this Code and the terms of the required bond.

(b) A property owner, receiving notice requiring concrete work to be done in or about any public place, shall not be held to have complied with such notice until the certificate provided for in this section has been issued to such owner.

(Code 1967, § 36-26)

Sec. 34-38. Notices to property Owners to contain warning.

Every notice to property owners with reference to concrete work in and about public places required to be done by such property owners shall contain a warning to the effect that concrete workers are required to be under bond to the city, to observe faithfully the provisions of this article and that, having faithfully observed all city regulations, they are entitled to receive from the city engineer a certificate to that effect.
(Code 1967, § 36-27)

Secs. 34-39--34-50. Reserved.

ARTICLE VI. SIDEWALKS

DIVISION 1. GENERALLY

Sec. 34-116. Definitions.

As used in this article the following terms shall have the indicated meaning:

Street: The entire width between right-of-way lines plus any pedestrian/sidewalk easement of every way, publicly maintained when any part thereof is open to the use of the public for the purpose of vehicular and/or pedestrian travel.

Walkway: That portion of a street between the curb lines, or the lateral lines of a roadway, and the adjacent property lines or pedestrian/sidewalk easement lines, intended for use of pedestrians.
(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-117. Obstructions generally.

It shall be a misdemeanor to obstruct any sidewalk or walkway with boxes, barrels, or other things interfering with the free passageway of the public or which may render such sidewalk or walkway unsafe for public travel.
(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-104)

Sec. 34-118. General duty of property owner to build, repair and clean.

(a) The owner of every lot and parcel of land abutting on any street, avenue, parkway, boulevard or other public street of the city, for which an established grade has been lawfully fixed, and curbs and gutters are in place, is hereby required to provide and maintain adjacent to his property a sidewalk in accordance with the specifications set out in this article when so ordered by the city engineer or his authorized representative.

(b) It shall be the duty of every owner of property, whether vacant or occupied, within the limit of the city abutting on or adjacent to, any street, avenue, parkway, or other public street of the city, to keep clean and open for public passage all public sidewalks or walkways abutting on or adjacent to such property, and to keep such sidewalks or walkways in good repair and condition.

(c) On streets, avenues, parkways or other public streets, for which an established grade has not been lawfully fixed, and curbs and gutters are not in place, the owners of abutting and adjacent property to such streets are required to keep the space provided for walkway or passageway for pedestrian traffic adjacent to their property in a safe condition, free from all obstructions, excavations, high grass, weeds, trash, debris, or other substances or material which may interfere with the free use of such passageway by the public. The abutting or adjacent owner may be required to lay a gravel, asphalt or cinder walkway of an approximate minimum width of three (3) feet abutting his property.

(Ord. No. 894, § 1, 4-6-71; Ord. No. 1635, § e, 3-13-73; Code 1967, § 36-105; Ord. No. 3590, § 1(5), 9-2-86)

Sec. 34-119. Work on sidewalks by tenants.

The duties and obligations imposed by this article on the owners of property abutting on any public street to build, repair, keep clean and open for public passage, public sidewalks and walkways, shall also devolve upon the tenant or other person occupying the premises adjacent to such sidewalks. Notice to such tenant or occupant in the manner hereinbefore specified shall be sufficient to compel him to do the things specified in such notice; provided that, whenever any tenant or occupant shall be required under the provisions of this article to build, repair, keep clean and open for public passage any sidewalk or walkway abutting his premises, such tenant or occupant shall have a lien on such property occupied for reimbursement and reasonable attorney's fees, if the primary obligation to do such was on the landlord. This lien may be enforced by attachment proceedings in any court of competent jurisdiction and the tenant or occupant may, when so entitled under the general principles of law of set-off, use such claims against his liability for rent, all in accordance with the provisions of section 1 of chapter 163 of the Acts of the General Assembly of the State of Tennessee for 1889.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-106)

Sec. 34-120. To be kept free of mud, weeds, grass, etc.

Every owner, tenant, lessee or occupant of any building or lot, whether vacant or occupied, within the city, shall keep, or cause to be kept, the sidewalks or walkways adjacent to or abutting such property, free from mud, weeds, grass, noxious growth, obstructions, encumbrances, trash, debris and foreign substances of every kind.

Sec. 34-121. To be kept free of ice and snow; exceptions.

All sidewalks shall be kept free from ice or snow; provided, however, that, tightly adhering ice may be sprinkled with sawdust, ashes or sand, so as to make the uses of the sidewalk by pedestrians safe.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-108)

Sec. 34-122. Time and Method of sweeping.

Sidewalks adjacent to business premises shall not be swept or cleaned, except in cases of necessity, between the hours of 7:30 a.m. and 7:30 p.m. Sidewalks shall be carefully cleaned or swept so as not to unnecessarily raise or spread dust, dried sputum or other substances which may carry the germs of infectious or contagious diseases.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-109)

Sec. 34-123. Wood and brick sidewalks to be kept in repair.

It shall be a misdemeanor to permit any wood or brick sidewalks now laid to become out of repair, or in such condition as to become dangerous, or annoying to pedestrians or those lawfully using such sidewalks.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-110)

Sec. 34-124. Slippery walks to be made safe.

It shall be unlawful for any person to permit to remain on or in any sidewalk adjacent to or adjoining his property, dwelling house, store building or other property, any tile or other material which may through use, become slippery or unsafe for public travel. It shall be the duty of the city engineer and his duly authorized representatives to order existing sidewalks which have become slippery or unsafe to be removed or made safe, and sidewalks according to the specifications set out in this article to be laid. The notice and

remedies of the city for the failure of any such person to obey such lawful order shall be the same as prescribed in the preceding sections of this article.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-111; Ord. No. 3590, § 1(6), 9-2-86)

Sec. 34-125. Use for storage, display or sale of merchandise prohibited.

(a) It shall be a misdemeanor for any person, public or private agency to use any part of any sidewalk or walkway between the private property line and curb or within a pedestrian/sidewalk easement for the storage of goods, merchandise or other material or for the purpose of displaying goods or articles for sale or barter, the parking of vehicles or to place on the sidewalk any sign or device for advertising purposes.

(b) It shall be unlawful for any person, public or private agency to rent, lease or let to another any portion of the sidewalks or walkways of the city for the purpose of selling fruits, vegetables, magazines, or any class of merchandise thereon.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-126. Drainage.

It shall be a misdemeanor to permit any sidewalk to remain which does not properly drain storm water, or which permits water to lie upon the surface thereof.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-113)

Sec. 34-127. Foliage and tree limbs projecting over sidewalks.

It shall be a misdemeanor to permit shrubbery, hedges, or foliage of any kind to project over sidewalks or walkways so as to interfere with the free use of such sidewalks or walkways by pedestrians. All trees upon or near sidewalks or walkways shall be so trimmed that the lower branches thereof are not less than eight (8) feet above the sidewalks.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-114)

Sec. 34-128. Metal drains across sidewalks.

It shall be a misdemeanor to permit any iron or metal drain to remain across a sidewalk, unless the top of such drain shall be roughened in an approved manner and be level or flush with the surface of the walk and securely bolted, riveted or welded to the body of such drain.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-115)

Sec. 34-129. Openings to be covered.

(a) It shall be a misdemeanor to leave open or unguarded any cellar or vault door or grating on any sidewalk, or to permit any unguarded well, cistern, coal hole or other opening to remain open and uncovered in any sidewalk.

(b) Every opening in the paved sidewalk leading into an area or vault beneath the surface of such sidewalk, or into a cellar or basement, shall be fitted with an iron grating or roughened metal cover, flush with the surface of the walk and securely bolted, riveted or welded so as to remain in place.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-116)

Sec. 34-130. Obstructing gutters adjoining sidewalks.

It shall be a misdemeanor to obstruct any gutter with dirt, gravel, sand or other substance, bridge or thing which will prevent the free and unobstructed flow of water in such gutter.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-117)

Sec. 34-131. Letters, numbers, etc., in sidewalks.

It shall be a misdemeanor for any person to erect on, in or about any sidewalk, or to permit on, in or about any sidewalk adjacent to his premises, any character, device, letters or numbers of any material so constructed as to interfere with the free and safe use of any sidewalk. It shall be a misdemeanor for any person maintaining in any sidewalk any such character, device, letter or number to permit same to become slippery, or otherwise dangerous to those using the sidewalk.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-118)

Sec. 34-132. Gates and doors not to swing over walks; exception.

It shall be a misdemeanor to permit any gate or door to open outwardly upon or across a sidewalk or driveway except where require by statute.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-119)

Sec. 34-133. Water not to drain on sidewalks.

No person, whether owner, lessee, tenant or occupant, of any house or building, shall permit any water or other liquid to run or drip from or out of his building upon or across any sidewalk. If such water or other liquid is carried to the street, it shall be confined in pipe, tile or other enclosed passageway, which shall be constructed of suitable strength and material underneath the surface of such sidewalk, and shall at all times be kept in repair and adequate to handle the waters or other liquids flowing into such street. No water, liquid or ice shall be allowed to gather, remain or drip upon the upper surface of such sidewalk or passageway. No storm water shall be allowed to fall through downpipes from any building upon the sidewalks or street, or across any sidewalk, but shall be conducted by downpipe or gutter under the sidewalk to the street gutter; provided, however, that, it shall be lawful for such storm waters, when conducted to alleys, to be conducted on the surface of such alleys.

(Ord. No. 894, § 1, 4-6-71; code 1967, § 36-120)

Sec. 34-134. Location of meter boxes, cut-off valves, etc.

Whenever possible, meter boxes, cut-off valves and like instrumentalities shall be placed in the grass plot between the sidewalk and curb, but where no grass plot exists, such meter boxes, cut-off valves and other like instrumentalities shall be placed adjacent to the curb.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-121)

Sec. 34-135. Base of poles set in sidewalks to be concreted.

It shall be a misdemeanor to set or install in any concrete sidewalk any pole or post without properly concreting around the base of same within thirty (30) days after installation. The area immediately around such pole or post shall be neatly isolated from the adjacent sidewalk by the placement of minimum one half ($\frac{1}{2}$) inch thick, full-depth expansion joint material forming a square or rectangular isolated sidewalk slab.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-122)

Sec. 34-136. When sidewalks to be relaid; concrete to be used.

Whenever it becomes necessary to relay sidewalks or when any sidewalks are lawfully ordered to be made, and are laid or repaired on all streets, avenues, parkways or other public street of the city, on which stone, concrete, or granite curbs have been set, or on streets which have been brought to the established grade, such sidewalks shall be laid, or repaired, with concrete in accordance with lines and grades furnished and established by the city engineer, and in strict accordance with the specifications set out in this article, except as specifically approved by the city engineer.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-123)

Sec. 34-137. Compliance with article II.

It shall be a misdemeanor to do or permit work to be done on any granolith, stone or cement sidewalk unless the person doing the work shall comply with the provisions of article II of this chapter, and shall have on file, in the office of the city engineer, the concrete worker's bond required by section 34-32. (Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-124)

Sec. 34-138. Work permit.

(a) It shall be a misdemeanor for any person to lay, construct, build or repair a sidewalk, hire others to work upon, or knowingly permit work to be done on any part of a sidewalk or street from the curb to the property line, without first obtaining a permit from the city engineer to do such work. The fee for such permit shall be twelve cents (\$0.24) per square foot of sidewalk and driveway abutting property used for residential purposes, and twenty-four cents (\$0.48) per square foot of sidewalk and driveway abutting property used for commercial or industrial purposes, provided a minimum fee shall be ten dollars (\$10.00) for each permit. On any sidewalk which the city has to lay and charge to the property owner, the cost of the proper work permit shall be added to the bill of costs and recovered in the same manner as are costs for such laying. All sidewalk work shall be done under the conditions and pursuant to the directions contained in the permit. The work permit shall be conspicuously posted at the work site and maintained until such work is completed and inspected by the city engineer or his representative.

(b) The permit shall state the place where the work is to be done, the nature of the work, and the material with which such work is to be constructed.

(c) The work embraced in this section shall not be held to include the removal of grass, weeds, trash, debris or other obstructions which can be done without damage to the Surface of such sidewalk, or which can be done without endangering the safety of persons lawfully using such sidewalk.

(Ord. No. 894, § 1, 4-6-71; Ord. No. 3024, § 1, 6-9-80; Code 1967, § 36-125; Ord. No. 3747, § 1, 5-3-88)

Cross reference--Taxes and licenses generally, Ch. 36.

Secs. 34-139--34-150. Reserved.

DIVISION 2. ADMINISTRATION

Sec. 34-151. Sidewalk construction in developing areas.

(a) Sidewalks shall be constructed along the public street frontages of all lots in developing areas that have curbs and gutters installed along the public streets abutting and within the development, in accordance with the specifications, standards and grades established by the city engineer with the following exceptions:

1. the lot frontages on cul-de-sacs with twenty-five (25) or less dwelling units,
2. the lot frontages on loop streets and "L" streets with fifty (50) or less dwelling units;

such exceptions to be determined by the city engineer based on the definitions of the street classifications established in the Subdivision Regulations.

(b) It shall be the duty and responsibility of the contractor/builder to whom the building permit for the lot is issued to obtain a permit from the city engineer and to install the required sidewalk across the street frontage(s) of the lot. The building official shall advise the city engineer in a timely manner of the issuance of all such building permits. The sidewalk shall be installed by the contractor/builder, and inspected and accepted by the city engineer prior to the final inspection of the structure by the building official and prior to any use or occupancy of the structure on the lot.

(c) It shall be a misdemeanor for the contractor/builder to permit any use to commence on any lot or occupancy to commence in any structure on any lot within a new development prior to the installation, inspection and acceptance of the sidewalks required by this article.

(d) The lot owner shall assume the responsibility of installation, maintenance and repair of the required sidewalks along the lot frontage(s) upon occupying the structure on the lot.

(e) The city engineer reserves the right to include the installation of required sidewalks within a standard development contract for nonresidential developments, street dedication contracts, and streets abutted by reverse frontage lots and/or unbuildable common open space lots.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-152. Sidewalks required on existing improved streets; when construction to begin.

(a) On existing streets, improved prior to the effective date of this section, sidewalks shall be required, provided that at least twenty-five (25%) per cent of the sidewalks already exist. These sidewalks shall be constructed immediately upon receipt of notice from the city engineer. For topographic reasons the city engineer may waive this requirement on all or any portion of any street, parkway, boulevard, avenue or other public street of the city for which an established grade has been lawfully fixed.

(b) A "street" is defined as that portion composing one city block, both sides of the street, unless, in the opinion of the city engineer, a natural neighborhood dividing line would cause such street to be either shorter or longer than one block.

(Ord. No. 1635, § 1, 3-13-73; Ord. No. 3047, § 1(b), 8-12-80; Code 1967, § 36-97.1; Ord. No. 3590, § 1(8), 9-2-86)

Sec. 34-155. Sidewalk inspector.

The city engineer shall employ an inspector to be known as the sidewalk inspector. It shall be his duty to enforce the provisions of this article, under the direction of the city engineer.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-156. Notice to property owner to build, repair, or clean.

(a) Whenever it is made to appear to the city engineer, or his lawfully authorized representative, that there has been a failure on the part of the owner of property to build, repair, keep clean and open for public passage any sidewalk or walkway abutting on or adjacent to such property, the city engineer, or his duly authorized deputy, shall give notice to such owner, or his duly authorized agent, of the failure of such owner to build, repair, keep clean and open for public passage such sidewalk or walkway.

(b) Such notice may be given either by personal service on the owner or his duly authorized agent, or by certified letter addressed to the last known place of residence of such owner, or his duly authorized agent, and proof of the mailing of such registered letter by the city engineer, or his duly authorized deputy, shall be a complete compliance with this provision.

(c) In the cases of nonresident or unknown owners, a publication of the notice by one insertion in a daily newspaper published in the city shall be a complete compliance with the provisions of this section as to notice.

(d) The notice in each case shall specify what is required of the owner with respect to the sidewalk.

The notice shall advise the owner that unless the requirement is carried out within thirty (30) days of the date of service, mailing or publication of the notice, the necessary work will be done by the city at the expense of the owner.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-99; Ord. No. 3590, § 1(12), 9-2-86)

Sec. 34-157. Failure of property owner to comply with notice.

(a) Failure to comply with the provisions of this article shall be a misdemeanor subject punishment as provided in section 1-8 of this Code of Ordinances.

(b) Further, upon the failure, refusal or neglect of any person notified to comply with the terms and orders of a notice given pursuant to section 34-156, the city engineer is hereby authorized to build, repair, keep clean and open for public passage any sidewalk or walkway abutting on or adjacent to the property of the person owning or controlling it. The cost of such work shall be a lien on such property, and may be enforced by suit in any court of competent jurisdiction.

(c) As an additional and cumulative remedy, the city engineer may certify to the city treasurer the cost of such work. It shall be the duty of the city treasurer to place the amount so certified on the bill for city taxes assessed against the property abutting on or adjacent to the sidewalk or walkway laid. It shall be the duty of the city treasurer to collect, as a special tax, the amount so certified which is hereby declared to be a special improvement tax on the property abutting on, or adjacent to, such sidewalks or walkways. This special tax may be collected in the same manner as other general taxes are collected by the city.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-158. City engineer to furnish grades and lines.

The city engineer shall furnish, to every person ordered or require to construct, pave or repair sidewalks, the proper grades and lines for such sidewalks, and such work shall be done in accord with the lines and grades so furnished.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-101; Ord. No. 3590, § 1(13), 9-2-86),

Sec. 34-159. Driveway openings.

(a) All driveway openings constructed for use by vehicular traffic to single family and duplex residential land uses shall be six (6) inches thick and composed of Portland cement concrete proportioned, mixed and laid as specified in this article and in accordance with the construction standards of the city.

(b) All driveway openings constructed for use by vehicular traffic to multi-family residential, commercial and/or industrial land uses shall be eight (8) inches thick and composed of Portland cement concrete proportioned, mixed and laid as specified in this article and in accordance with the construction standards of the city.

(c) All openings in the curb for driveways shall be approved by the city engineer prior to actual construction.

(d) Driveway openings providing access to streets where curbs and gutters are not in place shall be constructed of asphalt pavement in accordance with the design and material standards established by the city engineer and shall include a drainage pipe of adequate size as required to accommodate roadside drainage. Any person desiring to construct such a driveway opening shall obtain a permit from the city engineer prior to actual construction.

(e) The design, number and location of all driveway openings providing access to a lot and/or land use are subject to the approval of the city engineer.

(f) If the land use and/or the on-site improvements on a lot are modified, altered or changed, the design, number and location of all driveway openings providing access to the lot shall be submitted to the city engineer for review and approval.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-160. City engineer to accept and inspect work.

The laying of all sidewalks and driveway openings and the material and component parts thereof shall be under the inspection and subject to the acceptance of the city engineer or his authorized deputy.

(Ord. No. 4196, § 34, 8-24-93)

Secs. 34-161--34-170. Reserved.

DIVISION 3. TECHNICAL REQUIREMENTS

Sec. 34-171. Width, location of walks.

(a) All walks shall not be less than five (5) feet wide, unless otherwise especially provided in the permit or by this section.

(b) The normal location of walks shall be such that the edge of the walk farthest from the curb shall be on the property line. At the discretion of the city engineer, the normal location of walks may be varied within the city's right-of-way. In the event a walk is located adjacent to the back edge of the curb, the width of such walk shall not be less than six (6) feet as measured from the back edge of the curb, subject to the exception hereinafter noted, so as to avoid interference by poles, fire plugs, meters or any such obstruction capable of preventing free passage along such walk. Should the city not have sufficient right-of-way for a walk to be not less than six (6) feet wide, where such walk is adjacent to the curb, then in such event, the walk shall be full width, from the back edge of the curb to the property line.

(c) Sidewalks installed on residential minor streets, culs-de-sac, and loop streets shall not be less than five (5) feet wide and normally placed adjacent to the property line. Those sidewalks placed adjacent to the curb shall not be less than six (6) feet wide.

(d) Sidewalks may be installed behind the property line (on private property) if an appropriate pedestrian/sidewalk/Utility easement has been granted as part of an approved final plat of a subdivision. In such cases, sidewalks shall not be less than five (5) feet in width and normally located with the edge of the walk farthest from the curb against the easement line located farthest from the curb. Sidewalks located adjacent to the curb shall have a width of not less than six (6) feet.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-127; Ord. No. 3590, § 1(15), 9-2-86)

Sec. 34-172. Thickness and material to be used in concrete sidewalks.

Walks shall be a minimum of four (4) inches thick and composed of monolithic Portland cement concrete proportioned, mixed and cured in accordance with the specifications of the city engineer. (Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-128; Ord. No. 3590, § 1(16), 9-2-86)

Sec. 34-173. Tennessee One Call to be notified of laying sidewalks.

It shall be the duty of every person about to lay a sidewalk or driveway opening, or permitting such work to be done in his behalf, to give Tennessee One Call, underground utility location service, not less than three (3) working days notice in advance of the beginning of work.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-180. Cement; materials, preparation, placement, treatment, curing.

All materials, preparation, placement, treatment and curing of Portland cement concrete used in sidewalk and driveway opening construction shall be in accordance with the specifications of the city engineer and the standard construction specifications of the city.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-181. Reserved.

Sec. 34-184. Cuts and repairs.

Not less than five-foot by five-foot block shall be constructed in replacing or repairing sidewalk except in replacing squares around objects in the sidewalk which have previously been separated with expansion joints.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-140)

Sec. 34-186. Sidewalks surrounding buildings.

When a building permit is issued for the construction of new buildings or the remodeling of old buildings, the sidewalk, curb and driveway, if any, shall be left in first class condition upon completion of the building construction; and if damaged during the course of the demolition or construction of a building, it shall be restored to first class condition.

(Ord. No. 4196, § 34, 8-24-93)

Sec. 34-188. Contractor's responsibilities.

The contractor will be held responsible for all injury and damage to curbs, walks, pipelines, utility stretches and all other public and private property that may occur due to his operation while carrying out his work, and all repair or replacement costs if and where necessary, shall be borne by him. The contractor, at his own expense, shall erect and maintain all necessary walkways, barricades, and warning signs to assure safety of the public in the work area.

(Ord. No. 894, § 1, 4-6-71; Code 1967, § 36-144)

Cement proportions, consistency, fine aggregate, coarse aggregate, water, mixing methods, etc., can be found in the City of Memphis Standard Construction Specifications. Division 3-Concrete, Section 03050-Portland Cement Concrete and are contained in this booklet.

CEMENT WORKER'S BOND

Know All Men by these Presents, That we,

_____, as principal,

and

a surety company authorized to do business in the State of Tennessee, as surety, acknowledge ourselves to be held and truly bound to the City of Memphis in the sum of fifteen thousand dollars (\$15,000.00), for the payment of which sum well and truly to be made, we bind ourselves, our representatives, successors and assigns, firmly by these presents.

But the condition of the above obligations is such that:

Whereas the above bounden principal is desirous of engaging in the business of doing concrete work in or upon the streets, alleys, public places or ways in the City of Memphis for a period of one year from the date hereof now; if the said principal shall during the term of one (1) year faithfully observe the following regulations of the City of Memphis, to wit:

Shall observe the lines, grades and widths given by the City Engineer; shall not proceed to do any concrete work in the Streets, alleys and places in the City of Memphis without specific instruction from the City Engineer, or his authorized subordinates limited to their particular duties; shall do no work until a permit shall have been obtained therefor from the City Engineer; shall cover no stop boxes, valves or meter boxes belonging to any firm, company or individual; shall surround no poles, posts or other objects rightfully occupying the sidewalks unless the same are in their regularly appointed locations adjacent to the curb or edge stone; shall mix or deposit no material loose on the surface of any pavement; shall clear away all rubbish and all forms and materials from the location of the work within twenty-four (24) hours after the proper completion thereof, and shall do all work so that the same shall have the thickness, proportion, qualities, materials and texture called for by the specifications for such work, which may be in force in the City of Memphis, and shall in all other respects observe the terms and regulations of the ordinances of the City of Memphis regulating the work of doing any concrete work in or upon any street, alley, public place or way in the City of Memphis and shall, within ten (10) days after written notice by the City Engineer, remedy any defects that may appear within one year of completion of work, then this obligation shall be void; otherwise to remain in full force and effect.

Witness the hands and seals of the parties hereto, this the ____ day of _____, 20 ____.

(Seal) _____
Principal.

(Seal) _____
Surety.

Approved _____

ORIGINAL No. _____
PERMIT

SIDEWALK PERMIT
Office of City Engineer

Issued _____ 20 _____

Permission hereby granted to _____

To lay _____ repair _____ driveway _____ sidewalk _____ on _____

side of _____ Street
_____ Avenue between
Place
Street
_____ Avenue and _____ Street
Place Place

Known as House Number _____ Street
_____ Avenue
Place

Owner or Agent _____

Total area of walk _____ Sq.Ft. Heavy _____ Light _____

Received (\$) _____ for **CITY OF MEMPHIS, DIV. OF ENGINEERING**

By _____

By _____ Sidewalk Inspector

Inspected _____ 20 _____

F-4020.156
Rev. 4/88 jtc

CITY OF MEMPHIS
STANDARD CONTRACT SPECIFICATIONS
DIVISION 2 – SITE CONSTRUCTION SPECIFICATIONS
SECTION 02775--PORTLAND CEMENT CONCRETE
SIDEWALKS AND DRIVEWAYS

PART 1 – SCOPE

1.01 This work shall consist of constructing sidewalks, wheelchair ramps, and driveways of portland cement concrete on a prepared subgrade, in accordance with these Specifications and in conformity with the lines, grades, and typical cross-sections shown on the Plans or directed by the Owner. Wheelchair ramps and commercial and residential driveways shall be constructed in accordance with the Design Standards.

PART 2 – MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Concrete Materials: Concrete materials shall meet the requirements of Specification Section 03050, Portland Cement Concrete for Class A concrete.

B. Curing Materials: Curing materials shall conform to the applicable provisions of Specification Section 02750 Paragraph 2.01 C.

C. Preformed Joint Fillers: Preformed joint fillers shall be of the bituminous type and shall conform to the requirements of AASHTO M 213 and shall not be more than 1 inch or less than 1/2 inch in thickness. Their width shall be at least equal to the full thickness of the slab, and their length shall be sufficient to eliminate any splicing.

2.02 EQUIPMENT

A. Forms shall be of wood, metal, or other suitable material and shall be true to line, free from warp, and of sufficient strength to resist springing out of shape during placing, consolidating, and finishing the concrete. Curved forms of proper radius or flexible forms acceptable to the Owner shall be used on all radial sections.

B. Satisfactory floats, templates, straightedges, edgers, spades, tamps, and all other equipment necessary for the satisfactory performance of this construction shall be on the Project and approved before work will be permitted to begin.

PART 3 - CONSTRUCTION REQUIREMENTS

3.01 SUBGRADE PREPARATION

Subgrade preparation for sidewalks and driveways shall be made to the required configuration to conform to the slab thicknesses shown on the Plans. The subgrade shall be shaped and compacted in conformance with Specification Section 02335 Paragraph 3.03 and to a width that will permit satisfactory installation and bracing of forms. Density requirements may be waived if approved by the Owner.

3.02 FORMS

Forms shall be well staked or otherwise held to the established lines and grades, and their grade shall be such that finished sidewalks shall have one-quarter of an inch per foot fall toward the curb for drainage unless shown otherwise on the Plans or directed by the Owner. Driveway forms shall be of such width and slope that the finished driveway will conform to the slope of the adjacent sidewalk, grass plot, parking lot, or drive.

3.03 JOINTS

A. Unless otherwise indicated on the Plans or directed by the Owner, preformed expansion joint filler, 1/2 inch in thickness, shall be placed in sidewalks at the locations of and in line with expansion joints in the adjoining pavement, curb, or curb and gutter, but at spacings not to exceed 25 feet. When expansion joints have not been installed in the adjoining pavement or gutter, a 1/2 inch preformed expansion joint filler shall be placed transversely at intervals of not over 25 feet. Preformed expansion joint filler shall be placed at all abutting concrete such as driveways, buildings, or walls. Transverse expansion joints with 1/2 inch preformed expansion joint filler shall be placed to match existing joints in abutting facilities but not to exceed 25 feet between joints. Preformed expansion joint filler shall be placed at each intersection of sidewalk and street curb, longitudinally between sidewalks and street curb, and at such other points as may be shown on the Plans or directed by the Owner. Preformed expansion joint filler, 1 inch in thickness, shall be placed around all appurtenances such as manholes, valve, utility poles, fire hydrants, and signs extending into or through the sidewalk or driveway area, forming an isolated square or rectangular slab around the appurtenance with a minimum of 4 inches clearance of the appurtenance.

B. The surface of sidewalks shall be divided into blocks by use of a grooving tool. The grooves shall be spaced approximately 5 feet apart and the blocks shall be rectangular unless otherwise ordered by the Owner. The grooves shall be cut to a depth of 1/2 inch. The edges of the grooves shall be edged with an edging tool having a radius of 1/4 inch.

C. Expansion joint filler material shall not be placed at sidewalk drains. Driveway joints shall be placed as shown on the Design Standards.

3.04 PLACING AND FINISHING CONCRETE

A. Concrete shall be placed only on a moist subgrade and shall not be placed unless the ambient temperature is 35° F and rising. In no case shall concrete be placed on a frozen or frosty subgrade. After the concrete is placed in the forms, it shall be spaded along the forms (including cross forms for joints), tamped, and struck off in an approved manner to required section and grade and shall be finished with floats and straightedges until the surface requirements have been obtained. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be finished with a wooden float and swept lightly at right angles to the street centerline to produce a sandy texture. The longitudinal surface variations shall not be more than 1/4 inch under a 12 foot straightedge nor more than 1/8 inch on a 5 foot transverse section, or as approved by the Owner.

B. The edges of sidewalks and driveways shall be carefully finished and rounded with an edging tool have a 1/2 inch radius. An edge having a 1/4 inch radius shall be placed adjacent to and on both sides of all intermediate transverse expansion joints in sidewalks, and all marks caused by the edging tool shall be removed with a wetted brush or wooden float. The top of all expansion joint material shall be cleaned of all concrete, and the expansion joint material shall be trimmed if necessary as to be left slightly below the surface of the concrete.

3.05 TESTING CONCRETE

Concrete for sidewalks and driveways shall be tested by test specimens made and cured in accordance with AASHTO Designation T 23. The frequency and specific test method will be determined by the Owner. The Contractor shall furnish the concrete necessary for casting test specimens in the field. The City will supply all molds and labor necessary to cast and test the specimens.

3.06 CURING AND PROTECTION

A. Curing and cold weather protection shall be performed as provided for under Specification Section 02750 Paragraph 3.11 "Curing".

B. Forms may be removed and the slab backfilled at any time that removal will not damage the concrete. Pedestrians will not be allowed upon sidewalks or driveways until 72 hours after finishing the concrete, and no vehicles or loads shall be permitted on any sidewalk or driveway until the Owner has determined that the concrete has attained sufficient strength for such loads. The Contractor shall construct and place such barricades and protection devices as are necessary to protect the concrete. Any sidewalk or driveway damaged prior to final acceptance of the work shall be removed within joint or groove limits and replaced with concrete of the type and finish of the original construction.

3.07 WHEELCHAIR RAMPS

Wheelchair ramps shall be installed at each intersection at locations as reflected in the Design Standards or as directed by the Owner. For purposes of payment, wheelchair ramps shall be considered as sidewalk area in new construction areas. Where wheelchair ramps are to be installed at locations where curb and gutter is in place, wheelchair ramps will be paid as a unit in place, including removal of curb.

3.08 THICKNESS

Thickness of sidewalks and driveways shall be as shown on the Plans and Design Standards. Where a washed surface is specified for the concrete surface, and additional 1/2 inch thickness is required over that for the above specified finish.

PART 4 - MEASUREMENT

4.01 CONCRETE SIDEWALK

Concrete sidewalks will be measured for payment by the square foot at specified thickness, complete in place.

4.02 CONCRETE DRIVEWAY

Concrete driveways will be measured for payment by the square foot at specified thickness, complete in place.

4.03 WHEELCHAIR RAMP, EXISTING CONDITIONS

Wheel ramps placed in areas where curb and gutters exist will be measured by the unit, per each, complete

in place.

PART 5 – PAYMENT

5.01 CONCRETE SIDEWALK

The accepted quantities of concrete sidewalk, including area of wheelchair ramps in new construction areas, will be paid for at the contract unit price per square foot of each specified thickness, which price will be full compensation for excavating and preparing the subgrade; forming; furnishing, placing, finishing, and curing the concrete; providing all joints; and protecting the concrete until final acceptance, complete in place.

5.02 CONCRETE DRIVEWAY

The accepted quantities of concrete driveway will be paid for at the contract unit price per square foot of each specified thickness, which price will be full compensation for excavating and preparing the subgrade; forming; furnishing, placing, finishing, and curing the concrete; providing all joints; and protection of concrete until final acceptance, complete in place.

5.03 WHEELCHAIR RAMP, EXISTING CONDITIONS

The accepted quantities of wheelchair ramps placed in areas where curb and gutter exist will be paid for at the contract unit price per each, which price will be full compensation for removing existing curb and, if required, gutter and sidewalk; excavating and preparing the subgrade; furnishing, placing, and finishing the concrete; and protecting the concrete until final acceptance, complete in place.

5.04 PAYMENT WILL BE MADE UNDER:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
02775-01	Concrete Sidewalk	Square Foot
02775-01.____	_____ " Thickness	Square Foot
02775-02	Concrete Driveway	Square Foot
02775-02.____	_____ " Thickness	Square Foot
02775-03	Wheelchair Ramp (Existing Conditions)	Each

CITY OF MEMPHIS
STANDARD CONTRACT SPECIFICATIONS
DIVISION 3 - CONCRETE
SECTION 03050 - PORTLAND CEMENT CONCRETE

PART 1 - SCOPE

This specification covers the classification, materials, proportioning of materials, equipment, mixing requirements, and testing for portland cement concrete to be used for construction of streets, bridges, and miscellaneous structures and facilities as defined in Division 2 – Site Construction of these Specifications. The classification requirements, forming, curing, measurement, and payment for specific uses of concrete are specified and defined in the appropriate sections of Division 2.

PART 2 - CONCRETE CLASSIFICATION

2.01 CONCRETE CLASSIFICATION

Portland cement concrete used for construction of the various items covered in Division 2 of these Specifications shall be classified by usage as follows:

A. Class A.

Class A concrete shall be used as specified for such items as concrete curb, curb and gutter, sidewalks, drainage and sewer structures other than box culverts, ditch paving, bridges (other than superstructure) and similar uses.

B. Class A S.

Class A S concrete shall be used for bridge superstructures and channel lining of ditches.

C. Class B.

Class B concrete shall be used for roadway base and pavement.

D. Class C.

Class C concrete shall be used as specified for such items as concrete cradles, encasements, embankment slope paving at bridge abutments, and other low strength applications.

E. Class P.

Class P concrete shall be used for cast-in-place box culverts and precast and precast-prestressed

concrete structures or structural members. High-early-strength concrete shall be as specified in Specification Section 03050 Paragraph 6.05.

PART 3 – MATERIALS.

Materials used in the production of portland cement concrete of the various classifications specified herein shall meet the following requirements.

3.01 PORTLAND CEMENT.

Portland cement shall be Type I cement conforming to the requirements of AASHTO M 85, except that for high-early-strength concrete, Type III cement may be used.

3.02 FINE AGGREGATE.

A. Fine aggregate shall consist of natural sand, clean and free from any surface film or coating and graded from fine to coarse. Fine aggregate shall conform to the requirements of ASTM C 33 and the specifications included herein. The amount of deleterious substance shall not exceed the following percentage by weight:

Removed by decantation.....	3 percent
Coal or lignite.....	1 percent
Clay lumps.....	1 percent
Other local deleterious substances (such as shale, alkali, Mica, coated grains, soft and flaky particles).....	1 percent
Total coal, clay lumps, shale, soft fragments and other local deleterious substances	5 percent

B. All fine aggregate shall be free from amounts of organic impurities that would be detrimental to concrete strength and durability. Aggregate shall be subjected to the colorimetric test made in the field as follows:

Fill a 12 oz. graduated bottle to the 4 ½ oz. mark with the sand to be tested. Add a 3% solution of sodium hydroxide until the volume, after shaking, amounts to 7 ounces. Shake

thoroughly and let stand for 24 hours. The sample shall then show a practically colorless solution, or at least, a solution not darker than straw color.

C. Fine aggregate shall be well graded from coarse to fine and, when tested by means of laboratory sieves, shall conform to the following requirements:

<u>Passing</u>	<u>Percent</u>
3/8 in. Sieve.....	100
No. 4 Sieve.....	95 to 100
No. 16 Sieve.....	50 to 90
No. 50 Sieve.....	10 to 30
No. 100 Sieve.....	0 to 10
No. 200 Sieve.....	0 to 3

Note: Not more than 45% should be retained between any two consecutive sieves.

D. Fine aggregate shall be of such quality that mortar composed one (1) part portland cement and three (3) parts fine aggregate, by weight when made into briquets or cylinders, shall show a tensile or compressive strength at seven (7) and twenty-eight (28) days at least equal to the strength of briquets or cylinders composed of one (1) part of the same cement and three (3) parts standard Ottawa sand by weight. The percentage of water used in making the test specimens of cement and fine aggregate shall be such as to produce a mortar of the same consistency as that of the Ottawa sand test specimens of standard consistency.

3.03 COARSE AGGREGATE.

A. Coarse aggregate for any class of portland cement concrete shall consist of crushed stone or crushed or uncrushed gravel unless otherwise specified.

B. Coarse aggregate for Class A, Class B, or Class C concrete shall be furnished in two sizes:

Size No. 4 and Size No. 67 as shown hereinafter in Table 03050.1, Coarse Aggregate Gradation Table. The two sizes shall be manufactured, within the specified limits, to produce Size No. 467 when combined in the proper proportions at the batching plant. If the supplier provides a proper stockpile to prevent segregation, then a combined Size No. 467 can be used in lieu of blending Size No. 4 and Size No. 67.

C. Coarse aggregate for Class AS concrete shall be Size No. 57. Only limestone coarse aggregate will be used for Class AS concrete; gravel coarse aggregate will not be permitted.

D. Coarse aggregate for Class P concrete shall be size No. 57 or Size No. 67 as may be specified or directed. Only limestone coarse aggregate shall be used for Class P concrete; gravel coarse aggregate will not be permitted.

E. Coarse aggregate for concrete curbing placed by machine extrusion methods shall be Size No. 57 or Size No. 67.

F. The coarse aggregates shall otherwise conform to the requirements of AASHTO M 80 and ASTM C 33 with the following exceptions and stipulations:

1. Deleterious Substances.

The amount of deleterious substances shall not exceed the following limits:

	Maximum Percent by Weight
a. Soft or nondurable fragments (fragments which are structurally weak such as shale, soft sandstone, limonite concretions, gypsum, weathered schist or cemented gravel)	3.0
b. Coal and lignite	1.0
c. Clay lumps	0.25
d. Material passing the No. 200 sieve	1.00
e. Thin or elongated pieces (length greater than 5 times average thickness)	10.00

f. Other local deleterious substances

1.00

Notes: 1. In the case of crushed aggregate, if all the material finer than the 200 mesh sieve consists of the dust of fracture essentially free of clay or shale, Item 4, Maximum Per Cent by Weight, may be increased to 1.5.

2. The sum of the percentages of Items No. a, b, c, d, and f shall not exceed 5.0.

3. When the coarse aggregate is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than nine.

4. Alternate freeze/thaw tests for soundness will not be performed.

5. The percentage of wear as determined by AASHTO T 96 shall not exceed 40.

COARSE AGGREGATE GRADATION TABLE

Table 03050.1

Size Number	Amounts Finer Than Each Lab. Sieve (Sq. Openings), % By Weight							
	2"	1-1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8
4	100	90-100	20-55	0-15	----	0-5	----	----
467	100	95-100	----	35-70	----	10-30	0-5	----
57	----	100	95-100	----	25-60	----	0-10	0-5
67	----	----	100	90-100	----	20-55	0-10	0-5

3.04 WATER.

The water used in mixing concrete shall be clean, free from oil, acid, strong alkalis, organic or vegetable matter.

3.05 AIR-ENTRAINING ADMIXTURES.

A. Air-Entraining Admixtures shall conform to the requirements of AASHTO M 154, except that the tests for bleeding, bond strength and volume change will not be required.

B. The Owner will maintain a list of qualified products. The Contractor shall be required to furnish a material that appears on this list.

C. A product may become approved by furnishing test data from a recognized laboratory showing that the air-entraining admixture proposed for use conforms to the requirements of these Specifications. A recognized laboratory is defined as one of the following: A State Transportation Department Laboratory; a Federal Highway Administration Laboratory; or other laboratories which are approved by the Owner.

3.06 CHEMICAL ADDITIVES.

A. For portland cement concrete mixtures, these additives shall conform to the requirements of AASHTO M 194 covering the following five types:

1. Type A – Water reducing admixtures
2. Type B – Retarding admixtures
3. Type C – Accelerating admixtures
4. Type D – Water reducing and retarding admixtures
5. Type E – Water reducing and accelerating admixtures

B. Additionally, admixtures for increasing the flowable characteristics of concrete (super plasticizers) may be used, subject to the approval of the Owner for each class and intended use of the concrete. Such admixtures shall meet the applicable requirements of ASTM C 494. The use of a plasticizer shall not change the maximum water requirements for the approved design mix. When approved for use, the admixture shall be introduced into the mix in the manner and quantities recommended by the manufacturer.

C. Additives listed in items A through E above and super plasticizers may only be used with the written approval of the Owner. Before any admixture is approved, the manufacturer of the admixture or the Contractor shall furnish the owner documentary evidence that the material proposed for use has been tested in accordance with the methods of test specified in AASHTO M 194 (or ASTM C

494 for super plasticizers) and meets the requirements of the Specification. Documentary evidence for all additives shall be the results of tests conducted by a testing laboratory inspected at regular intervals by the National Bureau of Standards. The Owner may require a notarized certification from the manufacturer of any additives used stating that the material is identical with that originally approved and has in no way been changed or altered. Even though additives have been approved by the Owner, the Contractor shall be responsible for the successful use of the additives. No reduction in the cement content of the concrete as designed without chemical additives will be made when additives are permitted.

D. Calcium chloride additives will not be permitted.

3.07 CURING MATERIALS.

Curing materials shall be as specified in the various Specification Sections of Division 2 and as specified below:

A. Water.

Water used in curing portland cement concrete shall be free from any substance which may be injurious to concrete when applied on the surface as a curing agent.

B. Burlap.

Burlap shall conform to AASHTO M 182, Class 3 or Class 4. If Class 1 or Class 2 burlap is permitted, at least two layers shall be use.

C. Liquid Membrane-Forming Compounds.

These compounds shall conform to AASHTO M 148. Where applied texture finish is specified, a Type 1-D, Class B, membrane which is compatible with the texture finish shall be used. Type 2 (white pigmented) membrane shall be used in all other applications, unless otherwise specified.

D. White Polyethylene Sheeting.

This material shall conform to AASHTO M 171.

3.08 FLY ASH.

Class C fly ash conforming to the requirements of ASTM C 618-84 may be used as a replacement for portland cement if approved in writing by the Owner. The maximum amount of cement being replaced by fly ash shall not exceed 15 percent. Before any fly ash will be approved for use, the Contractor shall furnish the Owner documentary evidence that the fly ash proposed for use has been tested in accordance with

ASTM C 311-7 and meets the requirements of that specification. Documentary evidence shall be the results of tests conducted by a testing laboratory inspected at regular intervals by the National Bureau of Standards. Even though the fly ash has been approved by the Owner, the Contractor shall be responsible for its successful use. When a specific air content has been required and fly ash is being used, the air content shall be tested on each truck load of concrete at the batch plant and the tested value shall be indicated on the ticket.

PART 4 - EQUIPMENT

4.01 GENERAL.

Equipment and tools necessary for handling materials and performing all parts of the Work shall be subject to the approval of the Owner. The equipment shall be at the job site sufficiently ahead of the start of construction operations to be examined thoroughly and approved. The equipment and organization shall be of sufficient capacity to accomplish the maximum continuous concrete placement, as governed by the construction joints shown on the Plans and Design Standards or as directed by the Owner.

4.02 BATCHING PLANT AND EQUIPMENT.

A. General.

The batching plant shall include bins, weighing hoppers, and scales. If cement is used in bulk, a bin, hopper, and separate scale for cement shall be included. The Contractor shall provide adequate means for cement cut off checks. The weighing hoppers shall be properly sealed and vented to preclude dusting during operation. The bulk cement storage bin or hopper shall be provided with adequate means for sampling the cement in storage.

B. Bins and Hoppers.

Bins with adequate separate compartments for fine aggregates, each size of coarse aggregate, and cement shall be provided in the batching plant. Each compartment shall discharge efficiently and freely into the weighing hopper. Means of control shall be provided so that as the quantity desired in the weighing hopper is being approached, the material may be added slowly and shut off with precision. A port or other opening shall be provided for removing an overload of any one of the several materials from the hopper. Weighing hoppers shall be constructed so as to eliminate accumulations of tare materials and to discharge fully without jarring the scales. Partitions between compartments, both in bins and in hoppers, shall be ample to prevent spilling under any working conditions.

C. Scales.

1. The scales for weighing aggregates and cement shall be of either the beam type or the springless-dial type. They shall be accurate within 0.5 percent throughout the range of use. The value of the minimum graduation on the scale for weighing cement shall not be greater than 5 pounds. The value of the minimum graduation on the scale for weighing amounts of aggregates up to 10,000 pounds or more shall be not greater than 10 pounds. The value of the minimum graduation of scales used in weighing amounts of aggregate 10,000 pounds or more shall be not greater than 0.1 per cent of the nominal capacity of the scales but shall not exceed 50 pounds. When beam type scales are used, provision, such as a "tell-tale" dial, shall be made for indicating to the operator that the required load in the weighing hopper is being approached. The "tell-tale" device on weighing beams shall indicate critical position clearly. Poises shall be designed so that they cannot be easily removed from the beam and can be held firmly in place. The weigh beams and "tell-tale" device shall be in full view of the operator while charging the hopper, and he shall have convenient access to all controls.

2. Scales shall be tested no less than once monthly by a certified scale testing company. Testing shall meet the requirements of applicable City ordinances and State law. The Contractor shall have available not less than 10 standard 50 pound weights meeting the requirements of the U.S. Bureau of Standards for calibrating and testing weighing equipment. The person dispensing weighed material shall certify that the amounts of materials used is in accordance with quantities shown on the delivery ticket.

D. Equipment For Structural Concrete.

1. The requirements for batching plants shall be as prescribed above, except that when approved by the Owner, the requirement for storage compartments in addition to weigh bins, for fine and coarse aggregates may be waived, provided the batching tolerances specified in Specification Section 03050 Paragraph 5.02.A are maintained.

2. Ample and satisfactory equipment for conveying concrete from the mixer to final position in the forms shall be provided. Closed chutes or pipes shall be used when concrete is to be dumped or dropped for a distance greater than 5 feet. Where steep slopes are required, the chutes shall be equipped with baffle boards or shall be in short lengths that will enable the direction of movement to be reversed. Tremies for placing seal concrete under water shall consist of a water tight tube 10 inches to 14 inches in diameter. It shall be constructed so that

the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow.

4.03 MIXERS.

A. General.

1. Concrete may be mixed at a central point or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's plate showing the capacity of the drum, in terms of mixing and agitating capacity, and the speed of rotation of the mixing drum or blades for both mixing and agitation.

2. Mixers shall be capable of combining the aggregates, cement, additives when specified, and water into a thoroughly mixed and uniform mass within the specified mixing period. They shall have a minimum capacity sufficient to comply with minimum production requirements.

3. Mixers shall be equipped with an approved device for accurately measuring water within a range of error of not more than one percent. The amount of water used in each batch shall be shown by an indicator which is accurately calibrated and easily read.

4. Central plant mixers shall be equipped with an approved batch meter and timing device which will automatically lock the discharge lever during the full time of mixing and release it at the end of the mixing period. This device shall be equipped with a bell or other suitable warning device that will give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, providing the Contractor furnishes a satisfactory means of determining the mixing time.

B. Mixers At Site Of Construction.

Mixers at the site of construction will not be permitted, unless permitted by the Owner.

C. Truck Mixers And Truck Agitators.

Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall meet all the applicable requirements under Paragraph A above, and in addition, the manufacturer's plate shall indicate the various uses for which the equipment is designed, the gross volume of the drum, and the minimum and maximum speed of rotation of the drum or blades for

charging, mixing and agitating. Trucks equipped for mixing shall be equipped with an approved device for recording the number of revolutions of the drum or blades. Mixers or agitators used to mix and transport paving concrete shall be of the hydraulic drum lift type or other especially designed types which will discharge low slump concrete (1 – 2 ½ inch) at a satisfactory rate without segregation.

D. Nonagitator Trucks.

Bodies of nonagitator hauling equipment for concrete shall be smooth, mortar tight, metal containers, and shall be capable of discharging the concrete at a satisfactorily controlled rate without segregation. Covers shall be provided when needed for protection of the concrete. Nonagitator trucks may be used only with approval of the Owner.

E. Admixture Induction.

A satisfactory method and equipment for setting the dosage for admixtures must be furnished and if admixtures other than air entraining agents are used, they shall be added in the manner and in the dosage recommended by the manufacturer.

F. Vibrators.

Vibrators shall be of an approved type and design, and shall operate under load at the rate as recommended by the manufacturer and approved by the Owner. For concrete structures, all concrete to be vibrated shall be compacted by means of approved high frequency internal vibrators or other approved types of vibrators immediately after being deposited in the forms. At least two vibrators in good operating condition and tow sources of power shall be available at the site where more than 25 cubic yards of concrete are to be poured. The use of external vibrators for compacting concrete will be permitted where the concrete is inaccessible for adequate compaction, provided the forms are sufficiently rigid to prevent displacement or damage from external vibration and approved by the Owner. For concrete pavement, the frequency of surface vibrators shall not be less than 3,500 impulses per minute and the frequency of the internal type shall not be less than 5,000 impulses per minute for tube vibrators and not less than 7,000 impulses per minute for spud vibrators. When spud type internal vibrators, either hand operated or attached to spreader or finishing machines, are used adjacent to forms, they shall have a frequency not less than 7,000 impulses per minute. For prestressed concrete, all concrete shall be thoroughly compacted with approved high frequency vibrators operating at a minimum of 7,000 vibrations per minute.

PART 5 – HANDLING, BATCHING AND MIXING

5.01 STOCKPILING AGGREGATES.

A. Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground shall be firm and smooth and well drained. A cover of at least three inches of aggregate shall be maintained in order to avoid the inclusion of soil or foreign material. The stockpiles shall be built in layers not exceeding four feet in height, and each layer shall be completely in place before the next layer is started so as to prevent segregation. The material shall be deposited in such manner as to prevent coning, except in the case of aggregate composed essentially of material finer than the No. 4 sieve and base material.

B. Dumping, casting or pushing over sides of stockpiles will be prohibited, except in the case of aggregate for base material and fine aggregate materials.

C. Unless otherwise authorized, aggregates from different sources, different gradings or differing in specific gravity by more than 0.03 shall not be stockpiled together. Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or separated by suitable walls or partitions, to prevent the mixing of the aggregates.

D. When it is necessary to operate trucks or other equipment on a stockpile in the process of building the stockpiles, it shall be done in a manner approved by the Owner. Any method of stockpiling aggregate which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has operated, and failure of such samples to meet all grading requirements for the aggregate shall be considered cause for discontinuance of such stockpiling procedure.

E. Stockpiles shall be maintained in a saturated surface dry condition to the extent possible.

5.02 HANDLING, MEASURING AND BATCHING MATERIAL.

A. General.

1. The batch plant site, layout, equipment and provisions for transporting material shall be such as to assure a continuous supply of material to the Work.

2. Aggregates shall be handled from stockpiles or other sources to the batching plant in such

manner as to maintain a uniform grading of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipment requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage. In case the aggregates contain high or non-uniform moisture content, storage or stockpile periods in excess of 12 hours may be required by the Owner. The Owner may require sprinkling of aggregate that has dried to the extent that it absorbs mixing water.

3. The fine aggregate and each size of coarse aggregate shall be separately weighed into the hopper or hoppers in the respective amounts set by the Contractor and approved by the Owner. Cement shall be measured by the sack or weight. Separate scales and hoppers shall be used for weighing the cement. The scales shall be equipped with a device to indicate positively the complete discharge of the batch of cement into the batch box or container. Ninety-four pounds of bulk cement shall be considered one sack. Batches involving fractional sacks will not be allowed except when bulk cement is used.

4. Batching plants equipped to proportion aggregates and bulk cement by weight by means of automatic and interlocked proportioning devices of approved type may be used.

5. Batching shall be so conducted as to result in the required weights of each material being within a tolerance of 1.0 percent for cement and 1.5 percent for aggregates.

6. Water may be measured either by volume or by weight. The accuracy of measuring the water shall be within a range of error of not over 1.0 percent. Unless otherwise permitted, calibrated tanks for measuring water shall include an auxiliary tank from which the measuring tank shall be filled. The measuring tank shall be equipped with an outside tap and valve to provide for checking the setting unless other means are provided for readily and accurately determining the amount of water in the tank. The volume of the auxiliary tank shall be at least equal to that of the measuring tank.

7. The use of chemical additives shall be as prescribed under Paragraph 3.06 of this Specification and they shall be added to the mix using the methods and at the time and in the manner recommended by the manufacturer of the additive, subject to approval by the Owner.

8. Unless specifically provided in the contract, the furnishing and use of approved additives or

admixtures and the other precautions necessary to provide satisfactory concrete and concrete products shall be considered subsidiary to the furnishing and placement of the concrete and any and all additional costs related thereto and risks resulting there from shall be borne by the Contractor.

9. Different types of cement shall not be mixed, nor shall they be used alternately. Where it is necessary for the color of the concrete to be uniform, only those cements which will produce similar color in concrete may be used alternately. The Owner shall designate which cements may be used alternately.

10. Air entraining agents shall be added to the mix by an approved procedure and by the use of an approved dispenser to assure an accurate proportioning of the agent.

11. All admixtures shall be measured with an accuracy of plus or minus 3.0 percent.

B. Limitations On Concrete Operations.

1. Mixing of concrete shall be discontinued in time to allow finishing to be completed in daylight hours, unless an adequate and approved artificial lighting system is provided and operated.

2. When concrete is being placed during hot weather, appropriate measures shall be taken to reduce the hazards of increased rate of cement hydration and high concrete temperatures. The temperature of the concrete at point of discharge shall not exceed 90° F. The Owner may require any or all, but not limited to, the following precautions to reduce the temperature of the concrete:

a. Sprinkle coarse aggregate stockpiles in a manner so as to distribute the water evenly and to prevent a variation of moisture within the stockpile.

b. Use crushed or chipped ice as a portion of the mixing water, or use water cooled by refrigeration or other means. If ice is used, it shall be substituted on a pound for pound basis for water and completely melted before the concrete is discharged from the mixer.

c. The Contractor may employ other means which he may have at his disposal if approved by the Owner. In order to minimize the number and extent of precautions as indicated

during the production and use of concrete during hot weather, the Contractor may use approved chemical admixtures for set-retarding purposes, with the Owner's approval. However, the use of such approved set-retarding admixtures shall not relieve the Contractor of the necessity for other precautions deemed necessary to minimize variability of the physical characteristics, strength, and other requirements of the green concrete.

d. Unless authorized in writing by the Owner, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F (if the temperature is expected to reach 35°F or below), and not resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

e. When concreting at temperatures above 35°F, the aggregates or water shall be heated or cooled if necessary prior to being placed in the mixer so that the temperature of the resultant mixture will be not less than 50°F nor more than 90°F at the time of placement. If heating is required, the apparatus used shall heat the mass uniformly and shall be so arranged as to preclude the possible occurrence of overheated areas which might injure the concrete.

f. When concreting is authorized at temperatures 35°F or less, the Owner will require the water or the aggregates or both to be heated to not less than 70°F nor more than 150°F. The temperature of the mixed, heated concrete shall be not less than 50°F nor more than 100°F at the time of placement. No concrete shall be placed on frozen grade nor shall frozen aggregates be used in the concrete.

g. When it is expected that the ambient temperature will drop below 35°F, the Contractor shall provide sufficient canvas and framework, other types of housing, or to enclose and protect the concrete in such a way that the air surrounding the fresh concrete can be maintained at a temperature of not less than 45°F and the temperature of the concrete shall not exceed 80°F. The above conditions shall be maintained for a period of 120 hours after the concrete is placed. The Contractor shall be responsible for the quality of concrete placed during cold weather, and any concrete injured by frost action or freezing shall be removed and replaced at the Contractor's expense. When impending weather conditions indicate the possibility of the need for such temperature protection, all necessary heating and covering material shall be on hand ready for use before the Owner's permission is granted to begin placement.

5.03 MIXING CONCRETE.

A. General.

1. The concrete may be mixed in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity, and shall comply with the applicable requirements of Paragraph 4.03 of this Specification Section. Mixers shall be cleaned at suitable intervals. Equipment having components made of aluminum or magnesium alloys which would have contact with plastic concrete during mixing, transporting or pumping of portland cement concrete, shall not be used.
2. The batch shall be so charged into the drum that a portion of the mixing water shall enter in advance of the cement and aggregates. Mixing time shall be measured from the time all materials except water are in the drum. The flow of water shall be uniform, and all water shall be in the drum by the end of the first 15 seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the flow of materials into the drum.
3. When mixed in a central mixing plant, the mixing time shall not be less than 60 seconds nor more than 90 seconds. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers shall be included in the mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.
4. The mixer shall be operated at the drum speed recommended by the manufacturer. Any concrete mixed less than the specified time shall be discarded and disposed of by the Contractor at his expense. Mixers for central mix plants shall not be operated at a capacity greater than the manufacturer's guaranteed mixing capacity.
5. Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators or nonagitating trucks having special bodies. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the site of the Work shall not exceed 30 minutes when the concrete is hauled in nonagitating trucks, nor 60 minutes when hauled in truck mixers or truck agitators. When high early strength concrete is used, agitator trucks only shall be used and the concrete shall be deposited in place at the site of the Work within 30 minutes from the time water is added to the mix, regardless of the method of transportation, unless otherwise approved by the Owner.

6. Truck mixers and truck agitators used to transport concrete from a central mixing plant and truck mixers used to mix concrete in transit from a central batching plant shall meet all applicable requirements of Paragraph 4.03 of the Specification Section, and in addition, the mixing speed and agitating speed shall be those recommended by the manufacturer of the mixer and the total revolutions at mixing speed shall not be less than 70 nor more than 100. Truck mixers and truck agitators shall be operated within the capacity recommended by the manufacturer.

7. Retempering concrete by adding water or by other means will not be permitted. Concrete that is not within the specified slump limits at time of placement shall not be used. Admixtures for increasing the workability or for accelerating the set will be used only when provided for in the Contract, or permitted by the Owner. The addition of admixtures to the mix shall be in accordance with the provisions of Paragraph 5.02.A of this Specification Section.

8. Tests for air content shall be made on samples of fresh concrete when and as directed. The air content shall be that specified under Part 6 of this Specification Section and shall be determined in accordance with AASHTO T 152, T 196 or T 199.

B. Ready Mixed Concrete.

1. Ready mixed concrete shall fully comply with ASTM C 94 for Ready Mixed Concrete and to the requirements of these Specifications. Ready mixed concrete shall be discharged from the mixer within 1 hour after the introduction of water, provided the air temperature or the concrete temperature does not exceed 70°F. When the air temperature or concrete temperature exceeds 70°F, the elapsed time between the addition of water to the mix and discharge shall not exceed 30 minutes. The 30 minute time limit for temperatures exceeding 70°F may be extended to 1 hour, provided an approved admixture is used. The admixture shall be a water reducing and retarding agent meeting the requirements of Paragraph 3.06, Type D of this Specification Section and shall be used in accordance with the provisions of Paragraph 5.02.A of this Specification Section. The ready-mix plant furnishing the concrete shall have been inspected and approved for use as provided for in Part 4 of this Specification Section.

2. The delivery ticket accompanying each load of concrete shall show the class and quantity of concrete, the quantity of cement, aggregates, water, and additive used in the batch, and the time of batching. Materials used in the concrete shall be tested and approved.

PART 6 – MIX DESIGN AND PROPORTIONING

6.01 GENERAL.

A. A Concrete Classification Table, Table 03050.2 is provided hereinafter to indicate to the Contractor the five classes of concrete to be use. The table contains certain criteria to be met in the design of job mixes for the different classifications of concrete. Data included are the minimum 28 day compressive strength of the concrete (14 day strength for Class B concrete), the range of slum allowed, the minimum cement content of the concrete, and the maximum water allowed. The Contractor shall be responsible for design of the concrete mix to be used for each classification of concrete within the limits of Table 03050.2, and for providing concrete to the City in accordance with the approved design mixes.

B. Unless otherwise specified in the Contract Documents all concrete shall contain an air entraining admixture. The concrete shall contain between 5 percent and 8 percent entrained air. Other admixtures may be used if specifically approved by the Owner. The use of calcium chloride will not be allowed.

C. The Owner may specify differing compressive strengths for the several classifications by notation on the Plans or in the Special Provisions, and those values shall govern over the values of these Specifications.

CONCRETE CLASSIFICATION TABLE

Table 03050.2

Class Of Concrete	Minimum 28-Day Compressive Strength (psi)	Slump In Inches	Min. Cement Factor- Sacks / CY		Min. Cement Factor- # / CY		Net Water Max. Gals. / CY		Net Water Max- # / CY	
			Gravel Course Aggregate	Limestone Course Aggregate	Gravel Course Aggregate	Limestone Course Aggregate	Gravel Course Aggregate	Limestone Course Aggregate	Gravel Course Aggregate	Limestone Course Aggregate
A	3,000	3-5	6.0	5.5	564	517	36	33	300	275
AS	4,000	3-5	(2)	6.2	(2)	583	(2)	37.2	(2)	310
B	3,500 (1)	1-2 ½	6.2	5.8	583	545	34.1	31.9	284	266
C	2,500	2-4	5.0	4.5	470	423	34	30.6	283	255
P	5,000	1-3	(2)	7.0	(2)	658	(2)	35.0	(2)	292

(3) (3) (3)

(1) Minimum compressive strength @ 14 days. Minimum flexural strength @ 14 days of 550 psi per AASHTO T 22.
 (2) Gravel Coarse Aggregate no permitted.
 (3) Tabulated values are for Type I cement conforming to the requirements of AASHTO M 85 only.

6.02 MIX DESIGN.

Prior to mixing any concrete for the project, the Contractor shall submit his proposed design mix and reports of tests for each classification of concrete to the Owner for approval. The design mix shall be submitted on a form that indicates the supplier and type of the concrete and materials to be used as well as the amounts of materials per cubic yard for at least the following items and units (based upon saturated surface dry aggregate):

- A. Cement-Pounds
- B. Coarse Aggregate-Pounds
- C. Fine Aggregate-Pounds
- D. Air Entraining Admixture – Ounces
- E. Other Admixtures (if allowed) – Ounces
- F. Water – Pounds
- G. Fly Ash (if allowed) – Pounds

6.03 PROPORTIONING.

A. Each class of concrete shall be manufactured by combining the several materials prescribed in the design mix in the proportions necessary to obtain the specified compressive strength for each class. Proportioning shall be based upon the specified cement content, and the amount of water for each class of concrete shall not exceed the quantity shown in Table 03050.2. Below this limit, the quantity of water shall be adjusted to meet the slump requirements. Aggregate weights shown in the Contractor's mix design(s) shall be based on saturated surface dry aggregate; batch weights shall be corrected to compensate for surface moisture on the aggregate in order to determine the amount of water to be added at the mixer.

B. In addition to the requirements specified herein and on Table 03050.2, portland cement concrete for pavement, Class B, (Specification Section 02750) shall have a flexural strength at 14 days of not less than 550 pounds per square inch when tested in accordance with AASHTO T 22.

6.04 CHANGES IN MIX.

A. When approved by the Owner, the ration of coarse and fine aggregate may be adjusted in order to assure better workability or to accommodate placement by pumping. However, in no case shall the fine aggregate exceed 44 percent of the total aggregate.

B. If during the progress of the Work, the specific gravity of one or both of the aggregates change more than plus or minus 0.03 from those shown on the concrete design, the design weights shall

be adjusted by a design change to conform to the new specific gravity.

6.05 HIGH-EARLY-STRENGTH CONCRETE.

A. High-early-strength concrete may be required in the Plans and Specifications or substituted at the request of the Contractor, subject to the approval of the Owner. When high-early-strength cement concrete is authorized, it shall conform to the requirements of Table 03050.2 except that the 28 day strength (or 14 day strength for Class B concrete) shall be obtained in 7 days. The use of Type I or Type III cement for high-early-strength concrete in lieu of using Type III cement. When type I cement is used, the concrete shall have a minimum of 7.6 sacks (714 pounds) of cement per cubic yard of concrete. If admixtures are used to obtain high-early-strength concrete, such admixtures may only be used if previously approved by the Tennessee Department of Transportation for similar uses of the concrete and if specifically approved for the project by the Owner.

B. The gradation of fine and coarse aggregates shall be the same as that approved for the concrete for which the high-early-strength concrete is substituted. All materials entering into the high-early-strength concrete shall be of the same kind and class as the materials entering into the other part or parts of the facility constructed of the class of concrete for which high-early-strength is being substituted.

C. No additional compensation will be made if the Contractor elects to substitute high-early-strength concrete for any class of concrete. The unit price for the class for which the substitution is made shall be full compensation for the concrete.

PART 7 - TESTING

7.01 TEST SAMPLES.

The Owner shall provide for all test cylinders. All samples shall be cast, cured and tested by the City at its expense. The Contractor will be required to assist the Owner in securing necessary materials for casting the required number of cylinders. Testing ages will be 7 days and 28 days unless otherwise determined by the Owner. Laboratory cylinders shall be used to determine the quality of concrete produced. The number of cylinders to be cast daily for any quantity of concrete and laboratory tested, shall be specified by the Owner. With prior consent of the Owner, the Contractor may prepare field cylinders. These cylinders may be used as a gauge for early safe removal of forms where the Contractor requests earlier removal than set out in the Specifications.

7.02 CEMENT TESTING.

All cement used in the Work shall be pre-tested before use. Cement may be used upon completion of a

satisfactory 3 day physical test made in accordance with current ASTM Specifications. Cement shall be tested by an approved commercial testing laboratory at the Contractor's expense.

7.03 CORE SAMPLES.

A. If the Owner's testing of cylinders indicates compressive strength less than required in Table 03050.2 for the class of concrete specified, the Contractor may, at his option, elect to drill core samples from the actual concrete placed. If the Contractor elects to drill (or is instructed by the Owner to drill) core samples from the hardened concrete, the costs of obtaining the cores and of repairing the core holes with nonshrinking grout shall be borne by the Contractor.

B. The cores shall be drilled as directed by the Owner, at the same approximate locations from which the test cylinder concrete was obtained. The locations of the drilled cores shall be selected so that the remaining structure will not be impaired or sustain permanent damage after the holes are repaired by the Contractor. The drilled samples shall be tested for compressive strength by the Owner, and the equivalent 28 day strength of the concrete placed and represented by the drilled core samples shall be determined. The Owner shall use the test results of the drilled cores to determine the acceptability of the concrete.

7.04 METHODS OF SAMPLING AND TESTING.

A. Test cylinders cast to determine acceptability for minimum AASHTO strength requirements shall be made and cured in accordance with AASHTO T 23 and tested in accordance with AASHTO T 22.

Test cylinders cast to determine when a precast unit or a structure may be put into service or to determine when a tensioning load may be transferred shall be cured by methods identical to those used in curing the concrete member, and tested in accordance with AASHTO T 22.

B. Drilled core samples shall be taken and tested in accordance with AASHTO T 24. Due to possible fracturing effect of the coring operation, drilled core samples having a compressive strength of 85 per cent or more of specified strength will be considered acceptable.

C. Slump shall be determined in accordance with AASHTO T 119 on the job site during each placement.

D. The amount of air entrained shall be determined by pressure or volumetric meters of approved design and in accordance with AASHTO Method T 152 or AASHTO Method T 196, except that

AASHTO Method T 199 may be used after the accuracy of the Chace Air Indicator has been determined by comparison tests.

7.05 CONCRETE FAILING TO MEET STRENGTH REQUIREMENTS.

A. Concrete which has been mixed and placed in accordance with these Specifications, and which fails to meet the minimum 28 day strength requirements shall be removed and disposed of by the Contractor, at his expense, unless specifically authorized by the Owner, in writing, to remain in place. The removal shall be in such manner as will not cause damage to the remaining concrete or to other structural units or other facilities and property.

B. The Owner may, at his discretion, allow concrete which fails to meet the minimum strength requirement to remain in place. Payment for this concrete will be at a reduced price, to compensate the Owner for loss of durability. The amount of the reduction shall be determined by the Owner and shall be based on the particular circumstances.

PART 8 - MISCELLANEOUS

8.01 CONCRETE MIXED AND/OR BATCHED OFF PROJECT SITE.

Concrete may be mixed and/or batched off the immediate project site, subject to specific approval of the Owner and under the direct supervision of the Contractor. A delivery ticket (certified by the batch plant) showing mix, quantity of cement, quantity of fine and coarse aggregate, moisture content, total water and gallons per cubic yard of concrete shall be furnished to the Owner with each delivery of concrete and the Contractor shall show to the satisfaction of the Owner that the plant is so located and equipped as to produce and deliver concrete fully meeting the specification requirements.

8.02 MEASUREMENT AND PAYMENT.

The methods of measurement and payment for concrete shall be as specified in Divisions 2 and 3 of these Specifications for each particular item constructed by the Contractor.