

CITY OF MILWAUKEE

DEPARTMENT OF PUBLIC WORKS
INFRASTRUCTURE SERVICES DIVISION
CONSTRUCTION SECTION

STREET CONSTRUCTION SPECIFICATIONS

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MILWAUKEE, WISCONSIN
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PART 1 - INSTRUCTIONS TO BIDDERS
PART 2 - GENERAL CONDITIONS

These parts of the Street Construction Specifications are covered under the most current revision of the City of Milwaukee, Department of Public Works General Specifications, dated January 31, 1992. The most current revision can be found on the Department of Public Works website (<http://city.milwaukee.gov/mpw>) in the Official Bid Notices section.

- Added July 2014

PART 3

BUREAU REQUIREMENTS

SECTION 301 DEFINITIONS

301.1 Definition of Terms

Wherever any of the following listed terms appear in the contract documents, they shall be accepted as having the meaning set forth opposite each.

301.2 Department of Public Works

The Department of Public Works of the City of Milwaukee.

301.3 Infrastructure Services Division

The Infrastructure Services Division of the Department of Public Works.

301.4 Field Operations Section

The Field Operation Section of the Infrastructure Services Division.

301.5 Construction Section

The Construction Section of the Field Operation Section.

301.6 Electrical Services Unit

The Electrical Services Unit of the Field Operation Section.

301.7 City Engineer

The City Engineer of the City of Milwaukee or his duly authorized representative.

301.8 Engineer in Charge

The Engineer in Charge of the Construction Section.

301.9 District Engineer

The District Engineer of the Field Engineering Division of the Bureau of Engineers.

301.10 Special Layout Engineer

The Special Layout Engineer of the Department of Public Works.

301.11 Street

The public thoroughfare dedicated or reserved for street purposes. It shall be the area between the lot lines including roadway pavement, curb and gutter, and sidewalk.

301.12 Roadway

The portion of the street intended for vehicular traffic. Where curb exists, it is that portion of the street between the faces of the curbs.

301.13 Shoulder

The portion of the roadway contiguous with the traveled way for the accommodation of stopped or slow moving vehicles.

301.14 Sidewalk Area

That portion of the street located between the street lot line and the roadway. Where there are curbs it shall be that portion of the street between the lot line and the face of the curb.

301.15 Finished Grade

The lines, profile, and cross-section to which the work is to be built.

301.16 Specifications

The Street Construction Specifications of the Infrastructure Services Division.

301.17 Measurement Standards

All work completed under the contract will be measured according to United States Standard Measures.

SECTION 302 BIDDING REQUIREMENTS AND GOVERNING ORDER OF CONTRACT DOCUMENTS

302.1 Qualifications of Bidders for Asphalt and Concrete Paving Construction

Contracts for the construction of asphalt or concrete paving will be awarded only to contractors who have a competent and experienced employee, not below the rank of general superintendent, actively engaged in the prosecution of the work. The above experience requirement may be met by the subcontractor doing the particular item of work.

SECTION 303 UNITS FOR BIDDING

303.1 Units for Bidding

Bids shall normally be submitted on the basis shown in Table 1.

TABLE 1
STANDARD BID ITEMS

<u>Section</u>	<u>Item</u>	<u>Unit</u>
601	Asphalt Binder	Square Yard
601	Asphalt Concrete Pavement	Square Yard
606	Asphalt Curb	Lineal Foot
607	Asphalt Driveway	Square Foot
608	Asphalt Walk	Square Foot
306	Barricades	Day
611	Base Preparation for Asphalt Surface	Lump Sum
401	Compacted Filling	Cubic Yard
506	Concrete Alley Pavement	Square Yard
402	Concrete and Masonry Wall and/or Footing Removal	Cubic Yard
507	Concrete Base	Square Yard
502	Concrete Curb, Concrete Gutter, Concrete Curb and Gutter	Lineal Foot
503	Concrete Driveway	Square Foot
509	Concrete Header	Lineal Foot
503	Concrete Median	Square Foot
505	Concrete Pavement	Square Yard
505	Concrete Pavement – Inverted Crown	Square Yard
505	Concrete Pavement with Integral Curb	Square Yard
801	Concrete Slope Paving	Square Yard
402	Concrete Step Removal	Lineal Foot
504	Concrete Traffic Island	Square Foot
402	Concrete Traffic Island Removal	Square Foot
503	Concrete Walk	Square Foot
402	Concrete Walk and/or Driveway Removal	Square Foot
503	Concrete Walk with Integral Curb	Square Foot
604	Cracking and Seating	Square Yard
702	Crushed Gravel Base	Square Yard
701	Crushed Stone Base	Square Yard
703	Crushed Stone Driveway	Square Yard
704	Crushed Stone Shoulder	Square Yard

402	Curb and/or Curb and Gutter Removal	Lineal Foot
401	Cutting	Cubic Yard
812	Erosion Control	Each
812	Erosion Control Filter Fence	Lineal Foot
305	Field Office	Lump Sum
401	Filling	Cubic Yard
305	Finishing Roadway	Lump Sum
610	Granular Base Preparation	Square Yard
705	Gravel Filling	Ton
811	Internal Manhole Seal	Each
602	Manhole Adjusting Rings	Each
808	Metal Culvert	Lineal Foot
305	Mobilization	Lump Sum
603	Pavement Grinding	Square Yard
402	Pavement Removal	Square Yard
605	Plastic Lane Markers	Lineal Foot
401	Roadway Cutting	Cubic Yard
401	Roadway Filling	Cubic Yard
401	Unclassified Grading	Cubic Yard
404	Root Grubbing	Each
402	Sawing	Lineal Foot
807	Sealing Pavement Joints and Cracks	Square Yard
804	Seeding	Square Yard
810	Sewer Frame Adjustment	Vertical Foot
601	Sheet Asphalt Pavement	Square Yard
805	Sodding	Square Yard
802	Steel Plate Beam Guardrail	Lineal Foot
402	Surface Course Removal	Square Yard
609	Tack Coat	Gallon
806	Topsoil	Cubic Yard
402	Track Zone Removal	Square Yard
306	Traffic Control	Lump Sum
306	Traffic Control Signs	Day
404	Trees Clearing	Inch Dia
404	Trees Grubbing	Inch Diameter
401	Rock Excavation	Cubic Yard

809	Underdrains	Lineal Foot
601	Variable Thickness Asphalt Binder	Ton
601	Variable Thickness Asphalt Concrete Pavement	Ton
507	Variable Thickness Concrete Base	Cubic Yard
508	Variable Thickness Concrete Slurry Base	Cubic Yard
503	Variable Thickness Concrete Walk or Driveway	Cubic Yard
702	Variable Thickness Crushed Gravel Base	Ton
701	Variable Thickness Crushed Stone Base	Ton
703	Variable Thickness Crushed Stone Driveway	Ton
601	Variable Thickness Sheet Asphalt Pavement	Ton
803	Wood Barricade	Each

SECTION 304 SPECIAL NOTICES

304.1 Notice to Special Layout Engineer and District Engineer

Notification shall be given to the Special Layout Engineer at least 3 working days prior to the start of work on the contract. During this time period, line and grade will be furnished. As the work progresses, the District Engineer shall be notified to furnish additional line and grade at least 3 days and not more than 10 days before they are required. The protection and preservation of these points shall be the responsibility of the contractor.

304.2 Notice for Inspection

Notification shall be given to the Construction Division office at least 3 working days before starting work or resuming work on an officially suspended contract so that arrangements can be made to assign an inspector to the contract, see Part 2.

304.3 Notice to Testing Laboratory

Notification shall be given to the Testing Laboratory, 24 hours prior to the placement of asphalt so that arrangements can be made to perform the proper quality control functions during the production of the asphalt paving mixtures.

SECTION 305 GENERAL WORK PROVISIONS

305.1 Local Telephone Number

A local telephone number shall be available where the contractor can be contacted or messages left for him.

305.2 Grade Transfer

An approved leveling board of sufficient length or an engineering level and rod shall be used to transfer grades from the engineer's stakes or grade points to the forms. The use of a leveling board will not be permitted when the transfer distance is greater than 10 feet.

The contractor shall have an engineering level and rod available for use when requested.

305.3 Permits Furnished

The Bureau of Engineers will obtain all permits required by the State, County or contiguous governmental units which are required for the construction of the work under the contract, see Section 2. Other permits required such as for the operation or use of equipment, etc., shall be obtained by the contractor.

The contractor will not be required to obtain the following separate permits as designated in Part 2 which are construed to be a part of the contract and are governed by the contract documents.

"Permit for Storage of Materials", "Permit for Excavation" and "Permit for Street Closings".

305.4 Provision for City Electrical Service Installation

Plans showing the existing and proposed City electrical installations on the project will be furnished. Prior to doing any paving, sufficient notification shall be given to the Bureau of Traffic Engineering and Electrical Services so that the proposed work can be installed without delaying the paving operations. Wood boxouts will be furnished and placed by the bureau at locations of proposed electrical equipment installation. Alignment and adjustment to finished grade shall be done by the contractor at the time of concrete placement. In no event shall a location be paved where an existing or proposed installation is to be extended or made.

305.5 Adjustment of Underground Appurtenances

The Construction Division shall be given notification at least 5 working days prior to when adjustments to private utility manholes are necessary. All adjustment work will be furnished promptly but no claims for damage due to delays will *be* allowed. The cost of any subsequent adjustment occasioned by damage due to paving operations shall be assessed to the responsible party.

When a previously adjusted manhole requires minor shim work prior to concrete placement, this work shall be performed with the use of hardwood shims. The cost of this work shall be included in the price bid for the concrete work.

When adjusting rings are to be used in making adjustments to City manholes, prior to the placement of the asphalt, the cover of the existing manhole shall

be removed, the seat cleaned and primed with emulsified asphalt, the proper size adjusting ring placed and the cover replaced. The cost of obtaining and placing the adjusting ring shall be included in the price bid for the asphalt unless otherwise specified. See Section 602.

305.5.1 Cleaning Covers of Underground Appurtenances

Covers for all underground appurtenances shall be left free and clean of all foreign material. In no case shall the covers be removed from the appurtenances belonging to private utilities.

305.6 Working Days

305.6.1 Contract Working Day

Every day worked on a contract including tree clearing and grubbing, sawing, sodding, joint sealing, and finishing roadway shall be called a contract work day.

305.6.2 Project Working Days

The time on an individual project, Project Work Days, will commence on the first day removal work is performed with the exception that if only tree removals and/or sawing is performed, these operations will not constitute a start of this time. Once work has started on the project, the contractor will be required to continue until the project is complete and usable by the public. The project will not be considered complete and usable until all the concrete, asphalt and backfilling work is complete and all parking areas, garages and driveways are available to traffic.

A project work day shall be any day on which the contractor can start and continue work. Days of inclement weather, Saturdays, Sundays, nationally recognized legal holidays and curing periods shall not be considered a project work day unless the contractor actually performs work. Also not included in project work days are joint sealing, sodding and roadway finishing.

305.7 Charge for Inspection

The amount of the per diem charge for inspection as referred to in Part 2 shall be \$275. The contractor should be aware that work on each project is governed by the project work days, and a per diem inspectional charge of \$275 per day will be assessed for each work day after the allotted number. Inspectional charges will be assessed against each project which exceeds its allotted number of work days. An inspectional charge in addition to the project work day charge will be assessed if the number of work days for the overall contract exceeds the amount allotted.

305.8 Winter Access

Whenever a project is started but cannot be completed because of winter weather, access shall be provided during the time the work is suspended. This access shall consist of pavement, driveways and walks constructed of an approved granular material. The locations and widths of the access construction shall be as directed by the Commissioner. The above work shall be at the contractor's expense unless otherwise determined by the Commissioner.

305.9 Field Office

305.9.1 Extent of Work

When required, this item will be specified in the Special Provisions. This item shall consist of furnishing and maintaining a field office on the project site for the exclusive use of the inspector.

305.9.2 Description

The field office shall be a temporary, watertight structure which may be a shanty or one end of a shanty blocked off for the exclusive use of the Inspector: of approximately 65 square feet floor area and a minimum head room of 6.5 feet, having suitable windows, a plan table or shelf, 2 chairs or a bench, and supplied with fuel, lights and heating facilities when necessary. The contractor's name and telephone number shall be on the outside in letters at least 4 inches high.

A Type I Field Office shall be furnished with a telephone for the exclusive use of the Inspector.

A Type II Field Office need not be furnished with a telephone.

305.9.3 Placement

The field office shall be placed on the project site and ready for use by the Inspector prior to the start of the work. It shall be located so that the majority of the work on the project shall be in close proximity.

305.9.4 Measurement for Payment

This item will be paid as a lump sum. When the proper facility is furnished and maintained on an acceptable basis, payment will be made in accordance with the following schedule:

Fifty percent of the contract bid price will be paid on the first partial payment and the remainder will be paid on the second partial payment.

The cost of furnishing a telephone shall be included in the price bid for the field office.

305.10 Sweeping of Construction Site

In cleaning the construction site, as required by Part 2 and Section 305.11, all accessible areas shall be cleaned with a mechanical sweeper. The sweeper shall be equipped with a broom that will sweep the material directly into a closed dirt box or hopper. The machine shall have a vacuum unit or sprinkler system that eliminates the majority of the dust normally caused by sweeping.

305.11 Dust Free Construction Site

A reasonably dust free construction site shall be maintained at all times during the progress of the work. If necessary, as determined by the Commissioner, this may involve frequent sweeping with a mechanical sweeper, application of water or the use of an approved dust palliative.

Any streets or crossings being constructed under traffic shall be maintained dust free.

305.12 Construction Under Traffic

When an intersection is required to be kept open to vehicular traffic, it shall be accomplished by constructing one-half of the new pavement and opening it to vehicular traffic before disturbing the remainder of the existing pavement.

305.13 Mobilization

305.13.1 Extent of work

This item shall consist of all the work necessary for the movement of personnel, equipment, supplies and incidentals onto the project sites.

305.13.2 Limitation on the Amount to be Paid

The total amount paid for the item of mobilization shall be limited to the contract bid price. No adjustment will be made in the contract bid price because of changes in the original contract quantities or nature of the work.

305.13.3 Measurement for Payment

Mobilization shall be paid as a lump sum. Payment will be made in accordance with the following schedule: 50 percent of the contract bid price will be paid on the first partial payment and the remainder will be paid on the second partial payment.

305.14 Finishing Roadway

305.14.1 Extent of Work

This item shall consist of all work necessary for the final clean up and restoration of the project site.

The work shall include the final sweeping of the site; the removal of all erosion control devices; the cleaning of and removal of debris from all manholes, catch basins, and storm inlets; cleaning of appurtenances and covers; removal of all construction materials and barricades and any other items necessary for the completion of the work.

305.14.2 Measurement for Payment

Finishing roadway will be paid as a lump sum when all work has been acceptably performed.

SECTION 306 SPECIAL PROTECTIVE MEASURES

306.1 Water and Gas Box Locations

In advance of grading operations, each water gate valve and gas drip box and each water and gas service stop box will be staked or marked. Before paving, the Water Department and Gas Company will adjust the boxes to finished grade. All damaged boxes will be repaired and the cost of that work will be assessed to the party responsible for the damage.

306.2 Protection of Underground Appurtenances

Catch basin or storm water inlets and sewer and water manholes shall be protected with erosion control devices to prevent entry of foreign material during the construction period. If foreign material is deposited, it shall be removed immediately.

When a utility manhole is encountered, the frame and cover shall not be removed. If foreign material is deposited, the respective utility shall be contacted immediately and their forces will clean the appurtenance.

306.3 Protection of City Electrical System

All necessary information pertaining to the location of existing City electrical installations affected by the contract work shall be obtained from the Bureau of Traffic Engineering and Electrical Services. Care shall be taken to protect these installations from damage. In the event of damage, the Bureau shall be notified immediately, see Part 2.

306.4 Use of Drop Weight or Concrete Breaking Machine

A drop weight or concrete breaking machine may be used only when such usage does not become a nuisance or source of damage to underground structures or adjacent properties. The contractor shall be responsible for any damage caused thereby.

306.5 Storage of Material on the Street

Materials delivered on any street shall be neatly and compactly piled along the sides of the roadway in such manner as to cause the least inconvenience to the property owner and the general public and not within 20 feet of any hydrant. Private drives and street crossings shall be kept open. All trees and other improvements shall be protected from damage.

306.6 Contractor Not to Occupy Closed Pavement or Base

No equipment or material shall be placed or operated on new pavement or base during the curing period. See Section 306.7.3.

306.7 Barricades and Traffic Control Signs

306.7.1 Extent of Work

The work shall consist of furnishing, placing and maintaining the necessary barricades, lights and signs in sufficient quantity, size and condition to adequately protect life and property.

306.7.2 Materials and Equipment

All barricades, signs, and warning devices and their use shall conform to the Federal Highway Administration publication, "Manual on Uniform Traffic Control Devices".

306.7.3 Placement

All hazards within the limits of the work or on detours around the work shall be marked with barricades, reflectors, lights, flashers and caution, warning and directional signs in sufficient quantity, size and condition to adequately protect life and property. These safeguards shall be moved, replaced, increased or removed, as required, during the progress of the work, see Part 2.

When an intersection is closed to cross-street traffic, partial barricades Type I or II and "Road Closed to Thru Traffic" signs shall be placed one block away on either side of the closed intersection and complete barricades shall be placed at the intersection under construction. If the entire street is under construction, the ends of the project shall also be completely barricaded. When complete barricading is required, alley or roadway widths up to 36 feet shall have at least one Type III barricade placed at the center line. Widths in excess of 36 feet shall have at least two Type III barricades evenly spaced across the roadway.

When the Special Provisions require that the roadway is to be kept open to traffic, the sign posted on the Type III barricades shall read "Road Under Construction" instead of "Road Closed".

During the curing period, the concrete pavement or base shall be closed to vehicular traffic by the placement of Type III barricades spaced as required above for complete barricading. Barricades shall extend across the full width of the roadway at the ends of the pavement or base and at all alley and street crossings on the new pavement or base.

306.7.4 Measurement for Payment

The unit prices bid for Barricades Type I, Type III and Traffic Control Signs shall be paid for each calendar day from start to finish, including weekends and holidays, until completion, with the exception that payment will cease when the number of working days allowed or a specified completion date has expired. Any barricading or signing required after these dates shall be at the contractor's expense.

Payment will be limited to those Barricades and Signs installed and maintained in accordance with the Federal Highway Administration publication, "Manual on Uniform Traffic Control Devices".

306.8 Traffic Control

306.8.1 Extent of Work

The work shall consist of furnishing, placing and maintaining the necessary barricades, lights and signs in sufficient quantity, size and condition to adequately protect life and property.

306.8.2 Materials and Equipment

The material and equipment used shall conform with the Federal Highway Administration publication, "Manual on Uniform Traffic Control Devices".

306.8.3 Placement

All barricades, lights, signs, etc., shall be placed to meet the minimum requirements of the Street Construction specifications and Special Provisions of the contract.

When a plan for barricading is furnished, it shall be considered a minimum requirement and the contractor shall supplement these as necessary. The

proper number and type of barricades, lights and signs shall be placed prior to start of work. A check shall be made by the contractor, at least once every 24 hours or more frequently if conditions require, to insure that the barricades, lights and signs are in compliance with project conditions.

306.8.4 Measurement for Payment

Traffic Control shall be paid as a lump sum. When the required work is being performed in an acceptable manner, payment will be made in accordance with the following schedule:

When 5 percent or more of the original contract amount has been earned, 25 percent of the bid amount will be paid. When more than 25 percent of the original amount has been earned, 50 percent of the bid amount will be paid. When more than 50 percent of the original contract amount has been earned, 75 percent of the bid item will be paid. Broken or improperly illuminated barricades will not be counted for payment.

SECTION 307 GUARANTEE PROVISIONS

307.1 Guarantee

The work shall be constructed in such manner that no defects resulting from faulty workmanship or materials shall appear therein during the guarantee period. The guarantee period will be three years beginning with the actual completion date as described in Part 2 for all work under the contract. Any defects which cause a hazardous situation shall be repaired immediately.

307.2 Guarantee Bond

The guarantee required by Section 307.1 and incorporated as a part of the contract form shall be executed by the bidder and by an approved licensed Surety Corporation. The surety shall be bound in accordance with the provisions of the contract documents.

307.3 Repairs by Contractor

In the event of the failure of any part of the work to conform to the specific requirements during the guarantee period, the contractor shall make such repairs as are ordered by the Commissioner to restore the work to an acceptable condition.

307.4 Pavement Cuts during Guarantee Period

During the guarantee period, the applicant for a permit to cut the pavement shall furnish the City with a Guarantee that the pavement opened will be restored properly. The Commissioner will decide the sufficiency of any such guarantee.

SECTION 308 CONCRETE THICKNESS TOLERANCE

308.1 Coring

All concrete pavements, concrete alley pavements and concrete bases will be cored to determine the actual thickness constructed.

A minimum of one core will be sampled from each 2,000 square yards or fraction thereof, of pavement or base constructed on each project on the contract. On projects where the pavement or base is constructed other than full width each individually constructed pavement or base width will be cored.

All cores will be sampled in locations selected at random by the Commissioner except as hereinafter provided.

The length of each core will be determined by the average measurements of the core made in accordance with the Method of Measuring Length of Drilled Cores, A.A.S.H.T.O. Designation T148.

308.2 Determination of Pavement or Base Thickness

A pavement or base thickness will be determined for each width of pavement or base constructed on a project. When less than three cores are initially required as specified in Section 308.1 and each core is not deficient by more than 0.4 inch from the specified thickness, no additional cores will be taken. If one of these initial cores is deficient by more than 0.4 inch, additional random cores will be taken to provide a minimum of three cores.

If these additional cores are not deficient by 1.0 inch or more, no additional cores will be taken and the pavement thickness for the project or width of pavement will be the average of the three cores. Any cores taken which are deficient by 1.0 inch or more will be treated as specified in Section 308.4.

When a pavement has areas which are subject to removal, the two cores taken beyond the ends of the removal areas will be used, along with the other random cores taken, in determining the average pavement thickness. If the average thickness is deficient, a reduction in payment as specified in Section 308.3 shall be applied but will exclude all pavement areas subject to removal.

308.3 Reduction in Payment

When the average thickness of the cores, taken on a project on which the pavement was constructed full width, is deficient by more than 0.4 inch from the specified contract thickness, the final payment for the pavement area on that project will be subject to a reduction according to the following formula.

The adjusted contract unit bid price will be determined by multiplying the contract unit bid price by the square of the average core thickness divided by the square of the specified pavement thickness.

When the pavement on a project is constructed other than full width, average thickness of the cores will be determined for each width constructed, and if the average is deficient by more than 0.4 inch from the specified contract thickness, the final payment for the pavement area for that width of pavement constructed will be subject to reduction in accordance with the formula described in this section.

308.4 Criteria for Removal

When a core is found to be deficient by 1.0 inch or more from the specified contract thickness, the pavement slab containing this core shall be subject to removal and replacement by the contractor at his expense. Should the Commissioner direct that the pavement is to remain in place, then a credit will be taken in the amount of 150 percent of the contract bid price. A pavement slab shall be defined as that section of pavement bounded by the longitudinal construction or bonded joints and transverse dummy or bonded joints.

Additional cores will be taken from the adjacent pavement slabs in both longitudinal directions from the slab containing the deficient core until cores are obtained that are not deficient in thickness by more than 0.4 inch. All pavement slabs containing cores deficient in thickness by more than 0.4 inch shall also be subject to removal and replacement by the contractor at his expense unless otherwise directed by the Commissioner.

When cores from 10 consecutive pavement slabs are found to be deficient and warrant removal and further additional cores are required, the additional cores will be taken from every third slab thereafter to determine the limits of the deficient pavement. All pavement bounded by the deficient cores, including the two slabs between cored slabs shall be considered deficient and subject to removal and replacement at the contractor's expense unless otherwise directed by the Commissioner.

SECTION 309 ASPHALT THICKNESS TOLERANCE

309.1 Coring

All asphalt pavements that are contracted on a square yard basis will be cored to determine the actual thickness constructed. A minimum of one initial core, and as many additional cores as may be required, will be sampled from each 2000 square yards of pavement or fraction thereof for each project. All cores will be sampled in locations selected at random by the Commissioner.

The thickness of the cores will be determined by average measurements of the cores made in accordance with the Method of Measuring Length of Drilled Cores, A.A.S.H.T.O. Designation T148.

309.2 Determination of Pavement Thickness

The actual thickness of a pavement will be determined as the average of the cores taken.

When less than 3 initial cores are taken on a project and these cores are not deficient by more than 0.3 inch from the specified thickness, no additional cores will be taken. If one of these initial cores is deficient by more than 0.3 inch, additional cores selected at random but not in the same alignment as previous cores, will be taken to provide a minimum of three cores.

309.3 Reduction in Payment

When the average thickness of the cores taken is deficient by more than 0.3 inch but not more than 0.5 inch from the specified contract thickness, the final payment for the pavement on that project will be subject to a reduction according to the formula in Section 308.3.

309.4 Criteria for Remedial Action

When the average thickness of the cores is deficient by more than 0.5 inch from the specified contract thickness, the contractor shall be required to place at his expense an asphalt overlay on the entire project unless otherwise directed by the Commissioner.

All adjustment of underground structures and appurtenances and any removals required to provide for such overlay shall be at the contractor's expense.

SECTION 310 ASPHALT GRADATION TOLERANCE

310.1 Determination of Gradation

The gradation of each type of asphalt mix used on the contract will be determined from samples obtained during the course of the work.

310.2 Reduction in Payment

An asphalt mix will be considered deficient if the tests indicate that the gradation requirements specified in Table 14 have not been adhered to. When an asphalt mix is found to be deficient, the final payment for that mix will be subject to a reduction according to the following formula:

The adjusted contract unit bid price of the deficient mix will be determined by multiplying the contract unit bid price by 92 percent. The adjusted price will apply to all tonnage of that mix used on the contract.

SECTION 311 ASPHALT COMPACTION TOLERANCE

311.1 Determination of Compaction

Field density of asphalt concrete surface courses will be determined using the nuclear meter. Compaction will be determined by comparing the nuclear field density to the applicable laboratory density.

One nuclear density test per paving pass, per block, with a minimum of 4 densities per project will be taken.

When the average of all compaction results for a project indicates full payment, no additional testing

will be done. When the average of all compaction results for a project indicates a reduction in payment as per Table 2, all test locations in that project with compaction results below 94.5 percent will be retested. These retests will consist of three compaction tests at each location below 94.5 percent. One test will be at the original test location and one ten feet in each direction from that location, the same distance from the centerline. The compaction for each retest location will be reported as the average of these three test results.

If the contractor, with the approval of the Commissioner and at his own expense, elects to recompact a project which is subject to a reduction in payment, the project will be retested after recompaction according to the original test schedule. This retesting will be done at the contractor's expense. If the project is still subject to a reduction in payment after recompaction, no further retesting will be done.

311.2 Payment

When the average of all nuclear meter determinations per project indicates compaction to be above 95% of laboratory control density, full payment will be made in accordance to the unit bid prices.

311.3 Reduction in Payment

When the average of all nuclear meter determinations per project indicates compaction to be below 95% of the laboratory control density, the payment reductions as shown in Table 2 shall apply.

TABLE 2
ASPHALT COMPACTION TOLERANCE

Field Density Proportional Part Percent Below of Project Price Specified Minimum Allowed	Proportional Part of Project Price Allowed
From 0 to 0.5 inclusive 100 percent	100 percent
From 0.6 to 1.0 inclusive 97 percent	97 percent
From 1.1 to 2.0 inclusive 94 percent	94 percent
From 2.1 to 3.0 inclusive 90 percent	90 percent
From 3.1 to 4.0 inclusive 80 percent	80 percent
From 4.1 to 5.0 inclusive 65 percent	65 percent

*5.1 or more

**Areas of binder or surface course determined to be deficient in density by more than 5% below the specified minimum shall be removed and replaced by the contractor with binder or surface course of the specified density. When acceptably replaced, this work will be paid for at the contract unit bid price. The Commissioner may permit the deficient pavement course to remain in place, in which case it will be paid for at 50% of the contract unit bid price.*

PART 4
GRADING, REMOVALS, AND RELATED WORK

SECTION 401 GRADING

401.1 Description

Grading shall consist of cutting, filling, compacting, backfilling, sloping, disposing of surplus material and doing all work necessary or incidental to the formation of the roadway and sidewalk areas.

No work shall start until all required "Erosion Control Devices" have been installed.

The contractor shall comply with all Federal, State and local laws and regulations controlling pollution of the environment, including obtaining and executing all permits required. When contaminated soil is encountered the Wisconsin Department Natural Resources shall be contacted and the handling, storage and disposal of such soil shall conform to their requirements. Costs associated with meeting these requirements shall be paid for in accordance with the "Cost Plus Basis" for extra work.

401.1.1 Stabilization of Disturbed Ground

All disturbed ground, not to be restored with pavement and left inactive for 10 days or more, shall be stabilized by seeding, sodding, mulching, erosion nets/mats, or other equivalent control measure.

All seeding, sodding and mulching shall be performed in accordance with Street Construction Specifications.

Erosion nets and mats, including excelsior retention blankets, jute matting, and polypropylene netting may be used for stabilization and shall be installed according to the manufacturer's recommendations.

Cost of the stabilization procedures, unless specifically noted in the bid units shall be done at the contractor's expense.

401.2 Cutting and Roadway Cutting

401.2.1 Extent of Work

Cutting shall consist of removing and disposing of all material between the existing ground surface and the surface of the finished grade and/or subgrade as determined from the plans. Roadway cutting shall consist of that cut material from the portion of the street area located between the backs of the proposed curbs when there is an existing pavement or granular or asphalt surface.

Cutting and roadway cutting shall include removal of culvert pipe up to and including 24 inches in diameter, all trees and stumps 3 inches and less in diameter and removals of every description without classification of material except for those items specifically mentioned in Sections 402 and 404.

401.2.2 Disposal of Material

Excess and unsuitable cut material shall be disposed of by the contractor unless otherwise directed by the contract documents.

In areas where only grading, topsoil, or sod placement is proposed and unsuitable material such as bituminous, crushed stone, gravel, cinders, etc., is encountered, it shall be removed to a depth of 3

inches below subgrade and suitable fill material placed. In areas where a proposed pavement, curb and/or gutter, walk or driveway is to be constructed and unsuitable material such as debris, sod, topsoil, organic matter, etc., is encountered, it shall be removed completely, unless otherwise directed, and suitable fill placed.

401.2.3 Measurement for Payment

Cutting and roadway cutting performed to the line and grade given will be measured as cubic yards in its original position, computed by the average depth method.

The price bid for cutting or roadway cutting shall include removal of unclassified material.

The additional cutting required when unsuitable material is encountered and removed will be measured as cubic yards in its original position. The replacement filling will also be paid on the basis of this computation.

401.3 Filling and Roadway Filling

401.3.1 Extent of Work

Filling shall consist of furnishing, placing and compacting all material between the existing ground surface and the surface of the finished grade and/or subgrade as determined from the plans. Roadway filling shall consist of furnishing, placing and compacting all the material in that portion of the street area located between the backs of the proposed curbs.

401.3.2 Type of Material

Material used for filling shall consist of granular or clay soils, gravel or mixtures thereof, and be free from organic, perishable and deleterious matter. Backfill material used for filling parking areas or areas which are scheduled to be sodded, seeded or topsoiled shall meet the requirements for backfilling material, see Section 401.3.4. Material used for roadway filling shall be granular material where the existing pavement area is granular in nature. Any additional subgrade material required due to a thicker than anticipated existing pavement shall be paid as roadway fill. The use of all fill material shall be subject to the approval of the Commissioner.

When the available cut material on the project or contract is insufficient or unsuitable, additional material shall be furnished by the contractor to bring the fill areas to the proper width and grade. The cost of furnishing and placing this additional material is to be included in the price bid for filling.

401.3.3 Placement of Material

Fills shall be made by depositing the material in successive horizontal layers not exceeding 12 inches in depth and shall be spread uniformly over the entire area. Where filling in 12 inch layers is not feasible as in the case of filling over steep slopes, etc., it may be constructed in one layer to the minimum elevation at which equipment can be operated. Above this elevation, the fill shall be constructed in layers of the specified depth.

401.3.4 Backfilling and Backsloping

Backfill material shall meet the requirements for filling in Section 401.3.2 except that when sodding,

seeding, or topsoiling is to be performed, the material in the top 6 inch layer shall range from a sandy loam to a clay soil and shall pass a 2 inch sieve with a minimum of 95 percent passing a 3/8 inch sieve.

Backfill material placed in areas to be sodded, seeded, or topsoiled shall be thoroughly compacted including the area behind new concrete curb and gutter. That area shall be flooded or compacted with jumping jack or vibrating plate devices to prevent settlement.

All backfilling and sloping, with the exception of the placing of the topsoil and sod, shall be completed before the pavement or base is constructed. Backfilling adjacent to existing trees shall be in accordance with Section 404.3.3.

The slope of the grading in cuts and fills shall be one and one-half to one unless otherwise directed by the Commissioner. When the fill exceeds 2 feet, an extra shoulder width (berm) equal to one-half the depth of fill shall be provided unless otherwise directed.

When backfilling alleys, pavements, or walks, 3/4 inch graded crushed gravel or stone shall be used where existing stone parking areas or driveways are encountered. The area disturbed during the construction of the alley pavement in developed areas shall be backfilled with topsoil where the placement of sod, crushed gravel or stone, or concrete walk or driveway is not required.

401.3.5 Measurement for Payment

Filling and roadway filling performed to the line and grade given will be measured as cubic yards in place, computed by the average depth method.

401.4 Unclassified Grading

401.4.1 Extent of work

Unclassified grading shall consist of placing all the material between the existing ground surface and the surface of the finished grade and/or subgrade as determined from the plans.

401.4.2 Type of Material

Material used for filling shall conform to the requirements stated in Sections 401.3.2 and 401.3.4.

401.4.3 Determination of Quantities

Elevations will be taken prior to the start of grading work on the project from which actual quantities will be calculated. The quantities will be determined using an estimated 3 inches of grading over the entire street area, and this quantity will be shown on the schedule of bid items for the purpose of obtaining a bid price. The estimated and actual quantities may differ but this variation shall not be justification for additional compensation.

401.4.4 Measurement for Payment

Unclassified grading performed to the line and grade given will be measured as cubic yards of cutting and filling in place, computed by the average depth method.

401.5 Compacted Filling

401.5.1 Extent of Work

Compacted filling shall consist of furnishing, placing and compacting to, a specified density, all the material between the existing ground surface and the surface of the finished grade and/or subgrade as determined from the plans.

401.5.2 Preparation of Subgrade

The subgrade, upon which compacted fill is to be placed, shall be free from all organic matter and topsoil. When undesirable material is encountered, the removal of this material shall be at the direction of the Commissioner and will be paid at the unit bid price for cutting. The undesirable material shall be disposed of in accordance with Section 401.2.2 unless otherwise directed by the Commissioner.

401.5.3 Placement of Material

The fill material shall be spread in successive horizontal layers not exceeding 8 inches in depth. Each layer shall be manipulated sufficiently to break down clods over 6 inches in size and to secure uniform moisture content. When the material has a moisture content too low to secure the required compaction, water shall be applied uniformly and the material manipulated and mixed until the moisture content has been increased to the desired limits. When the material has a moisture content that exceeds the optimum moisture content by more than 3.0 percent, it shall be dried until the moisture content has been reduced to the desired limits. When necessary, drying of such materials shall be accelerated by aeration or manipulation by means of blade graders, harrow, discs or other appropriate equipment.

401.5.4 Density

Compaction operations on each layer of fill material shall continue until a density of 95 percent of the maximum theoretical density is obtained. The density will be determined in the field by the use of methods outlined in A.S.T.M. Designation D1556 or D2167 or at the option of the Commissioner by the use of a nuclear meter. The maximum theoretical density of the material will be determined in the laboratory by the use of methods outlined in A.S.T.M. Designation D698.

401.5.5 Borrow Pit

The City Testing Laboratory shall be notified a minimum of 5 working days in advance of use, of the location of the borrow pit from which fill is to be obtained. Samples will be obtained and a density curve developed. If the representative sample of the material proves undesirable, the use of the borrow pit will be prohibited.

401.5.6 Measurement for Payment

Compacted filling performed to the line and grade given will be measured as cubic yards in place computed by the average depth method. When compacted filling is required and is not a bid item on the contract, payment will be at 150 percent of the bid price for filling.

401.6 Rock Excavation

401.6.1 Extent of Work

Rock excavation shall consist of removing and disposing of all hard, solid rock in ledges, bedded deposits and unstratified masses and all conglomerate deposits in the area between the existing ground surface and a point 1 foot below the

surface of the finished grade or in paved areas, 1 foot below subgrade as determined from the plans.

401.6.2 Determination of Payment for Rock Excavation

Rock excavation shall be paid when any of the material specified in 401.6.1 is of such hardness or so firmly cemented that in the opinion of the Commissioner it is not practical to excavate and remove the same except after thorough and continuous drilling and blasting or the use of special rock removal equipment.

401.6.3 Measurement for Payment

Rock excavation performed to the line and grade given will be measured as cubic yards in its original position, computed by the average depth method.

SECTION 402 REMOVALS

402.1 Pavement Removal

402.1.1 Extent of Work

Pavement removal shall consist of removing and disposing of the pavement within the limits of construction as determined from the plans.

This work may also consist of sawing the remnant of the pavement at the match or limit lines as designated or given.

402.1.2 Definition of Pavement Removal

Pavement is defined as concrete, concrete with various types of surface courses, brick, block or stone block. All other pavement types or material within the street right-of-way shall be considered unclassified material to be paid as roadway cutting.

402.1.3 Measurement for Payment

Pavement removal will be measured in square yards as the actual quantity removed within the lines designated or given. Deduction will be made for any fixture, appurtenances, or excavation in excess of one square yard. Material which must be removed from the excavation will be paid as roadway cutting, or cutting in alleys as defined in Section 401.2.3.

When the full width of the pavement and the adjacent curb and/or gutter is to be removed, the cost of removing the curb and/or gutter shall be included in the price bid for pavement removal. Measurement for payment for pavement removal will be to the back of the curb and/or gutter.

For measurement for payment for sawing see Section 402.6.3.

402.2 Surface Course Removal

402.2.1 Extent of Work

Surface course removal shall consist of removing and disposing of the surface course to the line and grade shown on the plans or directed by the Commissioner.

This work may also consist of sawing the surface course at the locations designated or given.

402.2.2 Definition of Surface Course

Surface course is defined as asphalt or macadam on a rigid base or when shown on the plans, a designated portion of a macadam pavement. All other surfaces shall be considered unclassified material to be paid as roadway cutting. See Section 401.2.3.

402.2.3 Method of Removal

Grinding equipment may be used in lieu of removing the entire surface course providing the depth to which the surface course is removed is sufficient to permit a minimum depth of 1-1/2 inches of asphalt surface to be placed.

402.2.4 Measurement for Payment

Surface course removal will be measured in square yards as the actual quantity removed within the lines designated or given. Deduction will be made for any fixture, appurtenance or excavation in excess of one square yard.

For measurement for payment for sawing see Section 402.6.3.

402.3 Curb and/or Curb and Gutter Removal

402.3.1 Extent of Work

Curb and/or curb and gutter removal shall consist of removing and disposing of the concrete or stone curb and/or gutter within the limits of construction as determined from the plans or directed by the Commissioner. This work may also consist of sawing the remnant of the curb and/or gutter at the match or limit lines as designated or given.

On projects where the existing concrete or stone curb is to be removed and curb and gutter replaced and the majority of the existing roadway is not scheduled to be removed, the work shall include the removal of the material in the roadway area up to two feet from the proposed curb face. The roadway area may contain a gutter section, pavement and/or unclassified material.

402.3.2 Measurement for Payment

Curb and/or curb and gutter removal will be measured in lineal feet as the actual length removed within the lines designated or given. Deduction will be made for the length occupied by side inlet boxes of catch basin or storm water inlet frames.

On projects where the majority of the existing roadway is not scheduled to be removed and the curb alignment is not changed, the cost of removing the material in the roadway area to be occupied by the proposed curb and/or gutter shall be included in the price bid for curb and/or curb and gutter removal.

When only the curb portion of a concrete pavement with integral curb is removed, it will be paid as curb and gutter removal to a distance of 31 inches from the back of the curb.

For measurement for payment for sawing see Section 402.6.3.

402.4 Concrete Walk and/or Driveway Removal

402.4.1 Extent of Work

Concrete walk and/or driveway removal shall consist of removing and disposing of the concrete walk and driveway within the limits of construction as determined from the plans or directed by the Commissioner.

This work may also consist of sawing the remnant of the walk or driveway at the match or limit line as designated or given.

402.4.2 Measurement for Payment

Concrete walk and/or driveway removal will be measured in square feet as the actual quantity removed within the lines designated or given. When concrete walk or driveway with integral curb is removed the width will be measured from the face of the curb to the specified limit line or outer edge. Deduction will be made for any fixture, appurtenance or excavation in excess of two square feet. Material which must be removed from these excavations will be paid as cutting, see Section 401.2.3.

For measurement for payment for sawing see Section 402.6.3.

402.5 Removals, Miscellaneous Items

402.5.1 Extent of Work

This work shall consist of the removal and disposing of concrete and masonry walls and/or footings, concrete steps, track zone and concrete traffic island, etc., to the line and grade within the limits of construction as determined from the plans or directed by the Commissioner.

Concrete step, track zone and concrete traffic island removal may also consist of sawing the remnant of these items of work at the match or limit lines as designated or given.

402.5.2 Depth of Removals

Concrete and masonry walls and boulders shall be removed to a depth of 2 feet below subgrade unless otherwise directed by the Commissioner.

402.5.3 Measurement for Payment

Concrete and masonry walls and footing removal will be measured as cubic yards within the limits of construction as determined from the plans or directed by the Commissioner.

Concrete step removal will be measured in lineal feet of tread removed within the lines designated or given.

Track zone removal will be measured in square yards as the actual quantity removed within the lines designated or given. Concrete traffic island removal will be measured in square feet as the actual quantity removed within the lines designated or given.

For measurement for payment for sawing see Section 402.6.3.

402.6 Sawing for Removals

402.6.1 Extent of Work

Sawing for removals shall consist of sawing a joint to a minimum depth of 3 inches, at the location and to the alignment shown on the plans or directed by the Commissioner.

402.6.2 Alignment Tolerance

The alignment of the sawed joint shall not deviate from the proposed alignment by more than 1/2 inch. When the alignment deviates more than 1/2 inch, the Commissioner may direct the sawing of a second line, offset and parallel to the proposed line and the cost of the additional removal, replacement and sawing to be at the contractor's expense.

402.6.3 Measurement for Payment

Sawing will be measured in lineal feet as the actual length sawed within the lines designated or given.

When sawing is noted on the plans and is not a contract bid item, the cost of this work shall be included in the price bid for the removal work. If not noted on the plans and not a contract bid item, payment will be made in accordance with Part 2 Fixed Unit Prices. If sawing is noted on the plans, is not a contract bid item, and is deleted, a credit will be taken in accordance with Part 2.

SECTION 403 RETENTION OF MATERIAL

403.1 Material Retained by the City

Salvageable culvert pipe, 24 inches or larger in diameter, shall be delivered to the Bureau of Street and Sewer Maintenance yard at 126 North 6th Street. Salvageable culvert pipe less than 24 inches in diameter shall be delivered to 8424 West Florist Avenue.

Salvageable guard rail and posts shall be delivered to the Bureau of Street and Sewer Maintenance yard at either 8424 West Florist Avenue or 126 North 6th Street.

Street signs, stop signs or other traffic control signs that interfere with construction and are necessary for traffic control as designated by the Commissioner shall be immediately reset. Signs which are not reset shall be delivered to the City sign shop at 1540 West Canal Street.

403.2 Materials Belonging to Abutting Property

Obstructions owned by abutting property owners, the removal of which is necessary to execute and complete the work, shall be placed upon the abutting property, unless otherwise directed by the Commissioner.

403.3 Material Retained by the Contractor

Any materials not retained by the City or which do not belong to the abutting property shall be removed and disposed of by the contractor.

SECTION 404 TREE CLEARING AND TREE GRUBBING

404.1 Tree Clearing and Tree Grubbing

404.1.1 Extent of Work

Tree clearing and grubbing shall consist of removing trees 4 inches or larger in diameter. Tree clearing shall consist of cutting and disposing of that portion of the tree above the root swell.

Tree grubbing shall consist of the removing and disposal of the root stump.

404.1.2 Method of Removal

Grubbing by chipping type equipment is permissible. The material chipped shall be removed prior to grading.

404.1.3 Disposal of Elm Trees and Stumps

All elm wood consisting of brush, tree limbs or logwood shall be disposed of within 5 days after being topped or cut down. If the stump is not grubbed and disposed of within 10 days, it shall be sprayed with No. 1 fuel oil. Disposal of all elm wood

shall be accomplished by chipping or burying. Other methods of disposal such as burning shall be in accordance with local regulations.

404.1.4 Measurement for Payment

Tree clearing and grubbing will be measured as inch diameter of the tree within the limits of construction as determined from the plans or directed by the Commissioner.

Measurement of the circumference and computation of diameter will be to the nearest full inch. The diameter will be computed as $1/3$ the circumference measured approximately 4-1/2 feet above the existing ground level but above the root swell.

When the tree clearing has been performed by other parties and the stump is encountered, the diameter to be used for payment purposes shall be the diameter shown on the plan. If the diameter of the tree is not indicated, the stump measurement shall be obtained by averaging the maximum and minimum diameters and multiplying by 80 percent.

Trees and stumps, 3 inches or less in diameter, will be considered unclassified material, see Section 401.1.

404.2 Root Grubbing

404.2.1 Extent of Work

Root grubbing shall consist of grubbing or otherwise removing and disposing of the roots and/or stump at a location where a tree has been previously removed by others.

The work shall also consist of grading the area to an elevation sufficient to permit proper sodding.

404.2.2 Measurement for Payment

Root grubbing will be measured as a unit as designated and/or encountered. Areas designated for root grubbing but found to contain no roots or a minimum amount of roots shall be measured and paid as cubic yards of cutting, see Section 401.1.

404.3 Root Sawing

404.3.1 Extent of Work

Root sawing shall consist of sawing tree roots prior to grading or removal operations.

404.3.2 Equipment

An approved mechanical root cutter shall be used to saw the roots which interfere with the proposed construction except in those situations where hand implement usage is specified.

404.3.3 Method of Operation

When tree roots are cut, the following provisions shall apply:

- a. Concrete Walk The root system on the walk side of the tree, shall not be cut deeper than 9 inches below the proposed elevation of the new walk and not more than 5 inches from the edge of the proposed walk. Roots below the proposed walk shall be removed only to a depth of 9 inches below the proposed elevation of the new walk.
- b. Carriage Walk Roots shall not be cut by means of mechanical root cutting machines. If root removal is essential to carriage walk

replacement, interfering roots shall be manually cut with hand implements.

- c. Curb and/or Gutter The root system on the curb side of the tree shall not be cut deeper than 18 inches below the proposed elevation of the new curb, and not more than 2 inches from the back of the proposed curb.
- d. Driveway Roots shall not be cut by means of mechanical root cutting machines. If root removal is essential to driveway replacement, interfering roots shall be manually cut with hand implements.

Caution shall be used during root cutting operations, so as not to cause unnecessary damage to the tree or its root system.

- e. Root foundations for all trees must remain adequate to withstand heavy wind storms.
- f. Root systems of street trees shall not be cut for the installation of any type of cable by the contractor or City Department. Contact Forestry Services at 278-3595 for bridging/tunneling specifications.
- g. Caution should be used during the construction process to avoid damage to the roots, trunks, and branches of all street trees. Damage caused to any street tree will be repaired by Forestry Services and the costs of repair, rejuvenation, and/or value lost will be billed to the contractor or credited against the contract at the option of the City.
- h. At locations where the contractor has not complied with the Forestry Special Requirements stated in the special provisions, the maximum clearance was

exceeded or a slip (thin) form was not used, a minimum credit of \$50.00 per location will be taken. The credit will increase in proportion to the excess distance beyond clearance allowed. The credit will be \$50.00 for each 2 inch increment or part thereof in excess of the initial clearance allowed. If, in the opinion of Forestry Services, the tree has been damaged to the point that it warrants removal, the credit that will be taken will be equal to \$100.00 per inch diameter of the tree. A field measurement will be taken to determine the tree size.

- i. All exposed and severed roots shall be painted with an asphaltic paint and the roots covered with a mulch. Immediately after the concrete work is complete, the forms shall be removed and the area between the tree and concrete work backfilled. The time duration for completion of the backfilling operations shall not exceed 24 hours from the time the concrete was placed.

Special provisions may indicate the use of thin or slip forms at designated locations. The tree roots at these locations shall be cut not more than 2 inches from the edge of the proposed concrete work.

404.3.4 Measurement for Payment

The cost of sawing tree roots shall be included in the price bid for the related grading or removal work.

SECTION 405 PREPARATION AND CARE OF SUBGRADE

405.1 Preparations of Subgrade

Before paving, the subgrade shall be shaped and rolled with a steel-wheeled roller weighing not less than 3 tons for concrete walk and driveway construction and 6 tons for other paving. A vibratory steel-wheeled roller equivalent to the required tonnage of a static roller may be used. The subgrade shall be compacted uniformly and be at the proper elevation. Areas inaccessible to the roller shall be thoroughly compacted with a mechanical tamper.

405.2 Soft Areas in Subgrade

Material in the subgrade which in the opinion of the Commissioner is not firm and stable shall be removed and suitable fill shall be placed in 8-inch layers and thoroughly compacted by rolling or mechanical tamping. If suitable fill is not available, crushed stone shall be used and placed in 8-inch layers. When ordered in writing by the Commissioner, this work will be paid as extra work in accordance with Part 2.

If an area is soft or muddy and does not dry out and stabilize when left exposed to air for a reasonable length of time as determined by the Commissioner, a suitable substitute fill shall be placed. The cutting and filling shall be paid in accordance with Part 2. When a sufficient length of time to permit this drying is not afforded due to the Contractor's construction operations or scheduling, the removal and replacement of the unsuitable material will be at the expense of the contractor.

405.3 Care of Subgrade

Any holes, ruts, or low places which develop in the finished subgrade shall be filled, leveled and firmly compacted. All unnecessary hauling on the finished subgrade shall be prohibited.

PART 5 CONCRETE CONSTRUCTION

SECTION 501 CONCRETE CONSTRUCTION (General Requirements)

501.1 Forms

501.1.1 General Requirements

Forms shall be either wood or metal and be of a height equal to the specified thickness of concrete immediately in contact. They shall be free from warps and kinks and of sufficient strength and rigidity, when staked, to resist any pressure or load to which they may be subjected.

When forms without a V-notch are used and deformed tie bars are required, the bars shall be held in place by the use of a V-notch parting strip at least 12 inches in length.

Flexible forms, either wood or metal, shall be used for construction of curves having a radius of 200 feet or less.

When the form work is adjacent to trees, the type of form used shall conform to the requirements stated in Section 404.3.

All forms shall be free from dirt and mortar and shall have a coating of oil when used.

A slip form finishing machine may be used when it can produce the required cross-section and grade. The use of the machine will be prohibited if a deviation of more than $\frac{1}{4}$ inch vertical or 1 inch horizontal is produced.

501.1.2 Metal Forms

Metal forms shall be used on all standard work and shall be of substantial section, having a flat top surface not less than 1-3/4 inches wide. The forms shall be equipped with locking devices to hold them to proper grade and alignment during the consolidation and finishing of the concrete. The locking devices shall be designed to receive metal stakes and be capable of locking the form in place. Metal stakes used in securing the forms shall be driven below the top of the form.

Form sections shall be tightly joined to prevent movement in any direction.

501.1.3 Wood Forms

Wood forms may be used in special cases, such as irregular shapes and short sections. The lumber used shall be free from warp and other imperfections which would impair the strength for the use intended.

Wood forms shall be spliced by nailing a board to the outside of the forms.

501.2 Form Setting

501.2.1 General Requirements

The subgrade shall be thoroughly compacted to within 2 inches of proper elevation prior to setting the forms. The contractor shall have at least 200 feet of forms set and subgrade prepared in advance of placing concrete.

Wood forms shall be secured by nailing to side stakes. The tops of the side stakes shall be below the upper edge of the form. The stakes shall be of

sufficient number and length to adequately resist lateral displacement of the form during concrete placement and finishing operations.

The forms shall remain in place for 24 hours after placing the concrete unless otherwise directed by the Commissioner.

When slip form equipment is employed, the contractor shall have at least 600 feet of stringline set to line and grade and subgrade prepared in advance of placing concrete.

501.3 Placing Concrete

501.3.1 Description

After compaction, the subgrade shall be checked with a full depth scratch gage. For pavement widths over 15 feet, other approved methods for checking the subgrade may be used. The contact surface of all appurtenances shall be brushed clean and the subgrade shall be thoroughly dampened just prior to the placing of the concrete.

The concrete shall be placed to the proper height, consolidated and struck off to the required cross-section. In areas where a vibrating strike-off or finishing machine is not used and consolidation is not obtained by mechanical means such as portable vibrators, etc., particular care shall be exercised to insure that the concrete is thoroughly tamped prior to being struck off. When the forms are removed and honey-combing exists, the section shall be patched with a mortar mix, see Section 905.4. This corrective work shall be completed before backfilling is permitted.

Concrete operations shall be discontinued due to insufficient natural light, unless an adequate and approved artificial lighting system is provided and operated.

The concrete shall be placed in a continuous operation between transverse joints.

501.4 Concrete Placing and Finishing Equipment

501.4.1 General Requirements

The concrete spreader shall be self-propelled and have sufficient power and traction to spread and strike off the concrete to the desired cross-section. The machine shall be equipped with a power-driven device for spreading the concrete uniformly across the prescribed pavement width. The spreading device may be either a reciprocating blade, a screw conveyor or a belt conveyor.

The finishing machine shall be self-propelled and have sufficient power and traction so as to move at a uniform speed without slipping. The machine shall be equipped with at least two oscillating transverse screeds, adjustable for crown, and designed to strike off the concrete. The finishing machine shall be equipped with a pan float consisting of a rigid frame and a transverse smoothing float suspended from and guided by the frame. The transverse float shall be adjustable for crown and produce a uniform, closed surface finish. The frame shall be self-propelled or capable of being attached to and propelled by the finishing machine.

The slip-form paver shall be a self-propelled machine designed to spread, consolidate, screed and float-finish the concrete in one complete pass of the

machine in such a manner that a minimum of hand finishing is necessary to produce a dense homogenous concrete slab. It shall be equipped with sliding forms, rigidly held together laterally and of sufficient length so that no spreading or appreciable slumping of the concrete will occur.

When operating upon a curb flange or pavement, the concrete placement finishing equipment shall be equipped with rubber-tired wheels.

All equipment shall be approved by the Commissioner prior to its use.

501.5 Date and Identification Mark

501.5.1 Description

On each project, the ends of all concrete work shall be marked with an identification stamp as shown in Figure 2.

In addition, the ends of the individual pavement section shall be imprinted with the date of its construction. The date shall be in 2-1/4 inch numerals and be counter sunk in a 12 x 24 inch rectangular troweled area located as shown in Figure 1.

501.6 Curing Procedure

501.6.1 Description

The exposed surface of the concrete shall be covered uniformly with a water impermeable curing agent immediately after finishing operations are completed, unless otherwise directed by the Commissioner. The curing agent for concrete pavement shall be a white pigmented membrane forming compound and shall be applied as a fine spray by a motor-driven power sprayer at the rate of

one gallon per 200 square feet of surface area. The curing agent used on the concrete alleys, walks, driveways, and curb and/or gutters shall be a white pigmented emulsified linseed oil curing/ sealer compound. The curing/sealer compound shall be applied as a fine spray by a motor-driven power sprayer at the rate specified by the manufacturer. Curing agents for concrete shall conform to the requirements specified in Section 902.8.

A plastic covering placed directly in contact with the concrete surface for purposes of cold weather protection and maintained in place for a 5 day period may be substituted for the curing agent.

In areas where damage due to vandalism is a possibility, the application of curing agent to concrete which has not set sufficiently to prevent this damage may be delayed until the following morning. No concrete placement will be permitted until curing agent has been applied to all concrete placed on the previous day. Curing agent shall be reapplied to all concrete which requires corrective work.

The cost of furnishing and applying the curing/ sealer agent shall be included in the price bid for the concrete work.

501.7 Protection

501.7.1 Description

Concrete work shall be closed to pedestrian traffic for 24 hours, and to vehicular traffic for 7 days, unless otherwise directed by the Commissioner. See Section 306 Special Protective Measures.

Test Cylinders may be made and used to determine the compressive strength of the concrete. When the compressive strength is 2,500 pounds per square inch or more, the concrete pavement may be opened to traffic.

Concrete placement or finishing equipment shall not be operated on recently constructed adjacent slabs or flanges until the compressive strength of the concrete exceeds 2,000 pounds per square inch.

The use of equipment which results in damage to new or existing walk, curb and/or gutter or pavement shall be prohibited.

501.8 Delivery Tickets

501.8.1 Description

A delivery ticket shall be furnished to the inspector with each load of concrete delivered to the project. This ticket shall provide the following information:

- a. Name, plant number and location of ready-mix plant
- b. Name of contractor purchasing the concrete
- c. Project location
- d. Date
- e. Cement type and brand
- f. Admixtures, type, brand and amount used
- g. Cement content (sacks per cu. yd.)
- h. Maximum size of coarse aggregate
- i. Truck number
- j. Time dispatched
- k. Amount of concrete in the load (cu. yd.)
 1. City of Milwaukee concrete class (see Table 10)

501.9 Truck Time

501.9.1 Description

Concrete shall be discharged from a truck mixer or agitator within 1-1/2 hours after the introduction of water to cement and aggregate, unless a longer time is specifically authorized by the Commissioner.

501.10 Concreting and Protection During Cold Weather

501.10.1 Concrete Placement

Concrete shall not be placed unless the official air temperature is 32°F or higher and placement operations shall cease when the official air temperature falls below 32°F. Permission to place concrete at temperatures lower than 32°F must be obtained from the Commissioner. All concrete shall be protected from freezing. Concrete damaged due to freezing shall be removed and replaced at the contractor's expense.

The official air temperature shall be the temperature reading reported at Mitchell Field or Timmerman Field whichever is closest to the job site. An approved thermometer may be maintained at the project site, and placement operations shall be governed by its readings.

Sodium chloride or any other admixture shall not be added to the concrete to prevent freezing. Calcium chloride in solution may be used as an admixture for an accelerator, when approved by the Commissioner. The use of calcium chloride in concrete mixes will not be approved after May 15th and prior to September 15th. See Section 902.4.2 for the amount of calcium chloride allowed as an admixture.

Concrete shall not be placed on a frozen subgrade. If the subgrade is frozen, the contractor may, at his expense, thaw the subgrade by suitable methods before placing concrete.

Concrete delivered when the air temperature is lower than 45°F shall arrive at the work site having a temperature not less than 50°F. Heated concrete shall not exceed 90°F at any time during its production.

501.10.2 Cold Weather Protection

When the official air temperature may be expected to drop below 32°F for a short duration, all concrete less than 24 hours old shall be covered with a plastic sheet having a width sufficient to overlap the concrete by two feet in all directions. This protection shall be maintained in place not less than 48 hours.

When the official air temperature may be expected to drop below 25°F and continue to do so for several days or more, all concrete less than 24 hours old shall be covered with the following: a plastic sheet; hay or straw not less than six inches thick; and a second plastic sheet over the layer of hay or straw. This covering shall overlap the concrete by two feet in all directions, and shall be maintained in place not less than 48 hours.

501.10.3 Measurement for Payment

Cold weather protection consisting of two layers of plastic and hay or straw, will be measured as, and equal to, the units of the work item to be protected. Payment will be made in accordance with Part 2 Fixed Unit Prices.

The cost of cold weather protection which consists of an application of a plastic sheet only, shall be included in the price bid for the concrete work.

Payment for cold weather protection shall be made only when the Commissioner directs, in writing, concrete to be placed after the first of November, and only for work which was not required by the contract documents to be completed in the same year. Payment may also be made on work scheduled to be completed earlier, but delayed past the first of November by third party construction activities.

Payment for cold weather protection will not be made on work that is constructed after the first of November for the scheduling convenience of the contractor.

When ineligible for payment, cold weather protection shall be placed as required, and done so at the contractor's expense.

501.11 Application of Water

501.11.1 Description

No water shall be applied to the surface of the concrete during the finishing operations.

SECTION 502 CONCRETE CURBS AND/OR GUTTERS

502.1 Extent of Work

502.1.1 Description

The work shall consist of preparing the subgrade and constructing the type of curb, curb and gutter, or gutter specified.

This work may also include the grading of the space to be occupied by the curb and/or gutter.

The work may also include the removal of existing pavement adjacent to the proposed curb and/or gutter to permit installation of forms.

502.2 Type of Construction

502.2.1 Concrete Curb

This construction shall consist of a curb as shown in Figure 9.

502.2.2 Roll Face Concrete Curb and Gutter

This construction shall consist of a curb and gutter built as shown in Figure 5. When reinforced curb and gutter is specified, it shall be tied to the concrete pavement or base with deformed tie bars.

502.2.3 Vertical Face Concrete Curb and Gutter

This construction shall consist of a curb and gutter built as shown in Figure 6. When required, reverse pitch curb and gutter shall be built as shown in Figure 7. When reinforced curb and gutter of either type is specified, it shall be tied to the concrete pavement or base with deformed tie bars.

502.2.4 Concrete Gutter

This construction shall consist of a gutter built independently of a curb as shown in Figures 11 and 12. When reinforced gutter is specified, it shall be tied to the concrete pavement or base with deformed tie bars.

502.2.5 Integral Concrete Curb

This construction shall consist of a curb and gutter built as shown in Figure 8. It may be constructed

separately or integrally with the pavement. When built integrally with pavement, construction details shall be as required in Section 505.4.2(c).

502.2.6 Mountable Concrete Curb and Gutter

This construction shall consist of a curb and gutter built as shown in Figure 8. It may be constructed separately or integrally with the pavement. When built integrally with pavement, construction details shall be as required in Section 505.4.2 (c).

502.2.7 Run-off Curb

This construction shall consist of a curb built integrally with the pavement as shown in Figure 10.

502.2.8 Snow-Plowable Median Island Nose

When concrete curb and gutter is constructed at the end of a median island having a radius of 3 feet or less, a snow-plowable median island nose shall be constructed as shown in Figure 14.

502.3 Materials

502.3.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follow:

Concrete (Class C', C'-W, C'-F).....	Section 902.5.2
Deformed Tie Bars.....	Section 905.7.2
Expansion Joint Material.....	Section 905.12

502.4 Construction

502.4.1 Preparation of Subgrade

The Subgrade shall be prepared in accordance with Section 405. Prior to use of a slip form curb machine, the Subgrade shall be graded, shaped and compacted

with a roller weighing not less than 6 tons or a vibratory roller equivalent to a 6-ton static roller.

502.4.2 Joints

All dummy joints shall be 2 inches in depth and ¼ inch in width, and shall be formed by hand coincident with the joints in the pavement or at approximately 20 foot intervals. An approved method of sawing or forming joints may be used in lieu of hand forming. When joints are sawed, a hand-formed joint shall be placed every 80 feet. Sawed joints shall have a minimum width of 1/8 inch, and a depth of 2 inches.

One inch expansion joint material, in one piece and cut to the cross-section of the curb and gutter, shall be placed at or near the street lines, at points of considerable change in grade or alignment, at intervals not to exceed 600 feet, at the location of expansion joints in the pavement, and where abutting existing curb or curb and gutter. On projects where intermittent removal and replacement is scheduled, expansion joint material shall be placed only at those points where it would be if all new work was being constructed.

When constructing curb adjacent to a four-flange storm water inlet or catch basin frame, two deformed tie bars shall be placed longitudinally through the curb section and extending one foot beyond each side of the frame. A dummy joint shall be cut in the curb at each side of the frame.

502.4.3 Finishing

After placing and striking off the concrete, the exposed surfaces shall be worked with a hand float until a thin uniform mortar surface is obtained. The

surface shall then be trowelled smooth with a metal hand trowel. After the water sheen has disappeared and the concrete has attained the ability to stand without slumping, the face forms are to be removed and final finishing operations using the proper top tool, gutter tool, and metal hand trowel shall be employed. All edges shall be finished with an edging tool having a radius of $\frac{1}{2}$ inch and joints shall be finished with a jointer having radii of $\frac{1}{2}$ inch and a depth of 2 inches. The face, top and flow line of the curb and gutter shall be checked with a 10 foot straight-edge and any water pockets or deviations exceeding $\frac{1}{8}$ inch shall be corrected immediately. Deviations exceeding $\frac{1}{2}$ inch in a 10 foot length on the back of curb shall be corrected. A damp soft-bristled whitewash brush or floor brush shall be used to lightly brush the trowelled surface in a direction perpendicular to the line of work.

When a slip form paver is used to place and form the work, finishing operations shall not commence until after the initial set has occurred. Operations from this point shall be similar to those described above with the exception that hand tool usage be kept to a minimum in areas where the concrete work produced by the machine substantially meets the proposed standards.

502.5 Measurement for Payment

502.5.1 Description

Concrete curb, curb and gutter, and/or gutter will be measured in lineal feet as the actual length constructed within the lines designated or given. Deductions will be made for the length occupied by catch basins or storm water inlets if storm water inlets with curb box castings are used.

The cost of constructing snow-plowable median island nose shall be included in the price bid for concrete curb and gutter.

The cost of constructing run-off curb integral with the pavement shall be included in the price bid for the pavement.

When existing pavement adjacent to the proposed curb and/or gutter is not scheduled for removal, the Commissioner may permit the removing of sufficient pavement to provide space for a form. The cost of removing this pavement shall be included in the bid price for curb and/or gutter. For measurement for payment for the concrete base, see Section 507.6.1

SECTION 503 CONCRETE WALKS AND DRIVEWAYS

503.1 Extent of Work

503.1.1 Description

The work shall consist of preparing the subgrade and constructing the type of walk or driveway specified.

The work shall also include the restoration of the gravel or crushed stone parking areas and driveways adjacent to the walk and/or driveway.

503.1.2 Incidental Work

When the city walk is constructed through an existing or proposed residential driveway, 5 inch concrete walk shall be constructed. See Figure 21.

Where existing concrete access walk is within 3 feet of the street or alley lot line, 5 inch concrete walk shall be constructed between the access walk and

proposed city walk or alley pavement if the pitch across this walk does not exceed 1 inch per foot.

Where an existing residential concrete access driveway is within 3 feet of the street or alley lot line, 5 inch concrete walk shall be constructed between the access driveway and the city walk, alley pavement or driveway if the pitch across this section does not exceed 1 inch per foot. Commercial driveways shall be 7 inches thick.

On alley reconstruction projects, where a portion of the existing access driveway or walk is removed to permit placement of forms, variable thickness concrete driveway shall be constructed between the remnants or the access driveway or walk and concrete alley pavement.

503.2 Type of Construction

503.2.1 Concrete Walk

This construction shall consist of a concrete walk, 5 inches thick unless otherwise specified.

503.2.2 Concrete Carriage Walk

This construction shall consist of a concrete walk, 5 inches thick and of the configuration shown in Figure 20.

503.2.3 Concrete Pedestrian Handicap Ramps

This construction shall consist of a concrete walk, 5 inches thick and in the location and of the configuration shown in Figures 16, 17 and 18.

503.2.4 Concrete Walk with Integral Curb

This construction shall consist of a concrete walk 5 inches thick having a curb built integrally with it, as shown in Figure 19.

503.2.5 Concrete Median

This construction shall consist of a concrete walk 5 inches thick, unless otherwise specified. See Figure 14.

503.2.6 Concrete Driveway

This construction shall consist of a concrete driveway 7 inches thick unless otherwise specified, as shown in Figures 21, 22, 23, 24, 25 and 26. An abutting integral curb may be included in the construction of the driveway.

The driveway shall be tied to the concrete curb and gutter, concrete gutter, or concrete pavement with integral curb with $\frac{1}{2}$ inch deformed tie bars 24 inches in length spaced 3 feet on centers. Driveways shall not be tied to the mountable curb and gutter.

503.2.7 Variable Thickness Concrete Walk and/or Driveway

Concrete walk or driveway may also consist of variable thickness concrete placed as fill-ins adjacent to a concrete alley on a reconstruction project. See Figure 30.

To facilitate being able to use alleys as soon as possible, and permit the contractor to comply with the time restrictions, all variable thickness concrete walk and/or driveway shall be high early strength concrete (Class A', A'-W, A'-F). The cost is to be included in the price bid. All other concrete work

constructed at the time that the variable thickness concrete is placed shall also be high early strength. The cost shall be at the contractor's expense. This procedure will permit opening the alley to traffic three days after all the concrete has been placed, provided that all backfilling and asphalt placement is also complete.

503.3 Materials

503.3.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

- Concrete (Class C', C'-F, A', A'-W, A'-F).....Section 902.5.2
- Deformed Tie Bars.....Section 905.7.2
- Expansion Joint Material.....Section 905.12

503.4 Construction

503.4.1 Description

The Subgrade shall be prepared in accordance with Section 401 and 405.

Prior to using a slip form paver the Subgrade shall be shaped and graded. It shall then be compacted with a static roller weighing not less than 3 tons or a vibratory roller equivalent to a 3-ton static roller.

Where concrete walk or concrete median is constructed adjacent to a curb, the backfill material behind the curb shall be placed in a 6 inch layers and compacted with a mechanical tamper or flushed at least 24 hours prior to placing concrete.

In areas where variable thickness concrete walk or driveway is scheduled to be placed, no additional fill

is to be placed and all loose material and debris shall be removed prior to placement of the concrete.

503.4.2 Concrete Placement

The placement of concrete shall be in accordance with Section 501.3

503.4.3 Finishing

After placing and striking off the concrete, the surface shall be worked with a long-handled wood or metal float. The surface shall then be trowelled smooth with a metal trowel. After the water glaze or sheen has disappeared, the surface shall be trowelled smooth with a long-handled metal trowel in a direction perpendicular to the line of work.

All edges shall be finished with an edging tool having a radius of $\frac{1}{2}$ inch and all dummy joints shall be finished with a jointer having radii of $\frac{1}{4}$ inch and a minimum depth of 1 inch.

A damp soft-bristled whitewash or floor brush shall be used to impart the final surface finish by lightly brushing the trowelled surface in a direction perpendicular to the line of work.

When a slip form paver is used to place and form the work, finishing operations shall not commence until after the water sheen has disappeared, then operations from that point shall conform with the procedures stated above.

When concrete walk with integral curb is built, the curb face shall be finished to a depth of 2 inches below the proposed gutter or pavement elevation.

503.5 Joints

503.5.1 Concrete Walk

Dummy joints shall be constructed at right angles to the edge of the walk and spaced at a distance equal to the width of the walk, unless otherwise directed. These joints shall be 1 inch in depth and a $\frac{1}{4}$ inch in width. Joints may be formed by an approved method of sawing. When joints are sawed, the width of the joint may be a minimum of $\frac{1}{8}$ inch.

One-half inch expansion joint material shall be installed to the full depth of the concrete at the following locations:

- a. Near the street lines and at intervals not to exceed 100 feet. On projects where intermittent removal and replacement is scheduled, expansion joint material shall be placed following each accumulative total of 100 lineal feet of new walk per block with a minimum of one expansion joint at mid-block.
- a. Where walk adjoins a curb. The walk shall be constructed $\frac{1}{2}$ inch above this curb.
- b. Where walk is built in contact with a building wall, steps, access walk, or alley. If the face of the structure at the point of contact with the walk is in such condition that the expansion joint material cannot be placed properly, it shall be installed as directed by the Commissioner.
- c. Where walk is built in contact with a hollow walk.

- d. Where hydrants or poles are located in the area to be paved. The expansion joint material shall be to the full depth of the concrete and shall be scored for bending and held securely in an abutting position.

A lap joint, as shown in Figure 29, shall be used when two or more sections of expansion joint material are required.

503.5.2 Concrete Walk with Integral Curb

Joint requirements shall be as specified in Section 503.5.1. Curb joints shall extend to a depth of 2 inches below the proposed gutter or pavement elevation.

503.5.3 Concrete Median

In medians, dummy joints shall be placed at 5 foot intervals, or as directed, and matching the curb joint whenever possible. One-half inch expansion joint material shall be placed between the median and the adjacent curb and at locations specified in Section 503.5.1.

503.5.4 Concrete Driveway

Dummy joints shall be 2 inches in depth and $\frac{1}{4}$ inch in width with the exception that when joints are sawed, the width may be minimum of $\frac{1}{8}$ inch.

A longitudinal dummy joint shall be provided at the center line and/or all joints in the gutter section. A transverse dummy joint shall be provided if the distance between the walk and curb exceeds 12 feet.

One-half inch expansion joint material shall be installed to the full depth of the concrete as shown in

Figures 16, 17, 18 20 21, and 30. A lap joint, as shown in Figure 29, shall be used when two or more sections of expansion joint material are required.

On variable thickness concrete walk or driveway construction, a hand formed transverse dummy joint shall be placed to match joints in the existing approach or walk. If no transverse joints exist, a hand formed dummy joint shall be placed approximately every five feet.

503.6 Measurement for Payment

503.6.1 Description

The walk, median and driveway will be measured in square feet as the actual area constructed within the lines designated or given.

Variable thickness concrete walk or driveway will be measured as the actual cubic yard placed within the lines designated or given.

Walk with integral curb will be measured in square feet as the actual area within the lines designated or given. The width of the walk will be measured from the face of the curb to a specified construction joint or a maximum distance of 5 feet from the face of the curb. The area beyond the 5 foot limit or construction joint will be measured as concrete walk. See Figure 19.

Driveway with integral curb will be measured in square feet as the actual area within the lines designated or given. The driveway will be measured from the face of the curb to the construction joint. See Figures 24 and 26.

Deduction will be made for any fixture, appurtenance, or opening within the paved area that has a surface area in excess of two square feet.

Concrete pedestrian handicap ramp shall be paid at the unit price bid for concrete walk.

The cost of furnishing and placing crushed gravel or stone in parking areas and driveways adjacent to concrete walk and/or driveway shall be included in the price bid for the walk and/or driveway. Where a substantial change in grade is encountered, the additional material required will be paid for on a tonnage basis.

SECTION 504 CONCRETE TRAFFIC ISLANDS

504.1 Extent of Work

504.1.1 Description

The work shall consist of preparing the base and constructing a concrete traffic island to the lines and grades shown on the plans. Construction details for a typical concrete traffic island are shown in Figure 27.

504.2 Materials

504.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

- Concrete (Class C', C'-W, C'-F).....Section 902.5.2
- Deformed Tie Bars.....Section 905.7.2
- Dowel Bars.....Section 905.7.3

504.3 Construction

504.3.1 Preparation of Base

The new or existing base or pavement shall be cleaned of all debris. Deformed tie bars shall be installed when the pavement is constructed. When the island is to be placed on an existing pavement, holes shall be drilled, the bars inserted, and the annular space mortared.

Prior to placement of the concrete, the base pavement shall be swept or flushed down.

504.3.2 Forms

Metal or wood forms may be used and shall be in accordance with Section 501.1. When forms are placed on a finished pavement, any method of holding them in place that involves drilling, indenting or defacing the surface shall not be permitted.

504.3.3 Finishing

After placing the concrete, the areas adjacent to the forms shall be spaded to insure consolidation. The concrete shall then be struck off, using a strike-off board. The surface shall be worked with a long-handled wood or metal float. Operations shall continue using a long-handled metal trowel. After the water sheen has disappeared and the concrete has attained the ability to stand without slumping, the forms are to be removed and final finishing operations consisting of the proper top tool and metal hand trowel shall be employed. When a concrete traffic island is to be built on a concrete base or pavement that is to be resurfaced, the curb face shall be finished to a depth of 2 inches below the proposed pavement elevation.

All edges shall be finished with an edging tool having a radius of 1-1/2 inches and all dummy joints shall be finished with a jointer having radii of 1/4 inch and a minimum depth of 2 inches. A damp whitewash or floor brush with soft bristles shall be used to impart the final surface finish by lightly brushing the trowelled surface and face.

504.4 Joints

504.4.1 General

All joints shall be 2 inches in depth and 1/4 inches in depth and 1/4 inch in width. Joints may be formed by an approved method of sawing. When the joints are sawed, the width of the joints may be a minimum of 1/8 inch.

504.4.2 Transverse Joints

Dummy joints shall be placed to conform to the joint or crack pattern in the existing base or pavement. If no joint or cracks exist, transverse joints shall be placed approximately 20 feet apart.

504.4.3 Longitudinal Joints

A longitudinal dummy joint shall be placed in the island if the island is constructed over a longitudinal pavement joint.

504.5 Measurement for Payment

504.5.1 Description

Concrete traffic island will be measured in square feet as the actual area constructed within the lines designated or given. The cost of constructing and finishing the curb face shall be included in the price bid for the concrete traffic island.

SECTION 505 CONCRETE PAVEMENTS

505.1 Extent of Work

505.1.1 Description

The work shall consist of preparing the subgrade and constructing the type of pavement specified.

505.2 Types of Construction

505.2.1 Concrete Pavement

This construction shall consist of a Portland Cement concrete pavement of specified thickness.

505.2.2 Concrete Pavement – Inverted Crown

This construction shall consist of a Portland Cement concrete pavement of specified thickness.

505.2.3 Concrete Pavement with Integral Curb

This construction shall consist of Portland Cement concrete pavement of specified thickness, having a curb constructed integrally with it. The machine method of finishing shall be used unless otherwise directed by the Commissioner.

505.3 Materials

505.3.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Concrete (Class C, C-W, C-F).....	Section 902.5.2
Deformed Tie Bars.....	Section 905.7.2
Dowel Bars.....	Section 905.7.3
Expansion Joint Material.....	Section 905.12
Joint Sealer.....	Section 905.11

505.4 Construction

505.4.1 Preparation of Subgrade

The Subgrade shall be prepared in accordance with Section 401 and 405.

Prior to using a slip-form paver, the Subgrade shall be shaped and graded, and compacted with a roller weighing not less than 6 tons or a vibratory roller equivalent to a 6-ton static roller.

505.4.2 Finishing

(a) Hand Method – After the concrete has been deposited, it shall be struck off to the required elevation with a vibrating strike-off gage or template cut to the exact crown of the pavement. This gage or template shall go over each area of pavement as many times as required to produce a closed, uniform surface.

Following the strike off operation, the surface shall be floated in a transverse direction with a straight aluminum or magnesium channel, not less than 10 feet long and 6 inches wide operated by the use of the attached long handle. Each application of this float shall overlap the previous one by one-half its length. When separate floating operations are applied from each side of the pavement strip, each application shall extend to a point where there will be minimum 12 inch overlap at the center of the concrete strip. When the floating operation is applied from only one side of the pavement strip, it shall extend to a point within 12 inches of the opposite edge of the strip. All necessary corrections shall be completed and a satisfactory surface produced before the floating sequence is permitted to advance. Mechanical longitudinal floats or pan floats may be substituted

for the above floating operation. The channel is not a substitute for the straight edge.

After floating, the surface shall be scraped with a 10 foot metal straight edge and any deviations exceeding 1/8 inch shall be corrected immediately. Each application of the straight edge shall overlap the previous one by one-half its length.

A long-handled steel trowel having a minimum length of 24 inches shall be used to remove any marks left by the tools used to float, finish and check the surface.

The surface shall be finished by dragging a seamless strip of damp burlap length wise over the full width of the surface with a minimum of three feet of the burlap in contact with the concrete. The burlap shall be attached to a rolling bridge and dragged a minimum of two times over the surface or as often as necessary to obtain a satisfactory finish. Other suitable material or methods which produce a uniform anti-skid surface may be used with the permission of the Commissioner.

An edging tool with a one-half inch radius shall be used to finish all bonded and expansion joints and pavement edges. All hand-formed transverse joints shall be finished using a jointer having radii of 1/2 inch, a depth of 2 inches, and a flange width of 12 inches or more. Following the use of these tools, the surface shall be lightly brushed in a direction parallel to the joint using a damp soft bristled floor brush.

(b) Machine Method - After the concrete has been uniformly deposited, a finishing machine with screeds set to the exact crown of the pavement shall

be used to strike off the concrete to the required elevation. The pavement shall be struck off as many times as necessary to produce a smooth, uniform surface.

Following the final pass of the finishing machine, the floating and finishing operations shall continue as described under Hand Method. When a slip-form paver is employed, the finishing operations shall commence with the use of a straight edge.

(c) Concrete Pavement with Integral Curb - The machine method of finishing shall be used in constructing this type of pavement unless otherwise directed by the Commissioner.

The flow line shall be checked with a 10 foot straight edge and flow tested with water. All water pockets shall be corrected immediately. To avoid any scouring action, the water shall be poured upon a piece of burlap or other suitable material. The curb shall be given its final finish by brushing lightly in a transverse direction with a damp, soft-bristled whitewash or floor brush.

505.5 Width and Number of Pavement Strips

505.5.1 Concrete Pavement

Pavement strips shall not exceed 40 feet in width between longitudinal bonded joints. Bonded and/or dummy longitudinal joints shall be located as shown in Table 3, unless otherwise directed by the Commissioner. The pavement shall not be placed by the hand method when the strip exceeds 21 feet in width.

The machine method of finishing shall be used on all streets having a pavement width of 32 feet or more in width and on all divided lane roadways, unless otherwise directed by the Commissioner.

For pavements between 21 feet and 32 feet in width, a rigid vibrating metal truss screed, adjustable for crown and designed to strike off and consolidate the concrete, may be used on a construction project with pavement less than 600 feet in length, or if so provided in the contract special provisions. The vibrating truss screed shall go over each area of pavement as many times as required to produce a closed uniform surface. Following the strike off operation, the finishing operation shall continue as described in Section 505.4.2(a) Hand Method.

505.5.2 Concrete Pavement – Inverted Crown

The pavement shall be constructed in two strips with a longitudinal bonded joint 2 feet from the centerline for widths up to and including 26 feet; for widths over 26 feet, the pavement shall be constructed in three strips with a longitudinal bonded joint 5 feet to the right and left of the centerline.

505.5.3 Concrete Pavement with Integral Curb

The width and number of longitudinal strips for various widths of roadway shall be as shown in Table 3, unless otherwise directed by the Commissioner. There shall be a minimum of 2 strips.

TABLE 3
LOCATION AND TYPE OF LONGITUDINAL
JOINTS
Width of Longitudinal Strips Between Joints (Feet)

Single Roadway Width (Feet)	C/L					
30		13	13			
32		14	14			
34		15	15			
36	6	10	10	6		
40	7	11	11	7		
44	9	11	11	9		
48	10	12	12	10		
50	10	13	13	10		
60	6	11	11	11	6	
64	6	12	12	12	6	
66	7	12	12	12	7	
24	(Divided Roadway)			10	10	
26				11	11	
30				9	11	6
31				10	11	6
32				10	11	7
33				10	11	8
34				10	11	9
36				10	12	10
20	(Service Road)		8	8		
22			9	9		
24			10	10		

All joints may be bonded or dummy joints, See Figure 28.

Pavement strips shall not exceed 40 feet in width between longitudinal bonded joints.

For widths other than those shown, the joints are to be constructed as directed by the Commissioner.

The location and type of longitudinal joints shall be as shown in Table 3 except that the pavement placement sequence may be altered with the permission of the Commissioner because of the employment of special equipment and the attainment of the required elevations without altering the design grades.

505.5A Pavement Crown

505.5A.1 Requirements

All concrete pavements shall be constructed with a transverse parabolic curvature unless otherwise noted on the plans or directed by the Commissioner. This requirement shall apply whether the pavement is constructed full or partial width.

The ordinates for the parabolic curvature shall be as shown in Figure 4.

505.6 Joints

505.6.1 Requirements

All dummy joints shall be 2 inches in depth and $\frac{1}{4}$ inch in width.

Joint sawing operations shall commence within 12 hours or as directed by the Commissioner. The sawing of all transverse joints shall be completed within 24 hours and the sawing of all longitudinal joints shall be completed within 48 hours.

505.6.2 Longitudinal

Longitudinal joints shall be bonded or dummy joints as shown in Figure 28 and shall be parallel to the centerline of the roadway unless otherwise directed. The dummy joint shall be formed by an approved method of sawing.

When design grades permit and the concrete pavement is constructed integral with the curb and gutter section, the joint and required reinforcement may be omitted.

505.6.3 Transverse Joints

Transverse joints shall be dummy joints as shown in Figure 28 and placed at approximately 20 foot intervals. When paving is terminated, a bonded joint as shown in Figure 28 shall be provided unless otherwise directed. Dummy joints shall be formed by hand or an approved method of sawing.

Transverse joints shall extend across the pavement at right angles to the centerline unless otherwise directed. When curb and gutter is constructed, the joint in the pavement and in the curb and gutter shall form a continuous straight line. Where integral curb is constructed, the joint shall extend through the pavement and curb.

In pavement strips 11 feet or more in width, the joints shall be formed by an approved method of sawing, except that a hand-formed joint shall be provided every 80 feet. The joints in pavement strips less than 11 feet wide shall be hand-formed unless otherwise directed by the Commissioner.

505.6.4 Special Locations for Expansion Joint Material

One-half inch expansion joint material shall be placed for the full depth of the concrete where the pavement is constructed adjacent to a building or other permanent structure. If the face of the structure at the point of contact with the pavement is in such condition that the expansion joint material cannot be placed properly, it shall be installed as directed by the Commissioner.

Where pavement is placed adjacent to a pole, ½ inch expansion joint material shall be scored and bent around it to the full depth of the concrete and held securely in an abutting position.

A lap joint, as shown in Figure 29, shall be used when two or more sections of expansion joint material are required.

505.7 Measurement for Payment

505.7.1 Description

Concrete pavements will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance, or opening within the paved area that has a surface area in excess of one square yard.

SECTION 506 CONCRETE ALLEY PAVEMENT

506.1 Extent of Work

506.1.1 Description

The work shall consist of preparing the subgrade and constructing a Portland Cement concrete pavement 7

inches thick unless otherwise specified, to a cross-section similar to the one shown in Figure 30.

The work may also include the restoration of the gravel or crushed stone areas and garden or ground areas adjacent to the alley pavement.

To facilitate being able to use alleys as soon as possible and permit the contractor to comply with the time restrictions, all variable thickness concrete walk and/or driveway shall be high early strength concrete (Class A', A'-W, A'-F) cost to be included in the price bid. All other concrete work that is constructed at the time that the variable thickness concrete is placed shall also be high early strength. The cost shall be at the contractor's expense. This procedure will permit opening the alley to traffic, three days after all the concrete has been placed, providing that all backfill and asphalt placement is also complete.

506.2 Materials

506.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Concrete (Class C, C-W, C-F).....	Section 902.5.2
Deformed Tie Bars.....	Section 905.7.2
Dowel Bars.....	Section 905.7.3
Expansion Joint Material.....	Section 905.12

506.3 Construction

506.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Section 401 and 405.

506.3.2 Finishing

After the concrete has been deposited, it shall be struck off to the required elevation with a strike-off gage or template cut to the exact cross-section of the pavement. This gage or template shall go over each area of pavement as many times as required to produce the desired closed uniform surface. The surface shall be floated in a transverse direction with a straight aluminum or magnesium channel not less than 10 feet long and 6 inches wide, operated by the use of the attached long handle. Each application of this float shall overlap the previous one by one-half its length. Separate floating operations shall be applied from each side of the pavement when the pavement is constructed full width. Where the use of this channel is not workable, such as special ramps or grades, or irregular areas, a long-handled metal float having a minimum length of 48 inches shall be used to float finish the pavement surface. The flow line shall be checked with a 10 foot straight-edge and flow tested with water. All water pockets shall be corrected immediately. The aluminum or magnesium channel shall then be used to incorporate this flow line towards both pavement edges producing the desired typical alley cross-section. The edges of the pavement shall be finished with an edging tool having a ½ inch radius. The final surface finish shall be imparted by brushing with a damp, soft-bristled floor brush or alternate surface finish approved by the Commissioner.

506.4 Width and Number of Pavement Strips

506.4.1 Description

Concrete alley pavements greater than 15 feet wide and up to 26 feet wide shall be constructed in two strips, with a longitudinal bonded joint 2 feet from

the centerline. Alleys greater than 26 feet wide shall be constructed in three strips with a longitudinal bonded joint 5 feet to the right and left of the centerline. Widths of 15 feet or less, or where obstructions prevent the use of concrete placing equipment, may be constructed in one strip with the approval of the Commissioner. When an alley is paved in one strip, a dummy joint shall be sawed 2 feet from the centerline.

506.5 Joints

506.5.1 Requirements

All dummy joints shall be 2 inches in depth and $\frac{1}{4}$ inch in width.

Joint sawing operations shall commence within 12 hours or as directed by the Commissioner. Sawing operations shall be completed within 48 hours.

506.5.2 Longitudinal

Longitudinal joints shall be bonded or dummy joints as shown in Figure 28. The groove for dummy joints shall be formed by an approved method of sawing.

506.5.3 Transverse

Transverse joints shall be dummy joints as shown in Figure 28, with the exception that a one inch expansion joint shall be placed at or near the walk line. This expansion joint shall not require the use of dowel bars or basket. Transverse joints shall extend across the pavement at right angles to the centerline unless otherwise directed and be placed at all poles located within the pavement areas. When paving is terminated at a joint other than an expansion joint, a bonded joint as shown in Figure 28, shall be provided.

When additional expansion joints are specified, installment shall be as shown in Figure 29 and shall be placed at the locations shown on the plan.

When installing an expansion joint, the top edge of the expansion joint material shall be covered for its full length with a channel cap or wood strip prior to the final finishing of the joint. A lap joint, as shown in Figure 29, shall be used when two or more sections of expansion joint material are required.

506.5.4 Special Locations for Expansion Joint Material

One-half inch expansion joint material shall be placed for the full depth of the concrete where the pavement is constructed adjacent to a building or other permanent structure. If the face of the structure at the point of contact with the pavement is in such condition that the expansion joint material cannot be placed properly, it shall be installed as directed by the Commissioner.

Where the pavement is placed adjacent to a pole, ½ inch expansion joint material shall be scored and bent around it to the full depth of the concrete and held securely in an abutting position.

A lap joint, as shown in Figure 29, shall be used when two or more sections of expansion joint material are required.

506.6 Measurement for Payment

506.6.1 Description

The pavement will be measured in square yards as the actual area constructed within the lines designated or given. Deductions will be made for any

fixture, appurtenance or opening within the paved area that has a surface area in excess of one square yard.

On alley construction projects, the cost of furnishing and placing crushed stone in parking areas or topsoil in the garden areas adjacent to the pavement shall be included in the price bid for the concrete alley pavement. Where a substantial change in grade is encountered, the additional material required will be paid for on a tonnage and/or cubic yard basis.

SECTION 507 CONCRETE BASE

507.1 Extent of Work

507.1.1 Description

The work may consist of preparing the Subgrade and constructing a Portland Cement concrete base of specified thickness.

The work may also include the construction of a concrete header integral with the base.

On resurfacing projects, the work may also include constructing a Portland Cement concrete base, 6 inches in thickness on residential streets and 8 inches in thickness on arterial streets, in the optional pavement removal area adjacent to the new curb and gutter.

507.2 Materials

507.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Concrete (Class F).....	Section 902.5.2
Deformed Tie Bars.....	Section 905.7.2
Expansion Joint Material.....	Section 905.12

507.3 Construction

507.3.1 Preparation of Subgrade

The Subgrade shall be prepared in accordance with Sections 401 and 405.

In areas where variable thickness concrete base is to be placed, no additional fill is to be placed and all loose material and debris shall be removed before placement of the concrete.

507.3.2 Finishing

After placement, the concrete shall be floated on an even closed surface.

507.4 Width and Number of Pavement Strips

507.4.1 Description

The width and number of longitudinal strips for various widths of roadway shall be as shown in Table 3, unless otherwise directed by the Commissioner.

507.5 Joints

507.5.1 Requirements

All dummy joints shall be 2 inches in depth and ¼ inch in width.

507.5.2 Longitudinal

Longitudinal joints shall be bonded or dummy joints as shown in Figure 28 and shall be parallel to the centerline of the roadway, unless otherwise directed.

507.5.3 Transverse

Transverse joints shall be dummy joints as shown in Figure 28, and shall be provided at or near the intersecting street lines and at 40 foot intervals. Transverse joints shall extend across the pavement at right angles to the centerline unless otherwise directed.

When paving is terminated, a bonded joint as shown in Figure 28, shall be provided.

In non-roadway areas, the location of all transverse joints shall be as specified.

507.6 Measurement for Payment

507.6.1 Description

The base of specified thickness will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance, or opening within the paved area that has a surface area of one square yard or more.

Variable thickness base will be measured as the actual cubic yards placed within the lines designated or given.

The cost of constructing a concrete header, integral with the base, shall be included in the price bid for the concrete base. Concrete base with an integral

header shall be measured in square yards and is to include the horizontal area occupied by the header.

When existing pavement adjacent to the proposed curb and gutter is not scheduled for removal, the Commissioner may permit the removal of sufficient pavement to provide space for a flange form. The cost of removing this pavement shall be included in the bid price for curb and gutter. Concrete base, 6 inches in thickness on residential streets, and 8 inches in thickness on arterial streets, shall be constructed in areas where this additional pavement has been removed and will be paid for on a square yard basis up to a maximum width of 9 inches.

SECTION 508 CONCRETE SLURRY BASE

508.1 Extent of Work

508.2.1 Description

The work shall consist of preparing the Subgrade and constructing a concrete slurry base of specified thickness along the curb and gutter of macadam resurfacing projects.

508.2 Materials

508.2.1 Description

The material shall meet the requirements specified in Part 9, Materials, as follows:

Concrete Slurry Base.....Section 902.6

508.3 Construction

508.3.1 Preparation of Subgrade

The Subgrade shall be prepared in accordance with Section 401 and 405.

In areas where variable thickness concrete slurry base is to be placed, no additional fill is to be placed and all loose material and debris shall be removed prior to placement of the slurry base.

508.3.2 Finishing

After placement, the concrete slurry base shall be leveled with hand tools.

508.4 Measurement for Payment

508.4.1 Description

The concrete slurry base of specified thickness will be measured in square yards as the actual area constructed within the lines designated or given.

Variable thickness concrete slurry base will be measured as the actual cubic yards placed within the lines designated or given.

SECTION 509 CONCRETE HEADER

509.1 Extent of Work

509.1.1 Description

The work shall consist of preparing the Subgrade and constructing a Portland Cement concrete header of specified width, integral with the concrete base.

509.2 Material

509.2.1 Description

The material shall meet the requirements specified in Part 9, Materials, as follows:

Concrete (Class F).....Section 902.5.2

509.3 Construction

509.3.1 Preparation of Subgrade

The Subgrade shall be prepared in accordance with Sections 401 and 405.

509.3.2 Finishing

After placement, the concrete shall be floated to a closed smooth surface. The top surface shall be trowelled smooth and its edges shall be finished with an edging tool having a one-half inch radius. After the water sheen has disappeared, the surface shall be re-trowelled and re-edged and brushed lightly with a damp, soft-bristled whitewash or floor brush.

509.4 Joints

509.4.1 Transverse

Transverse joints, 2 inches in depth and $\frac{1}{4}$ inch in width, shall be placed to conform to the joints in the concrete base.

509.5 Measurement for Payment

509.5.1 Description

The cost of constructing a concrete header integral with the base shall be included in the price bid for the concrete base unless it is a separate bid item.

PART 6

ASPHALT CONSTRUCTION

SECTION 601 ASPHALT PAVEMENT CONSTRUCTION

601.1 Extent of Work

601.1.1 Description

The work shall consist of cleaning and preparing the base and placing the type and thickness of asphalt mix specified.

On granular base projects, the work may also include shaping and compacting the existing or new granular base or pavement.

On resurfacing projects on asphalt or concrete pavements, the work shall also include the removal of excess joint and crack sealing material.

601.2 Mixture Composition and Usage

601.2.1 Asphalt Binder

Asphalt binder shall be composed of asphalt cement and fine and coarse aggregate with the maximum size of coarse aggregate being $\frac{3}{4}$ inch or $\frac{1}{2}$ inch as specified. Recycled asphaltic pavement materials may be substituted for virgin materials to the extent that a maximum of 30 percent reclaimed material by weight may be blended with 70 percent virgin materials.

This mix may be used as a leveling course of variable thickness on resurfacing projects and may be placed to within 1- $\frac{1}{2}$ inches of the proposed roadway elevation. On granular base projects, the mix may be used as a base course of specified thickness and shall

be placed to within the specified depth of the surface course of the proposed roadway elevation.

601.2.2 Asphalt Concrete

Asphalt concrete shall be composed of asphalt cement and fine and coarse aggregate. The maximum size of coarse aggregate shall be ½ inch, 3/8 inch or ¼ inch as specified.

This mix is to be used as a surface course of variable or specified thickness on resurfacing projects. On granular base and stage construction projects, this mix is used as a surface course of specified thickness.

601.2.3 Sheet Asphalt

Sheet asphalt shall be composed of asphalt cement and fine aggregate.

This mix is used as a surface course of variable or specified thickness on resurfacing projects.

601.3 Type of Construction

601.3.1 Pavement Resurface

This type of construction involves cleaning and preparing the roadway surface, tack coating where necessary and placement of an asphalt overlay on the existing asphalt, brick, block, concrete or macadam pavement. The average depth of fill required will determine the number of layers, depths and types of asphalt mixes to be used.

601.3.2 Stage Construction

The first stage of this construction involves shaping the crushed stone base course or soil subgrade and placing an asphalt binder. After the binder has been used by traffic, the second stage of this construction

involves the cleaning and tack coating of the asphalt binder course and placing the asphalt concrete surface course.

601.3.3 Asphalt Concrete on Granular Base

This type of construction involves shaping the existing or new crushed gravel or stone and placing a surface course.

601.3.4 Alley Resurface

This type of construction involves cleaning and preparing the surface, tack coating and placing a surface course on the existing asphalt, block, brick, concrete or macadam alley pavement.

601.4 Materials

601.4.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Aggregates for Asphalt Mixture.....Section 903.4
Asphalt Cement.....Section 903.1
Asphalt Paving Mixtures.....Section 903.7
Emulsified Asphalt.....Section 903.3
Liquid Asphalt (Cut Back).....Section 903.2
Mineral Filler.....Section 903.5
¾ Inch Graded Crushed Gravel.....Section 904.2
¾ Inch Graded Crushed Stone.....Section 904.2
¾ Inch Recycled Crushed Pavement Materials
.....Section 904.3

601.5 Base Preparation

601.5.1 Pavement Resurface

All unstable patches and joint and crack sealing material in excess of 3/8 inches above the pavement shall be removed. The pavement surface shall be cleaned of all loose material and debris.

Areas, where only one layer of asphalt material is to be placed, shall be tack coated with emulsified asphalt Type SS-1 or MS-1 at the rate of 0.04 to 0.08 gallons per square yard. A project on which binder has been placed and time has elapsed (2 days) before the surface course is placed, the area shall be fog coated prior to asphalt placement operation. Emulsified asphalt Types SS-1 or MS-1 may be used with the permission of the Commissioner.

601.5.2 Stage Construction

After the completion of the shaping and compacting of crushed stone base course or soil subgrade and the placement of the asphalt base, the roadway shall be opened to traffic.

Prior to the placement of the surface course, the base course shall be cleaned and tack coated emulsified asphalt Type SS-1 or MS-1 at the rate of 0.04 to 0.08 gallons per square yard. Contact surfaces of curbs, flanges, underground appurtenances and other structures shall be painted with emulsified asphalt before the surface course is placed.

601.5.3 Granular Base

The new or existing granular material in the roadway shall be shaped to conform to the required subgrade of the proposed cross-section. The material shall be compacted and where necessary, new material, $\frac{3}{4}$ inch graded crushed stone or gravel shall be added to bring the surface to the proper subgrade elevation. If necessary, water shall be added during the compaction operations to obtain proper compaction. A 10 ton steel-wheel roller or vibratory roller equivalent to a 10 ton static roller shall be used to compact the subgrade. In addition, a mechanical

tamper shall be used to compact the material along the gutter flanges and around underground structures and appurtenances.

601.5.4 Alley Resurface

Base preparation on an alley surface project shall be similar to the requirements in Section 601.5.1

601.5.5 Sewer Frame Adjustment (Asphalt Resurface Projects)

The work shall be constructed in accordance with Section 810 and Figure No. 43.

601.6 Construction

601.6.1 Transportation of Mixtures

Asphalt mixtures shall be transported from the mixing plant to the work site in vehicles having tight, clean and smooth boxes. The inside surface of the boxes shall be cleaned of all foreign materials and shall be lightly coated with an approved release material before loading.

601.6.2 Temperature at Time of Asphalt Placement

Asphalt mixtures shall be placed at temperatures that conform to the requirements specified in Table 4.

TABLE 4
TEMPERATURE
AT TIME OF ASPHALT PLACEMENT

Temperature of Mixture	
Asphalt Binder	225°F to 325°F
Asphalt Concrete	225°F to 325°F
Sheet Asphalt	300°F to 375°F
Temperature of Air	
Asphalt Binder	Not less than 35°F
Asphalt Concrete	Not less than 40°F
Sheet Asphalt	Not less than 40°F

601.6.3 Delivery Tickets

A delivery ticket shall be furnished to the City with each load of asphalt material delivered to the project site. This ticket shall provide the following information.

- a. Name, plant number and location of the plant
- b. Name of contractor purchasing the material
- c. Project location
- d. Date
- e. Type of mixture
- f. Maximum size of aggregate
- g. Truck number
- h. Net weight of the load

Each ticket shall have the weight stamped by an automatic type register beam platform scale or marked by a bonded weigh master.

601.6.4 Placement

The asphalt materials shall be placed upon a base that is free from standing water, loose and foreign materials and shall not be placed during a rain.

Contact surfaces of curbs, flanges, underground appurtenances and other structures shall be painted with emulsified asphalt before the surface course is placed. The surface course shall be placed uniformly high so that after compaction it will be approximately $\frac{1}{4}$ inch higher than adjacent gutter flanges or other structures.

A finishing machine shall be used to place all asphalt materials except where the use of a machine is impractical. The machine shall be a self-propelled unit with screeds adjustable for crown and depth, suitable screed heating devices, and an approved mechanical means of compacting the asphalt material.

The Contractor shall place the asphalt surface in a number of parallel longitudinal passes to the width and crown shown on the plans. The placement sequence may be altered, with the permission of the Commissioner, because of the employment of special equipment. Such alterations may be granted if the elevations are met without altering the design grades. A written request for sequence alteration must be received by the Commissioner thirty (30) days prior to the date of asphalt placement.

For the alleys 15 feet wide or less, or those with restricted clearance, the required asphalt placing and finishing machine shall be capable of a transverse crown adjustment from at least negative (inverted) 2 inches to a positive $\frac{1}{2}$ inch in 5 feet.

The screed or strike-off assembly shall produce a finished surface of uniform closed texture with no visible signs of tearing, shoving, gouging or ridges. The screed shall be capable of being adjusted to the exact crown and cross-section of the finished pavement as shown on the plan. The width of each strip placed shall conform to the design or cross-section shown on the plan and shall not exceed the width the screed or strike off assembly is capable of extending to.

The finishing machine shall lap previously placed material a minimum of 3 inches and the material left sufficiently high to allow for compaction. The longitudinal joints in each course shall be offset from the previous course by a minimum of 6 inches.

A leveling course of asphalt material shall be placed in all depressions or holes 1 inch or more in depth and at all locations where the existing pavement or gutter is faulted or settled prior to the using of the finishing machine.

A maximum compacted depth of 3 inches may be placed in one lift. When the total depth of variable thickness asphalt binder or surface course is greater than 3 inches, leveling courses shall be placed so that the final surface course is approximately 1- $\frac{1}{2}$ inches in depth.

601.6.5 Compaction

The recommended sequence in rolling the asphalt material is as follows:

- a. Transverse joints
- b. Longitudinal joints
- c. Outside edge
- d. Initial or break down rolling
- e. Second rolling
- f. Finish rolling

A minimum of two rollers shall be used at all times unless otherwise directed by the Commissioner. Rolling equipment shall include a steel-wheel roller weighing not less than 10 tons and a pneumatic-tire roller. In lieu of a static roller, a vibratory roller equivalent to a 10 ton static roller may be used, but not for finish rolling on the wearing surface.

Rolling shall follow as soon as possible after asphalt placement; however, sufficient time shall have elapsed so that the surface will not blister under the roller.

Rolling shall continue until the surface density is not less than 95 percent of the density of the same material obtained in laboratory control tests. Pavement density will be determined by nuclear meter in accordance with ASTM Designation D2950.

Places not accessible to the 10 ton roller shall be compacted with a mechanical tamper, or small power roller.

601.6.6 Joints

When the surface has cooled to a temperature of 140°F or less, the edges of the joint shall be painted with a tack coat, or reheated to the point of softening with an infra-red joint heater, before work is resumed. When the joint becomes distorted, the edges of the joint shall be trimmed to line and painted with tack coat before work is resumed.

Joints shall always be above 140°F when another mat is placed alongside. The above conditions (below 140°F) should only exist due to a breakdown or at the staggered joints left at the end of a day.

On all garage approaches where placement of asphalt results in feathered edges, the edges shall be sealed with joint sealer and the cost included in the price of the asphalt surface.

601.6.7 Straight-edging

The wearing surface shall be checked with a 10 foot straight edge. Any deviations exceeding ¼ inch shall be corrected immediately.

At the completion of paving a 6 foot long straight-edge shall be placed over the centerline of each manhole frame parallel to the direction of traffic. If the manhole frame is lower than the adjacent pavement, a measurement between the manhole and the straight-edge shall be made at each side of the frame. If the frame is higher than the adjacent pavement, a measurement between the pavement and the straight-edge shall be made at each end of the straight-edge. The two measurements will be averaged.

If this average is 5/8 inch or less but greater than 3/8 inch, a credit will be taken equal to 50 percent of the contract unit bid price for sewer frame adjustment.

If this average is greater than 5/8 inch, a credit will be taken equal to 100 percent of the unit bid price for sewer frame adjustment, or the manhole will be reset to the correct plane and elevation at the direction of the Commissioner.

601.7 Protection

601.7.1 Description

The asphalt pavement shall be protected until adequately cooled to sustain traffic without damage.

Unnecessary walking on the hot surface course shall be prohibited. Where adjustments to appurtenances result in surface disturbance, additional material, if necessary, shall be placed and the area raked and luted prior to the initial rolling.

Care shall be taken to protect concrete driveway surfaces from the tire marks of the tack coat. Should these marks occur they shall be removed, without damage to the concrete surface at the contractor's expense.

601.8 Samples

601.8.1 Description

One nuclear meter determination will be observed from each paving machine pass per city block with a minimum of 4 determinations per project as detailed in Section 311.1.

601.9 Measurement for Payment

601.9.1 Description

Asphalt material bid on a square yard basis will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance, or opening within the paved area that has a surface area of one square yard or more.

Asphalt material bid on a tonnage basis will be paid as the actual tonnage placed and accepted.

The cost of removing the excess crack and joint sealing material shall be included in the price bid for the asphalt.

The cost of shaping and compacting the granular base shall be included in the price bid for the asphalt.

On stage construction projects, the cost of cleaning the asphalt base course shall be included in the price bid for base preparation for the asphalt surface.

SECTION 602 MANHOLE ADJUSTING RINGS

602.1 Extent of Work

602.1.1 Description

The work shall consist of furnishing and installing a cast iron manhole adjusting ring of specified height.

The work also includes removal of any existing 1 inch lids and returning them to the sewer maintenance yard. Rings that are removed become the property of the contractor.

602.2 Materials

602.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Manhole Adjusting Rings.....	Section 905.6
Emulsified Asphalt.....	Section 903.3

602.3 Installation

602.3.1 Placement

Prior to placement of the asphalt surface course, the existing sanitary sewer manhole cover shall be removed, the seat cleaned and tacked with emulsified asphalt, the proper size adjusting ring inserted, and the cover replaced. On existing storm and combined sewer manholes, the seat shall be tacked with an emulsified asphalt.

The height of the adjusting ring may be specified or designated but rings of different heights must be available so that the proper height ring can be installed to conform to the actual asphalt surface.

602.4 Measurement for Payment

602.4.1 Description

Manhole adjusting rings will be measured as the number of actual units supplied and installed.

When the item is not included on the schedule of bids, the adjusting rings will be furnished by the City and installed by the contractor. The cost of installing these rings shall be included in the price bid for the asphalt. See Section 305.5.

SECTION 603 PAVEMENT GRINDING

603.1 Extent of Work

603.1.1 Description

The work shall consist of grinding either the existing concrete or bituminous pavement to the depth specified. When significant areas of concrete are to be ground, it will be a separate bid item.

603.2 Equipment

603.2.1 Description

The equipment shall be a self-propelled unit with rotary cutters or revolving cutting heads designed to completely remove the existing surface to the specified depth without damaging the adjacent pavement, appurtenances, or concrete structure. The equipment shall include a recovery system designed to keep the work site relatively dust free. When water is employed, the resulting slurry runoff shall not be permitted to enter the City sewer system.

603.3 Method of Operation

603.3.1 Description

The equipment shall be operated in such a manner that the minimum specified depth of grinding is attained over the entire width of the designated area. Areas not at the specified minimum depth shall be reground.

Immediately after grinding, the area shall be swept and/or vacuumed of all loose material and debris, in accordance with Section 305.10.

When the existing concrete pavement is reinforced with mesh, all wire which is visible and loose after the grinding operation shall be trimmed off and

removed. The cost of this work shall be included in the item of pavement grinding.

After the surface stripping or milling is complete, asphalt operations shall be scheduled within 3 working days. The only exception may be for unforeseen concrete base replacement. An additional day or more will be allowed dependent on the extent of the new concrete base replacement required.

All holes or depressions that have developed, which are greater than 2 inches in depth, shall be filled with asphalt. The fill material may be binder or the ¼ inch mix and shall be placed in an acceptable manner and properly compacted.

During traffic use, precautions shall be taken to protect all transverse butt joints formed by grinding.

603.4 Measurement for Payment

603.4.1 Description

Pavement grinding will be measured in square yards as the actual area ground within the lines designated or given for the type of pavement ground.

SECTION 604 CRACKING AND SEATING CONCRETE PAVEMENT

604.1 Extent of Work

604.1.1 Description

The work shall consist of cracking and seating the existing concrete pavement prior to constructing concrete curb and gutter.

604.2 Equipment

604.2.1 Description

The device used to crack the pavement shall be capable of exerting a minimum of 12,000 foot pounds of energy. Cracking devices which cause undue displacement of the concrete or damage drainage facilities, utilities or other property or which destabilize the subgrade shall not be used. A vibratory roller equivalent to a 10 ton static roller shall be used to seat the cracked concrete. A water tank shall also be on the job site so the pavement can be lightly watered to make the cracking sequence more visible.

604.3 Method of Operation

604.3.1 Description

The concrete pavement, after cracking, shall have pieces approximately four to six square feet in area. The greatest dimension of the piece shall be oriented transversely with the centerline of the pavement. The pieces shall be cracked and seated without undue displacement. The broken surface shall be rolled sufficiently to firmly seat and lay the cracked pieces to an even surface. Pieces that continue to have a rocking motion shall be broken into smaller pieces and rerolled. After rolling and before use by traffic and again prior to the placement of the asphalt leveling course, the surface of the cracked and seated pavement shall be cleaned by removing dust, dirt, debris or other foreign or loose material.

604.4 Measurement for Payment

604.4.1 Description

The pavement will be measured in square yards as the actual area cracked and seated within the lines designated or given. All operations, including

cleaning, shall be included in the price bid for cracking and seating.

SECTION 605 PLASTIC LANE MARKERS

605.1 Extent of Work

605.1.1 Description

The work shall consist of marking locations, and obtaining and installing the plastic lane marking material.

605.2 Materials

605.2.1 Description

The plastic lane marking material shall be furnished by the City. The material shall be obtained at the Traffic Sign Shop at 1540A West Canal Street.

605.3 Placement

605.3.1 Notification

The Bureau of Traffic Engineering and Electrical Services shall be notified two working days prior to placement of the asphalt pavement. Personnel from this Bureau may be assigned to assist and check the installation of the marking materials.

605.3.2 Location

The material shall be installed at the locations shown on the Bureau of Traffic Engineering and Electrical Services plan.

605.3.3 Placement

The lane marking material shall be placed immediately following the use of the rubber-tire roller.

The proposed layout shall be marked upon the hot asphalt surface. The backing material shall be completely removed and the marking material applied. A light hand roller shall be used to obtain initial contact, and a 10 ton steel-wheeled roller shall be used to complete the installation. The water apparatus should be turned off on the steel-wheeled roller during this operation. Care shall be used to avoid any directional change while the roller wheels are in contact with the marking material.

605.3.4 Repairs

The cost of any repairs necessary because of defects in the placement of the material shall be done at no cost to the City.

605.4 Measurement for Payment

605.4.1 Description

Plastics lane markers will be measured in lineal feet as the actual length placed within the lines designated or given.

SECTION 606 ASPHALT CURB CONSTRUCTION

606.1 Extent of Work

606.1.1 Description

The work shall consist of preparing the base and constructing the type and section of curb as shown in Figure 33.

606.2 Materials

606.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Aggregates for Asphalt Mixture.....Section 903.4

Asphalt Cement.....	Section 903.1
Asphalt Paving Mixtures.....	Section 903.7
Emulsified Asphalt.....	Section 903.3
Liquid Asphalt (Cut Back).....	Section 903.2
Mineral Filler.....	Section 903.5

606.3 Construction

606.3.1 Base Preparation

The pavement surface shall be cleaned of all dirt, debris or other foreign material. A tack coat of emulsified asphalt Type SS-1 or MS-1 shall be applied at the rate of 0.04 to 0.08 gallons per square yard.

606.3.2 Transportation of Mixtures

Asphalt mixtures shall be transported according to the requirements stated in 601.6.1.

606.3.3 Temperature at Time of Asphalt Placement

Asphalt placement shall not be permitted if the air temperature is less than 40°F unless otherwise directed. The temperature of the asphalt mixture shall be between 225°F to 325°F.

606.3.4 Delivery Tickets

A delivery ticket shall be furnished to the City with each load of asphalt material delivered to the project site. The information on the ticket shall conform to the requirements stated in 601.6.3.

606.3.5 Placement

A curb finishing machine, approved by the Commissioner, shall be used to construct the asphalt curb. It shall be capable of receiving the hot asphalt mixture, forming it to the required shape, properly compacting the material by vibratory compactors or

mechanical tamper, and extruding a curb with a smooth closed surface.

When the quantity of curb does not warrant the use of a machine, the curb may be constructed by approved hand placing and shaping methods. A wood or metal form shall be set to the elevation and alignment at the back side of the curb and the mixture placed against it. After a sufficient amount has been placed, it shall be shaped to an approved cross-section and tamped.

606.3.6 Straight-edging

The face and top of the curb shall be checked with a 10 foot straight edge. Any deviations exceeding $\frac{1}{4}$ inch shall be corrected.

606.4 Protection

606.4.1 Description

The asphalt curb shall be protected until adequately cooled to prevent damage from traffic.

Unnecessary disturbance of the hot curb shall be prohibited. When adjustments to appurtenances result in a disturbance of the curb, this section shall be corrected immediately.

606.5 Measurement for Payment

606.5.1 Description

Asphalt curb placed by machine will be measured in lineal feet as the actual length constructed within the limits designated or given. Deductions will be made for the length occupied by catch basins or storm water inlets, unless four-flanged frames are used.

When not included in the schedule of bid items on the contract, the cost of constructing short sections for asphalt curb shall be included in the price bid for the asphalt concrete pavement and the quantity of asphalt used will be included in the tonnage placed and accepted in accordance with Section 601.8.

The cost of preparing the base shall be included in the price bid for the asphalt curb.

SECTION 607 ASPHALT DRIVEWAY CONSTRUCTION

607.1 Extent of Work

607.1.1 Description

The work shall consist of preparing the crushed stone base and constructing the asphalt base and driveway surface to the cross-section as shown in Figure 32A.

The cost of furnishing and applying the tack coat on the back of the curb is to be included in the price bid for tack coat.

607.2 Materials

607.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Aggregates for Asphalt Mixtures.....	Section 903.4
Asphalt Cement.....	Section 903.1
Asphalt Paving Mixtures.....	Section 903.7
Emulsified Asphalt.....	Section 903.3
Liquid Asphalt (Cut Back).....	Section 903.2
Mineral Filler.....	Section 903.5
1- ½ Inch Graded Crushed Stone.....	Section 904.2

607.3 Construction

607.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Section 405.

607.3.2 Placement of Crushed Stone Base

The crushed stone base shall be placed in accordance with Section 701 with the exception that the base shall be 5 inches unless otherwise specified.

607.3.3 Tack Coat

The back of the curb and all appurtenances shall be tacked with emulsified asphalt prior to placement of the wearing surface.

607.3.4 Transportation of Asphalt Mixture

The asphalt mixture shall be transported according to the requirements stated in 601.6.1.

607.3.5 Temperature at Time of Asphalt Placement

Asphalt placement shall not be permitted if the air temperature is less than 40°F unless otherwise directed. The temperature of the asphalt mixture shall be between 225°F to 325°F.

607.3.6 Delivery Tickets

A delivery ticket shall be furnished to the City with each load of asphalt material delivered to the project site. The information on the ticket shall conform to the requirements of 601.6.3.

607.3.7 Placement of Asphalt

The asphalt material shall be placed upon a base that is free from standing water and loose and foreign material and shall not be placed during a rain.

607.3.8 Compaction

A mechanical tamper shall be used to compact the asphalt binder. A steel-wheel power roller shall be used to compact the wearing surface.

Rolling or tamping shall follow as soon as possible after asphalt placement; however, sufficient time shall have elapsed so that the surface will not blister under the roller or tamper.

Rolling or tamping shall be continued until a density of not less than 95 percent of laboratory Marshall Method is obtained.

607.4 Protection

607.4.1 Description

The asphalt driveway shall be protected from traffic until the sides are properly backfilled.

Care shall be taken to protect the concrete curb and gutter from tack coat marks left from the vehicles' wheels. Should these marks occur, they shall be removed without damage to the concrete surface at the contractor's expense.

607.5 Samples

607.5.1 Description

Density computation shall be made according to the requirement stated in Section 601.8 with the exception that when no cores are taken, the density shall be calculated directly from nuclear meter readings with no correction factor.

607.6 Measurement for Payment

607.6.1 Description

Asphalt driveway will be measured in square feet as the actual area constructed within the lines designed or given. Deduction will be made for any fixture, appurtenance, or opening within the paved area that has a surface area of two square feet or more.

The cost of preparing the crushed stone base shall be included in the price bid for the asphalt driveway.

SECTION 608 ASPHALT WALK CONSTRUCTION

608.1 Extent of Work

608.1.1 Description

The work shall consist of preparing the subgrade and constructing the asphalt walk.

608.2 Materials

608.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Aggregates for Asphalt Mixture.....	Section 903.4
Asphalt Cement.....	Section 903.1
Asphalt Paving Mixtures.....	Section 903.7
Mineral Filler.....	Section 903.5

608.3 Construction

608.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Section 405.

608.3.2 Transportation of Asphalt Mixture

The asphalt mixture shall be transported according to the requirements stated in 601.6.1.

608.3.3 Temperature at Time of Asphalt Placement

Asphalt placement shall not be permitted if the air temperature is less than 40°F unless otherwise directed. The temperature of the asphalt mixture shall be between 225°F to 325°F.

608.3.4 Delivery Tickets

A delivery ticket shall be furnished to the City with each load of asphalt material delivered to the project site. The information on the ticket shall conform to the requirements of 601.6.3.

608.3.5 Compaction

The asphalt material shall be placed upon a base that is free from standing water and loose and foreign materials and shall not be placed during a rain.

608.3.6

A small power roller, approved by the commissioner shall be used to compact the asphalt. Areas not accessible to the roller shall be compacted with a mechanical tamper.

Rolling or tamping shall follow as soon as possible after asphalt placement; however, sufficient time shall have elapsed so that the surface will not blister under the roller or tamper.

Rolling or tamping shall be continued until a dense, smooth surface is obtained.

608.4 Measurement for Payment

608.4.1 Description

Asphalt walk bid on a square foot basis will be measured in square feet as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance or opening within the paved area that has a surface area of two square feet or more.

Asphalt walk bid on a tonnage basis will be measured as the actual tonnage placed and accepted.

SECTION 609 TACK COAT

609.1 Extent of Work

609.1.1 Description

The work shall consist of furnishing and applying a tack coat.

The work shall include applying a tack coat to all existing pavement and contact surfaces of curbs, flanges, underground appurtenances and other structures.

609.1.2 Materials

609.1.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Aggregates for Asphalt Mixtures.....	Section 903.4
Asphalt Cement.....	Section 903.1
Asphalt Paving Mixtures.....	Section 903.7
Emulsified Asphalt.....	Section 903.3
Liquid Asphalt (Cut Back).....	Section 903.2
Mineral Filler.....	Section 903.5
1- ½ Inch Graded Crushed Stone.....	Section 904.2

609.2 Application

609.2.1 Description

The existing base or pavement shall be tack coated at the rate specified in the section describing the method of construction of the asphalt item. The contact surfaces of pavements, curbs, flanges, underground appurtenances, and other structures shall be tack coated.

The exact amount of the material applied shall be measured by a method approved by the Commissioner. The measurement shall be to the nearest whole gallon. A delivery ticket shall be furnished to the City immediately after application.

609.2.2 Equipment

The equipment shall be capable of applying the material uniformly under pressure. Hand method applications shall be used only with the approval of the Commissioner and only in areas where it is impractical to use the equipment.

609.3 Measurement for Payment

609.3.1 Description

Tack coat will be measured in gallons as the actual amount applied within the lines designated or given. Deductions will be made when, in the opinion of the Commissioner, an excessive amount was placed.

The cost of applying a tack coat to the contact surfaces of pavements, curbs, flanges underground appurtenances and other structures shall be included in the price bid for the tack coat.

SECTION 610 GRANULAR BASE PREPARATION

610.1 Extent of Work

610.1.1 Description

The work shall consist of reshaping and compacting the existing granular base.

The work may also include the furnishing and placing of additional granular material to bring the base to the proposed subgrade elevation.

610.2 Materials

610.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

¾ Inch Graded Crushed Gravel.....Section 904.2

610.3 Construction

610.3.1 Description

After the asphalt surface has been removed, the granular base shall be reshaped to conform to the proposed cross-section. The material shall be compacted and where necessary, new material, ¾ inch graded crushed gravel, shall be added during the compaction operations and properly compacted. A 6 ton steel-wheel roller or vibratory roller equivalent to a 6 ton static roller shall be used. The completed subgrade shall be at an elevation which will permit the placement of a nominal 2- ½ inch asphalt concrete surface course.

610.4 Measurement for Payment

610.4.1 Description

Granular base preparation will be measured in square yards as the actual area prepared within the

lines designated or given. Deduction will be made for any fixture, appurtenance, or opening within the proposed pavement area that has a surface area of one square yard or more.

Crushed gravel will be measured as the actual tonnage placed and accepted and paid at the Fixed Extra Price.

SECTION 611 BASE PREPARATION FOR ASPHALT SURFACE

611.1 Extent of Work

611.1.1 Description

The work shall consist of cleaning and preparing the roadway surface prior to the placement of the tack coat or asphalt course.

611.2 Equipment

611.2.1 Description

The equipment used shall conform to existing ordinances regarding air and noise pollution limitations.

611.3 Work Required

611.3.1 Description

The existing pavement surface shall be cleaned of all loose material, vegetation and debris. All joint and crack sealing material in excess of 3/8 inches above the surface of the pavement shall be removed from the surface of the pavement.

611.4 Measurement for Payment

611.4.1 Description

Base preparation shall be paid as a lump sum. When the required work is being performed on an

acceptable basis, partial payment will be made in accordance with the following schedule.

When 10 percent or more of the original asphalt total tonnage has been placed, 25 percent of the bid amount will be paid. When 20 percent or more of the original asphalt total tonnage has been placed, 50 percent of the bid amount will be paid. When 30 percent or more of the original asphalt total tonnage has been placed, 75 percent of the bid amount will be paid.

No additional payment beyond the amount of the lump sum total will be made even if one or more projects on the contract require a second or additional cleaning.

PART 7

CRUSHED STONE OR GRAVEL CONSTRUCTION

SECTION 701 CRUSHED STONE BASE

701.1 Extent of Work

701.1 Description

The work shall consist of preparing the subgrade and constructing a crushed stone base of specified thickness.

701.2 Materials

701.2.1 Description

The material shall meet the requirements specified in Part 9, Materials, as follows:

¾ Inch Graded Crushed Stone.....	Section 904
1- ½ Inch Graded Crushed Stone.....	Section 904
2- ½ Inch Crushed Stone.....	Section 904
¾ Inch Recycled Crushed Pavement Materials	Section 904
1- ½ Inch Recycled Crushed Pavement Materials	Section 904

701.3 Construction

701.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Sections 401 and 405.

701.3.2 Placement and Consolidation

When the specified thickness of the base is 4 inches, the material may be placed in one layer. The 1- ½ inch graded crushed stone or recycled crushed concrete shall be spread upon the prepared subgrade and shaped to the proposed cross-section. The

material shall be compacted by rolling with a pneumatic tire wobble-wheel roller weighing not less than 10 tons or a vibratory roller equivalent to a 10 ton static roller for time duration equal to one hour for each 1,000 square yards of base constructed. At the end of this time, the surface of the base shall be reshaped, and if necessary, additional material added and rerolled. To facilitate compaction, the surface may be thoroughly flushed with water applied by using a pressure distributor.

When the specified thickness of the base is more than 4 inches 2- ½ inch crushed stone shall be spread on the prepared subgrade and shaped to within 2 inches of the proposed elevation of the finished base, and rolled. After compaction, a 2 inch layer of ¾ inch graded crushed stone or recycled crushed concrete shall be spread and shaped to the proposed cross-section. The base shall then be rolled with pneumatic tire wobble-wheel roller weighing not less than 10 tons or a vibratory roller equivalent to a 10 ton static roller for a time duration equal to one hour for each 1,000 square yards of base construction. At the end of this time, the surface of the base shall be reshaped, and if necessary, additional ¾ inch material added and rerolled. The use of water will be permitted to facilitate compaction.

701.4 Delivery Tickets

701.4.1 Description

A delivery ticket shall be furnished for each load of material delivered to the project site. This ticket shall provide the following information:

- a. Name and location of pit
- b. Name of contractor purchasing material

- c. Project location
- d. Date
- e. Type and size of material
- f. Truck name and number
- g. Net weight of the load

Each ticket shall have the weight stamped by an automatic type register beam platform scale or marked by a bonded weigh master.

701.5 Measurement for Payment

701.5.1 Description

Crushed stone base will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance or opening within the area given that has a surface area of one square yard or more.

SECTION 702 CRUSHED GRAVEL BASE

702.1 Extent of Work

702.1.1 Description

The work shall consist of preparing the subgrade and constructing a crushed gravel base 3 inches thick unless otherwise specified. Crushed stone or recycled crushed pavement materials may be substituted for the crushed gravel.

702.2 Materials

702.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

- $\frac{3}{4}$ Inch Graded Crushed Gravel.....Section 904
- $\frac{3}{4}$ Inch Graded Crushed Stone.....Section 904

702.3 Construction

702.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Sections 401 and 405.

702.3.2 Placement and Consolidation

The crushed gravel or recycled crushed concrete shall be spread upon the prepared subgrade in one layer and shaped to the proposed cross-section. The material shall be compacted by rolling with a roller weighing not less than 6 tons or a vibratory roller equivalent to a 6 ton static roller. When conditions warrant, water shall be applied during the rolling operations to insure proper compaction. At the end of this time, the surface of the base shall be reshaped, and if necessary, additional material added and rerolled.

702.4 Delivery Tickets

702.4.1 Description

A delivery ticket shall be furnished for each load of material delivered to the project site. The information on the ticket shall conform to the requirements stated in Section 701.4.1

702.5 Deletion of Base

702.5.1 Description

The Commissioner may at his discretion delete the placement of the crushed gravel base on any or all portions of the project. No adjustments in the other contract unit bid prices shall be allowed because of this deletion

702.6 Measurement for Payment

702.6.1 Description

Crushed gravel base will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance or opening within the paved area that has a surface area of one square yard or more.

SECTION 703 CRUSHED STONE DRIVEWAY

703.1 Extent of Work

703.1.1 Description

The work shall consist of preparing the subgrade and constructing a crushed stone driveway 6 inches thick unless otherwise specified.

703.2 Materials

703.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

- ¾ Inch Graded Crushed Stone.....Section 904
- ¾ Inch Recycled Crushed Pavement Materials
.....Section 904

703.3 Construction

703.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Sections 401 and 405.

703.3.2 Placement and Consolidation

When the specified thickness is 4 inches or greater, the ¾ inch material shall be spread upon the prepared subgrade in one layer and shaped to the proposed cross-section. The material shall be

compacted with a roller weighing not less than 6 tons or a vibratory roller equivalent to a 6 ton static roller. In areas inaccessible to a roller, a mechanical tamper shall be used.

703.4 Delivery Tickets

703.4.1 Description

A delivery ticket shall be furnished for each load of material delivered to the project site. The information on the ticket shall conform to the requirements stated in Section 701.4.1.

703.5 Measurement for Payment

703.5.1 Description

Crushed stone driveway of a specified thickness will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance or opening within the area given that has a surface area of one square yard or more.

Variable thickness crushed stone driveway will be measured as the actual tonnage placed and accepted.

SECTION 704 CRUSHED STONE SHOULDER

704.1 Extent of Work

704.1.1 Description

The work shall consist of preparing the subgrade and constructing a crushed stone shoulder 6 inches thick unless otherwise specified.

704.2 Materials

704.2.1 Description

The material shall meet the requirements specified in Part 9, Materials, as follows:

- ¾ Inch Graded Crushed Stone.....Section 904
- ¾ Inch Recycled Crushed Pavement Materials
.....Section 904

704.3 Construction

704.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Sections 401 and 405.

704.3.2 Placement and Consolidation

When the specified thickness is 4 inches or greater, the ¾ inch material shall be spread upon the prepared subgrade in one layer and shaped to the proposed cross-section. The material shall be compacted with a roller weighing not less than 6 tons or a vibratory roller equivalent to a 6 ton static roller.

Depositing or stockpiling the crushed stone on the concrete or asphalt pavement shall be prohibited.

704.4 Delivery Tickets

704.4.1 Description

A delivery ticket shall be furnished for each load of material delivered to the project site. The information on the ticket shall conform to the requirements stated in Section 701.4.1

704.5 Measurement for Payment

704.5.1 Description

Crushed stone shoulder will be measured in square yards as the actual area constructed within the lines

designated or given. Deduction will be made for any fixture, appurtenance or opening within the area given that has a surface area of one square yard or more.

SECTION 705 GRAVEL FILLING

705.1 Extent of Work

705.1.1 Description

The work shall consist of preparing the subgrade and placing gravel fill of variable thickness. Crushed stone or recycled crushed pavement materials may be used in lieu of crushed gravel.

705.2 Materials

705.2.1 Description

The material shall meet the requirement specified in Part 9, Materials, as follows:

- Crushed Stone.....Section 904
- ¾ Inch Graded Crushed Gravel.....Section 904
- ¾ Inch Recycled Crushed Pavement Materials
.....Section 904

705.3 Construction

705.3.1 Preparation of Subgrade

Before placement of the gravel, the area shall be cleared of all debris, organic matter and topsoil. When undesirable material is encountered, the removal of this material shall be at the direction of the Commissioner and will be paid at the unit bid price for cutting. The undesirable material shall be disposed of in accordance with Section 403 unless otherwise directed by the Commissioner.

705.3.2 Placement and Consolidation

The material shall be spread in successive horizontal layers, each not exceeding 8 inches in depth. Each layer shall be compacted.

705.4 Delivery Tickets

705.4.1 Description

A delivery ticket shall be furnished for each load of material delivered to the project site. The information on the ticket shall conform to the requirements stated in Section 701.4.1.

705.5 Measurement for Payment

705.5.1 Description

Gravel filling will be measured as the actual tonnage placed and accepted.

SECTION 706 CRUSHED STONE WALK

706.1 Extend of Work

706.1.1 Description

The work shall consist of preparing the subgrade and constructing a crushed stone walk 4 inches thick unless otherwise specified.

706.2 Materials

706.2.1 Description

The material shall meet the requirements specified in Part 9, Materials, as follows:

¾ Inch Graded Crushed Stone.....	Section 904
¾ Inch Recycled Crushed Pavement Materials	
.....	Section 904

706.3 Construction

706.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Sections 401 and 405.

706.3.2 Placement and Consolidation

The material shall be spread upon the prepared subgrade in one layer and shaped to the proposed cross-section. The material shall be compacted.

706.4 Delivery Tickets

706.4.1 Description

A delivery ticket shall be furnished for each load of material delivered to the project site. The information on the ticket shall conform to the requirements stated in Section 701.4.1.

706.5 Measurement for Payment

706.5.1 Description

Crushed stone walk will be measured as the actual tonnage placed and accepted.

PART 8

MISCELLANEOUS CONSTRUCTION

SECTION 801 CONCRETE SLOPE PAVING

801.1 Extent of Work

801.1.1 Description

The work shall consist of preparing the subgrade and constructing a concrete slope pavement 5 inches thick unless otherwise specified.

The work may also include the installation of weep holes and crushed stone.

801.2 Materials

801.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Concrete (Class C).....	Section 902.5
Deformed Tie Bars.....	Section 905.7.2
Expansion Joint Materials.....	Section 905.12
Curing Agents.....	Section 902.8
Crushed Stone.....	Section 904.1
and.....	Section 904.2

801.3 Construction

801.3.1 Preparation of Subgrade

The subgrade shall be prepared in accordance with Sections 401 and 405 with the exception that a mechanical tamper shall be used to compact the subgrade.

801.3.2 Forms and Form Setting

The type and placement of forms shall be in accordance with Section 501.1

801.3.3 Placement and Finishing

Concrete placement and finishing operations shall conform with Section 501.3 and 503.4.3.

801.4 Joints

801.4.1 Horizontal Construction

When the concrete slope pavement is constructed in horizontal strips, the vertical joints shall be dummy or expansion joints and constructed at right angles to the horizon and spaced at 10 foot intervals otherwise directed by the Commissioner. Horizontal joints shall be bonded joints and constructed parallel to the horizon and spaced at 5 foot intervals unless otherwise directed by the Commissioner.

801.4.2 Vertical Construction

When the concrete slope pavement is constructed in vertical strips, the vertical joints shall be bonded or expansion joints constructed at right angles to the horizon and spaced at 5 foot intervals unless otherwise directed by the Commissioner. Horizontal joints shall be dummy joints and constructed parallel to the horizon and spaced at 5 foot intervals unless otherwise directed by the Commissioner.

801.4.3 Type of Joint

Bonded joints shall be as shown in Figure 28. Dummy joints shall be 1 inch in depth and $\frac{1}{4}$ inch in width. When joints are sawed, the width of the joint may be $\frac{1}{8}$ inch.

Expansion joints shall be installed at intervals not exceeding 50 feet and shall contain $\frac{1}{2}$ inch expansion joint material to the full depth of the concrete.

801.5 Weep Holes

801.5.1 Description

When the slope pavement exceeds a vertical rise of 12 feet, weep holes shall be installed.

A 2 inch minimum diameter galvanized steel or PVC pipe shall be inserted horizontal for the full depth of the concrete at a point 1 foot above the bottom of the slope pavement and at 10 foot intervals. The exposed end of the pipe shall be flush with the concrete surface. One cubic foot of crushed stone shall be placed at the approximate location of the weep hole prior to the placement of the concrete.

801.6 Measurement for Payment

801.6.1 Description

Slope pavement will be measured in square yards as the actual area constructed within the lines designated or given. Deduction will be made for any fixture, appurtenance, or opening within the paved area that has a surface area of 1 square yard or more.

The cost of furnishing and installing the weep holes and crushed stone shall be included in the price bid for the concrete slope pavement.

SECTION 802 STEEL PLATE BEAM GUARD

802.1 Extent of Work

802.1.1 Description

The work shall consist of furnishing and installing timber posts and steel plate beam guardrail as specified in Figures 33 and 34.

802.2 Materials

802.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Steel Plate Beam Guard.....	Section 905.8
Timber Posts.....	Section 905.9

802.3 Installation

802.3.1 Description

The posts shall be placed in a vertical position 12 feet 6 inches on center in holes excavated to a depth of 3 feet 6 inches below finished grade. After the posts are placed, the holes shall be backfilled with approved material compacted in layers. The posts shall then be driven to a firm bearing, and the top of the post shall be sawed off so that the final elevation will be 25 inches above finished grade for Type I and 54 inches for Type II. The sawed cross-section of the posts shall be painted with two coats of creosote oil or approved equal.

After the posts have been set to proper line and grade, holes to receive the bolts for attaching the beam rail to the posts shall be bored at the proper elevation. The beam rail shall be attached to the posts by the use of 5/8 inch bolts, secured with a washer and nut. Bolts extending beyond the torqued nut by more than 1 inch shall be cut off at a point not more than 1/2 inch from the nut. Sections of the beam rail shall be connected together by the use of 5/8 inch bolts secured with nuts. The threaded end of all bolts shall be burred.

802.4 Measurement for Payment

802.4.1 Description

Steel plate beam guard will be measured in lineal feet as the actual length constructed within the lines designated or given.

The cost of furnishing and installing the wood posts, steel plate beam guardrail and hardware shall be included in the price bid for the steel plate beam guard.

SECTION 803 WOOD BARRICADE

803.1 Extent of Work

803.1.1 Description

The work shall consist of furnishing and installing timber posts and wood guard rail as specified in Figure 35.

The work shall also consist of painting the barricade.

803.2 Materials

803.2.1 Description

The materials shall be the requirements specified in Part 9, Materials, as follows:

Timber Posts.....	Section 905.9
Wood Guard Rail.....	Section 905.10

803.3 Installation

803.3.1 Description

The posts shall be placed in holes excavated to a depth of 3 feet 6 inches below finished grade and the holes backfilled with approved materials, compacted in layers. The posts shall be driven to a firm bearing and the top of the post sawed off so that the final

elevation will be 3 feet 6 inches above finished grade. The sawed cross-section of the post shall be painted with two coats of creosote oil or approved equal.

The wood guardrail shall be attached to the posts as shown in Figure 35. The top of the rail shall be 3 feet above the finished grade. The face of the rail shall be painted with alternating strips of luminescent orange and white. The top, bottom and back of the rail shall be painted white.

803.4 Measurement for Payment

803.4.1 Description

Wood barricade will be measured as the number of actual units installed.

The cost of painting the barricade shall be included in the price bid for the wood barricade.

SECTION 804 SEEDING

804.1 Extent of Work

804.1.1 Description

The work shall consist of preparing the seed bed, furnishing and distributing the grass seed, mulch and fertilizer and establishing and maintaining growth.

804.2 Materials

804.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Fertilizer.....	Section 905.13
Grass Seed.....	Section 905.14
Mulching Material.....	Section 905.15

804.3 Placement

804.3.1 Preparation of Seed Bed

Immediately prior to seeding, the area shall be worked with discs, harrows or other appropriate equipment until an even and loose seed bed is obtained.

804.3.2 Fertilization

Fertilizer shall be spread at the rate of 5 pounds per 100 square feet. The fertilizer and grass seed mixture may be placed in one operation, when equipment designed for that purpose is used.

804.3.3 Sowing

The grass seed shall be sown at the rate of 4 pounds per 1,000 square feet.

The seed may be sown by means of a pressurized stream or spray of water if an approved type of machine designed for that purpose is used. When using this machine, the seed mixture and water shall be placed into the tank, provided within the machine, in sufficient quantities that when the contents of the tank are sprayed on a given area, the seed will be uniformly spread at the required rate of application. During this process the contents of the tank shall be kept stirred or agitated.

804.3.4 Mulching

The seed area shall be mulched with straw, hay, or other suitable material of a similar nature which is substantially free of noxious weed seeds and objectionable foreign matter. The mulch shall be blown from a machine, and uniformly deposited over designated areas in one operation, to a loose depth of one to two inches. The rate of application shall be 75

to 100 gallons of emulsified asphalt per ton of mulching material and 1- ½ to 2 tons of mulching material per acre, unless otherwise directed by the Commissioner.

804.4 Measurement for Payment

804.4.1 Description

Seeding will be measured in square yards as the actual area placed within the lines designated or given.

SECTION 805 SODDING

805.1 Extent of Work

805.1.1 Description

The work shall consist of preparing the sod bed, furnishing and placing the fertilizer and sod, and maintaining rolling, watering and establishing sod growth.

805.2 Materials

805.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

- Fertilizer.....Section 905.13
- Sod.....Section 905.16
- Topsoil.....Section 905.17

805.3 Placement

805.3.1 Sod Bed Preparation

The sod bed shall be brought to an elevation 2 inches below the proper sod subgrade elevation, and all stones, weeds, roots, construction debris or other foreign material shall be removed. A minimum 2-inch layer of screened topsoil shall then be spread on

compacted soil material and raked to grade. The topsoil will be paid as a separate bid item in accordance with Section 806.4, Topsoil.

805.3.2 Fertilizing

Fertilizer shall be spread at the rate of 2 pounds per 100 square feet, and shall be spread uniformly on the prepared sod bed and thoroughly incorporated into the topsoil.

805.3.3 Sod Placement

Each strip of sod shall be laid abutting snugly against previously laid sod, existing asphalt, grass or concrete. All exposed sod edges shall be covered with topsoil. The sod may be laid uniformly in either direction but strips of sod 6 inches or less in width shall not be placed.

On all slopes steeper than 1 foot vertical in 4 feet horizontal, the sod shall be staked or pegged with a minimum of 4 pegs per square yard, unless otherwise directed by the Commissioner. The pegs or stakes shall be no greater than $\frac{1}{4}$ inch by $\frac{1}{2}$ inch by 6 inches in length and the top of the stake or peg shall be driven flush with the sod.

805.4 Establishing Growth

805.4.1 Description

After the sod has been placed, it shall be watered sufficiently to permit a flattening when rolled. After rolling, the sod shall be maintained and watered until growth has been established. The maintenance shall become the responsibility of the property owner only after growth has been established and the sod work accepted by the Commissioner. Under normal weather conditions and proper maintenance and

watering the acceptance of the work should be 10 days after all the sod has been placed.

805.5 Measurement for Payment

805.5.1 Description

Sodding will be measured in square yards as the actual area placed within the lines designated or given.

The cost of furnishing and installing the fertilizer, watering and establishing growth shall be included in the price bid for sodding.

SECTION 806 TOPSOIL

806.1 Extent of Work

806.1.1. Description

The work shall consist of preparing the subgrade, furnishing, placing, and leveling the topsoil and cleaning the work site.

806.2 Materials

806.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Topsoil.....Section 905.17

806.3 Placement of Topsoil

806.3.1 Description

Prior to placement of topsoil, the work shall be backfilled as specified in Section 401.2 and graded to a subgrade 2 inches below finished grade of the topsoil, unless otherwise directed. The topsoil may be placed by hand or mechanical methods, but care shall be taken so that the topsoil does not become

scattered in a manner that creates a nuisance or that it becomes so compacted that it is unworkable.

The topsoil on each project shall be placed immediately after the specified time for curing of the concrete has elapsed.

806.4 Measurement for Payment

806.4.1 Description

Topsoil will be measured in cubic yards as the volume in place within the lines designated or given, unless included in other bid items.

Topsoil shall be recorded on the contract memo in three forms. One figure will be the estimated amount, another the delivered amount, and lastly the calculated amount. The calculated amount would represent a 67% Swell Conversion Factor, (SCF) applied to the delivered quantity. This will represent the pay quantity and could be smaller than the estimated figure, but not larger, unless the surface area has been increased. Quantities which exceed the estimate after applying the SCF shall be deemed excessive, due to a deep subgrade.

SECTION 807 SEALING PAVEMENT JOINTS AND CRACKS

807.1 Extent of Work

807.1.1 Description

The work shall consist of preparing the pavement joint or crack and furnishing and installing the sealant.

807.2 Materials

807.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Joint Sealer.....Section 905.11

807.3 Type of Joint or Crack to be Sealed

807.3.1 General

All expansion, hand-formed and sawed joints in the pavement are to be sealed. Bonded or construction joints are also to be sealed. Cracks are to be sealed only when directed.

807.3.2 Concrete Pavement

In addition to the above requirements, the following joints shall be sealed:

- a. The expansion joint formed when a concrete gutter section is constructed adjacent to a hollow walk or overhanging walk with integral curb.
- b. The joint formed when the pavement is constructed adjacent to a structure.

807.3.3 Concrete Alley Pavement

In addition to the requirements stated in 807.3.1, the following joints shall be sealed:

- a. The joint formed when the pavement is constructed adjacent to a structure.
- b. The expansion joint circumferential to a pole.
- c. The joints and match lines in concrete fill-in pieces used for vehicular traffic purposes.

807.4 Installation

807.4.1 Preparation of Pavement Joint or Crack

The pavement joint or crack shall be cleaned of all foreign material prior to the installation of the joint sealer. A jet of compressed air shall be used to completely remove all dirt and slurry residue resulting from the sawing operations.

807.4.2 Preparation of the Sealant

The sealant should be treated in a kettle or melter, constructed as a double boiler with the space between the inner and outer shell filled with oil or other heat transfer medium. Positive temperature control, mechanical agitation, and recirculating pumps shall be provided. Direct heating shall not be used.

807.4.3 Temperature

The sealant shall be heated to the temperature range specified by the manufacturer. The atmosphere and concrete temperature shall be above 40°F.

807.4.4 Application of Sealant

The sealant shall be transferred from the boiler or melter directly into an approved, spouted pouring can or other suitable placing device.

Care shall be exercised when applying sealant to avoid over-filling the joint or crack. Dummy, contraction and expansion joints shall be filled in a neat workmanlike manner to within $\frac{1}{4}$ inch below the surface of the pavement. Bonded joints shall be sealed flush and cracks, when directed, shall also be sealed flush. Traffic shall be excluded from the immediate area until the sealant has cooled

sufficiently to insure that it will not adhere to vehicle wheels.

807.5 Measurement for Payment

807.5.1 Description

Sealed pavement joints and cracks will be measured in square yards as the actual area of pavement sealed within the lines designated or given. Payment for items listed in Sections 807.3.2. and 807.3.3 shall be included in the main pavement areas on each project.

SECTION 808 METAL CULVERT

808.1 Extent of Work

808.1.1 Description

The work shall consist of excavating the trench, furnishing and installing the pipe of specified size and type, and placing and compacting the backfill material.

808.2 Materials

808.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Corrugated Metal Culvert Pipe.....	Section 905.5
¾ Inch Graded Crushed Stone.....	Table 15 Section 904.2
Gravel.....	Table 16 Section 904.3

808.3 Construction

808.3.1 Placement

The trench shall be excavated and the metal culvert set in place, starting at the outfall and proceeding to the inlet.

808.3.2 Connecting Bands

When two or more sections are used, connecting bands shall be used to make the field joints. The bands shall be made of the same base metal as the culvert, and shall be installed so that it laps an equal portion on each of the sections to be connected. The bands shall be bolted firmly in place.

808.3.3 Backfilling

After the culvert has been placed, the trench shall be backfilled with $\frac{3}{4}$ inch graded crushed stone or gravel placed and compacted in 8-inch layers.

808.4 Measurement for Payment

808.4.1 Description

Metal culvert will be measured in lineal feet as the actual length constructed and backfilled with $\frac{3}{4}$ inch graded crushed stone or gravel within the lines designated or given.

SECTION 809 ALLEY UNDERDRAINS

809.1 Extend of Work

809.1.1. Description

The work shall consist of excavating the trench, furnishing and installing an underdrain of specified size and type, and furnishing, placing and compacting the bedding and backfill material.

809.2 Materials

809.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

- #1 Concrete Stone (Bedding Stone).....Section 902.2.3
- #2 Concrete StoneSection 902.2.3

Pipe Options:

- a. Class 3 Non-Reinforced Concrete
- b. Extra Strength Clay
- c. PVC: ASTM D3034, SDR-35 or ASTM F789

809.3 Construction

809.3.1 Description

The trench shall be excavated to the proposed subgrade. A geo-textile filter fabric shall be placed against the bottom and walls of the excavated area. Six inches of No. 2 concrete stone shall be placed evenly over the bottom of the trench and the pipe laid on this bed starting at the outfall and proceeding up grade. When the upper end of the drain is not used as an inlet, a suitable bulkhead shall be installed.

Perforated underdrain pipe shall be laid with the perforations facing down in accordance with Figure 44.

After the underdrain has been laid, the trench shall be backfilled with #2 concrete stone to an elevation 15 inches below the finished grade. The filter fabric shall then be closed over the #2 concrete stone with a minimum overlap of 18 inches. The trench shall then be topped with #1 concrete stone and compacted to the elevation of the existing alley pavement. If the alley pavement has been removed, 8 inches of #1 concrete stone shall be placed and compacted.

809.4 Measurement for Payment

809.4.1 Description

Underdrains will be measured in lineal feet as the actual length constructed within the lines designated or given.

Storm water inlets shall be paid per unit constructed. This shall be a lump sum bid which includes setting of all castings by the contractor. All castings shall be provided by the City unless noted otherwise in the contract documents.

SECTION 810 SEWER FRAME ADJUSTMENT

810.1 Extent of Work

810.1.1 Description

The work shall consist of removing the necessary brick or concrete block work and furnishing and installing brick or concrete block in cement mortar beds to raise or lower existing catch basin frames, storm water inlet frames and sewer manhole frames to finished grade. To accomplish this work it may be necessary to remove the adjacent pavement and/or curb and gutter section.

The work shall also consist of underpinning the frames and furnishing and installing the necessary steps.

810.2 Materials

810.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Mortar.....	Section 905.4
Concrete Block for Manholes.....	Section 905.1

810.3 Adjustment

810.3.1 Removal

Existing castings, including frames and grates or lids, shall be adjusted to the required elevation by removing the adjacent pavement and/or curb and gutter sections as required, and adjusting the top of the existing structure by removing or adding brick or concrete block masonry, and reinstalling the fixtures.

Removal of a portion of the existing structure shall be accomplished by the use of an air hammer or by hand methods, but care shall be taken so that the remaining structure is sound. The cost of removing and replacing fractured or unstable portions of the remaining structure, caused by the adjusting operations, shall be at the expense of the contractor.

810.3.2 Masonry Work

Brick shall be laid flat, with the long dimension tangent to the structure wall except for each fifth course laid as a header or binder course. The depressions in the brick shall be laid upward. Brick shall be laid with full, shoved joints of standard cement mortar, and the inside joints shall be tooled. Vertical joints shall be offset from the previous row. The outside face of the structure shall be back-plastered with a smooth coat of mortar, ½ inch thick. The interior of the structure, including manhole steps, benches and invert shall be cleaned of all excess mortar. All debris shall be removed from the structure and from the adjacent excavation prior to backfilling.

Where concrete block is substituted for brick, the above requirements shall apply, except that the header or binder courses are not required.

Precast concrete adjusting rings may be substituted for brick.

Concrete block or brick shall be clean, dry and free from frost when they are laid. The commissioner reserves the right to reject any block or brick which, in his opinion, may be unfit for use.

Catch basins or storm water inlets that are to be located in the proposed curb and gutter shall be adjusted to finished grade prior to the placement of the curb and gutter.

810.4 Steps

810.4.1 Description

Steps shall be installed on 16 inch centers to conform with the step arrangement in the residum of the manhole.

810.5 Underpinning

810.5.1 Description

Manholes that are to be located in the proposed pavement shall have the masonry work completed to within 2 inches of the finished grade prior to the placement of the concrete pavement and to finished grade prior to the placement of the asphalt pavement. After the concrete pavement has been placed but prior to opening it to traffic all hardwood shims shall be removed and the manhole frame underpinned with mortar.

810.6 Measurement for Payment

810.6.1 Description

Sewer frame adjustment will be measured in vertical feet as the actual height raised or lowered to the grades designated or given, with a minimum payment of 1 foot for each adjustment ordered.

Adjustment greater than 1 foot shall be measured as the actual difference in elevation of the existing frame and the raised or lowered frame, with the exception that additional footage will be added when portions of the existing structure beyond the adjustment limits warrant removal and replacement.

The cost of removals, underpinning the frames, and furnishing and installing all materials including steps shall be included in the price bid for adjustment.

The cost to replace the adjacent pavement, concrete walk or driveway, and/or concrete curb and gutter shall be paid in accordance with the unit bid price for the actual quantities measured. The three types of sewer frame adjustments are as follows:

Sewer Frame Adjustment Type I – This adjustment is for the new paving projects or the projects where the adjacent pavement surface will be entirely removed and replaced.

Sewer Frame Adjustment Type II – This adjustment is for asphalt resurface projects where the existing pavement is concrete, or asphalt on concrete base. See Figure 43.

Sewer Frame Adjustment Type III – This adjustment is for asphalt resurface projects where the adjacent

pavement is asphalt surface on gravel base, macadam, or a temporary bituminous patch. See Figure 43.

SECTION 811 INTERNAL MANHOLE SEAL

811.1 Extent of Work

811.1.1 Description

The work shall consist of cleaning and preparing the interior of the manhole structure and frame, and installing an internal manhole seal. See Figure 36.

The work may also include the furnishing of the sealant, bands and hardware and sleeve.

811.2 Materials

811.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Internal Manhole Sleeve.....	Section 905.20
Steel Bands.....	Section 905.20.2
Butyl Sealant.....	Section 905.20.3
Mortar.....	Section 905.4

811.3 Installation

811.3.1 Preparation of Interior

Prior to the installation of the internal seal, the interior surface of the manhole structure and frame shall be cleaned and all voids and cracks filled with mortar. Excessively rough masonry surfaces shall be coated with a thin layer of non-shrinking mortar. The non-shrinking mortar shall consist of mortar with an accelerator, Anti-Hydro or equal, mixed in accordance with the manufacturer's recommendation in order to achieve a fast set.

811.3.2 Description

The internal manhole sleeve shall be installed so that the center of the sleeve approximates the joint between the frame and manhole structure. The stainless steel bands shall be installed at the top and bottom of the sleeve and expanded to the extent that a water tight seal is formed.

When installing a sleeve which requires the application of a butyl sealant, the sealant should not be applied until after the sleeve has been positioned and the bottom band temporarily installed. The sealant shall then be applied uniformly to the frame areas where the sleeve will make contact. The upper band shall then be installed. The lower band is then removed and the sealant applied uniformly to the manhole structure area where the sleeve will make contact. The lower ring shall then be re-installed.

811.4 Measurement for Payment

811.4.1 Description

Internal manhole seals will be measured as the number of actual units installed.

The cost of cleaning the interior surface and furnishing and applying the mortar materials shall be included in the price bid for the internal manhole seal.

The cost of applying the butyl sealant shall be included in the price bid for the internal manhole seal.

The internal manhole sleeve and bands shall be furnished by the City, unless otherwise stated in the contracted documents.

SECTION 812 SOIL EROSION CONTROL

812.1 Extent of Work

The work shall consist of cleaning the storm water inlet or manhole and installing and maintaining the appropriate erosion control device as indicated on the design plan and as shown on Figures 37 through 42.

Inlet protection shall be installed at all inlets that will receive runoff from the construction site, including adjacent streets, and where materials are stockpiled. Depending on the slope of the street, this will include inlets in the block(s) downstream from the work site due to anticipated bypassing.

Any sediment reaching a public or private road by tracking shall be removed by street-cleaning, other than flushing, before the end of each workday. Earth storage piles must be covered with tarps or suitable alternate control if exposed for more than 10 days, and the storm water drainage structures and open waterways must be protected from these storage piles by employing the proper erosion control system.

812.2 Material

812.2.1 Description

The materials shall meet the requirements specified in Part 9, Materials, as follows:

Storm Inlet Fabric Membrane.....	Section 905.18.1
Filter Fence Fabric Membrane.....	Section 905.18.2

812.3 Installation

812.3.1 Scope of Work

The control of soil erosion requires flexibility to accommodate changing conditions as the construction project progresses. In general, the erosion control device is to be installed at locations as described on the Paving plan.

- a. At all inlet locations on resurface projects where curb and gutter and the inlet frame are removed, a Type R screen must be installed. Following curb and gutter replacement a Type P screen must be installed.
- b. Type P screens must be installed at all locations designated as overflow inlets and also at inlets where curb will not be removed. If the inlet being protected has a side inlet box, the inlet box shall be sealed until inlet protection is no longer needed. These screens must be in place when the project is started.
- c. On reconstruction projects, Type R screens must be installed at all inlets and storm or combined sewer manholes. These screens, or some other device or method acceptable to the Commissioner, for preventing infiltration of solids into the sewer system, must be installed on the day that removal takes place. When it becomes necessary to remove a brick from a drainage structure in order to drain the subgrade, filter screen approximately the size and shape of $\frac{1}{2}$ of the Type R shall be used. Cost of providing this protection, as well as that required for storage piles of earth,

gravel, stone or other debris shall, be the responsibility of the contractor.

812.4 Maintenance

812.4.1 Scope of Work

Cleaning and repair of all types of control devices shall be continued until the work is accepted by the City. All such cleaning and repair as well as the eventual removal of the devices is the responsibility of the contractor.

- a. Manholes, into which dirt or other debris has fallen, shall be completely cleaned out before the end of each work day. Should the contractor not perform the cleaning as required, his operation may be shut down until the situation is corrected.
- b. All control measures protruding above the normal paved and/or ground surface where vehicular and/or pedestrian traffic is being maintained shall be protected by barricades with flashing lights.
- c. The inlet basket shall be inspected within 24 hours after each rainfall or daily during extended periods of precipitation. Repairs shall be made immediately, as necessary, to prevent particles from reaching the sewerage system and/or causing surface flooding.

Sediment deposits shall be removed after each storm event, or as often as the fabric becomes clogged.

812.5 Measurement for Payment

812.5.1 Description

Manhole and storm water inlet erosion control devices will be measured as the number of actual devices supplied, installed and properly maintained.

Filter fence erosion control shall be measured in lineal feet as the actual length installed and maintained within the lines designated or given.

PART 9

MATERIALS

SECTION 901 MATERIALS, GENERAL REQUIREMENTS

901.1 General

Only materials conforming to the requirements of the specifications shall be used. The right is reserved to waive any gradation requirements on the basis of tests made for a specific contract.

901.2 A.S.T.M. and A.A.S.H.T.O. Standards

Unless otherwise noted, the use of an A.S.T.M. or A.A.S.H.T.O. Designation in these specifications refers to the latest revisions of that particular Standard or Tentative of that organization as amended to the date of advertising for bids.

The use of terms pertaining to the various materials shall be interpreted as set forth in A.S.T.M. Designations C125, C294 and D8, except as modified by these specifications.

901.3 Source of Supply

The source of supply of each of the materials shall be subject to the approval of the Commissioner before use. Approval may be rescinded at any time by the Commissioner, when in his opinion, the source of supply fails to produce materials that are uniform and satisfactory in quality and of required quantity. If the contractor desires to furnish material from a source not previously approved for a specific contract, he shall give sufficient notice so that tests

upon which approval will be based may be made before use of the material.

901.4 Samples

Samples of the materials proposed or furnished for the work may be taken by representatives of the Commissioner at any time at the point of manufacture, point of delivery or site of work; and the same right shall exist with respect to material partially or completely incorporated in the work.

Samples will be selected as far as practicable, in accordance with the standard or tentative methods for sampling such materials, as specified in the standards of the American Society for Testing and Materials or of the American Association of State Highway and Transportation Officials. All sampling will be done by authorized representatives of the Commissioner.

901.5 Cost of Samples

All samples of materials or fabricated units which are required for tests shall be furnished by the contractor without cost to the City.

901.6 Cost of Tests

The original tests and routine tests on samples selected by the City will be made by and at the expense of the City. Additional tests requested by the contractor will be made at his expense.

901.7 The Right to Weigh Materials

The Commissioner reserves the right to have any load of material delivered to a truck scale to check the weight of the load. No claim for loss or delay will be allowed on this account.

901.8 Sieves

Sieves shall be understood to mean laboratory sieves with square openings, meeting the requirements of A.S.T.M. Designation E11.

901.9 Uniformity in Gradations

The tabulated gradations represent the extreme limits of suitability from all sources of supply and to allow a reasonable tolerance for unavoidable variations in commercial operations. The average of the gradations from any one source shall remain substantially uniform.

901.10 Contamination

All necessary precautions shall be taken to prevent contamination or mixing of materials in storage, handling and delivery. Materials that have become mixed or contaminated will be rejected.

901.11 Provisional Methods of Tests

The determination of acceptability of materials will be made in accordance with methods as directed by the Commissioner when standard methods of tests are not specified.

SECTION 902 MATERIALS FOR PORTLAND CEMENT CONCRETE CONSTRUCTION

902.1 Portland Cement

902.1.1 General Requirements

The cement shall be an approved brand and shall meet the pertinent A.S.T.M. specifications listed below.

Cement shall not be used when its temperature exceeds 170°F.

Cement containing lumps or crusts shall not be used.

902.1.2 Air-Entraining Portland Cement

Air-Entraining Portland Cement shall comply with the requirements of A.S.T.M. Designation C150 Type IA.

Air-Entraining Portland-Pozzolan Cement shall comply with the requirements of A.S.T.M. Designation C595 IP-A.

902.1.3 Non Air-Entrained Portland Cement

Portland Cement shall comply with the requirements of A.S.T.M. Designation C150 Type I.

Portland-Pozzolan Cement shall comply with the requirements of A.S.T.M. Designation C595, Type IP.

902.2 Aggregates

902.2.1 General Requirements

Fine and coarse aggregates shall comply with A.S.T.M. Designation C33, except as modified by these specifications.

Fine aggregate shall drain for a minimum of 12 hours before being weighed for the batch. Coarse aggregate shall drain for such a period of time as will insure a uniform moisture content before being weighed for the batch.

Aggregates from different sources of supply shall not be mixed or stored in the same pile nor used alternately in the production of concrete without the permission of the Commissioner. Such permission will be contingent upon re-designing the concrete mix, if necessary, to protect its quality.

902.2.2 Fine Aggregate

Fine aggregate shall consist of sand composed of hard, tough, durable grains of approved inert materials from natural deposits.

The amount of deleterious substances shall conform to the requirements specified in Table 5.

**TABLE 5
DELETERIOUS SUBSTANCES IN FINE AGGREGATE**

Deleterious Substances	Maximum Percentage by Weight
Material finer than No. 200 sieve	3- ½
Shale	1
Coal	1
Clay Lumps and Friable Particles	1

The gradation of fine aggregate from any one source shall be reasonably uniform and not subject to the extreme percentages of gradation specified in Table 6. For the purpose of determining the degree of uniformity of a fine aggregate, a fineness modulus determination shall be made upon representative samples of fine aggregate from the sources proposed for use. Fine aggregate from any one source having a variation in fineness modulus greater than plus or minus 0.20 from the fineness modulus of a representative sample shall either be rejected or may be accepted subject to adjustment in concrete proportions.

Fine aggregate shall comply with the gradation requirements specified in Table 6.

**TABLE 6
GRADATION REQUIREMENTS FOR FINE
AGGREGATE**

Sieve Sizes	Percentage Passing by Weight
3/8 inch	100
No. 4	95 to 100
No. 16	50 to 80
No. 50	10 to 30
No. 100	2 to 10

902.2.3 Coarse Aggregates

Coarse aggregates shall consist of clean, hard tough, durable crushed rock, crushed gravel or gravel free from adherent coatings and organic substances.

The amount of deleterious substances and particles shall conform to the requirements specified in Table 7.

**TABLE 7
DELETERIOUS SUBSTANCES OR PARTICLES IN
COARSE AGGREGATE**

Deleterious Substances	Maximum Percentage by Weight
Chert (Visually Determined)	4
Coal	½
Clay Lumps and Friable Particles	1- ½
Soft Fragments	1
Any Combination of Above	4
Flat, Elongated or Laminated Pieces*	10
Material finer than No. 200 Sieve**	1

** Flat and elongated particles are those having a length more than 5 times the average thickness.*

***When the material finer than No. 200 sieve consists essentially of crusher dust, the maximum permissible limit shall be 1- ½ percent.*

Coarse aggregates shall comply with the requirements for abrasion loss shown in Table 8 when tested for resistance to abrasion in the Deval machine.

The abrasion test for crushed stone shall be made in accordance with A.S.T.M. Designation D2-33

The abrasion test for gravels shall be made in accordance with A.S.T.M. Designation D289-63.

TABLE 8
ABRASION LOSSES FOR COARSE AGGREGATES

Material	Maximum Loss Percentage by Weight
Crushed Stone	6
Gravel (100% uncrushed)	12
Gravel (100% crushed)	22
Gravel (% crushed)	Proportionate

Coarse aggregates shall comply with the gradation requirements specified in Table 9.

TABLE 9**GRADATION REQUIREMENTS FOR COARSE AGGREGATES**

Sieve Sizes	Percentage Passing by Weight
<u>SIZE NO. 1 (A.S.T.M. C33- Size No. 67)</u>	
1 inch	100
¾ inch	90 to 100
3/8 inch	20 to 55
No. 4	0 to 10
No. 8	0 to 5
<u>SIZE NO. 2 (A.S.T.M. C33 – Size No. 4)</u>	
2 inch	100
1- ½ inch	90 to 100
1 inch	20 to 55
¾ inch	0 to 15
3/8 inch	0 to 5

Gradations not meeting these requirements will be accepted if the composite gradation of Size No. 1 combined with Size No. 2 meets the gradation of Size No. 467 of Table 2 of A.S.T.M. Designation C33.

902.3 Water**902.3.1 Requirements**

Water used in mixing concrete or mortar shall be clean and free from injurious amounts of oil, alkali, salt, acid, silt, mud, grass, organic or other foreign substances harmful to the finished product.

902.3.2 Source

Water from the City water system shall be used unless other sources are permitted.

902.4 Admixtures

902.4.1 General

No admixture shall be added to produce a concrete of other than its natural color, except when specified in the contract documents.

902.4.2 Calcium Chloride

Calcium chloride admixture, used as a concrete set accelerator, shall be added in solution form. The maximum quantity of calcium chloride shall not exceed 2 percent by weight of the cement in the concrete (3.5 pints of 30 percent solution per sack of cement). Calcium chloride shall not be used in concrete mixes after May 15th and prior to September 15th unless approved by the Commissioner.

Calcium chloride shall comply with the requirements of A.A.S.H.T.O. Designation M144, Type L.

902.4.3 Flyash

The source of supply of the flyash shall be subject to approval by the Commissioner.

Flyash shall conform to the requirements of A.S.T.M. Designation C618, Class C. except that the loss of ignition shall be limited to a maximum of 2 percent.

Concrete containing flyash shall not be placed later than September 15th. If work in progress is not completed by this date, further concrete placement shall be with concrete free of flyash.

902.4.4 Water-Reducing Admixture

The brand of water-reducing admixture shall be subject to approval by the Commissioner. Such approval will be based upon the manufacturer's

certification of compliance with A.A.S.H.T.O. Designation M194 and the production of desired properties in the concrete.

Water-reducing admixture shall meet the requirements of A.A.S.H.T.O. Designation M194, Type A. Water-reducing retarding admixture shall meet the requirements of A.A.S.H.T.O. Designation M194 Type D.

The specific type of admixture and rate of use will be determined on the basis of the atmospheric conditions, desired properties of the finished concrete and the manufacturer's recommended rates to meet the requirements of A.A.S.H.T.O. Designation M194.

The water-reducing admixture shall not contain calcium chloride or other similar chemical agent.

902.4.5 Air-Entraining Admixture

The brand of air-entraining admixture shall be subject to approval by the Commissioner. Such approval will be based upon the certification of compliance with A.S.T.M. C260 and the production of the desired properties of the concrete.

Air-Entraining admixtures shall meet the requirements of A.S.T.M. Designation C260. The dosage rate shall be the amount necessary to meet the specified air-entraining requirements.

902.5 Air-Entrained Concrete

902.5.1 General Requirements

Air-Entrained Portland cement concrete shall be composed of Type IA Portland cement of Type I

Portland cement plus an air-entraining admixture, fine and coarse aggregates and flyash or water-reducing admixture when required (See Table 10). The concrete mix proportions will be determined by the Commissioner and will be designed to have a slump of 3 inches and an air content of between 4 and 7 percent by volume when the concrete contains No. 1 and No. 2 coarse aggregates and between 4.5 and 8 percent by volume when the concrete contains only No. 1 coarse aggregate. The absolute maximum slump allowed will be 4 inches as determined by field slump test.

Mixing water shall be measured either by weight or volume. When rinsing water is used as a portion of the mixing water for succeeding batches, it shall be measured according to these requirements. The water measuring device shall be accurate to 1 percent. Measurement shall be within a maximum error of 1 percent.

Testing shall be in accordance with the following standards:

- a. The method of making and storing compression test specimens of concrete (6" and 12" cylinders) in the field shall be in accordance with A.S.T.M. Designation C31, except that the use of a storage box may be waived at the option of the Commissioner.
- b. The method of making the compression test on 6" x 12" cylinders shall be in accordance with A.S.T.M. Designation C39.

- c. The slump shall be determined in accordance with A.S.T.M. Designation C143.
- d. The weight per cubic foot, yield, air content and cement content of the concrete shall be determined by measurement in a standard measure in conformance with A.S.T.M. Designation C138. The air content may be determined by the pressure method in accordance with A.S.T.M. Designation C231 or by the volumetric method in accordance with A.S.T.M. Designation C173, at the option of the Commissioner. The test shall be made at the site of the work.

902.5.2 Classification of Portland Cement Concrete

The classes of concrete to be used for the different items of construction, except when otherwise specified, shall be in accordance with Table 10.

TABLE 10
CONCRETE CLASSIFICATIONS

Concrete Use	Class of Concrete	Cement (lbs) ¹	Flyash Class C (lbs)	Water Reducing Admixture Added	Size of Coarse Aggregate Required	Estimated Compressive Strength (psi) ²
	A	660	0	0	#1+ #2	4000
	A-W	610	0	3	#1+ #2	4000
	A-F	560	130	0	#1+ #2	4000
HES Conc. (Pvmt, Base, VT Conc. Walk/Dwy.)	A	660	0	0	#1 Alone	4000
	A-W	610	0	3	#1 Alone	4000
	A-F	560	130	0	#1 Alone	4000
	C	565	0	0	#1+ #2	3600
	C-W	515	0	3	#1+ #2	3600
	C-F	480	110	0	#1+ #2	3600
Curb & Gutter, Walk/Dwy., Traf. Island	C	565	0	0	#1 Alone	3600
	C-W	515	0	3	#1 Alone	3600
	C-F	480	110	0	#1 Alone	3600
Base	F	425	0	0	#1+ #2	3000

¹ Cement type: Portland Cement Type IA, IP-A, I or IP plus air-entraining admixture.

² At 28 days moist cured.

³ A water reducing admixture meeting the requirements of Section 902.4.4 shall be added at a rate recommended by the manufacturer to produce the desired compressive strength

902.6 Concrete Slurry Base

Concrete slurry base consists of the following materials in the indicated proportions:

Portland Cement (Type I).....	94 lbs.
Flyash (Class C).....	75 lbs.
Concrete Sand (Damp).....	1830 lbs.
No. 1 Concrete Aggregate.....	1830 lbs.

The material shall be mixed with water to inundate the mix sufficiently to provide an approximate 3 inch slump. The mix shall be deposited in the trench directly from a concrete transit mix truck.

902.7 Ready-Mixed Concrete

Ready-mixed concrete shall comply with A.S.T.M. Designation C94 and the following modified or supplemental requirements.

1. Slump Tests - Concrete within the permissible ranges of slumps shall be available in the batch form from the time of beginning discharge for a period of 30 minutes, excepting the first and last $\frac{1}{4}$ cubic yard as discharged.
2. Limitations of Equipment - Mixers and agitators shall be operated within the limits of capacity and speed of rotation designated by the manufacturer of the equipment.
3. Truck Mixed Concrete - For concrete that is completely mixed in a truck mixer, 70 to 100

drum revolutions at mixing speed as designated by the manufacturer shall be required to produce uniform concrete.

4. Central Mixed Concrete – For central mixed concrete, the acceptable minimum mixing time for mixers having capacities of 1 yard or more is 1 minute increased by 15 seconds for each additional cubic yard. Where mixer performance tests have been made, the acceptable mixing time may be reduced to a point at which satisfactory mixing has been achieved as defined in A.S.T.M. Designation C94.
5. Addition of Water – No water shall be added after the initial introduction of mixing water to be batch except when, on arrival at the job site, the slump of the concrete is less than that specified. When the addition of water is necessary, the drum shall be turned an additional 30 revolutions or more at mixing speed.
6. Batch Hopper Scales – Batch hopper scales shall be tested and approved by the local sealer of weights and measures, the Wisconsin Department of Transportation, Division of Highways or an approved testing service. Approvals shall be obtained at intervals not exceeding 12 months. The hopper scales of portable plants shall be tested and approved after each movement of the plant.

7. Rejected Loads – Rejected loads of concrete shall not be re-tempered or adjusted by additional ingredients and shall not be shipped to another City contract.
8. Cold Weather Concrete – Concrete delivered when the air temperature is lower than 45°F shall arrive at the work site having a temperature not less than 50°F unless permitted by the Commissioner. Heated concrete shall not exceed 90°F at any time during its production.
9. Delivery Tickets – A delivery ticket shall be furnished to the inspector with each load of concrete delivered to the project. This ticket shall provide the following information:
 - a. Name, plant number, and location of ready-mix plant
 - b. Name of contractor purchasing the concrete
 - c. Project location
 - d. Date
 - e. Cement type and brand
 - f. Admixtures, type, brand and amount used
 - g. Cement content (sacks per cubic yard)
 - h. Maximum size of coarse aggregate
 - i. Truck number
 - j. Time dispatched
 - k. Amount of concrete in the load (cubic yard)

- l. City of Milwaukee concrete class (See Table 10)

10. Truck Time – Concrete shall be discharged from a truck mixer or agitator within 1- ½ hours after the introduction of water to cement and aggregate, unless a longer time is specifically authorized by the Commissioner.

902.8 Curing Agents

902.8.1 Requirements

The curing agent shall be a white pigmented, membrane forming compound or a white pigmented, emulsified linseed oil, curing/sealing compound as specified for the type of construction. These agents shall not react deleteriously with the concrete.

The curing agents shall be ready-mixed for immediate use without alterations, and shall adhere to the damp concrete forming a continuous, coherent, flexible covering without breaks or pin-holes.

The curing agents shall comply with the requirements of A.A.S.H.T.O. Designation M148, Type 2.

The test for water retention will be modified as follows:

Immediately after molding, specimens shall be weighed and placed in a curing cabinet or room in which the atmosphere shall be maintained at a temperature of 100°F ± 2°F and a relative humidity of 32 percent ± 2 percent. The specimens shall be level and not subject to vibration. The air in the cabinet or

room shall be circulated in such a manner as to avoid horizontal movement of the air directly across the top of the specimens.

When testing liquid curing agents, the edges of the specimen shall not be sealed by other means. Unless a greater rate of coverage is specified by the manufacturer, it shall be at the rate of one gallon per 200 square feet. The proper coverage shall be determined by weighing the specimen before and after application.

SECTION 903 MATERIALS FOR A SPHALT CONSTRUCTION

903.1 Asphalt Cement

903.1.1 General Requirements

Asphalt cement shall be prepared by the distillation of asphaltic petroleum. It shall be homogenous, free from water, and shall not foam when heated to 347°F.

Prior to its use, one quart of asphalt cement may be taken as a sample from each tank car or truck. Samplings shall be in accordance with A.S.T.M. Designation D140.

903.1.2 Detail Requirements

Asphalt cement shall be penetration grade 85/100 and shall conform to the requirements specified in Table 11.

TABLE 11
ASPHALT CEMENT REQUIREMENTS

Property	Method of Test (A.S.T.M.)	Penetration Grade 85-100	
		Min.	Max.
Flash Point, Cleveland Open Cup, °F	D-92	450	--
Penetration at 77°F, 100g., 5 sec.	D-5	85*	100*
Ductility at 77°F, 5 cm. per min., cm.	D-113	100	--
Solubility in Trichloroethylene, %	D-2042	99	--
Thin-Film Oven Test, 1/8 in., 325°F, 5 hr Loss on Heating, %	D-1754	--	1.0
Penetration of Residue, % of Original	D-5	50	--
Ductility of Residue at 77°F, 5 cm. per min., cm.	D-113	75	--

**An expanded penetration range of 70-110 shall be permitted provided material in the expanded portions of the ranges conforms to an Absolute Viscosity of 1,000± 200 poises (140°F, 30 cms. Hg)*

903.2 Liquid Asphalt (Cut-Back)

903.2.1 General Requirements

Liquid asphalt shall be produced by fluxing an asphaltic base with suitable light volatile solvents or distillates and shall be of the type and grade specified for the item of construction and shall be free from water. The material shall not foam when heated to application temperature and shall show no separation or curding prior to use.

903.2.2 Rapid Curing Type (RC70 through RC3000)

Rapid curing type cutback asphalt shall meet the requirements of A.A.S.H.T.O Designation M81.

903.2.3 Medium Curing Type (MC30 through MC3000)

Medium curing type cutback asphalt shall meet the requirements of A.A.S.H.T.O. Designation M82.

903.3 Emulsified Asphalt

903.3.1 Requirements

Emulsified asphalt shall be of the type specified for the particular item of construction and shall comply with A.A.S.H.T.O. Designation M140 for anionic emulsified asphalt and A.A.S.H.T.O. Designation M208 for cationic emulsified asphalt.

903.4 Aggregates

903.4.1 General Requirements

Aggregates for asphalt paving mixtures shall be of such nature that when thoroughly coated with the asphalt material proposed for the work, the coating will not slough off upon contact with water.

The blending of aggregates of more than one size or source, if and when necessary to meet the required composition of asphalt paving mixtures, shall be done with mechanical feeding devices assuring uniform and controlled blending before the material is introduced into the drier. Massed blending with cranes, bulldozers, or stock pile blending will not be permitted.

Crushed stone, commercially known as "chips", shall be considered as a coarse aggregate for the purposes

of this specification, even when the gradation contains particles predominantly finer than the No. 4 sieve.

903.4.2 Fine Aggregate

Fine aggregate shall comply with A.S.T.M. Designation D1073, except as modified by these specifications.

The fine aggregate shall consist of sand composed of clean, hard, tough, durable grains of approved inert materials from natural deposits and shall have a liquid limit of not more than 25 and a plasticity index of not more than 3.

The amount of deleterious substances shall conform to the requirements specified in Table 12.

TABLE 12

**DELETERIOUS SUBSTANCES
IN FINE AGGREGATE**

Deleterious Substances	Maximum Percentage By Weight
Shale	1
Coal	1
Clay Lumps and Friable Particles	1

The gradation of fine aggregate shall produce the composition for the asphalt paving mixture specified and shall be of such uniformity that the job mix gradation will be maintained within the tolerances hereinafter specified. At least 50 percent of the

coarse particles retained on the No. 4 sieve shall have a fractured face.

903.4.3 Coarse Aggregate

Coarse aggregate shall comply with A.S.T.M. Designation D692, except as modified by these specifications.

The material shall be free from injurious amounts of shale, clay, loam, crusher dust, and other adherent coatings. Stone which fractures to flat or elongated pieces is not acceptable.

Coarse aggregate crushed stone shall have not more than 6 percent loss in weight when tested for resistance to abrasion in the Deval machine. The abrasion test shall be made in accordance with A.S.T.M. Designation D2-33.

The gradation of coarse aggregate shall produce the composition for the paving mixture specified and shall be of such uniformity that the job mix gradation will be maintained within the tolerances hereinafter specified.

Asphalt concrete mixes shall consist of material produced by crushing hard, tough, durable, sound limestone or dolomite ledge rock.

Asphalt binder mixes shall consist of material produced by crushing hard, tough, durable, sound limestone, dolomite ledge rock or natural gravel. When natural gravel is used, at least 50 percent of the particles retained on the No. 4 sieve shall have a fractured face.

903.4.4 Crushed Stone Screenings

Aggregate produced by crushing hard, tough, durable, sound limestone or dolomite ledge rock commercially known as “crushed stone screenings”, may be substituted for portions of the fine and coarse aggregates and mineral filler in the production of asphalt paving mixtures if the uniformity of gradation is such as to maintain the job mix gradation within the tolerances hereinafter specified. The screenings shall meet all applicable requirements specified for fine and coarse aggregates.

903.5 Mineral Filler

903.5.1 Requirements

The mineral filler shall comply with A.S.T.M. Designation D242, except as modified by these specifications.

The mineral filler shall consist of thoroughly dry limestone dust free from lumps or aggregations of fine particles and organic impurities and have a plasticity index not greater than 4.

The material shall meet the gradation requirements specified in Table 13.

TABLE 13

**GRADATION REQUIREMENTS
FOR MINERAL FILLER**

Sieve Sizes	Percentage Passing by Weight
No. 30	100
No. 50	95-100
No. 200	70-100

903.6 Recycled Asphalt Pavement Materials

903.6.1 Composition

Recycled asphalt pavement materials shall consist of reclaimed asphalt pavement. The reclaimed material may contain a small portion of sand, gravel or crushed stone but this portion shall not exceed 10 percent by weight, of the reclaimed material used. The reclaimed material shall not contain road tar.

The reclaimed material shall be crushed, milled or otherwise processed so that 100 percent of the material passes a 1 inch screen.

903.7 Paving Mixtures

903.7.1 Composition

Asphalt concrete shall be composed of asphalt cement, fine and coarse aggregate, with or without mineral filler or crushed stone screenings. Sheet asphalt shall be composed of asphalt cement and fine aggregate alone, with or without mineral filler or crushed stone screenings. Asphalt binder shall be composed of asphalt cement, fine and coarse aggregate, with or without crushed limestone screenings or graded crushed gravel or recycled asphalt pavement materials. The asphalt binder containing recycled asphalt pavement materials shall contain a maximum of 30 percent recycled material by weight. The exact quantities shall be as designed by the Commissioner.

Samples of materials proposed to be used shall be furnished to the City Testing Laboratory at least 10 days prior to use in order to prepare a mix design.

The job mix shall be determined by means of the Marshall Apparatus A.S.T.M. Designation D1559. The

job mix shall have a minimum stability of 1,000, a maximum flow of 16 and a void content between 2 and 6 percent for asphalt concrete and sheet asphalt and between 2 and 8 percent for asphalt binder.

The job mix gradation shall fall within the specified gradations and be maintained within the following tolerances:

- Material passing the No. 8 and coarser sieves.....± 5 percent
- Material passing the Nos. 16, 30, 50 & 100 sieves.....± 3 percent
- Material passing the No. 200 sieve.....± 2 percent

The amount of bitumen designated for the job mix shall be maintained within a tolerance of ± 0.3 percent.

The paving mix composition shall comply with the gradation and asphalt requirements specified in Table 14.

TABLE 14

**GRADATION AND ASPHALT REQUIREMENTS
FOR ASPHALT PAVING MIXES**

**Percentage Passing by Weight for Aggregate
Gradation**

Sieve Size	<u>Asphalt Binder</u>			<u>Asphalt Concrete</u>		
	¾ Inch Max	½ Inch Max	½ Inch Max	3/8 Inch Max	¼ Inch Max	Sheet Asphalt
1 inch	100					
¾ inch	95- 100	100	100			
½ inch	70-90	90-97	90-97	100		
3/8 inch	60-85	75-95	75-95	95-100	100	100
No. 4	40-65	45-75	45-75	60-80	80-100	95-100
No. 8	25-50	30-55	30-55	40-60	45-75	70-100
No. 16	--	--	--	--	30-55	55-95
No. 30	10-35	15-35	15-35	15-35	25-45	30-90
No. 50	8-25	10-25	10-25	10-22	15-35	20-70
No. 100	--	--	--	--	--	10-50
No. 200	3-8	3-8	3-8	3-8	5-15	5-20
Bitumen, % of Total Weight	4-7	4-7	5-7	5-8	5-9	6-10
Asphalt Cement Grade	85- 100	85- 100	85- 100	85-100	85-100	85-100

Note: When recycled asphalt pavement material is used for asphalt binder, the penetration value of the Asphalt cement for the combined asphalt mixture shall not be less than 85 nor more than 100.

903.7.2 Plant Requirements

The bituminous paving mixture shall be produced in a mixing plant meeting the requirements of A.S.T.M. Designation D995. The bituminous mixing plant operation shall comply with the requirements of A.S.T.M. Designation D3515 and the following modified or supplemental requirements.

Mixing Plant Operation

1. Preparation of Bitumen – The bitumen shall be maintained at a temperature at which it can be properly handled through the pumping system and uniformly distributed throughout the mixture. At no time during the processing, from storage to laydown, shall the temperature of the bitumen be allowed to exceed 350°F.

2. Preparation of Mixture – The bitumen shall be added in an evenly spread sheet over the length of the mixer box in a batch plant, or shall be spread evenly across the mixer box in a continuous mix plant.

a. The mixing shall be accomplished in the shortest time that will produce a satisfactory mixture. Mixing time shall be specified within the following limits, except that the minimum may be determined as provided in subsection (b) below.

1. Batch Plants: 0 to 10 sec. dry mixing followed by 25 to 50 sec. additional mixing after the addition of the bitumen.

2. Continuous Mix Plants: 25 to 60 sec. based on the following equation:

$$\text{Mix time} \quad \text{sec.} \quad \equiv \quad \frac{\text{Pugmill capacity lb (kg)}}{\text{Pugmill output lb/s (kg/s)}}$$

- b. Minimum mixing time may be established on the percentage of coated particles as determined by A.S.T.M. Method D2489. The minimum values for percentage of coated particles used to establish the minimum mixing time shall be set by the Commissioner. These values will vary with aggregate gradation, particle shape, surface texture, the bitumen content and the use for which the mix is intended.

903.7.3 Silos

Storing of bituminous mixtures in silos will be permitted for a period not to exceed 36 hours, provided the mixtures when delivered to the paver meet all applicable design requirements and the temperature of the mixture meets the requirements of Section 903.7.5.

903.7.4 Transportation of Mixtures

Asphalt mixtures shall be transported from the mixing plant to the work site in vehicles having tight, clean and smooth metal boxes. The inside surfaces of the boxes shall be lightly coated with an approved release material before loading. Each load shall be covered with the canvas or other suitable material.

903.7.5 Temperature at Time of Asphalt Placement

Asphalt mixtures shall be placed at temperatures that conform to the requirements specified in Table 4.

TABLE 4

TEMPERATURE AT TIME OF ASPHALT PLACEMENT

Temperature of Mixture

Asphalt Binder	225°F to 325°F
Asphalt Concrete	225°F to 325°F
Sheet Asphalt	300°F to 375°F

Temperature of Air

Asphalt Binder	Not less than 35°F
Asphalt Concrete	Not less than 40°F
Sheet Asphalt	Not less than 40°F

903.7.6 Delivery Tickets

A delivery ticket shall be furnished to the City with each load of asphalt material delivered to the project site. This ticket shall provide the following information:

- a. Name, plant number and location of the plant
- b. Name of contractor purchasing the material
- c. Project location
- d. Date
- e. Type of mixture
- f. Maximum size of aggregate
- g. Truck number
- h. Net weight of the load

Each ticket shall have the weight stamped by an automatic type register beam platform scale or marked by a bonded weighmaster.

903.7.7 Sealed Scales

Batch hopper scales and truck scales shall be tested and approved by the local sealer of weights and measures, the Wisconsin Department of Transportation, Division of Highways, or an approved testing service. Approval shall be obtained at intervals not exceeding 12 months.

903.8 Curb Mixtures

903.8.1 Composition

The composition of the curb mixture to be placed by machine shall comply with the requirements for asphalt concrete, ¼ inch maximum.

SECTION 904 MATERIALS FOR CRUSHED STONE AND GRAVEL CONSTRUCTION

904.1 Crushed Stone

904.1.1 General Requirements

Crushed stone shall consist of material produced by crushing hard, tough, durable, sound limestone or dolomite ledge rock and shall comply with the requirements specified in Section 902.2.3 except that it shall be free from injurious amounts of shale, clay, loam, disintegrated pieces and crusher dust.

Stone which fractures to flat and elongated pieces is not acceptable.

904.1.2 Gradation Requirements

Crushed stone shall comply with the gradation requirements specified in Table 15.

904.2 Graded Aggregates

904.2.1 General Requirements

Graded aggregates shall consist of gravel, crushed gravel or stone, composed of hard, sound, durable particles and a filler of sand, stone dust or other finely divided mineral material and shall comply with A.S.T.M. Designation D1241, except as modified by these specifications.

The graded aggregate shall comply with the abrasion requirements specified in Section 902.2.3 and shall have a liquid limit of not more than 25 and a plasticity index of not more than 6.

The material shall be free from clay lumps and organic matter.

The fraction passing the No. 200 sieve shall be less than 50 percent of the total fraction passing the No. 40 sieve for gravel aggregate and less than 70 percent for crushed stone aggregate.

In filler, in addition to that naturally present in graded aggregate, is necessary for meeting the gradation requirements or for satisfactory binding, it shall be uniformly blended with the aggregate at the screening plant.

At least 50 percent of the particles retained on the No. 4 sieve shall have a fractured face.

904.2.2 Gradation Requirements

Graded aggregates shall comply with the gradation requirements specified in Table 15.

TABLE 15
GRADATION REQUIREMENTS FOR
CRUSHED STONE AND
GRADED AGGREGATES

Sieve Sizes	Percentage Passing By Weight
2- ½ Inch Crushed Stone	
3 inch	100
2- ½ inch	90-100
2 inch	35-70
1- ½ inch	0-15
¾ inch	0-5
1- ½ Inch Graded Crushed Stone or Gravel	
2 inch	100
1- ½ inch	85-100
1 inch	65-90
¾ inch	50-80
No. 4	30-60
No. 10	20-50
No. 40	10-30
No. 200	5-15
¾ Inch Graded Crushed Stone or Gravel	
1 inch	100
¾ inch	85-100
3/8 inch	50-80
No. 4	35-60
No. 10	25-50
No. 40	15-30
No. 200	5-15

904.3 Recycled Crushed Pavement Materials

904.3.1 General Requirements

Recycled crushed Pavement Materials shall consist of primarily reclaimed asphalt concrete and/or

reclaimed Portland Cement concrete pavement, base, walk, driveway and curb and/or gutter. The reclaimed material may contain sand, gravel and crushed stone. The reclaimed material shall not contain topsoil, loam or vegetation.

904.3.2 Gradation Requirements

Recycled crushed pavement materials shall comply with the gradation requirements specified in Table 16.

TABLE 16
GRADATION REQUIREMENTS FOR
RECYCLED CRUSHED
PAVEMENT MATERIALS

Sieve Size	Percentage Passing By Weight	
	1- ½" Graded Crushed Stone or Gravel Substitution	¾" Graded Crushed Stone or Gravel Substitution
2 inch	100	--
1- ½ inch	85-100	--
1 inch	65-90	100
¾ inch	50-80	85-100
3/8 inch	40-70	50-80
No. 4	30-60	35-60
No. 10	20-50	25-50
No. 40	10-30	15-30
No. 200	5-15	5-15

SECTION 905 MISCELLANEOUS CONSTRUCTION MATERIALS

905.1 Concrete Block for Manholes

905.1.1 General Requirements

Concrete block shall conform to the physical requirements of A.S.T.M. Designation C139, except as modified by these specifications.

905.1.2 Physical Requirements

Concrete block shall conform to the physical requirements specified in Table 17.

TABLE 17

PHYSICAL REQUIREMENTS FOR CONCRETE BLOCK

Absorption Limit, Maximum Ave. of 5 Units	Compressive Strength, Minimum (Gross Area)	
	Ave. of 5 Units	Individual
10 (lbs. /cu. ft.)	2500 (psi)	2000 (psi)

905.1.3 Size of Block

Concrete block shall be 7-5/8 inches high, 6 inches thick and of such length as to fit the standard manhole in even units. The inner and outer faces shall be curved to coincide with the inside and outside circumferences of the manhole, and the end faces shall be cut to fit radial lines. All blocks shall have a key way in either the top or bottom of the block. Special block shall be furnished with the upper face notched for steps.

905.1.4 Quality of Concrete Block

Concrete block shall be made from Portland cement, sand and gravel or crushed stone. They shall be of uniform and compact texture, free from cracks or warpage and with square corners.

905.1.5 Sampling and Testing

Concrete block shall be sampled and tested in accordance with A.S.T.M. Designation C140.

905.2 Concrete Brick

905.2.1 General Requirements

Concrete brick shall conform to the requirements for Grade N-II of A.S.T.M. Designation C55 except as modified by these specifications.

905.2.2 Physical Requirements

Concrete brick shall conform to the physical requirements specified in Table 18.

TABLE 18

**PHYSICAL REQUIREMENTS
FOR CONCRETE BRICK**

Absorption Limit, Maximum	Compressive Strength, Minimum	
Ave. of 5 Units	Ave. of 5 Units	Individual
10 (lbs. /cu. ft.)	3500 (psi)	3000 (psi)

905.2.3 Size of Brick

Concrete brick may be of full size, 2- 1/4 inches by 3- 3/4 inches by 8 inches, or of modular size, 2-1/8 inches by 3-5/8 inches by 7-5/8 inches.

905.2.4 Quality of Concrete Brick

Concrete brick shall be made from a mixture of Portland cement, sand and gravel or crushed stone. They shall be free from cracks and warpage and shall have plane surfaces and square corners. They shall have a uniform, compact and dense texture. Bricks which do not split properly are not acceptable. Concrete brick shall have a depression or keyway centered on the top or bottom surface. The depression shall not exceed 5/8 inch in depth and 1/2 inch in width with one end closed. Brick with both ends open shall not be acceptable.

905.2.5 Sampling and Testing

Concrete brick shall be sampled and tested in accordance with the requirements of A.S.T.M. Designation C140.

905.3 Mason Sand

905.3.1 Requirements

Mason sand shall meet the requirements of the Specifications for Aggregate for Masonry Mortar, A.S.T.M. Designation C144, except as modified by these specifications.

The material shall consist of sand composed of clean, hard tough, durable grains of approved inert materials from natural deposits.

It shall meet the gradation requirements of Table 19.

TABLE 19
GRADATION REQUIREMENTS
FOR MASON SAND

Sieve Sizes	Percentage Passing By Weight
No. 8	100
No. 50	15-35
No. 100	2-10

905.4 Mortar

905.4.1 General Requirements

Mortar to be used for joints in masonry units and plastering or for any other specified use shall be in accordance with requirements of A.S.T.M. Designation C270, Mortar Type M.

The mortar shall consist of a mixture of mason sand, water and cementitious materials which comply with the following requirements.

Portland Cement, Type I or IP.....Section 902.1
 Masonry Cement, Type N.....A.S.T.M. Designation C91
 Hydrated Lime, Type S.....A.S.T.M. Designation C207
 Mason Sand.....Section 905.3
 Water.....Section 902.3

905.4.2 Proportions

The mortar shall be mixed in the proportion as specified in Table 20.

TABLE 20**MORTAR PROPORTIONS**

Parts By Volume Portland Cement	Parts By Volume Masonry Cement	Parts By Volume Hydrated Lime	Damp, Loose Mason Sand
1	1	0	Not less than 2- ¼ and not More than 3 of the volume of the cements and lime used.
1	0	1/4	

A mixture of any of the above cementitious materials, when furnished in approved packages, may be accepted in such proportions that when mixed with mason sand and water will produce a suitable mortar and meet the compressive strength requirement of 2500 psi for Mortar Type M of the property specification of A.S.T.M. Designation C270.

905.5 Zinc Coated (Galvanized) Corrugated Iron or Steel Culvert

905.5.1 Requirements.

Corrugated metal culvert pipe shall be fabricated from corrugated galvanized metal sheets and factory riveted and shall be of the diameter specified.

The pipe shall comply with the requirements of A.A.S.H.T.O. Designation M36.

905.5.2 Coupling Bands

Coupling bands shall not be less than 7 inches wide for diameters of 8 inches to 30 inches, inclusive, not less than 12 inches wide for pipe larger than 30 inches. The bands shall be connected at the ends by galvanized angles. The angles shall have the minimum dimensions of 2 inches by 2 inches by 3/16 inches. The 7 inch band shall have at least 2 galvanized bolts not less than 1/2 inch diameter. The 12 inch band shall have three 1/2 inch galvanized bolts.

905.5.3 Wall Thickness

The wall thickness shall conform to the requirements specified in Table 21.

TABLE 21

**WALL THICKNESS FOR CORRUGATED
STEEL PIPE AND COUPLING BANDS**

Nominal Diameter Inches	Corrugated Steel Pipe Thickness Inch	Coupling Band Thickness Inch
6	0.052	0.0486
8	0.064	0.0486
10	0.064	0.0486
12	0.064	0.0486
15	0.064	0.0486
18	0.064	0.0486
21	0.064	0.0486
24	0.064	0.0486
30	0.079	0.0486
36	0.079	0.0486

905.6 Manhole Adjusting Rings

905.6.1 Requirements

The manhole adjusting ring shall comply with the requirements of A.A.S.H.T.O. Designation M105.

The ring shall be cast to proper shape and ready for installation when delivered to the work site. This item shall be equal to Neenah Foundry No. R-1979, D-1 for the 2 inch height. D-2 for the 2- ½ inch height and D-3 for the 3 inch height.

905.7 Steel

905.7.1 General Requirements

Steel used for all reinforcing or load transfer devices shall be free from dirt, excessive rust, oil or other harmful coatings, and shall not be appreciably bent out of shape when incorporated in the work.

905.7.2 Deformed Tie Bars

Deformed tie bars shall be of a diameter or number and length as specified, and shall comply with the requirements of A.S.T.M. Designation A615, Grade 40.

905.8 Steel Plate Beam Guard

905.8.1 Requirements

The corrugated sheet steel beam shall comply with the requirements of A.A.S.H.T.O. Designation M180.

The material shall be blanked to proper shape, fabricated and ready for assembly when delivered to the work site. The edges of the beams shall be rolled or rounded to eliminate sharp edges. Any section of steel plate beam guard which is warped or deformed shall be rejected.

905.9 Timber Posts

905.9.1 Requirements

Timber posts shall be preservative treated sawed wooden posts of the dimensions specified.

905.9.2 Species of Wood

The post material shall be from one of the following species: Pacific Coast Douglas Fir, Southern Yellow Pine, Norway Pine, Jack Pine, White Pine, Eastern Hemlock, Western Hemlock or Western Larch, and shall be of the stress grade known as 1200 f for structural beams and timbers.

905.9.3 Preservative Treatment

Timber posts shall be pressure treated with one of the preservatives specified in Table 22.

TABLE 22

WOOD PRESERVATIVES

Type	Preservative	Preservation Specifications
Water-Borne	Acid Copper Chromate (Celcure)	Federal TT-W-546
Water-Borne	Ammoniacal Copper Arsenite (Chemonite)	Federal TT-W-549
Water-Borne	Chromated Copper Arsenate	Federal TT-W-550
Water-Borne	Chromated Zinc Chloride	Federal TT-W-551
Water-Borne	Osmosar (Osmosalts)	Federal TT-W-535
Water-Borne	Tanalith (Wolman Salts)	Federal TT-W-535
Oil-Borne	Pentachlorophenol*	A.A.S.H.T.O. M133
Oil-Borne	Petroleum Solvent	A.A.S.H.T.O. M133

**Pentachlorophenol, when used, shall be a pentachlorophenol solution in heavy petroleum solvent equivalent to 5 percent pure pentachlorophenol, by weight, of the total solution.*

The preservative treatment shall be by the pressure process in accordance with the requirements of Federal Specification TT-W-571.

905.10 Wood Guard Rail

905.10.1 Requirements

The wood guard rail shall be untreated structural lumber of the dimension specified.

905.10.2 Species of Wood

The lumber shall be from one of the following species: Pacific Coast Douglas Fir, Southern Yellow Pine, Western Larch, Northern Hemlock, Norway Pine, White Pine, Jack Pine or Eastern Hemlock and shall be of the stress grade known as 1200 f for structural beams and timbers.

905.11 Joint Sealer

905.11.1 Requirements

Joint sealer shall comply with the requirements of ASTM Designation D3405.

Joint sealer shall be composed of a mixture of materials that will form a resilient and adhesive compound capable of effectively sealing joints in concrete against the infiltration of moisture and foreign material throughout repeated cycles of expansion and contraction with temperature changes and that will not flow from the joints or be picked up by vehicle tires at summer temperature. The material shall be capable of being brought to a uniform

pouring consistency suitable for completely filling the joints without inclusion of large air holes or discontinuities.

The joint sealer shall be melted, by indirect heat, in suitable equipment provided with positive temperature control and mechanical agitation. The material shall not be damaged when heated to the temperature required for satisfactory pouring.

905.12 Performed Expansion Joint Material

905.12.1 Requirements

The expansion joint material shall be a performed filler of the type and dimensions specified. The allowable tolerance in dimensions are plus 1/16 inch in thickness, plus or minus 1/8 inch in depth and plus or minus 1/4 inch in length.

Expansion joint filler, other than the one specified below, may be used only with the approval of the Commissioner.

Expansion joint material shall consist of preformed strips which have been formed from cane or other suitable fibers of a cellulosic nature, securely bound together and uniformly saturated with asphalt, or strips formed from clean granulated cork particles securely bound together by a suitable asphalt binder and encased between two layers of asphalt saturated felt or two layers of glass fiber. The material shall comply with the requirements of A.S.T.M. Designation D1751.

905.13 Fertilizer

905.13.1 Requirements

Fertilizer shall consist of 10 percent nitrogen, 10 percent phosphorus and 10 percent potash. Each package of fertilizer shall be plainly marked with the analysis of the content.

905.14 Grass Seed

905.14.1 General Requirements

The grass seed shall conform to the Seed Law of the State of Wisconsin regarding noxious weed seed content. No seed shall be used on the work later than one year after the test date which appears on the label.

905.14.2 Purity and Germination

Grass seed shall be tested when required in accordance with the methods and procedures used in making purity analysis and germination tests as adopted by the U.S. Department of Agriculture in the Administration of the Federal Seed Act.

905.14.3 Seed Mixture

The seed mixture shall be composed of seeds of the purity, germination and proportions by weight as specified in Table 23.

TABLE 23**SEED MIXTURE**

Ingredients	Purity	% Germination	% Weight
21 # Kentucky Bluegrass	85	80	50-60
Creeping Red Fescue	97	80	30
Red Top	92	90	0-10
Perennial Ryegrass	98	90	10

Each bag of seed shall have a label securely attached showing the ingredients, minimum crop seed and germination.

905.15 Mulching Material**905.15.1 Requirements**

Mulching material shall consist of any straw, hay or other suitable material substantially free of noxious weed seeds and objectionable foreign matter.

905.16 Sod**905.16.1 Requirements**

Sod shall be freshly cut, nursery grown grass consisting of two or more Kentucky Bluegrass varieties incorporated within the sod, so as to form a poly-stand. The dominant grass must be of a preferred variety. The other grasses should be of the preferred varieties; however, less desirable varieties will be accepted providing they do not occupy more than 40 percent of the stand.

The preferred Kentucky Bluegrass varieties are: Glade, Baron, Victa, Majestic, Adelphi, Bonnie Blue, Parade and Nugget. The less desirable Kentucky Bluegrass varieties are Merion and Flyking.

Sod shall be of uniform thickness with a minimum of $\frac{3}{4}$ inch. At the time the sod is cut, grass shall have a length of approximately 2 inches and the sod shall have been raked free of debris.

The sod shall not be cut in a dry condition. In the event of dry weather conditions, the sod shall be watered in sufficient quantities to provide a well-moistened condition of sod to the depth to which it is to be cut. Depending on the nature of the sod, all of the dense root system shall be retained in the sod strip.

905.17 Topsoil

905.17.1 Requirements

The topsoil shall be fertile, natural humus-bearing soil adapted to the sustenance of plant life, within the range of light clay loam to fine sandy loam, either slightly alkaline or acid (pH limits 6.3 to 7.5).

The material shall be stockpiled in sufficient quantity to supply the contract. These stock piles are subject to inspection and testing prior to approval and use.

Immediately prior to delivery to the work site, the topsoil from the stockpiles shall be screened through a $\frac{1}{2}$ inch screen to insure uniformity of texture and freedom from lumps, gravel, stone and other undesirable foreign matter.

905.18 Filter Fabric for Erosion Control

905.18.1 Filter Fabric for Control of Surface Water

The filter fabric shall be a geo-textile fabric: polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride meeting the following specifications:

Grab Strength: 45 lbs. minimum in any principal direction (A.S.T.M. D1682).

Mullen Burst Strength: Minimum 60 psi (A.S.T.M. D3786).

The fabric shall have an opening no greater than a number 20 U.S. Standard Sieve, and a minimum permeability of 120 gpm. / sq. ft (Multiply Permittivity in Sec. ⁻¹ determined by A.S.T.M. D4491 Constant Head Test by conversion factor of 74).

905.18.2 Filter Fabric for Control of Trench Sediment

The filter fabric shall be a geo-textile fabric: polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride meeting the following specifications:

Grab Strength: 400 lbs. minimum in any principal direction (A.S.T.M. D1682)

Mullen Burst Strength: Minimum 600 psi (A.S.T.M. D786)

The fabric shall have an opening no greater than a number 140 U.S. Standard Sieve, and a minimum permeability of 25 gpm. / sq. ft. (Multiply

Permittivity in Sec. ⁻¹ determined by A.S.T.M. D4491 Constant Head Test by conversion factor of 74).

905.19 Geo-Textile Filter Fabric for Underdrain Wrapping

The filter fabric shall be geo-textile fabric: polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride meeting the following specifications:

Grab Tensile Strength: 35 lbs. in any principal direction (A.S.T.M. D4632)

Mullen Burst Strength: Minimum 60 psi. (A.S.T.M. D3786)

Equivalent Opening Size: 30-140 (Corps of Eng. CW-02215-77)

Water Flow Rate (gpm. / sq. ft.): 100 (Min.) (at 50 mm. Constant Head)

Water flow rate in gpm. / sq. ft. shall be determined by multiplying Permittivity in Sec. ⁻¹ as determined by A.S.T.M. D4491 constant Head Test by a conversion factor of 74.

905.20 Internal Manhole Sleeve

905.20.1 Requirements

The internal manhole sleeve shall be a thermal PVC material or equal and comply with the requirements of A.S.T.M. C-443

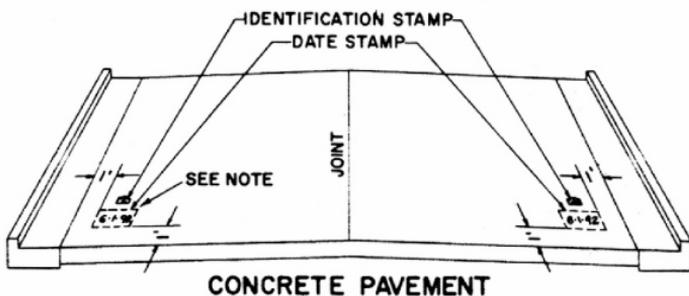
The shape of the sleeve shall be pleated so that a 2 inch movement of the frame will not displace the watertight bands.

905.20.2 Steel Bands

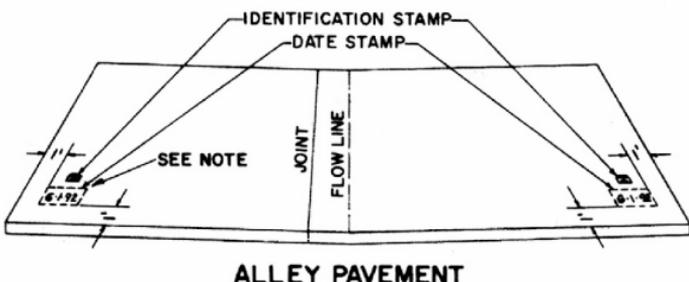
The steel bands shall be type 304 stainless steel and 16 gage thickness. Each band shall be equipped with a device that is capable of expanding the band and maintaining the tension after a watertight seal is obtained. All hardware used in conjunction with this device shall be stainless steel.

905.20.3 Butyl Sealant

The butyl sealant shall be a hi-grade material and shall be applied according to the manufacturer's recommendation. Prior to its use, a sample of the material in its original container, shall be furnished to the City for approval.



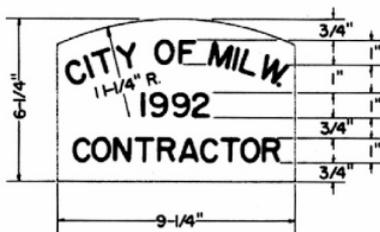
NOTE: SECOND SET REQUIRED ONLY IF PAVEMENT IS
CONSTRUCTED IN SEPARATE STRIPS



IDENTIFICATION AND DATE STAMPS ON CONCRETE PAVEMENTS

FIGURE - 1

STD. DWG. 105

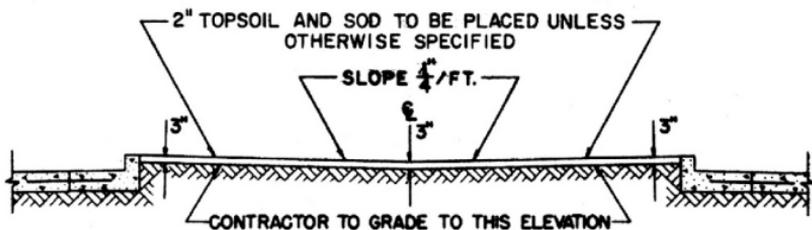


IDENTIFICATION STAMP

FIGURE - 2

STD. DWG. 106

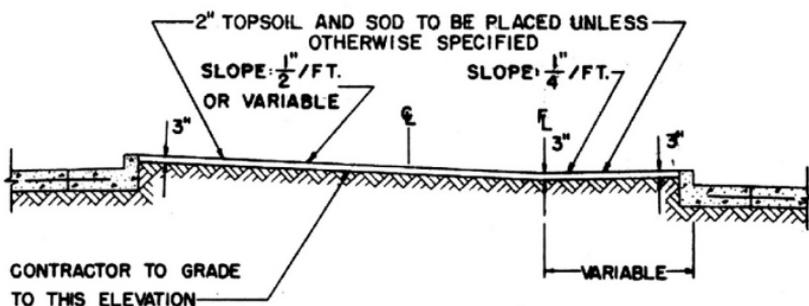
BUREAU OF ENGINEERS	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
<i>Donald H. Jenke</i> APPROVED BY	<i>David V. Kishitani</i> DRAWN BY
<i>Walter H. Graetz</i> APPROVED BY	WALTER H. GRAETZ CHECKED BY
<i>John Q. Eason</i> APPROVED CITY ENGINEER	DATE - JUNE 1, 1991



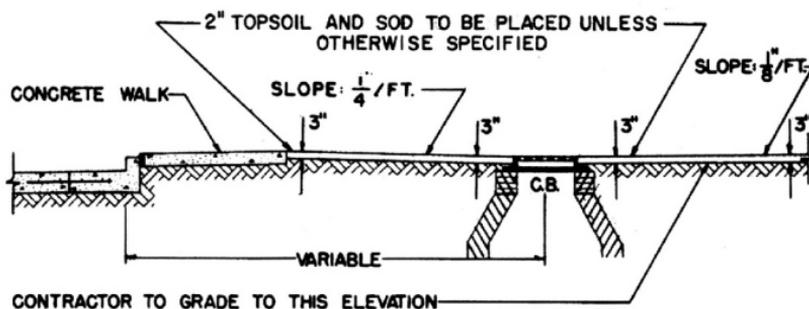
NOTE:

IF LONGITUDINAL GRADES ON CURBS ARE LESS THAN 0.50%, TRANSVERSE SLOPE OF THE DRAINAGE SECTION SHALL VARY BETWEEN $\frac{1}{4}$ " / FT. AT THE SUMMIT, TO $\frac{1}{2}$ " / FT. AT THE CATCH BASIN IN ORDER TO IMPROVE LONGITUDINAL DRAINAGE.

TRANSVERSE SECTION WITH CURBS AT SAME ELEVATIONS



TRANSVERSE SECTION WITH CURBS AT DIFFERENT ELEVATIONS



LONGITUDINAL SECTION AT CROSSWALK

CENTER PLOT CROSS SECTIONS

FIGURE - 3

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DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

Ronald H. Jenke
APPROVED BY

David A. B. Mattson
DRAWN BY

Manion
APPROVED BY

STEPHEN CARLSON

John R. Erickson
APPROVED CITY ENGINEER

DESIGNED BY

DATE - JUNE 1, 1991



C = Crown
 X = Distance Left or Right of Centerline
 Y = Distance From Screed to Stringline (Crown Ordinate)

TABLE OF PARABOLIC CROWN ORDINATES

CROWN >	20' POUR		22' POUR		24' POUR		26' POUR		28' POUR		30' POUR	
	1"	2"	1"	2"	1"	2"	1"	2"	1"	2"	1"	2"
C/L	0.083	0.167	0.083	0.167	0.083	0.167	0.083	0.167	0.083	0.167	0.083	0.167
1'	0.083	0.165	0.083	0.166	0.083	0.166	0.083	0.166	0.083	0.166	0.083	0.166
2'	0.080	0.160	0.081	0.161	0.081	0.162	0.081	0.163	0.082	0.163	0.082	0.164
3'	0.076	0.152	0.077	0.154	0.078	0.156	0.079	0.158	0.080	0.159	0.080	0.160
4'	0.070	0.140	0.072	0.145	0.074	0.148	0.075	0.151	0.077	0.153	0.077	0.155
5'	0.062	0.125	0.066	0.132	0.069	0.138	0.071	0.142	0.073	0.145	0.074	0.148
6'	0.053	0.107	0.059	0.117	0.062	0.125	0.066	0.131	0.071	0.136	0.074	0.141
7'	0.042	0.085	0.050	0.099	0.055	0.110	0.059	0.118	0.062	0.125	0.065	0.130
8'	0.030	0.060	0.039	0.079	0.046	0.093	0.052	0.104	0.056	0.112	0.060	0.119
9'	0.016	0.032	0.028	0.055	0.036	0.073	0.043	0.087	0.049	0.098	0.053	0.107
10'	0.000	0.000	0.014	0.029	0.025	0.051	0.034	0.068	0.041	0.082	0.046	0.093
11'			0.000	0.000	0.013	0.027	0.024	0.047	0.035	0.052	0.039	0.056
12'					0.000	0.000	0.012	0.025	0.037	0.049	0.030	0.046
13'							0.000	0.000	0.000	0.000	0.021	0.034
14'											0.011	0.021
15'											0.000	0.000

< CROWN

DISTANCE LEFT OR RIGHT OF CENTERLINE

**PARABOLIC CROWN TABLE
 CONCRETE PAVEMENT**

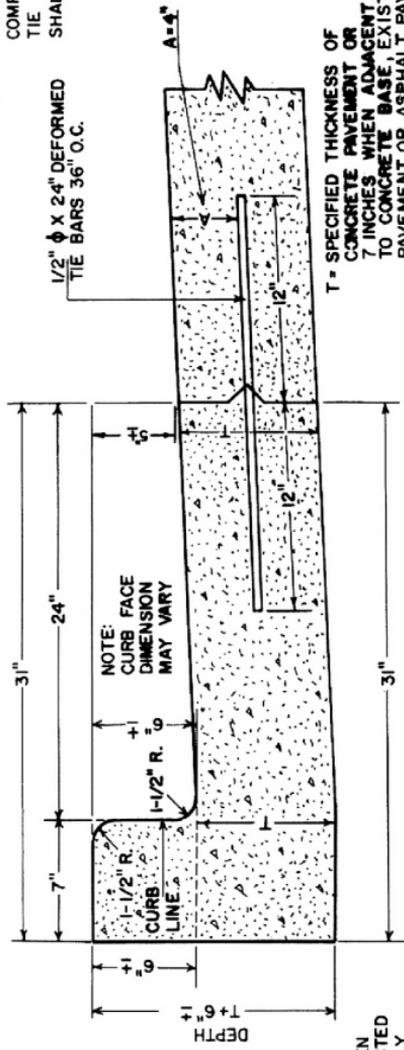
FIGURE 4

BUREAU OF ENGINEERS
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 MILWAUKEE, WISCONSIN

Donald H. Jencks APPROVED BY
 MILWAUKEE, WISCONSIN
Stephen Carlson CHECKED BY
 MILWAUKEE, WISCONSIN
John P. ... APPROVED BY
 MILWAUKEE, WISCONSIN
 DATE - JUNE 1, 1991

NOTE: TO OBTAIN AN ORDINATE FOR A GIVEN POUR WIDTH, MULTIPLY THE CROWN WANTED AT C/L BY THE ORDINATES FOR A GIVEN 1" CROWN FOR THAT GIVEN POUR.

NOTE: AN APPROVED METHOD FOR COMPLETE EMBEDMENT OF THE TIE BAR WITHIN THE CONCRETE SHALL BE USED.



T = SPECIFIED THICKNESS OF CONCRETE PAVEMENT OR 7 INCHES WHEN ADJACENT TO CONCRETE BASE, EXISTING PAVEMENT OR ASPHALT PAVEMENT ON GRAVEL BASE

NOTE: WHEN CONSTRUCTED INTEGRALLY DEPTH SHOULD BE $T+6 \pm 1/2"$

NOTE: IF CONSTRUCTED INTEGRALLY JOINT AND BARS MAY BE OMITTED

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REINFORCED VERTICAL FACE CONCRETE CURB AND GUTTER

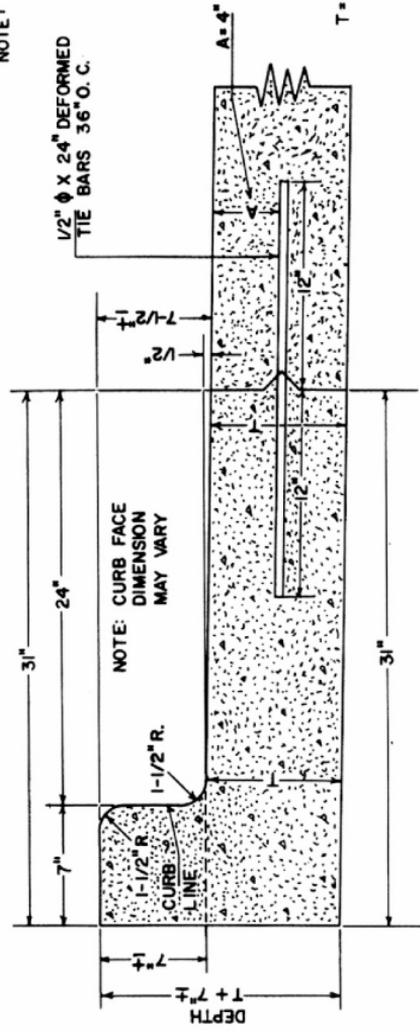
FIGURE - 6

APPROVED BY: *Ronald H. Jenke*
DATE: *6-1-1991*

APPROVED BY: *Stephen Carlson*
DATE: *JUNE 1, 1991*

APPROVED BY: *John D. Eisenberg*
DATE: *JUNE 1, 1991*

NOTE: AN APPROVED METHOD FOR COMPLETE EMBEDMENT OF THE TIE BAR WITHIN THE CONCRETE SHALL BE USED.



T = SPECIFIED THICKNESS OF CONCRETE PAVEMENT OR 7 INCHES WHEN ADJACENT TO CONCRETE BASE, EXISTING PAVEMENT OR ASPHALT PAVEMENT ON GRAVEL BASE

NOTE: IF CONSTRUCTED INTEGRAL JOINT AND BARS MAY BE OMITTED

BUREAU OF ENGINEERS	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
APPROVED BY <i>Ronald H. Janku</i>	DRAWN BY <i>A.C. Schindler</i>
APPROVED BY <i>Marion J. Dwyer</i>	CHECKED BY STEPHEN CARLSON
APPROVED BY <i>John E. Erickson</i>	DATE - JUNE 1, 1991
APPROVED CITY ENGINEER	

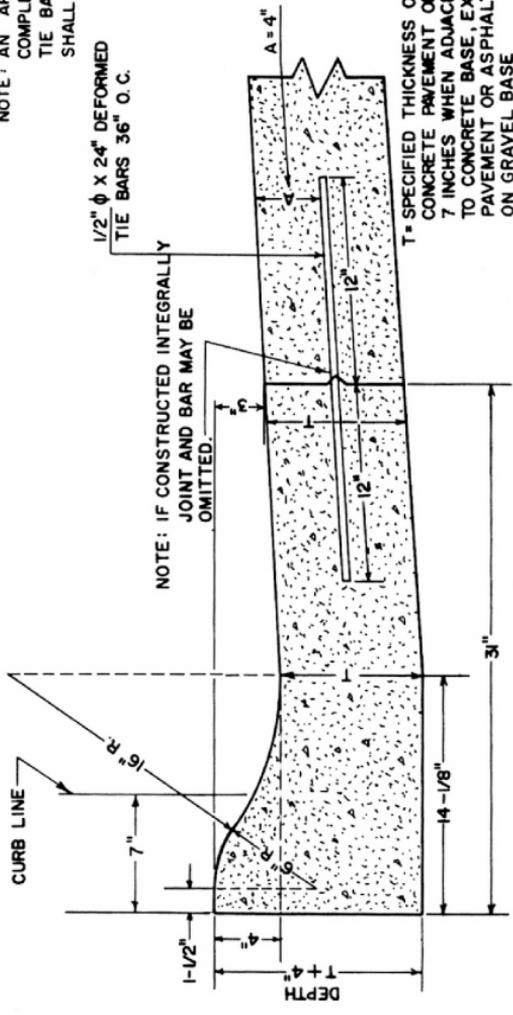
REINFORCED VERTICAL FACE CONCRETE CURB AND GUTTER REVERSE PITCH SECTION

FIGURE - 7

NOTE: AN APPROVED METHOD FOR COMPLETE EMBEDMENT OF THE TIE BAR WITHIN THE CONCRETE SHALL BE USED.

1/2" ϕ X 24" DEFORMED TIE BARS 36" O.C.

NOTE: IF CONSTRUCTED INTEGRALLY JOINT AND BAR MAY BE OMITTED.



NOTE: WHEN CONSTRUCTED INTEGRALLY DEPTH SHOULD BE $T + 4" + 1\frac{1}{2}"$

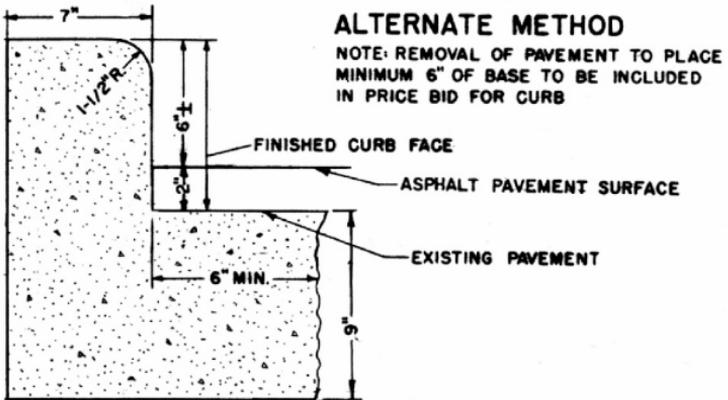
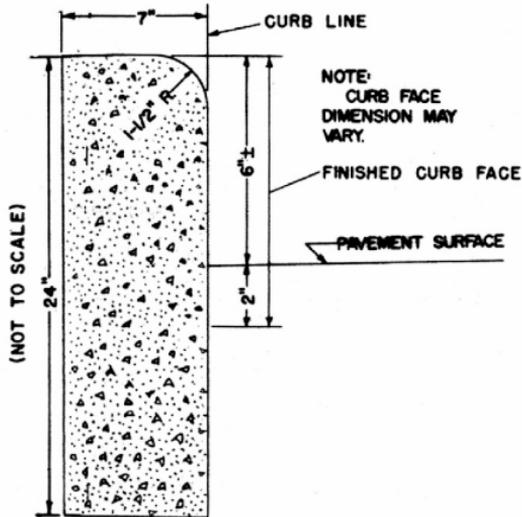
T = SPECIFIED THICKNESS OF CONCRETE PAVEMENT OR 7 INCHES WHEN ADJACENT TO CONCRETE BASE, EXISTING PAVEMENT OR ASPHALT PAVEMENT ON GRAVEL BASE

REINFORCED MOUNTABLE CONCRETE CURB AND GUTTER

FIGURE - 8

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APPROVED BY <i>Ronald H. Jenke</i>	APPROVED BY <i>W.C. Schindler</i>
DRAWN BY <i>William D. D.</i>	DRAWN BY STEPHEN CARLSON
APPROVED BY <i>John P. Eidenben</i>	CHECKED BY
APPROVED CITY ENGINEER	DATE - JUNE 1, 1991



ALTERNATE METHOD

NOTE: REMOVAL OF PAVEMENT TO PLACE MINIMUM 6" OF BASE TO BE INCLUDED IN PRICE BID FOR CURB

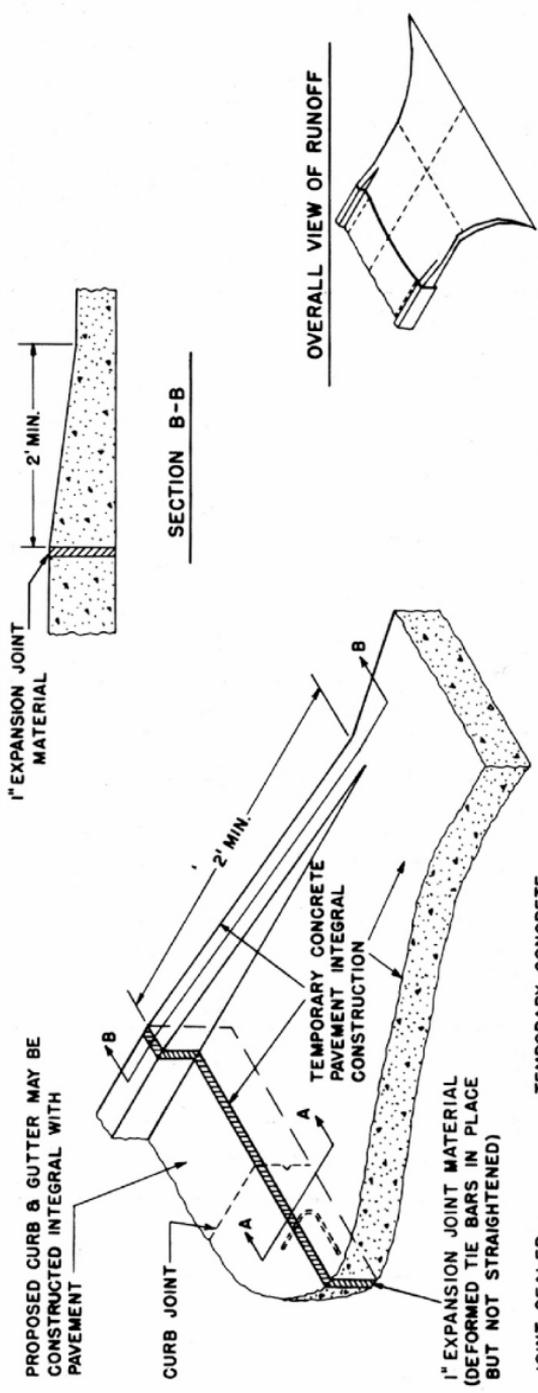
CONCRETE CURB

FIGURE 9

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DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

<i>Ronald W. Jenke</i> APPROVED BY	<i>David U. Kilkenny</i> DRAWN BY
<i>Mano Schifano</i> APPROVED BY	STEPHEN CARLSON CHECKED BY
<i>John A. E. ...</i> APPROVED CITY ENGINEER	DATE - JUNE 1, 1991



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APPROVED BY *R. Oldenburg*
 DRAWN BY STEPHEN CARLSON

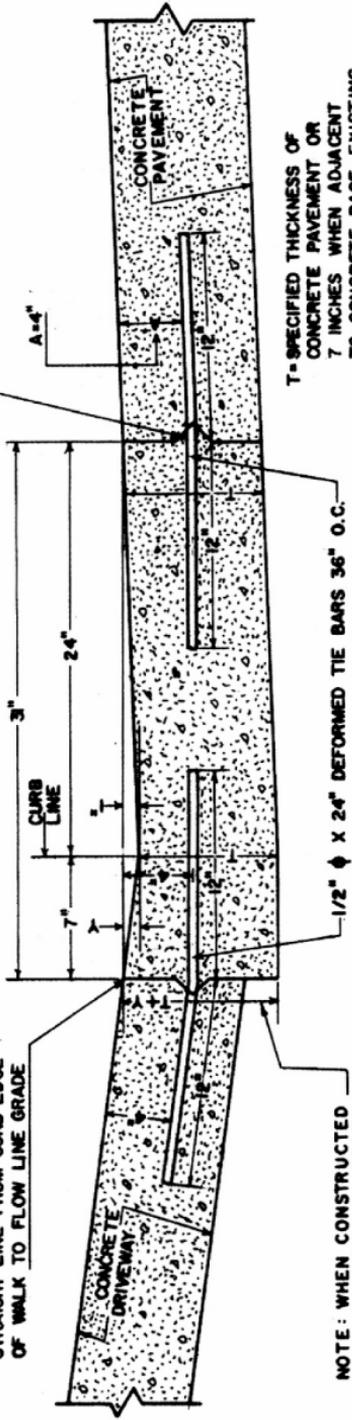
APPROVED BY *Marion J. [Signature]*
 CHECKED BY

DATE- JUNE 1, 1991
 APPROVED CITY ENGINEER *[Signature]*

RUN-OFF CURB & TEMPORARY PAVEMENT

FIGURE - 10

HEIGHT OF CONCRETE (Y) ABOVE FLOW LINE SHALL BE DETERMINED BY A STRAIGHT LINE FROM CURB EDGE OF WALK TO FLOW LINE GRADE



NOTE: IF CONSTRUCTED INTERNALLY JOINT AND BARS MAY BE OMITTED.

T = SPECIFIED THICKNESS OF CONCRETE PAVEMENT OR 7 INCHES WHEN ADJACENT TO CONCRETE BASE, EXISTING PAVEMENT OR ASPHALT PAVEMENT ON GRAVEL BASE

NOTE: AN APPROVED METHOD FOR COMPLETE EMBEDMENT OF THE TIE BAR WITHIN THE CONCRETE SHALL BE USED.

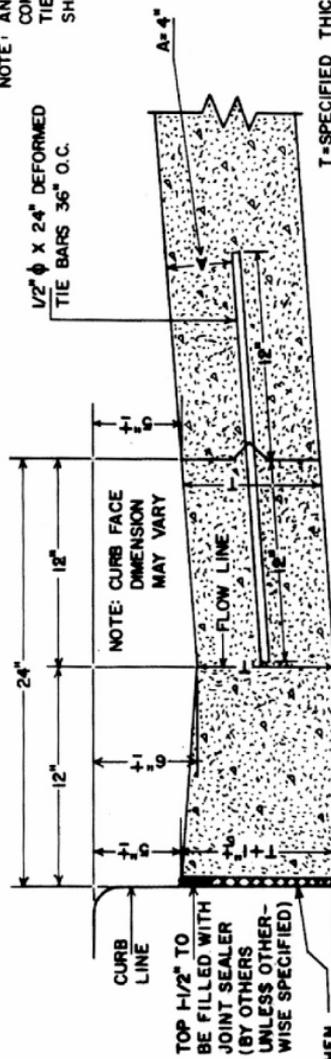
NOTE: WHEN CONSTRUCTED INTERNALLY DEPTH SHOULD BE T + Y + 1/2"

REINFORCED CONCRETE GUTTER (AT CONCRETE DRIVEWAY)

FIGURE - 11

BUREAU OF ENGINEERS	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
<i>Arnold J. Jenke</i> <small>DESIGNED BY</small>	<i>W.C. Hoffmann</i> <small>CHECKED BY</small>
<i>Michael J. Dwyer</i> <small>APPROVED BY</small>	STEPHEN CARLSON <small>CHECKED BY</small>
<i>John P. ...</i> <small>APPROVED CITY ENGINEER</small>	DATE - JUNE 1, 1991

NOTE: AN APPROVED METHOD FOR COMPLETE EMBEDMENT OF THE TIE BAR WITHIN THE CONCRETE SHALL BE USED.



NOTE: WHEN CONSTRUCTED INTEGRALLY DEPTH SHOULD BE $T + 1\frac{1}{2} + 1\frac{1}{2}$ MATERIAL

TOP $1\frac{1}{2}$ " TO BE FILLED WITH JOINT SEALER (BY OTHERS UNLESS OTHERWISE SPECIFIED)

NOTE: IF CONSTRUCTED INTEGRALLY JOINT AND BARS MAY BE OMITTED

T = SPECIFIED THICKNESS OF CONCRETE PAVEMENT OR 7 INCHES WHEN ADJACENT TO CONCRETE BASE, EXISTING PAVEMENT OR ASPHALT PAVEMENT ON GRAVEL BASE

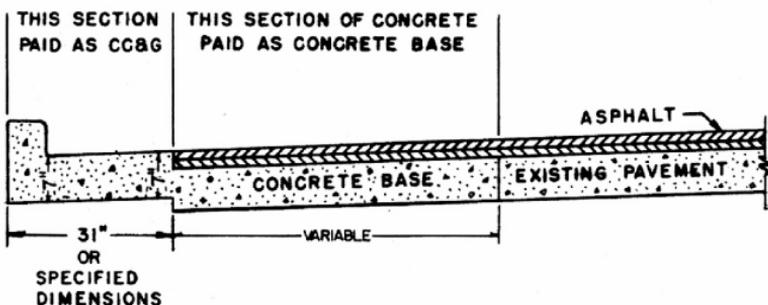
BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

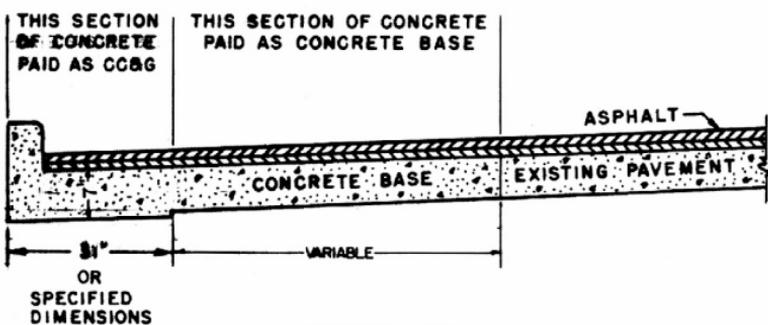
APPROVED BY <i>Donald H. Jenke</i> C. C. <i>de la Motte</i>	DRAWN BY STEPHEN CARLSON
APPROVED BY <i>Minard D. Dwyer</i>	CHECKED BY DATE - JUNE 1, 1991
APPROVED BY <i>John E. Erickson</i>	APPROVED CITY ENGINEER

REINFORCED CONCRETE GUTTER
(ADJACENT TO HOLLOW WALK OR WALK WITH INTEGRAL CURB)

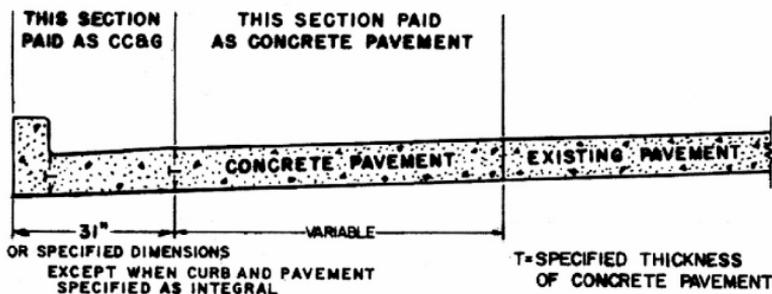
FIGURE - 12



TYPE I



TYPE II



TYPE III

**SPECIAL
CONCRETE CURB
AND GUTTER
SECTIONS
FIGURE-13**

STD. DWG. - 116

BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

Donald H. Janke
APPROVED BY

Marion J. [Signature]
APPROVED BY

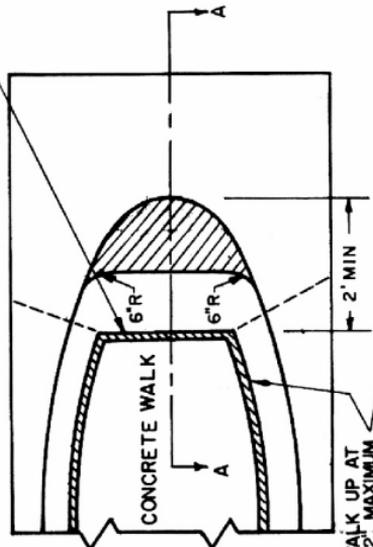
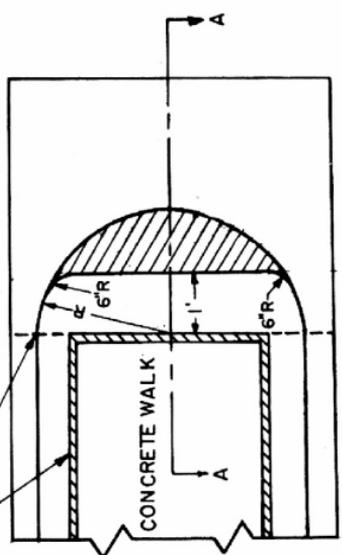
John A. Eichen
APPROVED CITY ENGINEER

W. C. IDZIKOWSKI
DRAWN BY
STEPHEN CARLSON
CHECKED BY

DATE - JUNE 1, 1991

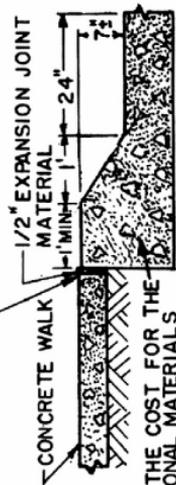
CURB JOINT AT THIS LOCATION MAY BE EXPANSION TYPE DEPENDING ON CORRESPONDING PAVEMENT JOINT

1/2" EXPANSION JOINT MATERIAL



VERTICAL FACE
CONCRETE CURB AND GUTTER
WITH SNOW-PLOWABLE
MEDIAN ISLAND NOSE

TYPICAL SECTION TO BE
CONSTRUCTED AT END OF
ISLAND WITH END RADIUS
OF 3' OR LESS.



NOTE: THE COST FOR THE
ADDITIONAL MATERIALS
AND LABOR IN THIS SECTION
SHALL BE INCLUDED IN THE
PRICE BID FOR CONCRETE
CURB AND GUTTER

BUREAU OF ENGINEERS

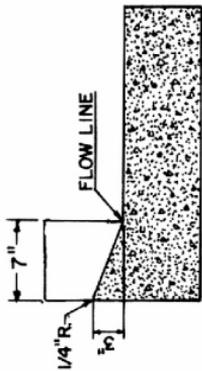
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

APPROVED BY: *Donald H. Jensen*
DRAWN BY: *J. J. Balisinski*
APPROVED BY: *Stephen Carlson*
DRAWN BY: *Stephen Carlson*
CHECKED BY: *Stephen Carlson*

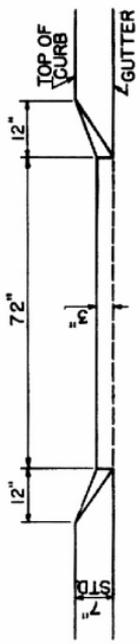
DATE - JUNE 1, 1991
APPROVED CITY ENGINEER: *John P. Erickson*

FIGURE - 14

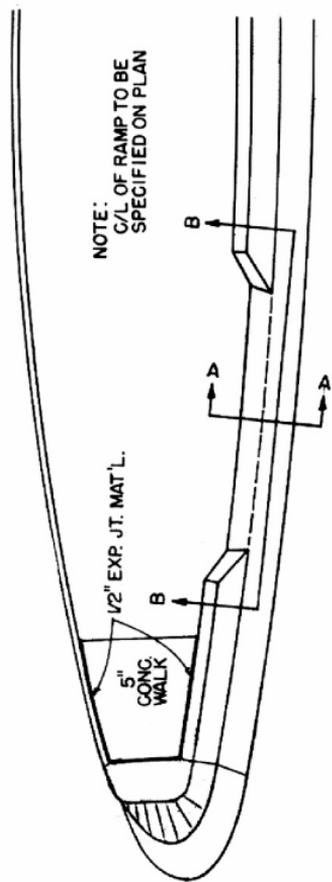
STD. DWG.-110



SECTION A - A



SECTION B - B

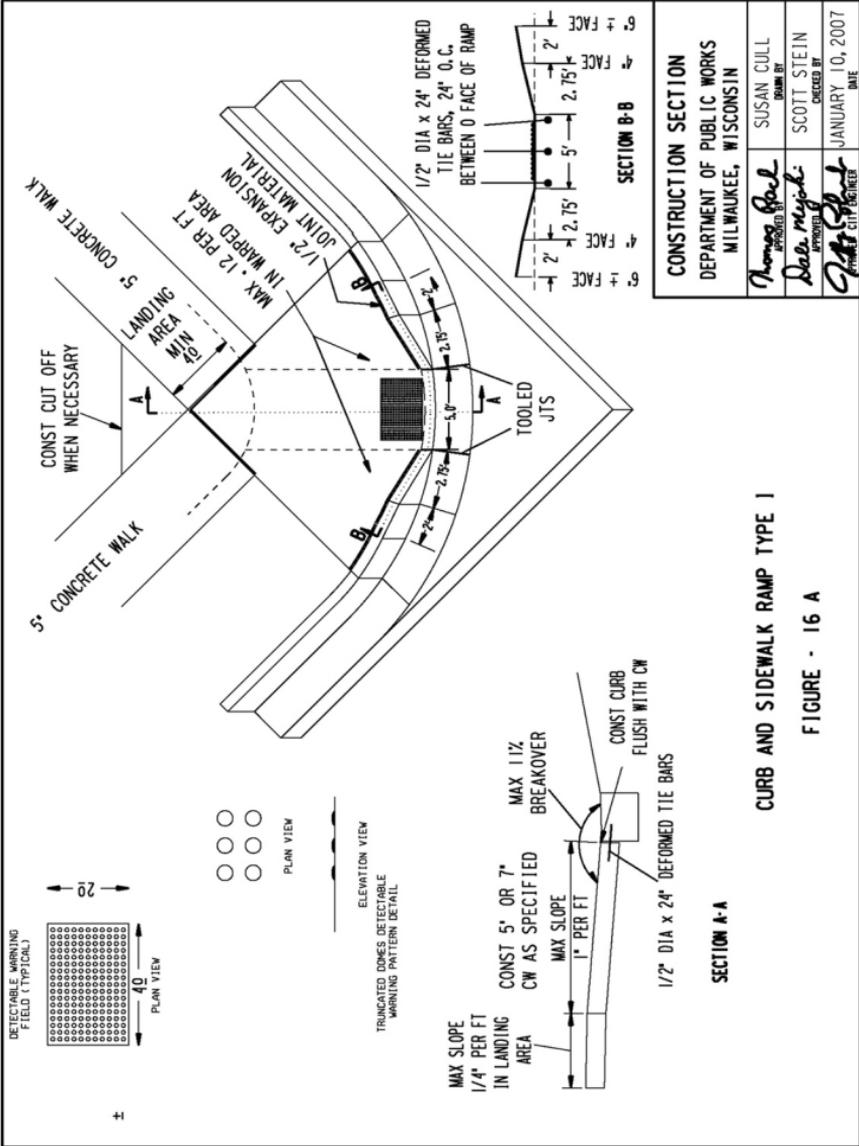


MAINTENANCE (MOWER) RAMP

FIGURE - 15

BUREAU OF ENGINEERS
 DEPARTMENT OF PUBLIC WORKS
 MILWAUKEE, WISCONSIN

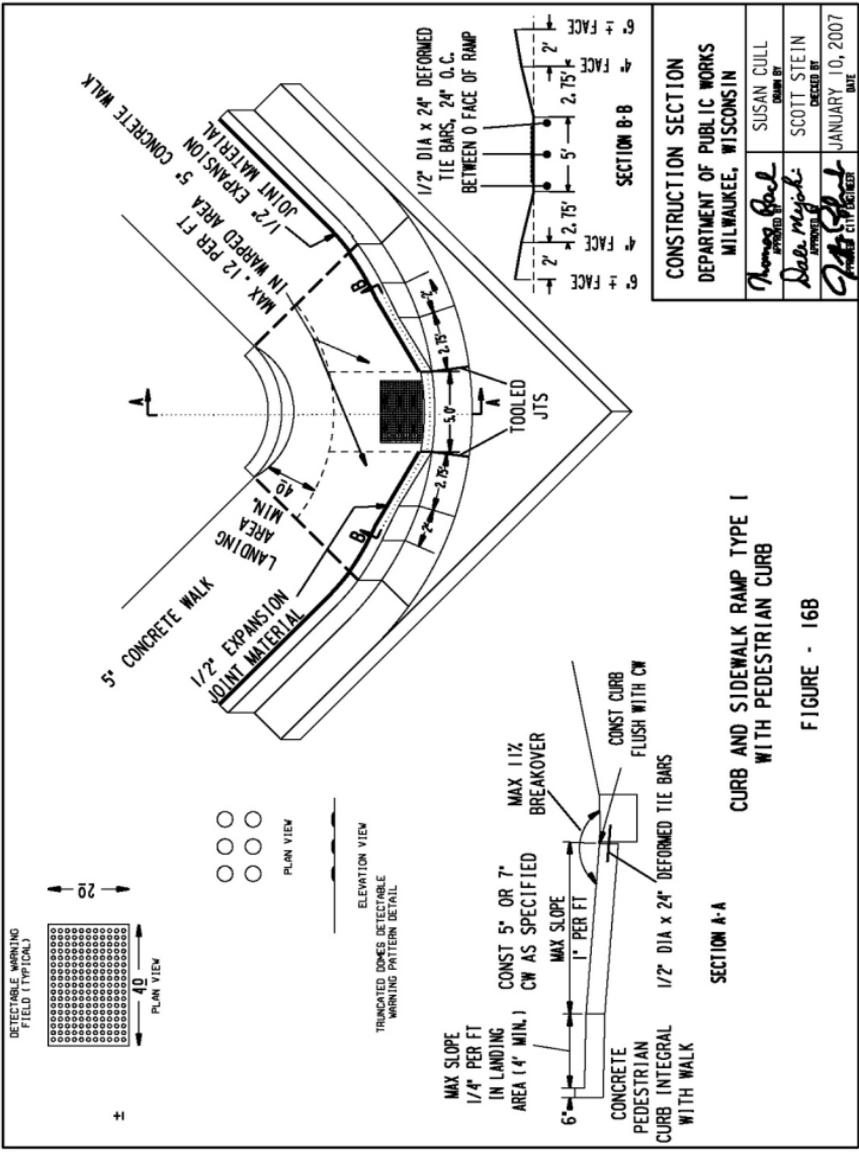
DRAWN BY: <i>R. J. ...</i>	DATE: JUNE 1, 1931
APPROVED BY: <i>Stephen Carlson</i> STEPHEN CARLSON CHECKED BY:	
APPROVED BY: <i>John P. E. ...</i> JOHN P. E. ... CITY ENGINEER	



CONSTRUCTION SECTION	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
DESIGNED BY <i>Thomas Paul</i>	SUSAN CULL DRAWN BY
CHECKED BY <i>Debra Myjda</i>	SCOTT STEIN
DATE <i>1/10/07</i>	JANUARY 10, 2007

CURB AND SIDEWALK RAMP TYPE I

FIGURE - 16 A



CONSTRUCTION SECTION		SUSAN CULL	
DEPARTMENT OF PUBLIC WORKS		DRAWN BY	
MILWAUKEE, WISCONSIN		SCOTT STEIN	
		CHECKED BY	
		JANUARY 10, 2007	
		DATE	

CURB AND SIDEWALK RAMP TYPE I WITH PEDESTRIAN CURB

FIGURE - 16B

SECTION A-A

SECTION B-B

MAX SLOPE 1/4" PER FT IN LANDING AREA (4' MIN.)

CONST 5" OR 7" CW AS SPECIFIED

MAX SLOPE 1" PER FT

CONCRETE PEDESTRIAN CURB INTEGRAL WITH WALK

CONST CURB FLUSH WITH CW

1/2" DIA x 24" DEFORMED TIE BARS

6" ± FACE

4" FACE

2" ± FACE

2.75'

5'

2.75'

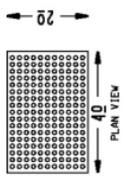
2" ± FACE

1/2" DIA x 24" DEFORMED TIE BARS, 24" O.C. BETWEEN O FACE OF RAMP

ELEVATION VIEW

TRUNCATED DOMES DETECTABLE WARNING PATTERN DETAIL

PLAN VIEW



5' CONCRETE WALK

LANDING AREA

MIN. 4.0'

TOOLED JTS

5.0'

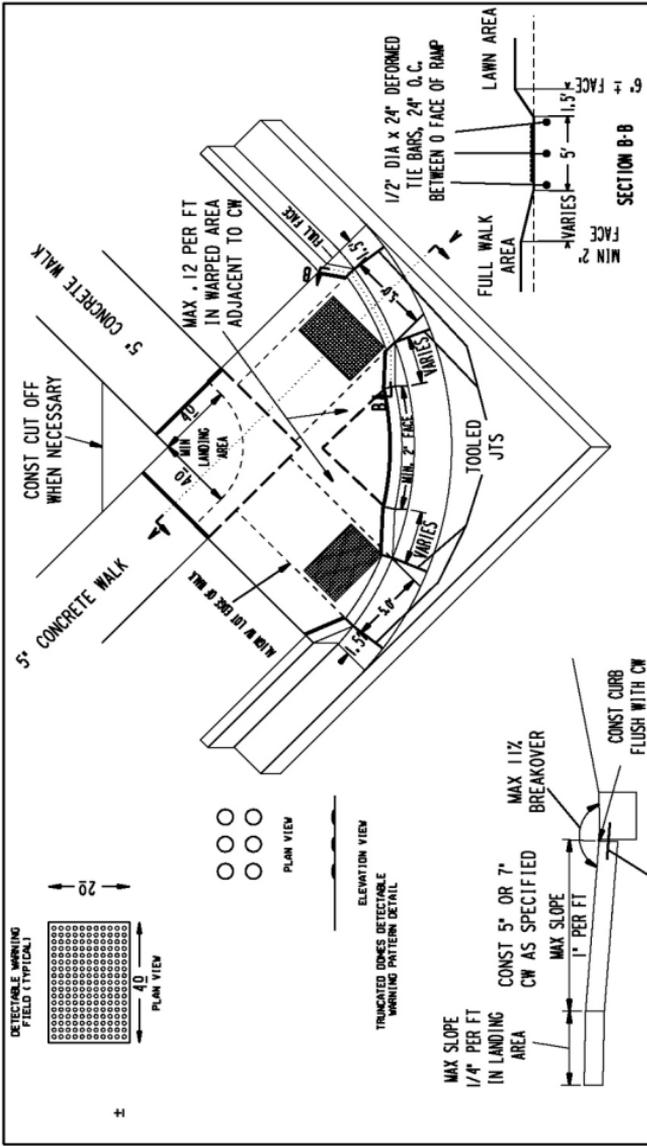
2.75'

2.75'

MAX. 12 PER FT IN WARPED AREA

1/2" EXPANSION JOINT MATERIAL

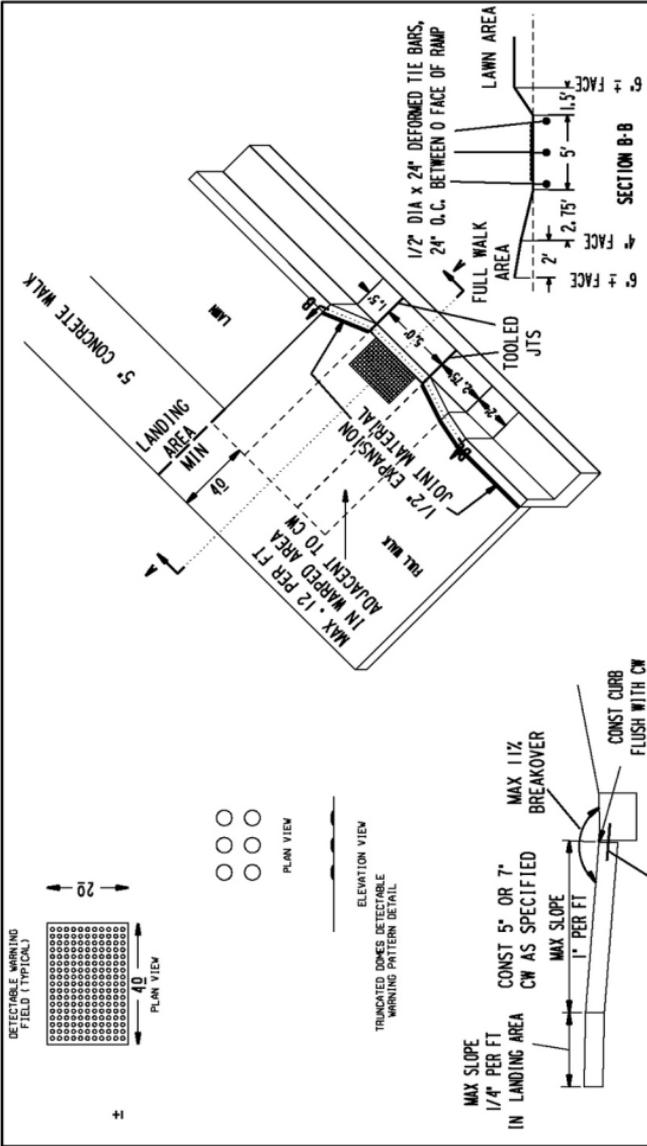
5' CONCRETE WALK



CONSTRUCTION SECTION		SUSAN CULL
DEPARTMENT OF PUBLIC WORKS		DRAWN BY
MILWAUKEE, WISCONSIN		SCOTT STEIN
		CHECKED BY
		JANUARY 10, 2007
		DATE

CURB AND SIDEWALK RAMP TYPE 11

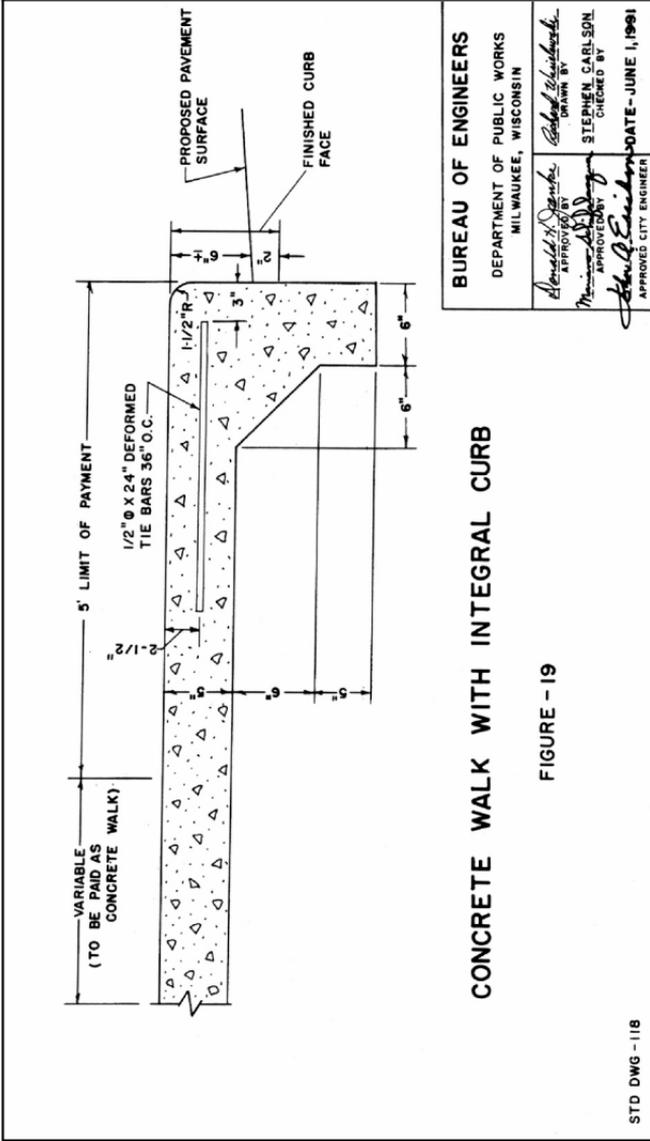
FIGURE - 17 A



CONSTRUCTION SECTION	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
DESIGNED BY <i>Thomas Paul</i>	SUSAN CULL
APPROVED BY <i>Debra Myjak</i>	SCOTT STEIN
DATE <i>1/10/07</i>	JANUARY 10, 2007

CURB AND SIDEWALK RAMP TYPE III

FIGURE - 18 A



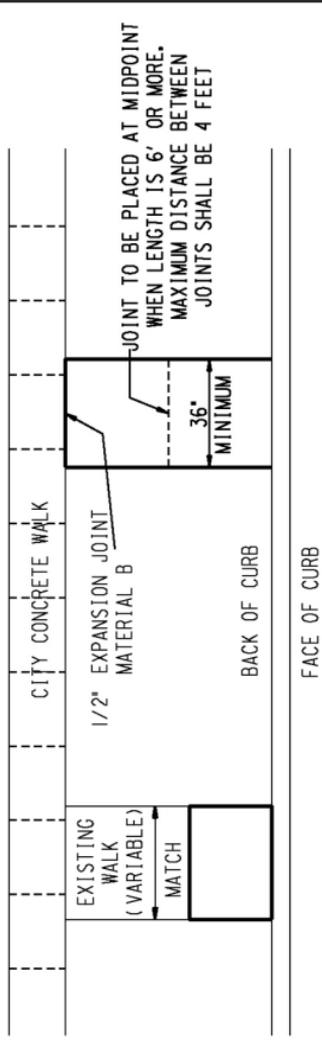
BUREAU OF ENGINEERS
 DEPARTMENT OF PUBLIC WORKS
 MILWAUKEE, WISCONSIN

APPROVED BY <i>Richard J. Deane</i> DRAWN BY <i>Richard J. Deane</i>	CHECKED BY STEPHEN CARLSON APPROVED BY <i>John R. Emswiler</i> APPROVED CITY ENGINEER
---	---

DATE - JUNE 1, 1991

CONCRETE WALK WITH INTEGRAL CURB

FIGURE - 19



MATCH WALK TO
BACK OF CURB HEIGHT



DRILL MINIMUM OF 2
4 TIE BARS
AT BACK OF CURB

ON RECONSTRUCTION OR CURB AND GUTTER REPLACEMENT PROJECTS,
THE WIDTH OF THE CARRIAGE WALK SHALL BE DETERMINED AS FOLLOWS:

- (1) IF A CARRIAGE WALK IS TO BE COMPLETELY REMOVED, AND IS 36" WIDE OR LESS - REPLACE WITH 36" WIDE.
- (2) IF A CARRIAGE WALK IS TO BE COMPLETELY REMOVED, AND IS WIDER THAN 36" - REPLACE WITH ORIGINAL WIDTH.
- (3) IF A CARRIAGE WALK IS ONLY PARTIALLY REMOVED - MATCH EXISTING WIDTH

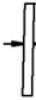
WIDTH INDICATED MAY CHANGE AS PROPERTY OWNERS REQUEST.

NOTE: THE CONSTRUCTION OF CARRIAGE WALK WHERE NONE EXISTED MAY BE REQUIRED
IF REQUESTED BY THE PROPERTY OWNER.

CONSTRUCTION SECTION DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
APPROVED BY	SUSAN CULL <small>DRAWN BY</small>
APPROVED BY	SCOTT STEIN <small>CHECKED BY</small>
APPROVED - CITY ENGINEER	FEBRUARY 16, 2006 <small>DATE</small>

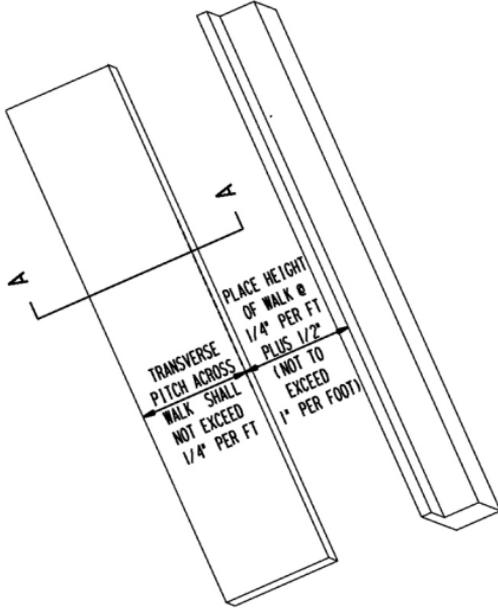
CONCRETE CARRIAGE WALK
FIGURE - 20

5' CONCRETE WALK



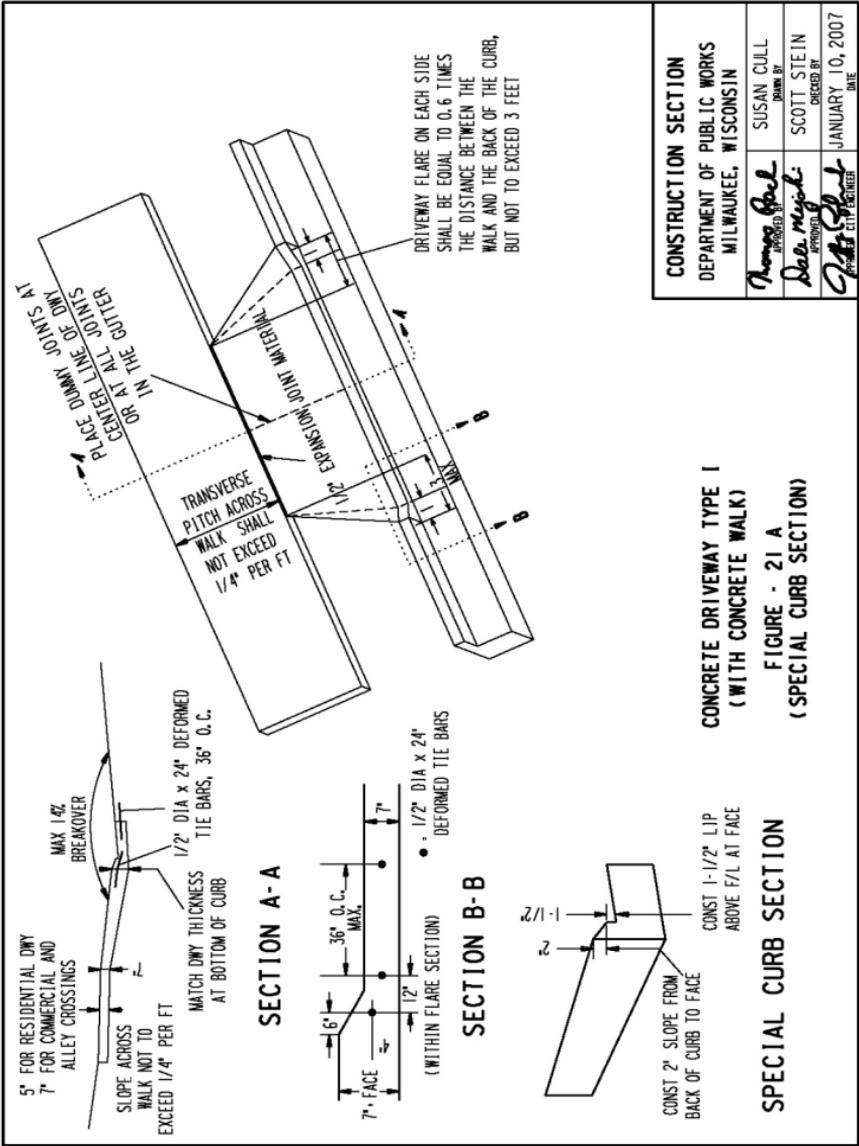
SLOPE ACROSS WALK
NOT TO EXCEED 1/4" PER FT

SECTION A-A



CONCRETE WALK
FIGURE- 20A

CONSTRUCTION SECTION DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
APPROVED BY	SUSAN CULL ENGINEER
APPROVED BY	SCOTT STEIN ENGINEER
APPROVED- CITY ENGINEER	JANUARY 10, 2007 DATE



CONSTRUCTION SECTION	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
PREPARED BY <i>Thomas Bach</i>	SUSAN CULL CHECKED BY
DESIGNED BY <i>Scott Stein</i>	SCOTT STEIN CHECKED BY
DATE JANUARY 10, 2007	

CONCRETE DRIVEWAY TYPE I
(WITH CONCRETE WALK)
FIGURE - 21 A
(SPECIAL CURB SECTION)

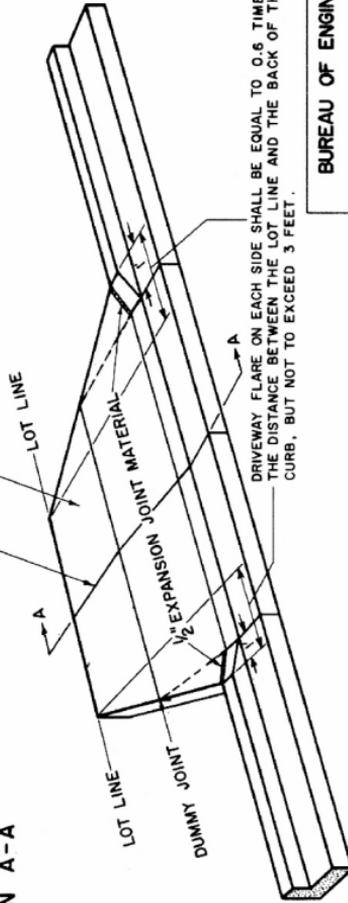
SPECIAL CURB SECTION

1/2" Ø X 24" DEFORMED TIE BARS 36" O.C.



SECTION A-A

PLACE DUMMY JOINT AT CENTER LINE OF DRIVEWAY AND/OR AT ALL JOINTS IN THE GUTTER, AND AT CURB EDGE OF FUTURE CONCRETE WALK. THIS SECTION OF DRIVEWAY SHALL HAVE A TRANSVERSE PITCH OF ONE-HALF INCH PER FOOT.



DRIVEWAY FLARE ON EACH SIDE SHALL BE EQUAL TO 0.6 TIMES THE DISTANCE BETWEEN THE LOT LINE AND THE BACK OF THE CURB, BUT NOT TO EXCEED 3 FEET.

BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

APPROVED BY <i>Donald H. Sporko</i>	DESIGNED BY <i>Richard W. Baur</i>
APPROVED BY <i>Stephen Carlsson</i>	CHECKED BY <i>Stephen Carlsson</i>
DATE: <i>5/10/91</i>	
APPROVED: <i>Richard W. Baur</i> DATE: JUNE 1, 1991	

**CONCRETE DRIVEWAY TYPE I
(WITHOUT CONCRETE WALK)**

FIGURE - 22

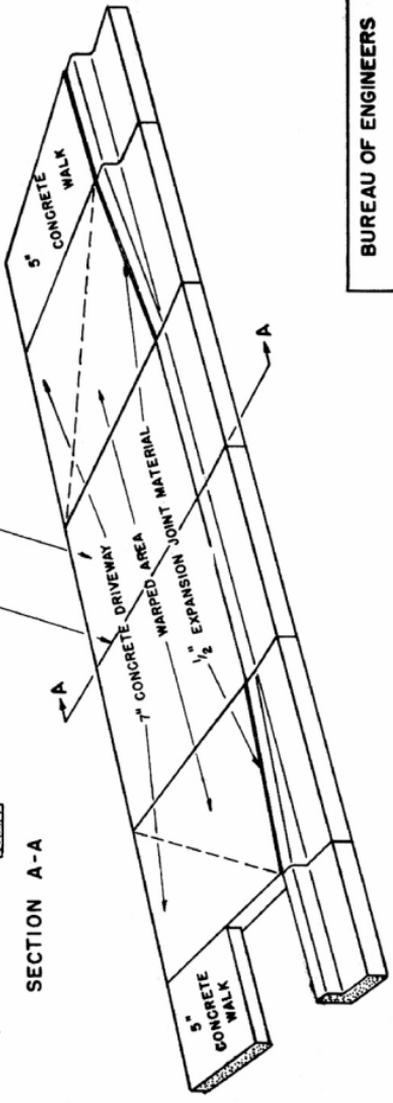
STD DWG - 143

1/2" @ X 34" DERORMBED TIE BARS, 36" O.C.



SECTION A-A

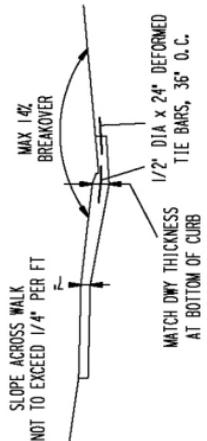
PLACE DUMMY JOINT AT CENTER LINE OF DRIVEWAY AND/OR AT ALL JOINTS IN THE BUTTER
 SLOPE SHALL NOT EXCEED ONE INCH VERTICAL IN ONE FOOT
 HORIZONTAL IN LONGITUDINAL OR IN TRANSVERSE DIRECTIONS



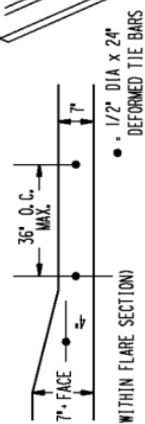
CONCRETE DRIVEWAY TYPE II
 (DEPRESSED)
 FIGURE-23

BUREAU OF ENGINEERS
 DEPARTMENT OF PUBLIC WORKS
 MILWAUKEE, WISCONSIN

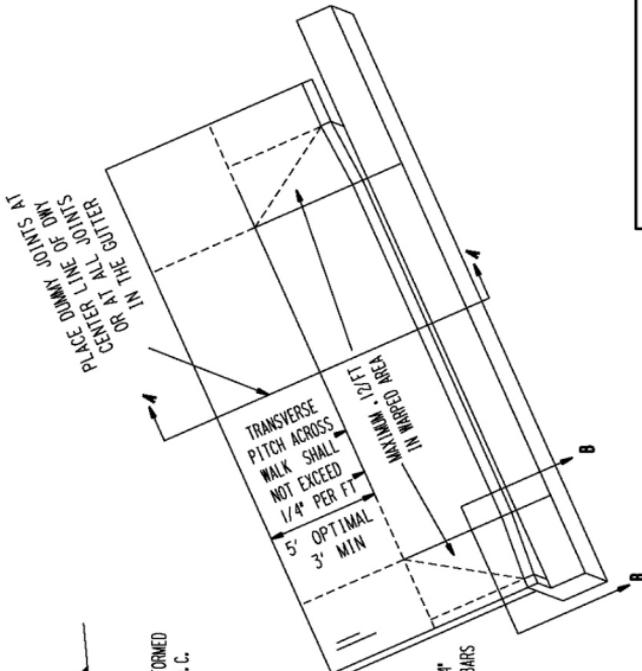
APPROVED BY: *[Signature]*
 APPROVED BY: *[Signature]*
 CHECKED BY: *[Signature]*
 DATE - JUNE 1, 1991
 APPROVED CITY ENGINEER



SECTION A-A

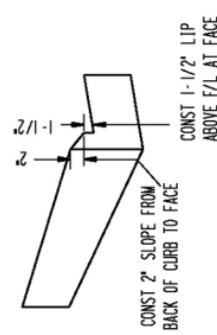


SECTION B-B



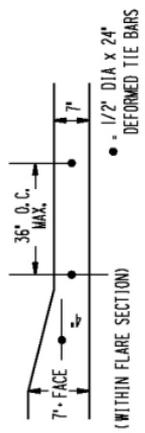
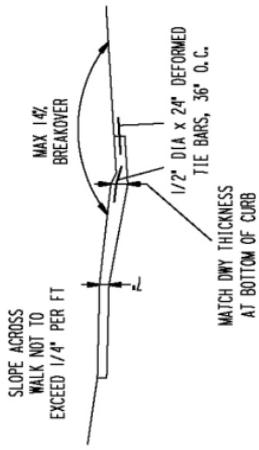
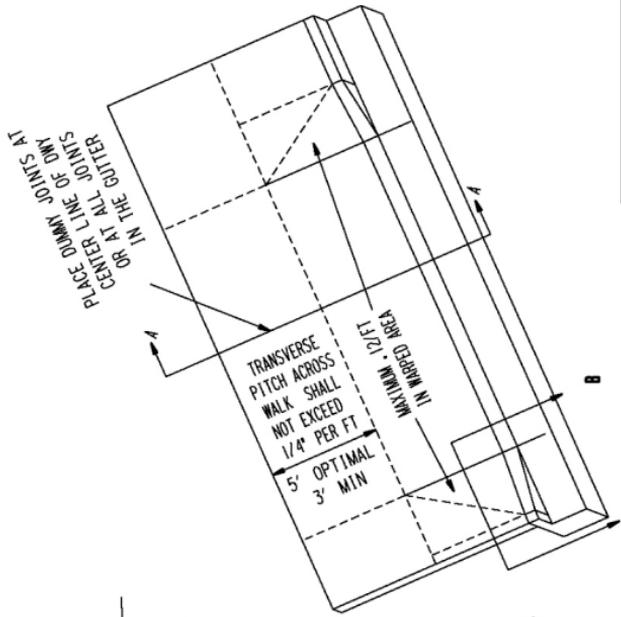
**CONCRETE DRIVEWAY TYPE II
(MODIFIED DEPRESSED)**

**FIGURE - 23 A
(SPECIAL CURB SECTION)**



SPECIAL CURB SECTION

CONSTRUCTION SECTION	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
DESIGNED BY <i>Thomas Ford</i>	ISSUED BY SUSAN CULL
APPROVED BY <i>Dee Mykle</i>	CHECKED BY SCOTT STEIN
<i>John Steiner</i>	DATE JANUARY 10, 2007



CONCRETE DRIVEWAY TYPE II (MODIFIED DEPRESSED)

FIGURE - 23 B

CONSTRUCTION SECTION	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
APPROVED BY <i>Susan Cull</i>	SUSAN CULL DRAWN BY
APPROVED BY <i>Scott Stein</i>	SCOTT STEIN CHECKED BY
APPROVED BY <i>John J. ...</i>	JANUARY 10, 2007 DATE

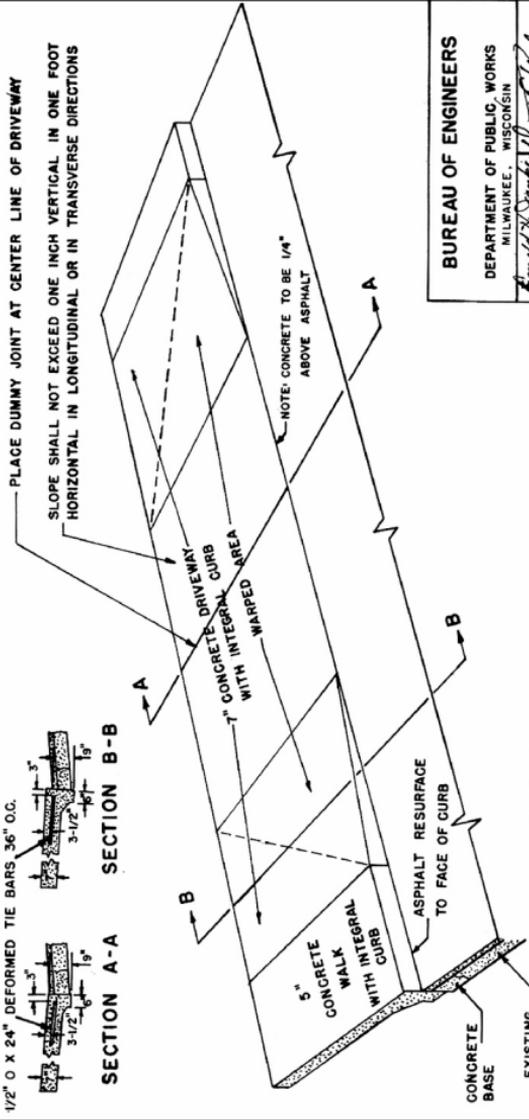
1/2" O X 24" DEFORMED TIE BARS 36" O.C.



SECTION A-A



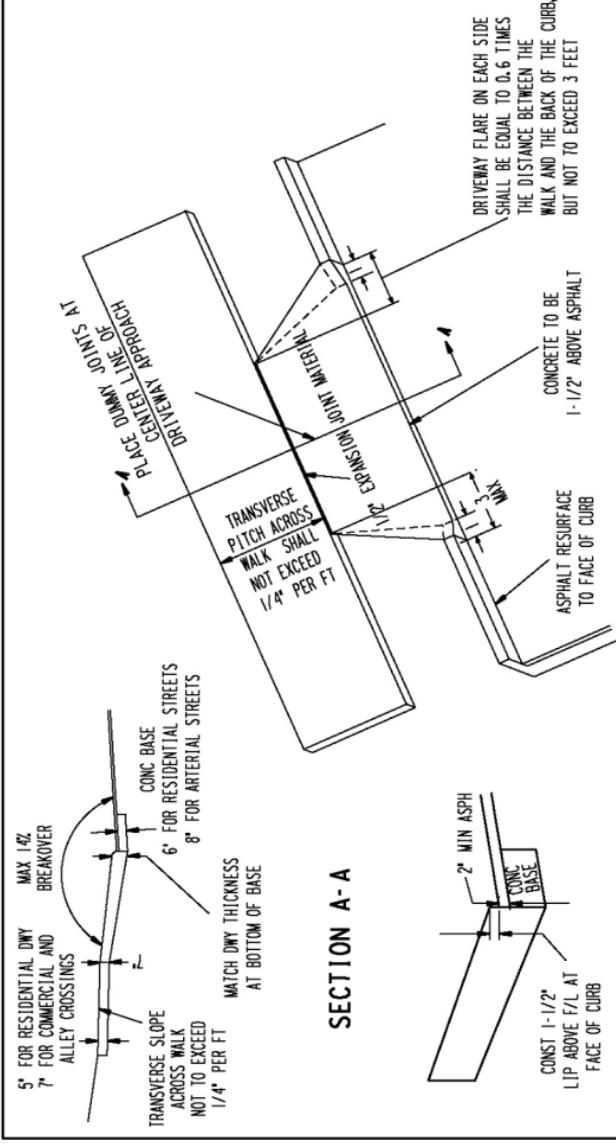
SECTION B-B



**CONCRETE DRIVEWAY TYPE IIA
(DEPRESSED, INTEGRAL CURB)**

FIGURE 24

BUREAU OF ENGINEERS	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
APPROVED BY <i>Stephen Carlson</i>	DRAWN BY <i>Stephen Carlson</i>
APPROVED BY <i>Stephen Carlson</i>	CHECKED BY <i>Stephen Carlson</i>
DATE - JUNE 1, 1991	
APPROVED CITY ENGINEER	

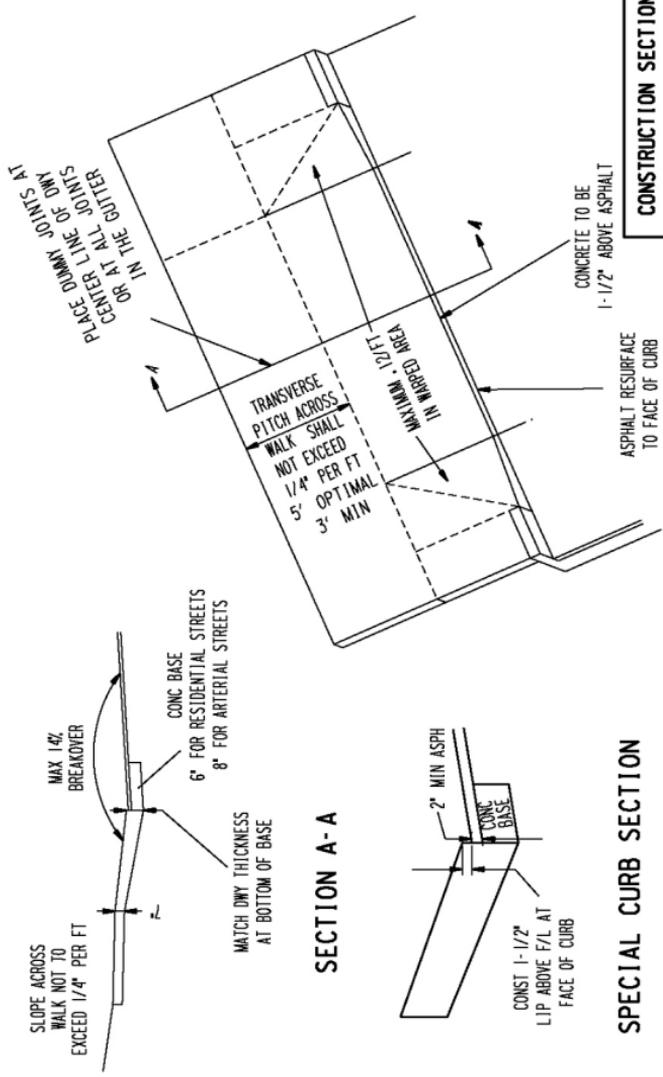


SPECIAL CURB SECTION

**CONCRETE DRIVEWAY APPROACH REPLACEMENT
 ASPHALT RESURFACE PROJECT**

**FIGURE - 26 A
 (SPECIAL CURB SECTION)**

CONSTRUCTION SECTION	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
DESIGNED BY <i>Thomas Spick</i>	DRAWN BY SUSAN CULL
APPROVED BY <i>Debra Meyer</i>	CHECKED BY SCOTT STEIN
DATE <i>1/10/07</i>	DATE JANUARY 10, 2007

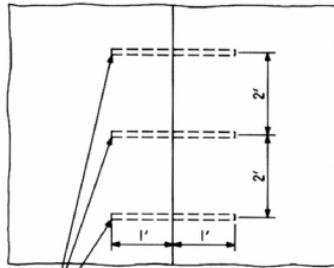


SPECIAL CURB SECTION

**CONCRETE DRIVEWAY TYPE II
(MODIFIED DEPRESSED)
ASPHALT RESURFACE PROJECT**

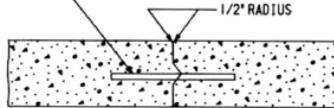
FIGURE - 268

CONSTRUCTION SECTION	SUSAN CULL <small>DRAWN BY</small>
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	SCOTT STEIN <small>DESIGNED BY</small>
	JANUARY 10, 2007 <small>CITY ENGINEER</small>



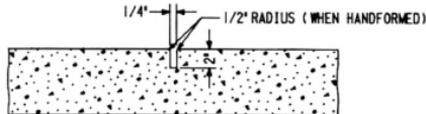
(TOP VIEW)

1/2" DIA. X 24"
DEFORMED TIE BARS



NOTE * AN APPROVED METHOD FOR COMPLETE
EMBEDMENT OF THE TIE BAR SHALL BE USED.

BONDED JOINT
TYPE I



DUMMY JOINT
TYPE II

BONDED JOINT
AND
DUMMY JOINT

FIGURE - 28

STD. DWG. - 126

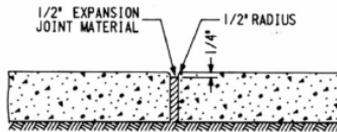
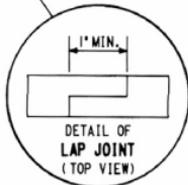
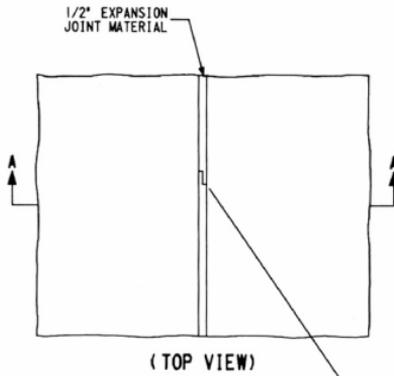
BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

Ronald J. Janke
APPROVED
Man...
APPROVED BY
John B. ...
APPROVED CITY ENGINEER

MILO VOJVODICH
DRAWN BY
STEPHEN CARLSON
CHECKED BY

JUNE 1, 1991



SECTION A-A

ALL EXPANSION JOINT MATERIAL SHALL BE INSTALLED TO THE FULL DEPTH OF THE CONCRETE.

EXPANSION JOINT

FIGURE - 29

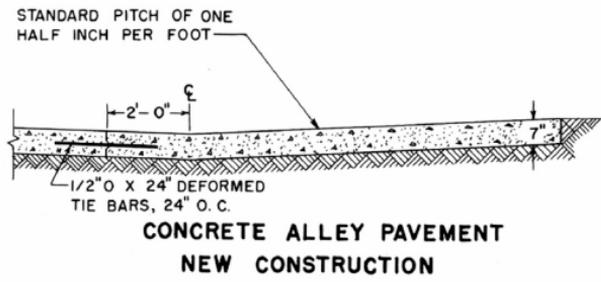
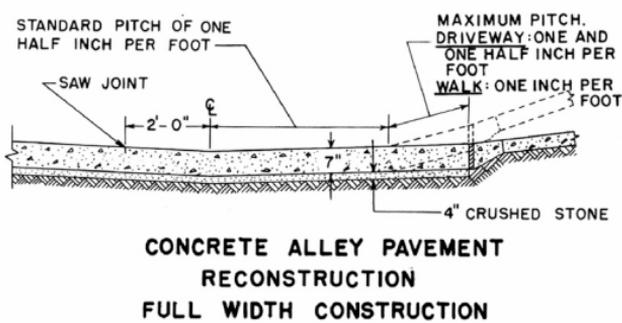
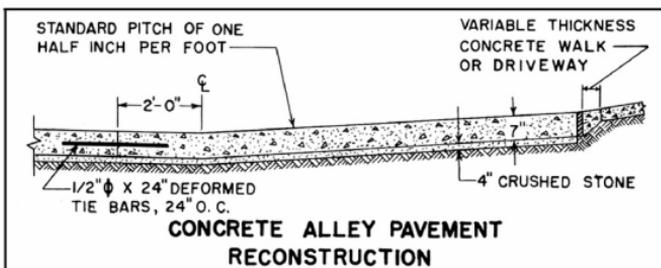
STD. DWG.-154

BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

Ronald H. Spink
APPROVED BY
Manoel D. ...
APPROVED BY
John R. ...
APPROVED CITY ENGINEER

MILO VOJVODICH
DRAWN BY
STEPHEN CARLSON
CREATED BY
JUNE 1, 1991

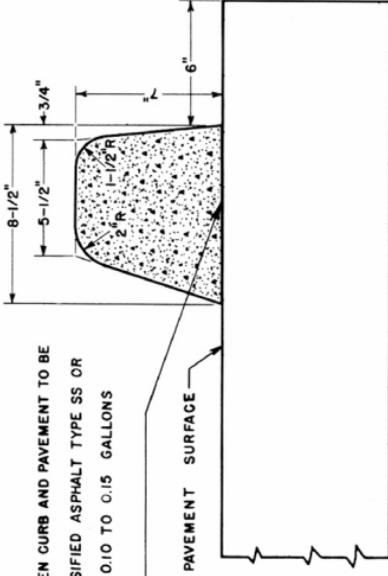


TYPICAL CROSS SECTIONS
CONCRETE ALLEY PAVEMENT
 FIGURE - 30

BUREAU OF ENGINEERS	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
<i>Donald H. Danks</i> APPROVED BY	<i>B. Oldenburg</i> DRAWN BY
<i>Marion D. Dugan</i> APPROVED BY	STEPHEN CARLSON CHECKED BY
<i>John P. Erickson</i> APPROVED CITY ENGINEER	DATE - JUNE 1, 1991

STD. DWG. - 144

CONTACT AREA BETWEEN CURB AND PAVEMENT TO BE TACKED WITH AN EMULSIFIED ASPHALT TYPE SS OR MS-1 AT THE RATE OF 0.10 TO 0.15 GALLONS PER SQUARE YARD.



ASPHALT CURB SECTION

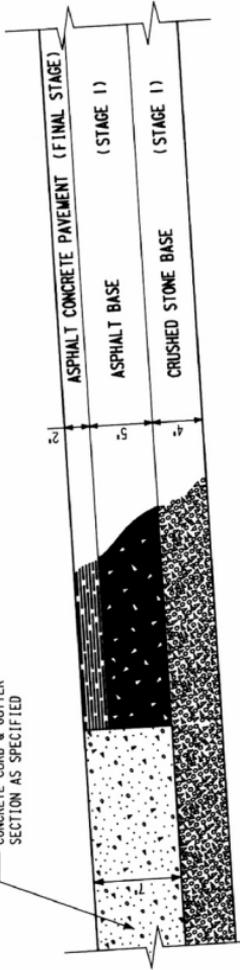
FIGURE - 31

STD DWG - 131

BUREAU OF ENGINEERS
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MILWAUKEE, WISCONSIN.

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APPROVED BY: <i>[Signature]</i>	JOSEPH NOVOTNY
CHECKED BY: <i>[Signature]</i>	DATE - JUNE 1, 1991
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CONCRETE CURB & GUTTER
SECTION AS SPECIFIED



ASPHALT CONCRETE PAVEMENT
STAGE CONSTRUCTION
(RESIDENTIAL AREAS)

FIGURE - 32

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MILWAUKEE, WISCONSIN

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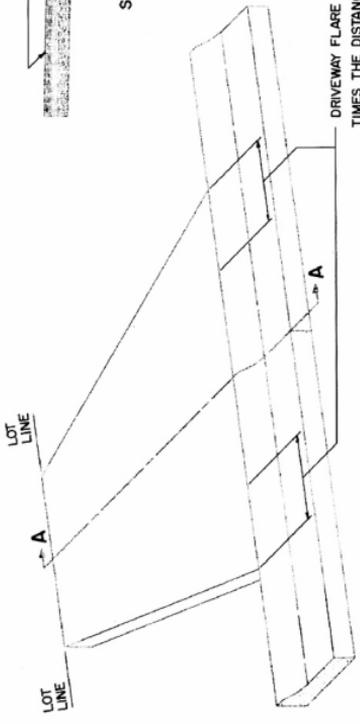
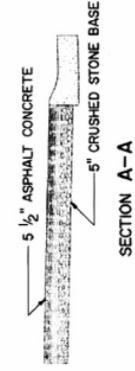
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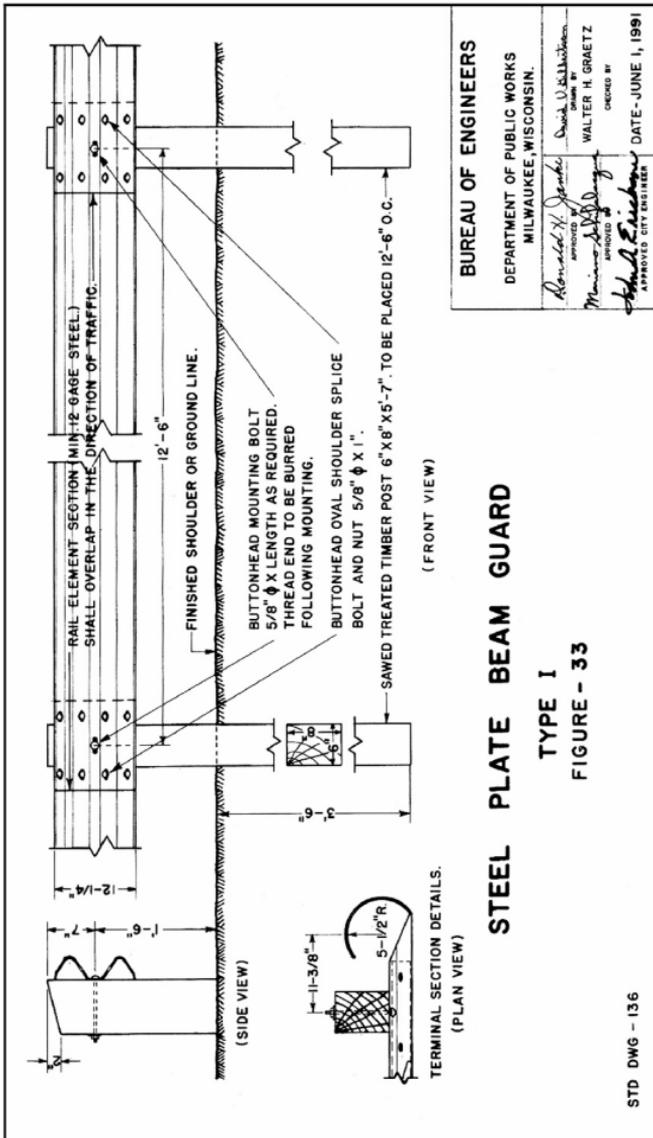
DRIVEWAY FLARE ON EACH SIDE SHALL BE EQUAL TO 0.6 TIMES THE DISTANCE BETWEEN THE LOT LINE AND THE BACK OF THE CURB, BUT NOT TO EXCEED THREE FEET.

**ASPHALT DRIVEWAY
MOUNTABLE CURB
(WITHOUT CONCRETE WALK)**

FIGURE - 32A

BUREAU OF ENGINEERS
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

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APPROVED BY <i>Joseph Novotny</i>	CHECKED BY <i>Joseph Novotny</i>
APPROVED BY <i>John P. Eichel</i>	DATE - JUNE 1, 1991



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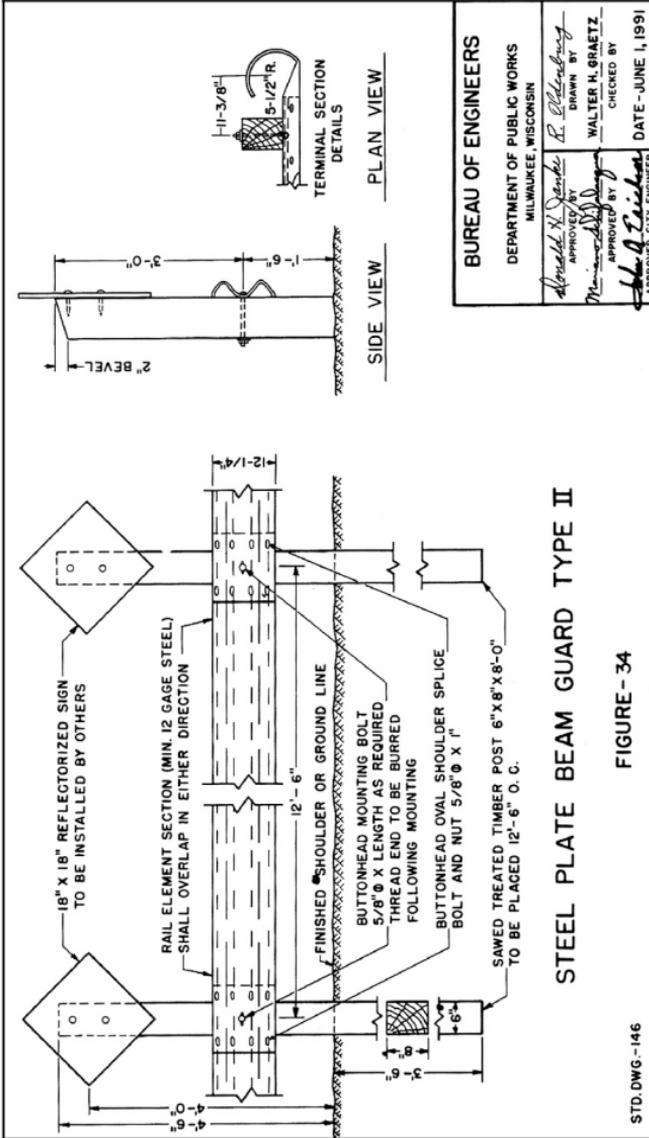
Ronald H. Jencks
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Walter H. Graetz
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STEEL PLATE BEAM GUARD
TYPE I
FIGURE - 33



BUREAU OF ENGINEERS
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

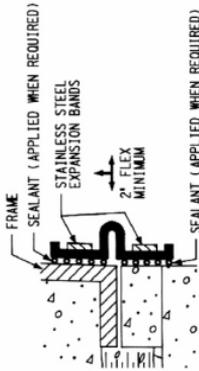
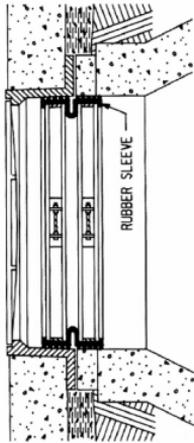
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DRAWN BY *R. Blumberg*

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STEEL PLATE BEAM GUARD TYPE II

FIGURE - 34



INTERNAL MANHOLE SEAL
FIGURE - 36

BUREAU OF ENGINEERS

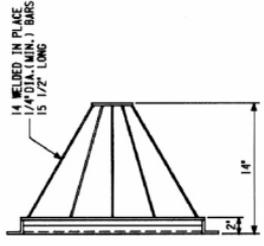
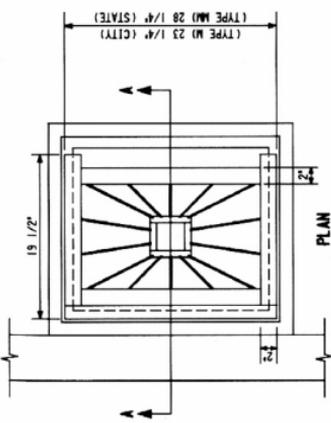
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 DRAWN BY

APPROVED BY *Walter H. Graetz* WALTER H. GRAETZ
 CHECKED BY

APPROVED BY *Edward P. Fisher* EDWARD P. FISHER
 APPROVED CITY ENGINEER

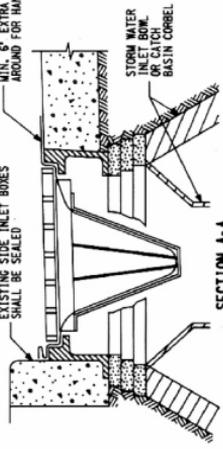
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* MAY BE DECREASED IF INLET IS OF INSUFFICIENT DEPTH

FILTER FABRIC TO BE MIN. 6" EXTRA ALL AROUND FOR HAND HOLD

EXISTING SIDE INLET BOXES SHALL BE SEALED



INLET BASKET
(TYPE M) - CITY
(TYPE MM) - STATE

FIGURE - 37

BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

MIL O. HOUNDTICH
CHIEF ENGINEER

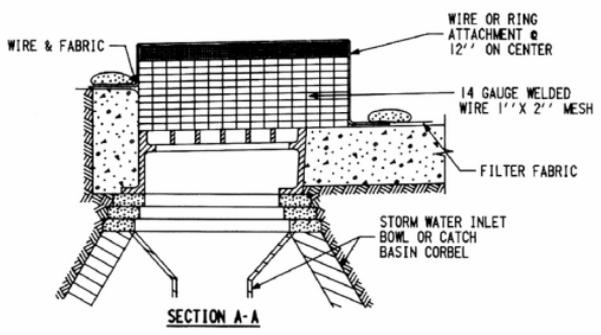
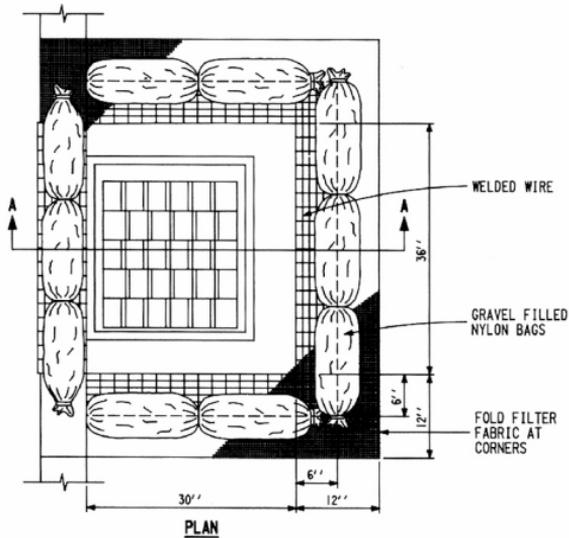
WALTER H. GRAMMETZ
DESIGNED BY

JUNE 1, 1991

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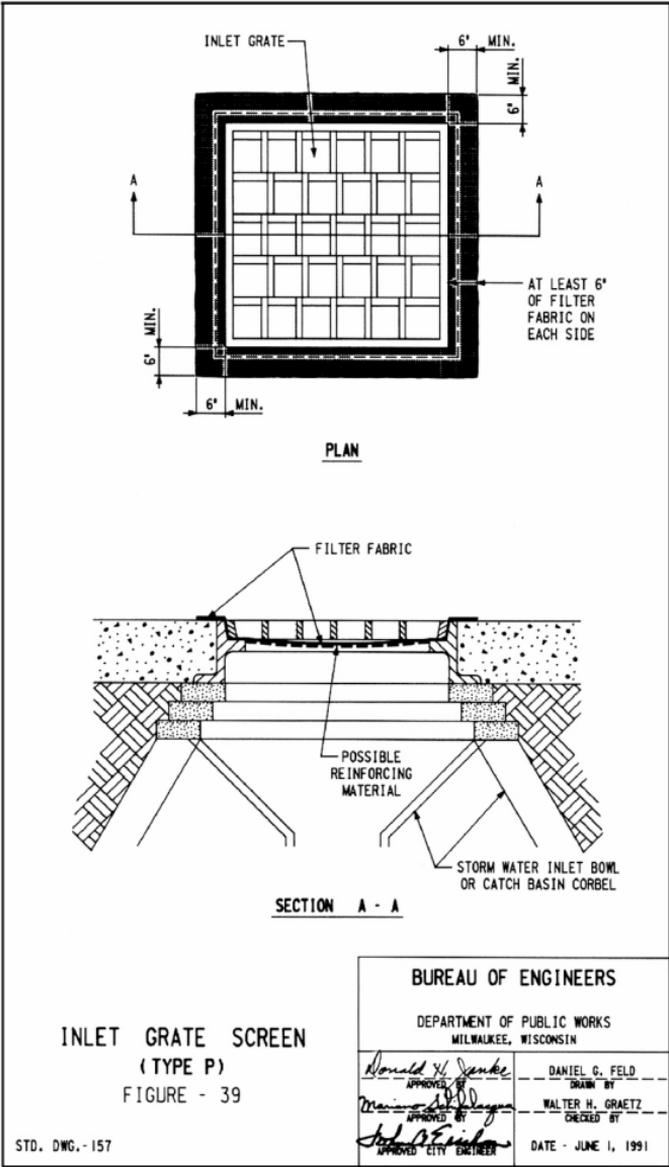


INLET SCREEN (PAVED)
(TYPE N)

FIGURE - 38

STD. DWG. - 156

BUREAU OF ENGINEERS	
DEPARTMENT OF PUBLIC WORKS MILWAUKEE, WISCONSIN	
<i>Donald H. Sank</i> APPROVED BY <i>Marion J. [Signature]</i> APPROVED BY <i>John P. [Signature]</i> APPROVED CITY ENGINEER	CHRISTOPHER E. BLACK DRAWN BY WALTER H. GRAETZ CHECKED BY JUNE 1, 1991



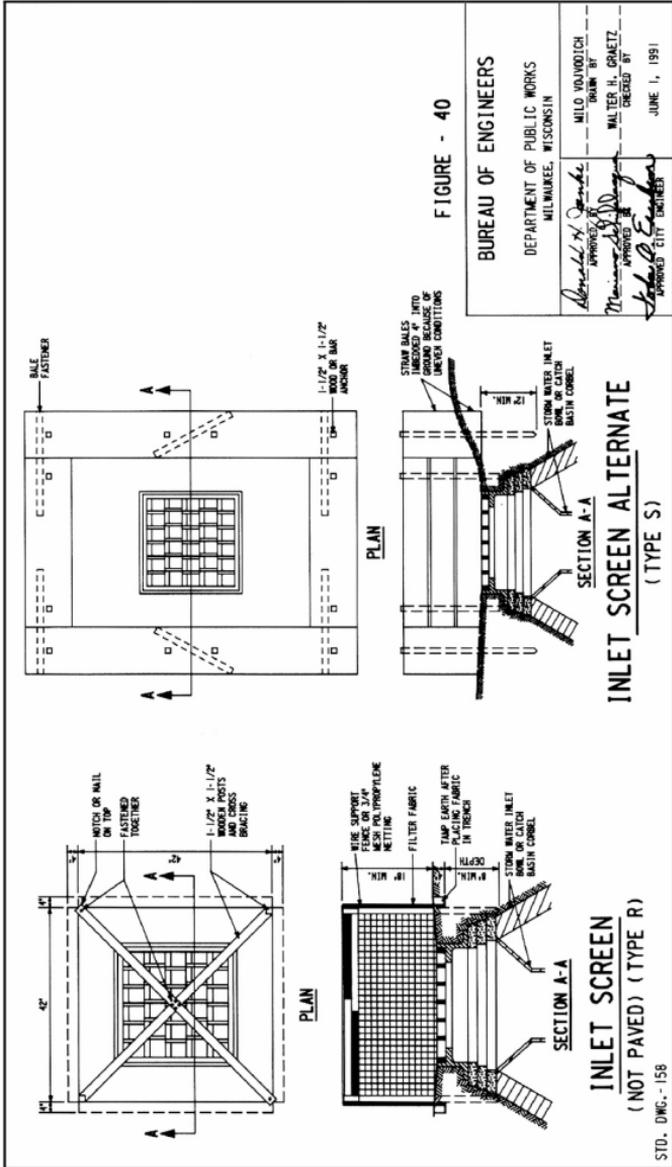


FIGURE - 40

BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

MILWAUKEE DIVISION
DRAWN BY

WALTER H. GRABETZ
CHECKED BY

JUNE 1, 1981

Approved
APPROVED

Checked
CHECKED

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INLET SCREEN ALTERNATE
(TYPE S)

INLET SCREEN
(NOT PAVED) (TYPE R)

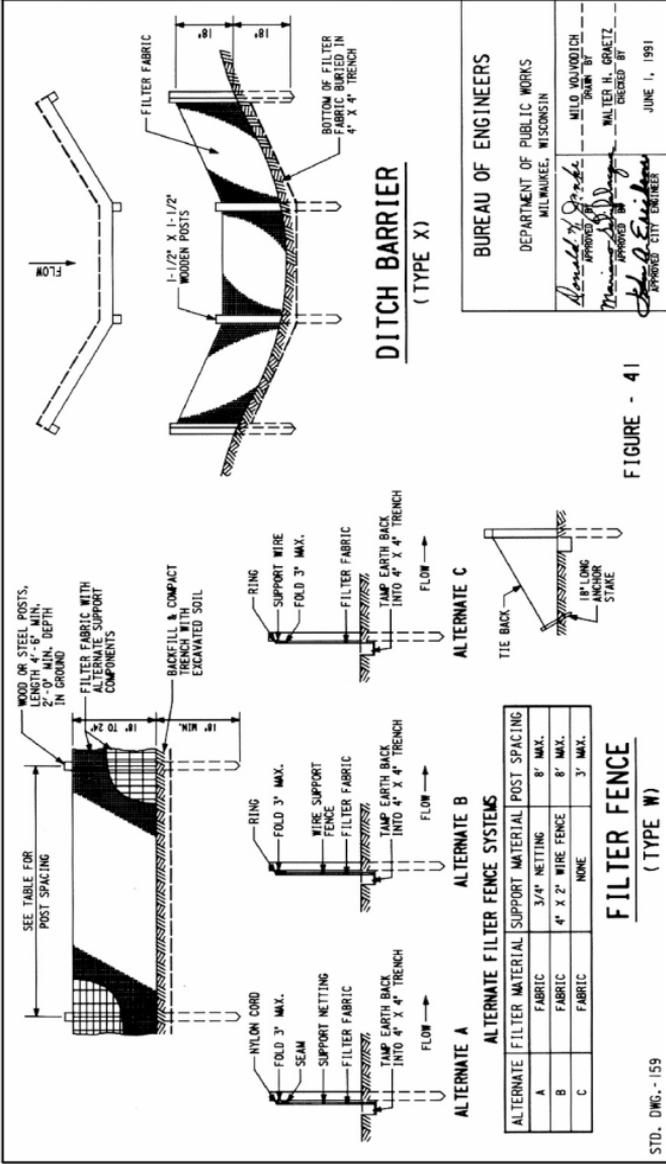


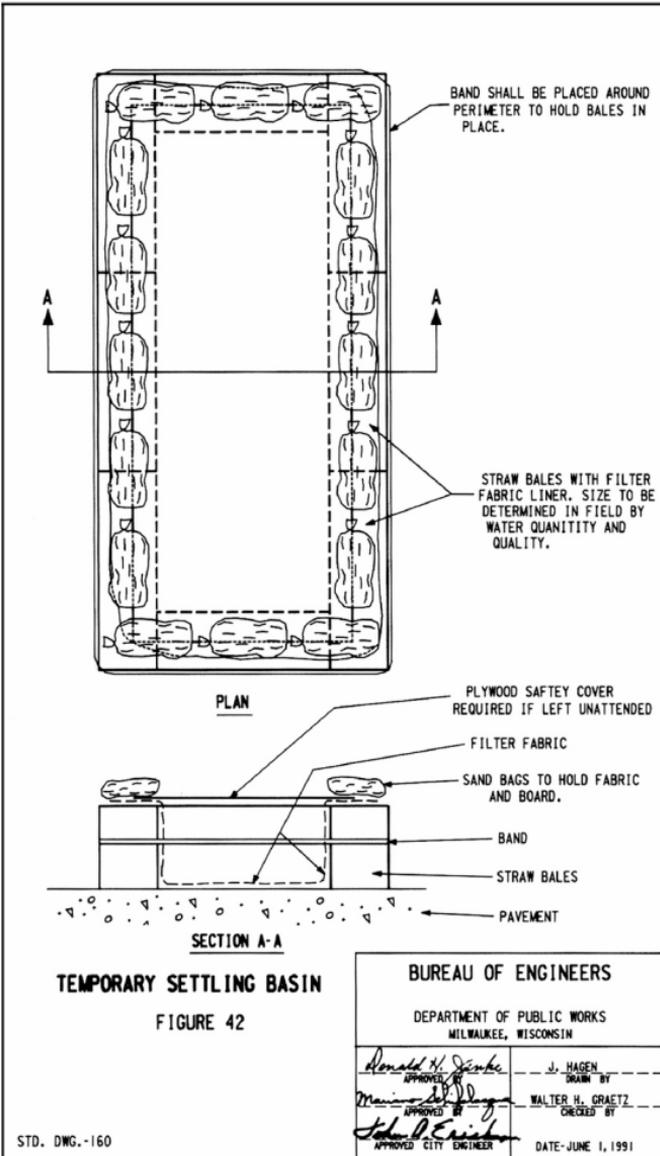
FIGURE - 41

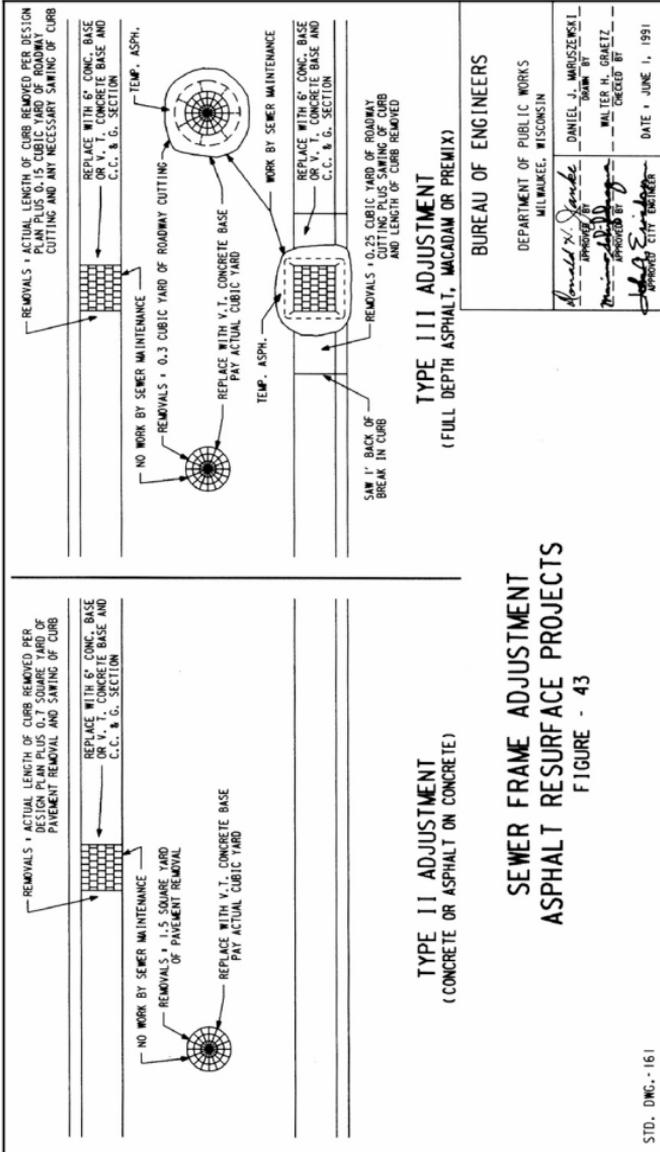
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MILWAUKEE, WISCONSIN

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DRAWN BY: *MILDO VOLVOVICH*

APPROVED BY: *Walter H. Graetz*
CHECKED BY: *Walter H. Graetz*

APPROVED CITY ENGINEER: *John P. Egan*
JUNE 1, 1981





**SEWER FRAME ADJUSTMENT
ASPHALT RESURFACE PROJECTS**
FIGURE - 43

BUREAU OF ENGINEERS
DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

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DESIGNED BY: *Walter H. Graetz*
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CHECKED BY

DATE - JUNE 1, 1981

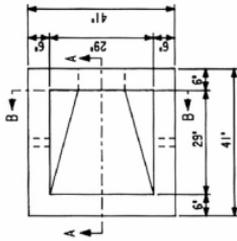
FOR USE WITH M.S.-8 FRAME AND TYPE "B" PRECAST CONCRETE RECTANGULAR ADJUSTING RINGS.

THE MINIMUM COMPRESSIVE STRENGTH OF THE CONCRETE SHALL BE 3300 P.S.I.

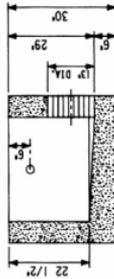
TWO HANDLING HOLES, 2 1/4" IN DIAMETER SHALL BE CAST OR DRILLED IN THE WALL AS SHOWN.

NEW CASTING SHALL BE :
GRADE M.S.-8
GRADE M.S.-55

EXISTING CASTING UNIT FOR REUSE SHALL BECOME THE PROPERTY OF THE CONTRACTOR.



PLAN



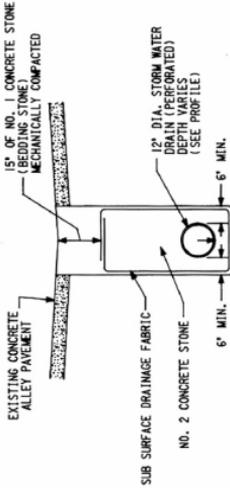
SECTION A-A



SECTION B-B

PRECAST OR MASONRY FLAT BOTTOM ALLEY STORM INLET

ALLEY UNDERDRAIN & STORM INLET UNIT
FIGURE - 44



PIPE OPTIONS -

A. CLASS 3 NON-REINFORCED CONCRETE

B. EXTRA STRENGTH CLAY, OR

C. PVC ASTM D3034, SDR 35, OR ASTM DESIGNATION F-769

THE PERFORATED PIPE SHALL MEET ASTM DESIGNATIONS C-444 FOR CONCRETE AND C-700 FOR CLAY. IF PVC IS USED, THERE SHALL BE SIX (6) ROWS OF MINIMUM 1/4-INCH DIAMETER HOLES, SPACED 12 INCHES ON CENTER. THE HOLES SHALL BE SPACED AT INTERVALS OF 45, 60, 75 AND 90 DEGREES FROM VERTICAL ON THE BOTTOM OF THE PIPE.

SEC. 0-1 (MOD.) TRENCH SECTION

BUREAU OF ENGINEERS

DEPARTMENT OF PUBLIC WORKS
MILWAUKEE, WISCONSIN

DANIEL J. MARCZEWSKI
CITY ENGINEER

WALTER H. GRAETZ
CITY ENGINEER

DATE - JUNE 1, 1991

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