Construction Standards and Concrete Specifications for the City of Englewood, Colorado
CONCRETE STANDARDS
AND
CONCRETE SPECIFICATIONS
MANUAL

CITY OF ENGLEWOOD, COLORADO
DEPARTMENT OF PUBLIC WORKS

APRIL, 2011
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Permits</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Special Provisions</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Portland Cement Concrete</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Placing and Finishing Concrete</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Construction Standards</td>
<td>A</td>
</tr>
</tbody>
</table>
ATTENTION CONCRETE CONTRACTORS

In the past, Englewood contractors have been required to saw the asphalt 12 inches from the lipline to allow adequate space for concrete forms and proper asphalt patching. This may no longer be required where the asphalt edge is in good condition and is maintained during removal and replacement of the curb and gutter, and thus providing an acceptable finishing edge for the new concrete. The City inspector will make this determination. In the event the asphalt line is in poor condition, or a good line cannot be maintained, the City will assess a four dollar ($6.90) per linear foot charge, and the contractor will be required to saw cut the asphalt 12 inches from the lipline. Prior to patching, it shall be the responsibility of the contractor to clean this area for patching to avoid an additional four dollar ($6.90) per linear foot charge.

If the sawed edge is damaged after removal of the forms, a new saw cut will be necessary to maintain a straight edge.

Barricades are to remain in place to protect the concrete as well as the asphalt edge. The City will patch the asphalt as soon as the concrete has cured sufficiently, generally within five to seven days.

Rick Kahm, Director
Department of Public Works

08/2013
DATE: August 30, 2013

JOBSITE ADDRESS:

<table>
<thead>
<tr>
<th>CONSTRUCTOR:</th>
<th>Cell:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone Numbers:</td>
<td>Emergency/Pager:</td>
</tr>
<tr>
<td>LICENSE NUMBER:</td>
<td>LICENSE EXPIRES:</td>
</tr>
<tr>
<td>BOND EXPIRES:</td>
<td></td>
</tr>
</tbody>
</table>

Start Date: | Completion Date: |

- 0 L.F. Vertical Curb & Gutter
- 0 L.F. Sidewalk - Width: 
- 0 L.F. Curbwalk - Type: 
- 0 L.F. Curbcut - Approved By: 

Other:

Estimated Value of Work $0.00

Special Conditions/Notes:

FEES:

- Permit Fee $100.00  $0.00
- Asphalt Patch $6.90 / SF  $0.00
- Re-Inspection Fee $50.00
- Work w/o Permit Double Fee $0.00

\[ \text{AC 1400} \times \text{AC 1500} = \text{TOTAL FEES} \]

All work is to be done with permission of Property Owner.

All work is to be done in accordance with approved plans.

I/We agree to call (303) 762-2500 for inspection of forms at least four (4) hours prior to placement of concrete.
I/We shall comply with permit requirements and all specifications of the City of Englewood, and will place construction signing in accordance with the M.U.T.C.D.

CITY APPROVAL:

Contractor Signature

Director of Public Works

Prepared by:

<table>
<thead>
<tr>
<th>Accepted/Date</th>
<th>Inspector</th>
<th>Rejected/Date</th>
<th>Inspector</th>
<th>Special Conditions</th>
</tr>
</thead>
</table>

SEE REVERSE FOR GENERAL REQUIREMENTS
GENERAL REQUIREMENTS

Concrete Permits

1. This permit authorizes Concrete work only in the public right-of-way. In no event does this permit authorize work of any kind, even work of a temporary nature, outside of the public right-of-way.

2. This permit does not alleviate the requirement for other necessary permits such as CDOT permits, Building Permits, or Excavation Permits.

3. A copy of this permit shall be kept on site while work is in progress and shall be available upon request to Police, Code Enforcement, or City representatives.

4. Work started without a permit is subject to double fee.

5. In the event that an inspection fails, the contractor shall be charged an additional $50.00 for each inspection necessary until such time as the City inspector approves. Engineering Services will mail billing for failed inspections.

6. Expansion joints are required in all locations where private sidewalk or driveways abut to City right-of-way concrete.

7. Concrete replacement must be done within five (5) working days after removal of said concrete.

8. Concrete mix design shall be 4000 psi or 5000 psi with Fiber Mesh or as directed by City Engineer.

9. If damage occurs to underground facilities, contractor must immediately notify Facilities operator (i.e. gas, water, telecommunications, etc.). If the presence of flammable, toxic or corrosive gas exists, contractor must immediately notify the Facilities operator and call 911, then take immediate action to protect the public and nearby properties.

10. When necessary to remove asphalt, the contractor shall cut (min 1 ft wide) and remove asphalt, and prepare cut for City crews to patch.

11. The Contractor shall provide proper barricades to allow pedestrian and vehicle traffic to navigate the area safely.

12. Upon written notice to the contractor, this permit may be revoked or suspended by the City for:
   A. Major deviation from the approved plans, except for field changes authorized by the City.
   B. Failure to comply with any special conditions of this permit.
   C. Violation of any provision of the Englewood Municipal Code or other City ordinance or state law relating to the work.
   D. Determination of any condition, or performance of any act, constituting or causing a condition endangering life or damage to public or private property.

13. State law requires that you contact the following agencies at least two (2) business days prior to the start of excavation:
   Utility Notification Center of Colorado 1 (800) 922-1987
   City of Englewood - Traffic Division (303) 762-2512
   City of Englewood - Utility Department (303) 762-2635

14. Contractor must provide advance written notification to all businesses for right-of-way construction work that may interfere with public parking or access to those businesses.
# INDEX

## SECTION 2

SPECIAL PROVISIONS

<table>
<thead>
<tr>
<th>Paragraph</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Insurance Limits</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2</td>
<td>Concrete Removal</td>
<td>2-1</td>
</tr>
<tr>
<td>2.3</td>
<td>Obstructions</td>
<td>2-1</td>
</tr>
<tr>
<td>2.4</td>
<td>Maintenance of Traffic and Drainage</td>
<td>2-1</td>
</tr>
<tr>
<td>2.5</td>
<td>Final Acceptance</td>
<td>2-1</td>
</tr>
<tr>
<td>2.6</td>
<td>Water</td>
<td>2-1</td>
</tr>
<tr>
<td>2.7</td>
<td>Tamping</td>
<td>2-1</td>
</tr>
<tr>
<td>2.8</td>
<td>Waste Disposal Areas</td>
<td>2-1</td>
</tr>
<tr>
<td>2.9</td>
<td>Barricades and Barricading</td>
<td>2-2</td>
</tr>
<tr>
<td>2.10</td>
<td>Backfilling, Backsloping, Asphalt Patching, Final Cleanup</td>
<td>2-2</td>
</tr>
<tr>
<td>2.11</td>
<td>Construction Permits</td>
<td>2-2</td>
</tr>
<tr>
<td>2.12</td>
<td>Use of Fly Ash</td>
<td>2-2</td>
</tr>
<tr>
<td>2.13</td>
<td>Contractor’s Guarantee</td>
<td>2-2</td>
</tr>
<tr>
<td>2.14</td>
<td>Stop Boxes and Meter Pits</td>
<td>2-2</td>
</tr>
<tr>
<td>2.15</td>
<td>Opening to Traffic</td>
<td>2-2</td>
</tr>
<tr>
<td>2.16</td>
<td>Sawing Asphalt</td>
<td>2-2</td>
</tr>
<tr>
<td>2.17</td>
<td>Utility Locates</td>
<td>2-2</td>
</tr>
<tr>
<td>2.18</td>
<td>Fire Hydrant Policy</td>
<td>2-3</td>
</tr>
<tr>
<td>2.19</td>
<td>Handicap Ramps</td>
<td>2-3</td>
</tr>
<tr>
<td>2.20</td>
<td>Spalling Concrete</td>
<td>2-3</td>
</tr>
<tr>
<td>2.21</td>
<td>Concrete Markings</td>
<td>2-3</td>
</tr>
<tr>
<td>2.22</td>
<td>Sawing Concrete</td>
<td>2-3</td>
</tr>
<tr>
<td>2.23</td>
<td>Concrete Alley and Cross-pans</td>
<td>2-3</td>
</tr>
<tr>
<td>2.24</td>
<td>Fiber Mesh</td>
<td>2-3</td>
</tr>
</tbody>
</table>
SECTION 2

SPECIAL PROVISIONS

2.1 Insurance Limits. The Contractor shall carry throughout the life of the contract, the insurance called for in the General Contract Conditions in minimum limits as follows:

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Public Liability</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Public Liability</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Property Damage</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Automotive Liability</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Public Liability</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Property Damage</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

2.2 Concrete Removal. Concrete removal shall not precede concrete placement by more than two (2) days. Each removal shall be barricaded, per MUTCD, for the protection of the public. If this time frame is not being followed, the engineer can direct all removals to stop until this situation is corrected. No time extensions or extra cost associated with the stoppage will be granted.

2.3 Obstructions. No extra payment shall be considered or allowed for removal or protection of any obstruction which can be seen by a visual inspection, nor shall any payment be made for extra work involved in the protection or the repair of damage to any underground service, the presence of which can be ascertained by inspection of appropriate maps of the utility companies or the City, or by proper inquiry with the utility companies, the City and the property owners.

2.4 Maintenance of Traffic and Drainage. During the progress of the work, the Contractor shall provide free access to fire hydrants, water and gas valves; gutters and water-ways must be kept open or other suitable provisions made for the removal of storm water. The Contractor shall build and maintain temporary driveways, bridges and crossings, such as in the opinion of the Engineer as necessary to reasonably accommodate the public. In the event of the Contractor’s failure to comply with the foregoing provisions, the City may without notice, cause the same to be done and deduct the cost of such work from any money due, or to become, due, the Contractor under this Contract. Performance of such work by the City shall serve in no wise to release the Contractor from his general or particular liability for the safety of the public or the work.

2.5 Final Acceptance. Upon written request of the Contractor, the City will give final acceptance of logical areas of the Program as they are completed to the satisfaction of the Engineer.

2.6 Water. Water may be obtained by the Contractor from municipal fire hydrants designated by the Utilities Director for the City. The Contractor shall be responsible for negotiating a flat fee to be paid to the Utilities Department for the water to be used on the Program. The Contractor shall be liable for any damage to fire hydrants and adjacent property resulting from the use of the hydrants. Any damage so incurred shall be repaired by the City at the expense of the Contractor.

At the direction of the Engineer, water shall be furnished to insure the compaction of the subgrade, select material and gravel base course and shall be included in the unit bid price for the various units requiring water by the Engineer.

2.7 Tamping. To insure proper compaction of the subgrade, select material, and gravel base course, tamping shall be as directed by the Engineer and shall be included in the unit bid price for the various units requiring tamping by the Engineer. Jumping-jack and plate tampers must be on site at all times during sub grade preparations.
2.8 Waste Disposal Areas. The disposal of all waste material such as broken concrete, pavement, trees, roots, rocks, pipe and excess earth material, shall be the sole responsibility of the Contractor.

2.9 Barricades and Barricading. At the end of each workday, it shall be the responsibility of the Contractor to check each job site and insure proper barricading is in place. Barricades will not be removed from each job site until the hazard has been removed. All barricades and traffic control devices must have working lights when in service.

2.10 Backfilling, Backsloping, Asphalt Patching, Final Cleanup. Wherever the installation requires backfilling or backsloping, the top six (6) inches shall be top soil. The backfilling, backsloping, asphalt patching, and final cleanup shall be completed within 3 days of concrete pour. If this time frame is not being followed, the engineer can direct all other work to stop until this situation is corrected. No time extensions or extra cost associated with the stoppage will be granted. No work shall be paid for until all backfilling, backsloping, asphalt patching and final cleanup is complete.

2.11 Construction Permits. All construction permits necessary for this project shall be the responsibility of the Contractor to acquire from the City of Englewood, 1000 Englewood Parkway, or the Colorado Department of Transportation.

2.12 Use of Fly Ash. Refer to Section 4, 4.04

2.13 Contractor's Guarantee. The Contractor shall guarantee that the paving shall remain in good order and repair for a period of two (2) years from all causes arising from defective workmanship and materials, and to make all repairs arising from said causes during such period without further compensation, and shall guarantee the concrete curbs, gutters and sidewalks against defective workmanship and materials, and shall keep the same in good order and repair without further compensation for a period of two (2) years from and after completion and acceptance thereof by the City. The determination of the necessity for the repair or replacement of said paving, curbs and sidewalks or any portion thereof, shall rest entirely with the Engineer whose decision upon the matter shall be final and obligatory upon the Contractor.

2.14 Stop Boxes and Meter Pits. All stop boxes and meter pits located in the sidewalk, driveway or any finished surface will be at finished grade, level and in good condition by the end of the project. All lids will be free of cement or finished material on top and sides. Any adjustment to stop boxes or meter pits will be completed by the Contractor.

2.15 Opening to Traffic. Concrete shall not be opened to traffic for a period of at least seven (7) days after the last concrete has been placed, or for a longer period of time if the Engineer considers it necessary. If a 5000 psi mix is used, traffic may be opened after three days. It shall be the obligation of the contractor to maintain suitable barricades for this purpose.

2.16 Sawing Asphalt at Lip Line. The City is requiring that you saw cut a minimum of twelve (12) inches away from the lip and the asphalt removed. After pulling your forms, clean the area so that it is ready for patching. If the sawed edge is damaged after pulling of the forms, make sure the damaged area is squared out.

Barricades are to be left to protect the fresh concrete as well as the asphalt edge. The contractor is responsible for patching these areas with a minimum of three (3) inches of asphalt or as directed by the Engineer. 2) No payment will be made for sawing and patching when excess damage to adjacent asphalt is caused by carelessness or negligence of the Contractor as determined by the Engineer.

2.17 Utility Locations. It is the Contractor's responsibility to contact Utility Notification Center of Colorado (Ph. 1-800-922-1987); and City Traffic Division (Ph. 303-762-2514) for all utility locates prior to construction.
2.18 Fire Hydrant Policy. Hydrant use is strictly regulated by the Englewood Utilities Department. Their hydrant policy shall govern all hydrant use. The Contractor shall be responsible for obtaining these regulations and paying any associated use fees.

2.19 Curb Ramps. This item shall include all material, labor and any incidental work to construct a curb ramp (Bid Item #133). All ramps shall be constructed per enclosed revised CDOT Detail 608-1. Detectable warning surface color shall be Brick Red manufactured by Pavestone or an approved equal. An area of up to 56 SF of 6" thick walk and 14.0 LF of 8" thick curb and gutter shall be included in the unit price for each curb ramp.

2.20 Spalling Concrete. The Contractor guarantees all concrete against spalling for two (2) years from the date of acceptance. (Note: It is the City's contention that concrete that spalls is due to materials and/or workmanship if placed between April 1 and October 15; additionally, if placed between October 16 and March 31, the Contractor assumes responsibility knowing the concrete may be exposed to chemical deicers that may also affect the finish of the concrete.)

2.21 Concrete Markings. All concrete removals are marked with a pink dot in the Center of the stone, or arrows at both ends of removal. If removal is in question, contact the Inspector on the job.

2.22 Sawing Concrete. Concrete sawing will be paid for only as marked by the Engineer. Any concrete sawing by the Contractor for his convenience shall be at the Contractor's expense.

2.23 Concrete Alleys, Entrances and Cross-Pans. All concrete placed in alleys and cross-pans or directed by the engineer shall have fiber mesh, placed 8" thick, and use an 5000 psi mix with fiber mesh.

2.24 Fiber Mesh. All items defined in 2.30 shall have ¾" fiber mesh and it shall be added to the mix at a rate of 1½ lbs. per cubic yard.
# INDEX

## SECTION 4

PORTLAND CEMENT CONCRETE

<table>
<thead>
<tr>
<th>Paragraph</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01</td>
<td>General</td>
<td>4-1</td>
</tr>
<tr>
<td>4.02</td>
<td>Materials</td>
<td>4-1</td>
</tr>
<tr>
<td>4.03</td>
<td>Storage of Materials</td>
<td>4-2</td>
</tr>
<tr>
<td>4.04</td>
<td>Concrete Mixture Requirements</td>
<td>4-3</td>
</tr>
<tr>
<td>4.05</td>
<td>Proportioning of Materials</td>
<td>4-4</td>
</tr>
<tr>
<td>4.06</td>
<td>Batching Plant</td>
<td>4-4</td>
</tr>
<tr>
<td>4.07</td>
<td>Mixing Concrete</td>
<td>4-5</td>
</tr>
<tr>
<td>4.08</td>
<td>Protection</td>
<td>4-6</td>
</tr>
<tr>
<td>4.09</td>
<td>Testing</td>
<td>4-6</td>
</tr>
</tbody>
</table>
SECTION 4
PORTLAND CEMENT CONCRETE

4.01 General. Portland Type I/II cement, air entrained, concrete shall consist of Portland Cement, mineral aggregates (both fine and coarse), water, and any specified admixtures mixed in accordance with the requirements of these specifications and as directed by the Engineer.

All materials, methods of preparation, and construction shall conform to the requirements of these specifications.

4.02 Materials.

A. Cement. Portland Cement shall conform to the "Standard Specifications for Portland Cement" (A.A.S.H.T.O. Designation: M-85) and shall be Type I/II or shall be air entraining Portland Cement conforming to A.A.S.H.T.O. Designation: M-85, Type I/IIA.

B. Fine Aggregate. Fine aggregate shall be composed of clean, hard, durable uncoated particles of stone, free of lumps of clay, alkali, soft or flaky materials, loam and organic matter, well graded from coarse to fine and conforming to the following requirements:

1. Gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>95-100</td>
</tr>
<tr>
<td>No. 16</td>
<td>45-80</td>
</tr>
<tr>
<td>No. 50</td>
<td>10-30</td>
</tr>
<tr>
<td>No. 100</td>
<td>2-10</td>
</tr>
</tbody>
</table>

2. Deleterious Substances.

<table>
<thead>
<tr>
<th>Material</th>
<th>Max. % of Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay lumps</td>
<td>1.0</td>
</tr>
<tr>
<td>Material finer than No. 200 sieve</td>
<td>3.0</td>
</tr>
<tr>
<td>Material floating on a liquid having a specific gravity of 1.95</td>
<td>0.5</td>
</tr>
</tbody>
</table>

3. Organic Impurities. All fine aggregates shall be free from injurious amounts of organic impurities and producing a color darker than the standard shall be rejected unless they pass the following mortar strength test.

4. Mortar Strength. Fine aggregate shall be of such quality that when made into a mortar and tested in accordance with the "Standard Method of Test of Measuring Mortar-Making Properties of Fine Aggregate" (A.A.S.H.T.O. Designation: T 71), the mortar shall develop a compressive strength at seven (7) and twenty-eight (28) days of not less than ninety-five (95) per cent of that developed by the mortar specified in that method as the basis for comparison.

5. Soundness. When tested in accordance with the "Tentative Method of Test of Soundness of Aggregates by Use of Sodium Sulfate" (A.A.S.H.T.O. Designation: T 104), the weighted average loss in five (5) cycles shall not exceed ten (10) per cent.

6. Fineness Modulus. Fine aggregates shall have a fineness modulus between 2.50 and 2.90.
C. **Coarse Aggregate.** Coarse aggregate shall consist of crushed stone or gravel having hard, strong, durable pieces, free from adherent coating and conforming to the following specifications:

1. **Gradation.** Coarse aggregate shall be well graded between the following limits:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>95-100</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>20-55</td>
</tr>
<tr>
<td>No. 4</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 8</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2. **Deleterious Substances.** The maximum amount of any one of the deleterious substances given below shall not exceed the following percentage by weight:

<table>
<thead>
<tr>
<th>Material finer than No. 200 sieve</th>
<th>Max. % of Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shale</td>
<td>1.50</td>
</tr>
<tr>
<td>Chert</td>
<td>1.0</td>
</tr>
<tr>
<td>Coal</td>
<td>1.0</td>
</tr>
<tr>
<td>Clay lumps</td>
<td>1.0</td>
</tr>
<tr>
<td>Soft fragments</td>
<td>0.25</td>
</tr>
<tr>
<td>Material floating on a liquid having a specific gravity of 1.95</td>
<td>3.00</td>
</tr>
</tbody>
</table>

The maximum amount of any combination of the deleterious substances listed in the foregoing shall not exceed three (3) per cent by weight.

3. **Abrasion.** When tested in accordance with "Standard Method Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine" (A.A.S.H.T.O. Designation: T 96), all weighted average loss in five (500) revolutions shall not exceed forty (40) per cent.

D. **Water.** When used in concrete shall be clean, clear, free from oil, acid, alkali, vegetable matter or other substance injurious to the finished concrete.

E. **Air-Entraining Admixture.** The Contractor may elect to use a regular Portland Cement with the addition of an air-entraining admixture. Air-entraining admixtures shall conform to the requirements of A.A.S.H.T.O. Designation: M 154.

4.03 **Storage of Materials.**

A. **Cement.** Cement may be shipped from pre-tested and approved bins at the mill. The cement shall be well protected from rain and moisture, and any cement damaged by moisture or which fails to meet any of the specified requirements shall be rejected and removed from the work. Cement stored by the Contractor for a period longer than sixty (60) different brands, types, or from different mills shall be stored separately.

B. **Aggregate.** Aggregates shall be handled and stored at the site in such a manner as to avoid a separation of the coarse and fine particles and contamination be foreign materials. Sites for stockpiles shall be prepared and maintained in such manner as to prevent the mixing of deleterious materials with the aggregate. The Contractor shall deposit material in stockpiles at the batching plant site until the moisture content becomes uniform. Stockpiles shall be built in layers.
not to exceed five (5) feet in height, and each layer shall be completed before beginning the next one.

Coning or building up stockpiles by depositing the materials in one place will not be permitted.

4.04 Concrete Mixture Requirements. The concrete mixture shall meet the following requirements:

<table>
<thead>
<tr>
<th>TABLE OF CONCRETE REQUIREMENTS f’c = 4000 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>Portland Cement</td>
</tr>
<tr>
<td>Class F fly ash</td>
</tr>
<tr>
<td>Water-cement ratio</td>
</tr>
<tr>
<td>Entrained air</td>
</tr>
<tr>
<td>Slump</td>
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</tbody>
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Aggregate Proportions Per Sack of Cement

<table>
<thead>
<tr>
<th>Property</th>
<th>lbs.</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine aggregate</td>
<td>150</td>
<td>230</td>
</tr>
<tr>
<td>Coarse aggregate</td>
<td>300</td>
<td>380</td>
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Minimum Compressive Strength

<table>
<thead>
<tr>
<th>7 day</th>
<th>psi</th>
</tr>
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<tbody>
<tr>
<td>2400</td>
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<table>
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<th>28 day</th>
<th>psi</th>
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<td>4000</td>
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<table>
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<th>TABLE OF CONCRETE REQUIREMENTS f’c = 5000 psi</th>
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<tr>
<td>Property</td>
</tr>
<tr>
<td>Portland Cement</td>
</tr>
<tr>
<td>Class F fly ash</td>
</tr>
<tr>
<td>Water-cement ratio</td>
</tr>
<tr>
<td>Entrained air</td>
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<tr>
<td>Slump</td>
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Aggregate Proportions Per Sack of Cement

<table>
<thead>
<tr>
<th>Property</th>
<th>lbs.</th>
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<tr>
<td>Fine aggregate</td>
<td>150</td>
<td>230</td>
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<tr>
<td>Coarse aggregate</td>
<td>300</td>
<td>380</td>
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Minimum Compressive Strength

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<table>
<thead>
<tr>
<th>28 day</th>
<th>psi</th>
</tr>
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<tbody>
<tr>
<td>5000</td>
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Concrete shall be uniformly plastic, cohesive, and workable. Workable concrete is defined as concrete which can be placed without honeycomb and without voids in the surface. Workability shall be obtained without producing a condition such that free water appears on the surface when finished. The consistency of the mix shall be that required for the specified conditions and methods of placement; however, the previously determined maximum water cement ratio shall not be exceeded.

The properties of the concrete mixture will be determined by the Engineer to insure compliance with these specifications. Modifications will be made in the material proportions as are necessary to provide a satisfactory concrete mixture.
4.05 Proportioning of Materials.

A. Mixed Proportions. The actual proportions of all materials entering into the concrete mixture shall be determined by the Contractor within the limits set forth above and shall be submitted to the Engineer for approval prior to the placement of any concrete. The proportions shall be changed whenever necessary to maintain the workability, strength and standard of quality required for the concrete covered by these specifications, and to meet the varying conditions encountered during the construction. The fine aggregate and coarse aggregate shall be measured separately for each batch of concrete. The cement shall be in contact with the aggregate no longer than forty-five (45) minutes before being deposited in the mixer.

B. Measurement. The Contractor shall provide the equipment necessary to measure and control the amount of each material in each batch of concrete. All aggregates shall be mechanically batched and measured by weight. Bulk cement shall be weighted, but cement in unopened bags as packed by the manufacturer may be used without weighing. If bag cement is used, batches shall be proportioned so that fractional bags will not be required. One bag of Portland cement will be considered as ninety-four (94) pounds. Mixing water and air-entraining admixtures may be measured by volume or by weight. One gallon of water will be considered to weigh 8.33 pounds.

4.06 Batching Plant.

A. General. Separate bins or compartments shall be provided for the different sizes of aggregates to be batched and for bulk cements when used. The compartments shall be of ample size and so constructed that the materials will be kept separated under all working conditions. The plant shall be capable of ready adjustment to compensate for the varying moisture contents of the aggregates, and to change the weights of the materials being batched.

B. Weighing of Materials. Aggregates may be weighed in separate weigh-batchers with individual scales, or cumulatively in one weigh-batcher on one scale. Bulk cement shall be weighted on a separate scale in a separate weigh-batcher. Water may be measured by weight or by volume.

The plant shall be arranged so as to facilitate the inspection of all operations at all times. Weighing of materials from the batching equipment shall be within the following limits of accuracy:

<table>
<thead>
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<th>Material</th>
<th>Per Cent</th>
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<tbody>
<tr>
<td>Cement</td>
<td>1</td>
</tr>
<tr>
<td>Water</td>
<td>1</td>
</tr>
<tr>
<td>Aggregate</td>
<td>2</td>
</tr>
<tr>
<td>Air-Entraining Admixture</td>
<td>3</td>
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C. Water-Batcher. A suitable water-measuring device shall be provided that will be capable of measuring the mixing water within the specified requirements for each batch. The mechanism for delivering water to the mixers shall be such that leakage will not occur when the valves are closed. The filling and discharge valves for the water-batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is full closed.

D. Dispenser. A suitable device for measuring and dispensing the air-entraining admixture shall be provided. The device shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. The dispenser for air-entraining admixtures shall be so designed as to permit discharge into the water-discharge lines. The air-entraining admixture shall be discharged simultaneously with discharge of the water into the batch. The entire batch of air-
entraining admixture shall be discharged prior to the completion of the water discharge cycle.

E. Scales. The scales for weighing aggregates and cement may be of either the beam type or the springless-dial type. They shall be accurate at all loads within the specifications previously stated. A sufficient number of standard fifty (50) pound weights for calibrating and testing scales shall be furnished by the Contractor for each and testing scales shall be furnished by the Contractor for each plant. All exposed fulcrums, devices and similar working parts of scales shall be kept clean. When beam-type scales are used, provisions shall be made for indicating to the operator that the required load in the weighing hopper is being approached; the device shall indicate at least the last two hundred (200) pounds of load. The weighing equipment shall be arrange so that when operating the bin gates, the operator stands in such a position that the weighing beam or dial is in full view and he can conveniently shovel material from the weighing hopper. A port or other opening for removing an overload of any one of the several materials from the weighing hopper. A port or other opening for removing an overload of any one of the several materials from the weighing hopper shall be provided. There shall be enough clearance at the top to the weighing hopper to permit the scale operator to shovel material out of the weighing hopper. Weighing hoppers shall be constructed so as to eliminate accumulations of tare materials and to discharge fully.

On beam-type scales, at least that part of the total load which is a fraction of 100 pounds shall be indicated on a graduated beam. Scales shall be protected from air currents that may affect the accuracy of weighing. The scales shall be kept level and in adjustment at all times. Scales for weighing bulk cement in a closed compartment shall be equipped with an independent tare beam, and the scale shall be balanced to the tare before weighing and after discharging each batch of cement. In the case of a springless-dial type of scale, the indicator shall register zero before charging the weighing hopper and after the cement is discharged.

F. Protection. Weighing, indicating, and control equipment shall be protected against exposure to dust and weather.

G. Batch Trucks. When the aggregates are delivered to the mixer in trucks, each batch shall be in a separate compartment of the capacity required by the Engineer. Suitable covers shall be provided for the batch compartments of the trucks to protect the cement from the wind. All trucks, truck bodies, bulkheads and compartments used in proportioning and transporting to the mixer of concrete materials shall be so designed and operated to insure the charging of the mixer, batch by batch, with the proper amounts of each materials without overspillage, intermixing of batches or wastage. Any units which, in the opinion of the Engineer, do not operate satisfactorily, shall be removed from the work until properly rebuilt and corrected.

4.07 Mixing Concrete. Mixing of concrete shall conform to one of the two following methods:

A. Mixer on Project. The mixing machine used shall be of an approved type known as batch mixer and of a design having a suitable device for automatically measuring the proper amount of water accurately to one-half (1/2) of one (1) percent and for automatically timing each batch of concrete so that all materials will be mixed together for the minimum time required. If the timing device becomes broken or fails to operate, the Contractor will be permitted to continue for the balance of the day and for one additional day without the timing device while
the same is being repaired providing that each batch of concrete is mixed not less than two (2) minutes.

All of the materials for each batch of concrete, including the water, shall be mixed not less than one and one-half (1½) minutes after all of the materials are in the mixer, which shall revolve at the speed for which it is designed but not less than fourteen (14), or more than twenty (20) revolutions per minute. If, in the opinion of the Engineer, a thorough mixing of the concrete is not obtained during this period of time, a sufficient number of additional revolutions at the same rate shall be given to assure thorough mixing.

The inside of the mixer drum shall be kept free from hardened concrete. No materials for a batch of concrete shall be placed in the mixer until all of the previous batch has been discharged therefrom. Water shall be added at the time the materials are being run into the mixer.

B. Central-Mixed, Shrink-Mixed or Transit-Mixed Concrete. Central-mixed, shrink-mixed or transit-mixed concrete shall be mixed and transported to the site of the work in accordance with "Standard Specifications for Ready-mixed Concrete" (A.A.S.H.T.O. Designation: M157) with the following restrictions:

1. **Cement Content.** Delivery tickets shall show the batch weight per cubic yard for each load.

2. **Time of Delivery.** Concrete must be delivered and discharged from the truck mixer or agitator truck within a period of ninety (90) minutes after introduction of the water to the cement and aggregate or of the cement to the aggregate. Delivery tickets shall have the time clearly shown thereon, the original or a copy thereof to be furnished the Inspector on the work before the concrete is discharged.

3. **Type of Delivery Equipment.** Concrete shall be delivered in truck mixers or agitator trucks (trucks providing mechanical agitation by revolving drums or revolving blade in stationary drum) operated, after time required for thorough mixing of the concrete, at the speed designated by the manufacturer as agitating speed. Delivery of the central-mixed concrete shall not be made in non-agitating equipment without securing the prior written approval of the Engineer of the type of equipment to be used and method of operation.

4. **Retempering of Concrete.** Retempering of concrete which has partially hardened by remixing either with or without the addition of water will not be permitted.

4.08 **Protection.** It shall be the responsibility of the Contractor to protect from damage all freshly poured concrete regardless of the location or type of structure for a minimum period of seven (7) days or for such longer period as the Engineer may direct. Any concrete which is damaged shall be repaired to the satisfaction of the Engineer prior to acceptance of the completed work.

4.09 **Testing.** Test cylinders six (6) inches in diameter and twelve (12) inches in length shall be made as directed by the Engineer. Samples of concrete shall be taken in accordance with the "Standard Method of Sampling Fresh Concrete" (A.A.S.H.T.O. Designation: T 141). Test cylinders shall be made in accordance with "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field" (A.A.S.H.T.O. Designation: T 23), shall be properly identified as to location which concrete was placed and shall, as directed by the Engineer, be sent to the Laboratory for testing. Test shall be made in accordance with "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders" (A.A.S.H.T.O. Designation: T 22).
Cylinders shall be tested at the age of seven (7) days, at the age of twenty-eight (28) days, and the remaining cylinders held for later testing if considered necessary by the Engineer. The expense of testing the cylinders shall be borne by the City.
### INDEX

**SECTION 5**

**PLACING AND FINISHING CONCRETE**

<table>
<thead>
<tr>
<th>Paragraph</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.01</td>
<td>General</td>
<td>5-1</td>
</tr>
<tr>
<td>5.02</td>
<td>Reinforcing Steel</td>
<td>5-1</td>
</tr>
<tr>
<td>5.03</td>
<td>Structural Concrete</td>
<td>5-1</td>
</tr>
<tr>
<td>5.04</td>
<td>Curb and Gutter, Curbwalk, Sidewalks, Driveways and Cross Pans</td>
<td>5-3</td>
</tr>
<tr>
<td>5.05</td>
<td>Curing</td>
<td>5-4</td>
</tr>
<tr>
<td>5.06</td>
<td>Cold Weather Concreting</td>
<td>5-4</td>
</tr>
<tr>
<td>5.07</td>
<td>Hot Weather Concreting</td>
<td>5-5</td>
</tr>
<tr>
<td>5.08</td>
<td>Opening to Traffic</td>
<td>5-5</td>
</tr>
<tr>
<td>5.09</td>
<td>Measurement and Payment</td>
<td>5-5</td>
</tr>
</tbody>
</table>
5.01 General. The placing and finishing of concrete as described in this section, shall include all forming, placing, reinforcing, finishing and curing.

5.02 Reinforcing Steel. Reinforcing bars shall conform to the Standard Specification for Billet Steel Bars for Concrete Reinforcement (A.A.S.H.T.O. Designation: M 31), shall be "Intermediate Grade", and shall be of the sizes and shapes indicated on the plans.

Wire fabric shall conform to the Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement (A.A.S.H.T.O. Designation: M 55), and the size shall be 6" by 6" by #10/#10 gage.

5.03 Structural Concrete.

A. Forming. The forms shall be tight and constructed in a workmanlike manner, and shall be of such dimensions and so constructed as to remain rigid and unyielding under the load of wet concrete. The lumber used shall be sound and free from loose knots. The form work shall be so constructed as to permit easy removal without injuring the concrete. Lumber once used in forms shall be cleaned before being used again. Before depositing concrete, the forms shall be thoroughly wetted and cooled, and the space to be occupied by the concrete cleared of shavings, sticks of wood or other debris. Use an approved type of form clamps and ties for all forms. Form ties in walls shall be cut off back of surface of wall.

Whenever concrete is to be left exposed, the forms shall be given special attention and all splinters, defects, loose knots, etc., shall be removed. Chamfer all exposed edges of concrete one (1) inch unless otherwise directed.

Unless otherwise authorized, the form lumber which is in contact with all exposed concrete surfaces shall be plywood or shall be faced with an approved type of composition board. All joints in such plywood or facing material shall be carefully matched to prevent the forming of irregularities in the concrete surface.

The term "exposed concrete surfaces" applies to above ground outside faces of structures.

Approved type metal forms may be used. Battered, bent, or twisted forms which will affect the alignment or appearance of the finished concrete shall not be used.

Openings shall be left at the bottom of the wall forms so they may be cleaned out after the forms have been washed. The time for removal of the form work shall depend on the weather conditions and shall be subject to the approval of the Engineer.

Forms for exposed surfaces shall be coated with oil before reinforcement is placed. The oil shall be a mineral base oil which will not discolor or interfere with the finish of the concrete. Surplus oil on form surfaces and any oil on reinforcement shall be removed before concrete is placed. Forms for interior surfaces and for exterior surfaces not exposed to view may be thoroughly wet with water in lieu of oiling immediately before placement of concrete, except that the freezing weather, oiling will be mandatory.
B. **Placing Reinforcing Steel.** Reinforcing steel delivered or stored along the site of the work shall be neatly piled on blocks or timbers in such a way as to keep it off the ground.

Before being placed, all steel shall be thoroughly cleaned of mill rust, scale and of grease or other coatings that will destroy the bond.

Reinforcement shall be carefully placed exactly as indicated on the plans. Bars shall not be bent or straightened in a manner that will injure the material.

Bars shall be accurately and rigidly secured in position by use of such approved metal clips, spacers, bar supports, or hy-chairs as may be necessary. Should it be necessary to supply extra reinforcing bars for the purpose of supporting the mat of reinforcement and tying it together, such bars shall be furnished at the expense of the Contractor.

Splices shall not be made at point of maximum stress and where made, bars shall be lapped at least forty (40) times their least diameter.

Reinforcement shall be secured in position, inspected and approved before placing of concrete.

C. **Placing Structural Concrete.** The Contractor shall give notice sufficiently in advance of placing concrete to permit proper inspection of forms and reinforcement by the Engineer. Concrete shall be as specified in Section 4.

After the completion of the mixing, the concrete shall be rapidly conveyed to and deposited in the forms. The concrete shall be deposited in such a manner as will prevent the separation of the ingredients and permit the most thorough compacting. It shall be compacted by spading or by a mechanical vibrator until the ingredients have settled in the proper place and the surplus water is forced to the surface. Form vibrators shall be used only with the specific approval of the Engineer.

The concrete shall be placed in such manner as to prevent excessive crawling and segregation of the aggregate.

Location of all construction joints must be as approved by the Engineer. Such joints shall be roughened, rabbeted horizontally and grouted with cement, before joining new concrete to old. Construction dowels shall be placed as directed by the Engineer in both reinforced and non-reinforced work.

Before pouring new concrete on top of concrete which has set, the surface shall be thoroughly cleaned of foreign matter and laitance of scum, drenched and slushed with neat cement.

D. **Finished.** All exposed formed concrete surfaces exclusive of any surfaces below the water line or below the line of backfill, and exclusive of curbs and walks, will be given the surface finish described as follows:

As soon as the concrete has set sufficiently to permit it, the surface shall be thoroughly wet with a brush and rubbed with a No. 16 carborundum stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections producing a smooth, dense surface without pots or irregularities. The material which, in the above process, has been ground to a paste shall be carefully spread or brushed uniformly over the entire surface and permitted to reset. The
final finish shall be obtained by thoroughly rubbing with a No. 30
carborundum stone or an abrasive of equal quality. This rubbing shall
continue until the entire surface is of a smooth texture and uniform
in color.

5.04 Curb and Gutter, Curbwalk, Sidewalks, Driveways and Cross Pans.

A. Preparation of Subgrade. All subgrade upon which concrete is to be
placed shall be thoroughly compacted and moistened. Concrete shall be
placed only when the subgrade is moist and not when it is too wet or
dry.

B. Forms. Metal or wooden forms may be used. They shall be free from
warp, of sufficient strength to resist springing out of shape. Forms
shall be cleaned of all mortar and dirt and oiled before they are
used. They shall be set to the established line and grade, being well
staked, braced, or otherwise held in place. Forms shall remain in
place at least twelve (12) hours after concrete has been placed
against them or for a longer period if so directed by the Engineer.

Maximum deviation of the top surface shall not exceed one-eighth (1/8)
inch in ten (10) feet or the inside face not more than one-quarter (1/4)
inch in ten (10) feet. The method of connections between sections
shall be such that the joint thus formed is tight and free from
movement in any direction. Approved flexible forms shall be used for
construction where the radius is one hundred fifty (150) feet or less.

C. Placing Concrete. After the inspector has approved the forms and
subgrade, then concrete shall be deposited on the subgrade to the
required depth and width in successive batches and in a continuous
operation. The concrete shall be placed as uniformly as possible to
minimize the amount of spreading necessary. While being placed, the
concrete shall be spaded and/or vibrated with suitable tools to
prevent the formation of voids or honeycomb.

Wire fabric shall be placed at a point three (3) inches below the
surface of a cross pan and squared-out return. The fabric shall be
fully supported on precast mortar blocks prior to placing the
concrete.

1. Expansion Joints. Expansion joints shall be provided in
accordance with the thickness and other dimensions indicated on
the plans or as directed by the Engineer. The joint filler shall
extend the full depth and width of the concrete and shall be set
vertical with the tip edge flush with the finish surface of the
concrete. Preformed expansion joint filler conforming to the
requirements of A.A.S.H.T.O. Specification M 213-74 or latest
revision shall be used.

Expansion joints shall be provided at the following locations and
shall be in place prior to the placing of concrete:

   a. Between back of sidewalk and driveway slab or service
      walk.
   b. Between new concrete and existing masonry buildings.
   c. As shown on the plans.
   d. As directed by the Engineer.

D. Finishing. Finishing shall be done with a screed or mule designed to
give proper shape to the section as detailed. Final finish shall be
applied by a float or other means approved by the Engineer. The final
texture desired may be obtained by lightly brooming the surface, edge
to edge, to produce a slightly roughened finish at the discretion of the Engineer. Particular care shall be used to finish gutter flow line to a true uniform grade. Any pockets which will pond any appreciable amounts of water shall be removed by grinding. **No water shall be added to the concrete surface to facilitate finishing.**

1. **Edging.** Before final finishing is completed and before the concrete has taken its initial set, all edges in contact with the forms shall be tooled with an edger having three-eighth (3/8) inch radius.

2. **Jointing.** Transverse joints shall be placed at maximum intervals of ten (10) feet. To control random cracking, the joints shall be formed, sawed or tooled to a minimum depth of one-quarter (1/4) of the total thickness. If divider plates are used, the maximum depth of plates shall not be greater than one-half (1/2) the total thickness. The joints shall be finished with a jointer having a width no greater than five-sixteenth (5/16) inch and a depth of not less than three-quarter (3/4) inch. A maximum joint width at the finished surface shall be no greater than five-sixteenth (5/16) inch.

**Tool joints shall be spaced as follows:**

- a. Not more than ten (10) feet nor less than five (5) feet apart in curb and gutter and curbwalk.
- b. Not more than six (6) feet nor less than four (4) feet apart in sidewalk.
- c. In driveways one or two joints equally spaced as applicable.
- d. As directed by the Engineer.

3. **Marking.** All sidewalks, curb, gutters and driveways shall have the name of the Contractor and the year of construction impressed therein, using block letters one (1) inch high and three-eighth (3/8) inch deep. One impression shall be made in each driveway. Impressions shall be made in sidewalks, curbs, gutters at each end of the construction, or at one hundred (100) foot intervals and at each extension to curbing.

**5.05 Curing.** Concrete shall be cured by protecting it against moisture loss, rapid temperature change, from rain, flowing water and mechanical injury for a period of not less than five (5) days after placement.

It shall be the Contractor's responsibility to protect from the elements and traffic, and if neglected the Engineer shall direct that the necessary protective measures be taken at the expense of the Contractor, and no further pouring will be permitted.

- **Moist Curing.** Moist curing shall be accomplished after initial set by covering with wet burlap, cotton mats, or other approved fabric used singly or in combination. Curing mats shall be kept continuously wet and in intimate contact with the concrete for the duration of the moist cure.

- **Waterproof Paper and Polystyrene Sheets.** The surface of the concrete shall be thoroughly moistened with a fine spray of water and then covered after initial set with the waterproof paper or sheeting. Paper or sheeting shall cover the entire width and edges shall be lapped at least twelve (12) inches to insure complete coverage. Paper or sheeting shall be adequately weighted to prevent displacement or billowing due to wind. ("Sheet Materials for Curing Concrete", A.A.S.H.T.O. Designation: M 171-70.)
C. Liquid Membrane Curing Compound. Only white pigmented membrane curing compound shall be used (PROTEX Promulsion 50AW or equivalent) and shall be applied immediately after the water sheen has left the finished concrete. The compound shall be applied at a rate of one gallon per 200 square feet.

5.06 Cold Weather Concreting. Except by specific written authorization, concreting shall cease when descending air temperature in the shade and away from artificial heat falls below 40 degrees Fahrenheit. It shall not be resumed until the ascending air temperature in the shade and away from artificial heat rises to 35 degrees Fahrenheit.

When concrete is permitted during cold weather, the temperature of the mix shall be not less than 60 degrees Fahrenheit or more than 80 degrees Fahrenheit at the time of placing. Aggregates or water or both may be heated, but the water shall not be hotter than 175 degrees Fahrenheit and aggregates shall not be used which are hotter than 150 degrees Fahrenheit. Before concreting is started, remove ice, snow and frost.

When concrete is being placed in cold weather and temperature may be expected to drop below 35 degrees Fahrenheit, a supply of straw, insulated curing blankets, or other suitable material shall be provided along the line of work.

At any time when the air temperature may be expected to reach the freezing point during the day or night, the materials so provided shall be spread over the concrete to a sufficient depth to prevent freezing of the concrete. Concrete shall be protected from freezing temperatures until it is at least five (5) days old. Concrete injured by frost action shall be removed and replaced at the Contractor's expense.

5.07 Hot Weather Concreting. Except by written authorization, concrete placing shall cease if the temperature of the plastic concrete cannot be maintained at 90 degrees or lower. To facilitate the placement of concrete in hot weather, the aggregates or water or both may be cooled.

5.08 Opening to Traffic. Concrete shall not be opened to traffic for a period of at least seven (7) days after the last concrete has been placed or for a longer period of time if the Engineer considers it necessary. It shall be the obligation of the Contractor to maintain suitable barricades for this purpose.

5.09 Measurement and Payment.

A. Payment of structural concrete shall be included in the contract unit price of the applicable item such as "Construct Catch Basin Inlet", etc.

B. Measurement and payment for concrete items shall be made on the following basis:

- Vertical curb and gutter: Per lineal foot
- Curbwalk: Per lineal foot
- 8" Concrete alley paving: Per square yard
- Concrete sidewalks and driveways: Per square foot
- Cross pans: Per square foot
- Handicap Ramps (Sec. 2.19): Per each

or other items as set forth in the Proposal Form and shall be full payment for excavating, backfilling, the finishing and compacting of subgrade, furnishing, placing, finishing and curing of the concrete, reinforcing and other materials, and all incidentals connected therewith.
Concrete alley paving shall be paid by the square foot. Alley excavation will be paid at the unit bid price for concrete alley paving.
CITY OF ENGLEWOOD
COLORADO

CONSTRUCTION STANDARDS
AND
CONCRETE STANDARDS

Department of Public Works
Engineering Division

DRAWN BY: R.A.K
REVISED BY: D.A.C

SCALE
AS SHOWN

DATE
8/25/75
REVISED
4/22/97
2/1/2008
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>DETAIL NO.</th>
<th>TITLE</th>
<th>FILE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1</td>
<td>TABLE OF CONTENTS</td>
<td>CCDT01.dwg</td>
</tr>
<tr>
<td>E-2</td>
<td>INDEX</td>
<td>CCDT02.dwg</td>
</tr>
<tr>
<td>E-3</td>
<td>TYPICAL PAVEMENT SECTIONS</td>
<td>CCDT03.dwg</td>
</tr>
<tr>
<td>E-4</td>
<td>TYPE I CURB/WALK 2'-8&quot;</td>
<td>CCDT04.dwg</td>
</tr>
<tr>
<td>E-5</td>
<td>TYPE II CURB/WALK 3'-11&quot;</td>
<td>CCDT05.dwg</td>
</tr>
<tr>
<td>E-6</td>
<td>VERTICAL CURB &amp; GUTTER SECTION VIEW</td>
<td>CCDT06.dwg</td>
</tr>
<tr>
<td>E-7</td>
<td>VERTICAL CURB &amp; GUTTER PLAN VIEW</td>
<td>CCDT07.dwg</td>
</tr>
<tr>
<td>E-8</td>
<td>CROSSSPAN SECTION AND PIPE ENCASEMENT</td>
<td>CCDT08.dwg</td>
</tr>
<tr>
<td>E-9</td>
<td>SIDEWALK DRAIN</td>
<td>CCDT09.dwg</td>
</tr>
<tr>
<td>E-10</td>
<td>SQUARED OUT RETURN W/TRANSITION</td>
<td>CCDT10.dwg</td>
</tr>
<tr>
<td>E-11</td>
<td>CURB RAMPS</td>
<td>CCDT11.dwg</td>
</tr>
<tr>
<td>E-12</td>
<td>4' SPECIAL INDUSTRIAL V-PAN</td>
<td>CCDT12.dwg</td>
</tr>
<tr>
<td>E-13</td>
<td>VERTICAL CURB &amp; GUTTER WITH 5'-0&quot; LIP</td>
<td>CCDT13.dwg</td>
</tr>
<tr>
<td>E-14</td>
<td>TYPICAL HAMMERHEAD CUL-DE-SAC</td>
<td>CCDT14.dwg</td>
</tr>
<tr>
<td>E-15</td>
<td>SECTION OF SLOPE BACK VERTICAL CURB &amp; GUTTER</td>
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<td>TYPICAL CONCRETE ALLEY PATCH SECTION</td>
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<td>TYPICAL CONCRETE HEADER</td>
<td>CCDT17.dwg</td>
</tr>
<tr>
<td>E-18</td>
<td>CUL-DE-DAC WITH ATTACHED SIDEWALK</td>
<td>CCDT18.dwg</td>
</tr>
<tr>
<td>E-19</td>
<td>CURB RAMPS</td>
<td>CCDT19.dwg</td>
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<tr>
<td>E-20</td>
<td>CONCRETE PAVEMENT JOINT</td>
<td>CCDT20.dwg</td>
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<td>CONCRETE PAVEMENT JOINT</td>
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<tr>
<td>E-22</td>
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<td>CCDT22.dwg</td>
</tr>
</tbody>
</table>
INDEX

PROFILES

NORTH OR EAST PROPERTY LINE
WEST OR SOUTH PROPERTY LINE
WEST OR SOUTH FLOW LINE
NORTH OR EAST FLOW LINE

POWER POLE
TELEPHONE POLE
POWER & TELEPHONE POLE
STREET LIGHT
WATER VALVE
FIRE HYDRANT
STOP SIGN
WARNING SIGN
INFORMATION SIGN
MAIL BOX
HEDGE
BRUSHES
TREE
EVERGREEN TREE
MANHOLE
EXISTING CONCRETE
CONCRETE TO BE PLACED
CONCRETE TO BE REMOVED AND REPLACED
LAND LINE
CENTER LINE
DITCH SHOWING FLOW DIRECTION
GAS LINE SHOWING SIZE
WATER LINE SHOWING SIZE
SANITARY SEWER SHOWING FLOW & SIZE
STORM SEWER SHOWING FLOW & SIZE
FIBER OPTIC
FENCE (ALL)
RAILROAD

DETAI NO. P-2
SECTION I 32' PAVEMENT

CROWN IS CONSTANT ABOVE STRAIGHT LINE FROM LIP TO LIP

DEPTH OF PAVEMENT AND BASE COURSE AS SPECIFIED ON PLANS

MINIMUM CROSSFALL = 1.5%
MAXIMUM CROSSFALL = 3.0%

SECTION II 40' PAVEMENT

CROWN IS CONSTANT ABOVE STRAIGHT LINE FROM LIP TO LIP

DEPTH OF PAVEMENT AND BASE COURSE AS SPECIFIED ON PLANS

MINIMUM CROSSFALL = 1.5%
MAXIMUM CROSSFALL = 3.0%

STANDARD ALLEY SECTION

5000 psi CONCRETE W/FIBER MESH

NOTE: SLOPE FROM EDGE OF ALLEY TO RL
NOTE: EDGES OF ALLEY MAY VARY FROM STANDARD

TYPICAL PAVEMENT SECTIONS
EXPANSION JOINT SHALL BE PLACED AT EXISTING CONCRETE

CONCRETE DEPTH 6" MINIMUM

CONTROL JOINTS AS DIRECTED

SLOPE

1-5/8" MAX. BUMPER STRIP (OPT)

MIN.

MAX.

TOP OF CURB

FLOW LINE

GUTTER LIP

MIN.

ALLEY & DRIVEWAY - PLAN VIEW

NOTE:
ONLY PERMITTED WHERE INKIND CURBWALK IS BEING REMOVED AND REPLACED

SECTION OF 4" CURBWALK

SECTION OF DRIVEWAY

SECTION OF ALLEY

TYPE I CURB WALK 2'-8"
MAX VARIES
CONCRETE DEPTH 6" MINIMUM
CONTROL JOINT AS DIRECTED

SLOPE
1-5/8" MAX, BUMPER STRIP (OPT)

SLOPE
TOP OF CURB
FLOW LINE

GUTTER LIP

MAX VARY
CONCRETE DEPTH 6" MINIMUM
CONTROL JOINT AS DIRECTED

SLOPE
1-5/8" MAX, BUMPER STRIP (OPT)

SLOPE
TOP OF CURB
FLOW LINE

GUTTER LIP

ALLEY & DRIVEWAY - PLAN VIEW

AS DIRECTED
6'-6"
7"
2'-0"
2 7/8"

2-

2'-3"

6'-6"

10"

NOT MORE THAN 2:1

SECTION OF 4" CURB WALK

SECTION OF DRIVEWAY

SECTION OF ALLEY

TYPE II CURB WALK 3'-11"

5000 psi CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

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CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH

CONCRETE W/FIBER MESH
NOTE: VERTICAL CURB & GUTTER WITH ADJACENT WALK MAY BE Poured MONOLITHIC.

SECTION OF VERTICAL CURB & GUTTER

SECTION OF ALLEY & DRIVEWAY

SECTION OF DEPRESSED ALLEY

VERTICAL CURB & GUTTER
ALLEY & DRIVEWAY WITH ADJACENT WALK

ALLEY & DRIVEWAY WITH SET BACK WALK

VERTICAL CURB & GUTTER

PLAN VIEW

EXPANSION JOINT SHALL BE PLACED AT EXISTING CONCRETE

CONCRETE DEPTH 6" MINIMUM

MAX. VARIES

BACK OF WALK

SLOPE

6'-0" MIN.

CONTROL JOINTS AS DIRECTED

BACK OF CURB

FLOOR LINE

GUTTER LIP

GUTTER LIP

BACK OF WALK

FLOOR LINE

EDGE OF WALK

FLOW LINE

LIP

BACK OF CURB

FLOOR LINE

ALLEY & DRIVEWAY WITH ADJACENT WALK

ALLEY & DRIVEWAY WITH SET BACK WALK

VERTICAL CURB & GUTTER

PLAN VIEW

DETAI NO. E-7
CROSSSPAN SECTION

SECTION OF MEDIAN CURB & GUTTER
AREA GRADED TO DRAIN TOWARD SIDEWALK CHASE

ISOMETRIC VIEW
N.T.S.

NON-SLIP RAISED PATTERN
STEEL TREAD 1/2" PLATE

1/2" x 1" FLATHEAD MACH. SCREW
BRASS OR ELECTRO-GALVANIZED
FINISH, 2' O.C.

#3 BAR 6" LONG
WELDED TO ANGLE IRON AT 12" O.C.
EACH SIDE (1/2"
ANCHOR BOLT MAY
BE USED)

ANGLE IRON TO BE DRILLED AND THREADED
TO ALLOW SCREW

CONCRETE TO BE DRILLED
TO ALLOW FOR SCREW

SECTION A-A
N.T.S.

SIDEWALK DRAIN

DETAIL NO. E-9
ALL CONCRETE SHALL BE 5000 PSI WITH FIBER MESH
ALL RAMPS SHALL NOT EXCEED 12:1 SLOPE

NOTE: ALL RETURNS SHALL BE RAMPED
UNLESS OTHERWISE INDICATED ON THE
PLAN OR AS DIRECTED BY THE ENGINEER.
UNLESS OTHERWISE INDICATED ON THE

SQUARED OUT RETURN W/TRANSITION

DETAIL NO. E-10
GENERAL NOTES

1. RAMP AND WING SLOPES SHALL NOT BE STEEPER THAN 1:12. DIMENSIONS SHOWN SHALL BE MODIFIED AS NECESSARY TO MEET THIS REQUIREMENT.

2. ALL CONCRETE SHALL BE 3000 PSI WITH FIBER MESH.

3. NORMAL GUTTER FLOW LINE AND PROFILE SHALL BE MAINTAINED THROUGH THE RAMP AREA.

4. IF POSSIBLE, DRAINAGE STRUCTURES SHALL NOT BE PLACED IN LINE WITH RAMPS. LOCATION OF THE RAMP SHALL TAKE PRECEDENCE OVER LOCATION OF THE DRAINAGE STRUCTURES, EXCEPT WHERE EXISTING STRUCTURES ARE BEING UTILIZED IN THE NEW CONSTRUCTION.

5. THE TYPE OF RAMP SHALL BE AS SHOWN ON THE PROJECT PLANS. IN GENERAL, THE RAMPS ARE INTENDED TO BE USED AS FOLLOWS:

   TYPE 1 RAMP IS FOR USE WHERE THE SIDEWALK IS SET BACK FROM THE STREET, AND WHEELCHAIR ACCESS FROM THE SIDE OF THE STREET IS NOT LIKELY TO OCCUR (BECAUSE THE APPROPRIATE WALL IS COVERED BY LUMBS OR GRAVEL). IF AN OBSTRUCTION IS PRESENT, TYPE 1 CAN BE USED ANYWHERE IN THE BLOCK.

   TYPE 2 RAMP IS FOR GENERAL USE AT INTERSECTIONS, ESPECIALLY WHERE PEDESTRIANS ARE ALLOWED TO CROSS DIAGONALLY.

   TYPE 3 RAMP IS FOR USE WHERE THE SIDEWALK EXTENDS TO THE CURB OR CAN BE EASILY TRANSFORMED TO PERMIT WHEELCHAIR ACCESS TO THE RAMP FROM THE SIDE. TYPE 3 CAN BE USED ANYWHERE IN THE BLOCK, AS WELL AS AT INTERSECTIONS, AS AN ALTERNATE TO TYPE 2.

   TYPE 4 RAMP IS FOR USE WHERE WHEELCHAIR ACCESS CAN OCCUR FROM ONLY ONE SIDE.

   TYPE 5 RAMP IS FOR USE WHERE AN EXISTING SIDEWALK, INCLUDING THE CURB, IS LESS THAN 6 FT AND WIDENING IS NOT FEASIBLE.

CONCRETE RAMP AND WING SURFACES SHALL BE TREATED WITH A LIGHT BROOMED SURFACE ONLY. GRADE OR SLOPE AREA ADJACENT TO RAMP WING OR WALL THAT IS NOT APPROPRIATE FOR WHEELCHAIR TRAFFIC.

DETECTABLE WARNING PAVING WITH A TRUNCATED DOME SURFACE.

SECTIONS A - A
GENERAL NOTES

1. THE DETECTABLE WARNINGS SHALL BE INSTALLED AT SIDEWALK/STREET TRANSITIONS. THEY SHALL BE MADE IN PAVER FORM WITH A TRUNCATED DOME SURFACE.
2. THE TOP OF THE DRAINAGE WEEP HOLE SHALL BE LOCATED AT THE LOWEST POINT OF THE DETECTABLE WARNING WELL.
3. ALL DETECTABLE WARNING AREAS SHALL BE PAVERED. THEY MAY BE LOCATED IN PAVER FORM WITH A TRUNCATED DOME SURFACE.
4. THE DETECTABLE WARNING AREA SHALL BE INCLUDED IN THE COST OF THE CONCRETE CURB RAMP.
5. RAMP SLOPES SHALL NOT BE STEEPER THAN 12:1. THE DETECTABLE WARNING AND WELL AREA SLOPES SHALL NOT BE STEEPER THAN 20:1.

DETAILED FOR TYPES 1 AND 3 CURB RAMPS

P.J = PERMISSIBLE JOINT WITH EPOXY-COATED DEFORMED NO. 4 BY 18 IN. BARS CONFORMING TO ASHMTD W-294 AT 18 IN. SPACING.
CROSS SECTION

PLAN VIEW

4' SPECIAL INDUSTRIAL V-PAN
VERTICAL CURB & GUTTER
WITH 5'-0" PAN

5000 PSI CONCRETE W/FIBER MESH

DETAIL NO. E-13
TYPICAL HAMMERHEAD CUL-DE-SAC

DETAIL NO. E-14
NOTE

ONLY PERMITTED WHERE INKIND CURBWAIlK 1 IS
BEING REMOVED AND REPLACED

SLOPE BACK CURB & GUTTER WITH SIDEWALK

SECTION OF SLOPE BACK CURB & GUTTER

DETAIL NO. E-15
SECTION A-A

TYPICAL CONCRETE ALLEY PATCH SECTION
TYPICAL CONCRETE HEADER
20' MIN.
DRIVE LANE WIDTH

6' ATTACHED WALK
IRRIGATED LANDSCAPED ISLANDS W/ 1" SPILL CURB

4' TRANSPORTATION/UTILITY EASEMENT

6 - 9'X18' PARKING SPACES

R=50' FL

R=50' FL (MIN.)

R=1' EASEMENT
R=15' FL (MIN.)

R=20' FL (MIN.)

ALL OTHER DIMENSIONS ARE THE SAME

54' ROW

34' FL-FL

54' ROW

34' FL-FL

CUL-DE-SAC
WITH ATTACHED SIDEWALK

NOTE:
1. LANDSCAPING REQUIRED IN PARKING ISLANDS IF SIDEWALK IS ATTACHED.
GENERAL NOTES

1. THIS STANDARD PLAN DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITE TOPPING).
2. LOCATE (J) JOINT AT A (O) JOINT OR A MINIMUM OF 2 FEET FROM A (O) JOINT.
3. THIS JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT.
   IF THE CONTRACTOR PROPOSES MODIFICATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR
   IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAYROLLMENT JOINT
   LAYOUT FOR APPROVAL IN THE ENGINEER. 14 FOOT SLABS SHALL BE CONSTRUCTED ONLY WHERE
   DESIGNATED ON THE PLANS.
4. WHEN A CONTINUOUS WIDTH OF PAVEMENT IS POURED WIDER THAN 60 FEET, THE JOINT
   NEAREST THE CENTERLINE SHALL BE AN UNITED (O) JOINT.
5. ON A LANE DIVIDED HIGHWAY, THE 2 LANE DIRECTIONAL PAVERMENT AND BOTH SHOULDERS SHALL BE PLACED
   WITH (O) LONGITUDINAL SHAPED CONSTRUCTION JOINTS.
6. ON VARIABLE WIDTH SLABS, THE 2 FOOT OR 4 FOOT END OF SLAB WIDTH DIMENSION MAY VARY 3/4 INCHES.
7. (O) TO BE USED WHEN TRAFFIC LANE IS ADDED SEPARATELY OR FOR TAPERS OR SPEED CHANGE LANES. ALTERNATIVE
   LONGITUDINAL JOINT LOCATIONS AT SPEED CHANGE LANE MAY BE USED IF APPROVED.

JOIN LEGEND

- TRANSVERSE CONTRACTION
- LOCAL CONSTRUCTION
- DOWEL TRANSVERSE CONSTRUCTION
- LOCAL CONSTRUCTION OR LONGITUDINAL CONSTRUCTION
- TRANSVERSE CONSTRUCTION

STATEMENTS ILLUSTRATING DOWEL PLACEMENT TOLERANCES

SEE SUBSECTION 412.7(b) FOR ALLOWED TOLERANCE VALUES.
GENERAL NOTES

1. THIS STANDARD DOES NOT APPLY TO THIN CONCRETE OVERLAYS (BITUMINOUS).

2. THIS TYPICAL JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THE STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAYMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER.

3. LONGITUDINAL JOINTS SHALL COINCIDE WITH LANE MARKINGS WHEN POSSIBLE, AND HAVE MAXIMUM SPACING OF 12.5 FT. (15 FT. PERMITTED WITH MONOLITHIC CURB AND GUTTER).

4. CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.

5. PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.

6. THE CONTRACTOR SHALL, LESS AS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLE AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VXW AND MONUMENT BOXES SHALL NOT REQUIRE A BOND BREAKER.

7. TRANSVERSE JOINTS SHALL BE LOCATED AT THE CENTER OF CIRCULAR MANHOLES AND INLETS, NO TRANSVERSE JOINT SHALL PASS WITHIN 4 FT. OF A MANHOLE.

8. WHERE A LONGITUDINAL JOINT WOULD PASS LESS THAN 1 FT. FROM A CAST-IN PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. ROD JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.

9. LOCATE JOINT AT 2FT. MIN FROM C.

10. WHEN A CONTINUOUS WIDTH AT PAVEMENT IS Poured Wider THAN 40 FT., THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNITED (6) JOINTS.

TYPICAL CURBED PAVEMENT JOINT LAYOUT

CITY OF ENGLEWOOD

DEPARTMENT OF PUBLIC WORKS

DRAWN BY: NBL

CONCRETE PAVEMENT JOINT

DETAIL NO. E-20
GENERAL NOTES:
1. CAST IRON SHALL CONFORM TO AASHTO M105/ASTM A48, CLASS 35B, MINIMUM.
2. CASTINGS SHALL COMPLY WITH AASHTO M208-89 FOR CASTING PROOF LOADING (DESIGNED FOR AASHTO HS-20 LOADING).
3. SEE CITY OF ENGLEWOOD DETAIL AND TECHNICAL SPECIFICATIONS, AND OTHER RELATED STANDARD DETAIL DRAWINGS.
4. CASTINGS SHALL BE MANUFACTURED WITH SPECIAL LETTERING IN THE CURB HEAD THAT PROHIBITS DUMPING, (I.E.: NO DUMPING DRAINS TO RIVER)
Typical Vertical Curb & Gutter

Plan View

Section

SINGLE TYPE 16 OPEN THROAT INLET
ADJUSTABLE CURB BOX

Notes:
1. For paving purposes, inlet structures shall also include 2'-0" curb & gutter transition section at each end of inlet plus sidewalk. Sections where required behind inlet structure and transition sections.
2. Floor slabs may be poured monolithic with base.
3. Gutter Elevation to Grade E elevation, if so, shall be constructed with an adjustable curb box.
4. Design conditions for inlet allow depths of 8" (max). For Inlets more than 8 feet in depth, shop drawings and design analysis shall be submitted for approval.
5. All reinforcing steel shall be ASTM A-615, Grade 60 deformed bars. Diameter of rod measured on piece of the bar shall be a minimum of 6 bar diameter.
6. Linear joints shall be provided when inlet depth exceeds 8'-6" and shall be in accordance with ASTM A-1769.
7. Concrete shall have a 28 day compressive strength of 4000 psi.
8. No form work shall remain inside structure when complete.
9. Steel bars shall be deformed and specified with approved cement material for the City of Englewood specifications.
10. Structures of reinforcing steel shall be permitted only where detailed in drawings.
11. Inlet shall be formed both inside and outside of sidewalks. Earth not permitted.
12. Lean concrete fill to be Fc = 2000 psi.
13. Lean concrete fill to be Fc = 2000 psi.
GENERAL NOTES:
1. CAST IRON SHALL CONFORM TO AASHTO M115/ASTM A48, CLASS 30B, MINIMUM.
2. CASTINGS SHALL COMPLY WITH AASHTO M305-89 FOR CASTING PROOF LOADING (DESIGNED FOR AASHTO H-20 LOADING).
3. SEE CITY OF ENGLEWOOD DETAIL AND TECHNICAL SPECIFICATIONS, AND OTHER RELATED STANDARD DETAIL DRAWINGS.

CITY OF ENGLEWOOD
1000 ENGELWOOD PATIOWAY
ENGLEWOOD, CO 80110-1000
Phone: (303) 762-2300
Fax: (303) 763-8963

File Information
DEPARTMENT OF PUBLIC WORKS
DRAWN BY: KELLMER
Drawing File Name: FDD4-505.dwg
Scale: N/A
Acad Version: 2002
NOTE: KELLMER

Project Detail Revised
Type: 13
GRATE AND FRAME DETAILS

DETAIl NO. D-5
-
DEPTH VARIES 4'-6'

STD. 6" - 0"

MAX 3"

EXPANSION JOINT

---

PLAN

SECTION

1 1/2" CL (TYP.)

RCP PIPE

RCP PIPE

UP OF CONCRETE GUTTER

REBAR REPLACEMENT

DETAIL INLET WALL PENETRATION (TYP.)

CONNECTOR PIPE END TREATMENT (TYP.)

SINGLE TYPE 13 INLET

DETAIl NO. D-6

FILE INFORMATION

PROJECT DETAIL REVISED

SINGLE TYPE 13 INLET

DETAIL NO. D-6
STORM CONNECTOR PIPE CLOSURE DETAIL

[TO BE USED ONLY WHERE NECESSARY AND AS AUTHORIZED BY THE ENGINEER.]

CONCRETE IS TO TOTALLY EXCISE THE PIPE ENDS AS SHOWN.

MINIMUM DIMENSIONS

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<tr>
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<tr>
<td>21&quot;</td>
<td>12&quot;</td>
<td>6&quot;</td>
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VERTICAL SECTION

CUT NO. 1: SAW THE TUBE AT AN ANGLE OF 45° WITH THE TRANSVERSE PLAN. REVERSE ONE SECTION AND TAPE BOTH SECTIONS TOGETHER FORMING THE DEFLECTION ANGLE A.


DETAIL "A"
SONO-TUBE, OR EQUAL, INTERIOR FORM

GENERAL NOTES

1. A CONCRETE COLLAR IS REQUIRED WHERE THE CHANGE IN GRADE EXCEEDS 0.10 OF A FOOT PER FOOT.
2. GAP LIMITS CAN NOT EXCEED MANUFACTURER'S TOLERANCES.
3. CONCRETE COLLAR SHALL NOT BE USED FOR A SIZE CHANGE ON THE MAIN LINE.
4. WHERE REINFORCING IS REQUIRED THE DIAMETER OF THE CIRCULAR TIES SHALL BE 0.125 WALL THICKNESS + T.
5. REINFORCING SHALL BE USED WHERE THE SPACES BETWEEN THE EXTREME OUTER ENDS IS 2 1/2" OR LARGER.

<table>
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<th>PIPE DIAMETER</th>
<th>SPACE BETWEEN EXTREME OUTER ENDS</th>
<th>NO. OF CIRCULAR TIES</th>
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</thead>
<tbody>
<tr>
<td>21&quot; OR LESS</td>
<td>2 1/2&quot;</td>
<td>3</td>
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WHERE THE SPACE BETWEEN PIPE LONGITUDINAL ENDS EXCEEDS 2 1/2", THE NUMBER OF CIRCULAR TIES SHALL BE INCREASED TO MAINTAIN AN APPROXIMATE SPACING OF 6" OC.

7. AN INTERIOR FORM OF UNSEALD SONO-TUBE OR EQUAL SHALL BE USED TO PROVIDE A SMOOTH INTERIOR JOINT. THE PAPER FORM MAY BE LEFT IN PLACE (SEE DETAIL "A").

8. THIS DETAIL APPLIES "ONLY" TO PIPE 21" DIAMETER OR LESS.