

**DIVISION V
STREET CONSTRUCTION AND REPAIR**

1.	General		
	1A.	Scope	V-1
	1B.	Edge Drain Installation	V-1
	1C.	Part Width Construction.....	V-2
	1D.	Turf Restoration and Clean-Up	V-2
2.	Pavement Removal		
	2A.	Bituminous Pavement Cutting and Removal.....	V-2
	2B.	Cold Milling of Bituminous Pavement.....	V-3
	2C.	Concrete Pavement, Curb & Gutter, Sidewalk, and Drive Removal	V-4
	2D.	Subbase and Base Removal and Replacement	V-4
3.	Subgrade, Subbase, and Base Construction		
	3A.	Pulverizing Bituminous Pavement	V-5
	3B.	Machine Grading.....	V-5
	3C.	Subgrade Undercutting.....	V-7
	3D.	Construction of Subbase and Base Courses	V-8
4.	Concrete Curb & Gutter, Sidewalk, and Drive Construction		
	4A.	Concrete Curb & Gutter	V-9
	4B.	Concrete Sidewalk	V-10
	4C.	Concrete Drive	V-11
5.	Bituminous Pavement Construction		
	5A.	Cleaning	V-11
	5B.	Bituminous Placement.....	V-12
	5C.	Bituminous Finish Wedging.....	V-14
	5D.	Structure Adjustment	V-14
6.	Concrete Pavement Construction		
	6A.	Concrete Placement.....	V-15
	6B.	Hot Joint Sealing.....	V-15
	6C.	Structure Adjustment	V-15
	6D.	Installation of Mechanical Anchors and Hook Bolts	V-16

7. Patching

7A.	Bituminous Pavement Patching and Repair	V-16
7B.	Concrete Pavement Patching and Repair	V-17
7C.	Brick Pavement Patching and Repair	V-17
7D.	Flowable Fill	V-17

8. Pavement Markings

8A.	Removal of Pavement Markings	V-18
8B.	Temporary Pavement Markings, Type R	V-18
8C.	Temporary Pavement Markings, Type NR.....	V-19
8D.	Reflectorized, Fast-Dry Pavement Markings	V-19
8E.	Hot-Applied, Thermoplastic Pavement Markings.....	V-19

**DIVISION V
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1. GENERAL

1A. Scope

The Contractor shall furnish all materials, equipment, tools, and labor necessary to perform the work required by this section, and unload, haul, distribute, store, and install all pipe, aggregates, castings, asphalt and concrete.

The Contractor shall also remove pavement as specified; properly handle all drainage or ground water; provide traffic and pedestrian control, barricades, guards, and warning lights; fill and consolidate the pavement area(s); restore the surface; remove and dispose of surplus excavated material; clean the site of excess materials and construction debris; and maintain the street or other surfaces as specified.

All work shall be in accordance with the latest edition of the MDOT Standard Specifications for Construction Manual, except as modified herein.

1B. Edge Drain Installation

Geotextile wrapped edge drain shall be installed as shown on the Plans or as directed by the Public Services Director. The installation of edge drain, where called for on the Plans or as directed by the Public Services Director, shall precede all other street construction activities including, but not limited to; sand subbase and gravel base placement, pavement milling, pavement pulverization, pavement removal, pavement patching, curb repair, and curb and gutter placement.

The edge drain shall be installed at the line, grade, and depth as shown on the Plans. The Contractor shall maintain line and grade by means of a laser.

Where called for in this section, C.I.P. shall refer to 2NS granular material compacted-in-place to not less than 95 percent of its maximum unit weight, as determined by the AASHTO T-180 test.

Cutting of bituminous surfaces for removal shall be by saw or jackhammer, or other methods approved by the Public Services Director, and shall leave a clean, straight, vertical edge without disturbance to the adjacent pavement. Backhoe teeth, jackhammers equipped with spike points, and backhoe-mounted wheel cutters are not acceptable for cutting pavement edges, however, they may be used to break-up pavement within the section to be removed.

The trench shall be constructed to have a minimum width of 18-inches. The edge drain shall be placed on a 3-inch thick bedding C.I.P., with subsequent lifts placed at a maximum thickness of 12 inches C.I.P. to the top of the subbase grade.

Upgrade ends of the pipe shall be closed with manufactured caps to prevent entrance of trench backfill material. All couplings, tees and other fittings shall be manufactured for the intended purpose and shall be installed so as to prevent any infiltration of trench backfill material. Geotextile wrap shall be pulled over the end of the edge drain, overlapped and taped.

During the construction of edge drain runs, it may be necessary to terminate construction due to conflicts with buried obstructions or for other reasons. The Public Services Director will review conflicts on a case by case basis and shall decide where to continue or terminate edge drain runs.

All downgrade ends of the underdrain shall be tapped into a storm sewer structure, as shown on the Plans, and as directed by the Public Services Director.

1C. Part Width Construction

The Contractor shall segment the pavement construction as necessary to satisfactorily complete the work, and to safely maintain vehicular and pedestrian traffic. This includes pavement gapping at drives and intersections if required by the Public Services Director, to complete the work. This work shall also include the installation and removal of dust palliative, maintenance aggregate and cold patching mixtures as required and as directed by the Public Services Director, for maintenance of vehicular and pedestrian traffic.

1D. Turf Restoration and Clean-Up

The Contractor shall permanently prepare, fertilize and seed or sod, the areas specified on the Plans and all areas disturbed by the Contractor, and remove all surplus materials as required by **Division VIII, Landscaping and Restoration** of these Specifications.

2. PAVEMENT REMOVAL

2A. Bituminous Pavement Cutting and Removal

Bricks, if present, are to be salvaged and delivered by the Contractor to the City to any location within the City limits designated by the Public Services Director. The location of disposal areas and the proper disposal of asphalt and concrete shall be the responsibility of the Contractor. At no time shall the Contractor stockpile excavated material overnight on or adjacent to the site.

Cutting of bituminous surfaces for removal shall be by saw or jackhammer or other methods approved by the Engineer and shall leave a clean, straight, vertical edge without disturbance to the adjacent pavement. Backhoe teeth, jackhammers equipped with spike points, and backhoe-mounted wheel cutters are not acceptable for cutting pavement edges, however, they may be used to break up pavement within the section to be removed. All pavement cuts shall be made perpendicular to, or parallel with, the centerline of the pavement. Pavements less than three years old may only be cut in the case of an emergency, and only with the approval of the Public Services Director.

For final patches required as a result of utility construction or repair, the existing pavement shall be removed to provide for a replacement of not less than one foot wider and longer than the utility trench on each side. All final patches (patches in the wearing course of asphalt) shall be rectangular (four-sided in shape). If these removals will result in existing pavement of less than five feet wide from the patch to a lane line, gutter edge-of-metal, or existing patch, this existing pavement shall also be removed to the lane line, gutter edge-of-metal, or existing patch. Each joint of final patches made in streets under the street cut moratorium described in **Division I, Section 1H. Work in Right-of-Way** shall be sealed with an approved asphaltic sealant.

Any damage to the adjacent pavement, pavement base, subbase, or utility structures caused as a result of the removal of the bituminous surface is the complete responsibility of the Contractor, and shall be corrected by the Contractor at the Contractor's expense.

The pavement shall be removed full depth or to a depth of 3", whichever is greater, unless otherwise specified on the Plans. If additional aggregate or clay base is removed, without written approval of the Public Services Director, it shall be replaced by the Contractor, with 22-A aggregate compacted-in-place (C.I.P.) to 98% of the maximum unit weight as determined by the AASHTO T-180 method, or bituminous asphalt, as directed by the Public Services Director, at the Contractor's expense.

Prior to filling the excavated areas with patching material, if the base has become damp/wet due to rain or due to the Contractor's operation, it shall be dried by aerating or other approved method(s), by the Contractor. Prior to patch placement, the excavation(s) shall be cleaned with compressed air to remove dirt and loose material. The Contractor shall use an air source which provides a minimum 90 psi and 150 cubic feet per minute of air at the nozzle. The base shall then be recompact with a vibratory plate compactor or other approved method(s), and the exposed edges of each patch shall be tacked by a power sprayer. No excavated areas will be allowed to remain open overnight, but must be properly refilled to grade with bituminous patching material.

Butt joints must be saw cut straight if not already straight, cleaned and tacked just prior to bituminous paving.

2B. Cold Milling of Bituminous Pavement

The bituminous surface shall be removed to the depth, width, grade and cross section as indicated on the Plans, or as specified by the Public Services Director.

After milling, locations may exist where it is necessary for the Contractor to remove and/or reshape and recompact the existing roadbed materials. When these areas are encountered, the Contractor shall provide the necessary personnel and equipment to properly construct, in the opinion of the Public Services Director, the roadway to the cross-section as indicated on the Plans, or as directed by the Public Services Director. This may require the use of a blade grader and vibratory roller, or equivalent equipment as approved by the Public Services Director, to accurately grade and compact the roadbed to the required cross-section and density as shown on the Plans, as detailed in the Specifications, or as directed by the Engineer. Further, additional materials may be required to be removed (or added) to the jobsite in order to properly complete the work.

Where material is removed below the grade specified, the resulting void or depressions shall be backfilled and compacted by the Contractor, by hand patching the areas in accordance with subsection 4.00.07-h of the MDOT Specifications. This work shall be done at the Contractor's expense.

After a location is milled to the specified depth by the Contractor, the finished work will be inspected by the Public Services Director. The City may choose to have additional bituminous milling performed by the Contractor. This work may be repeated more than once to achieve satisfactory results.

The number of intersections and areas which are to be milled may be increased or decreased by the City, as necessary to complete the work, without adjustment to the contract unit price.

Cold-milling machines shall have continuously variable depth control adjustments and be capable of removing, in a single pass, bituminous material having a thickness of up to four inches. The cutting drums shall be enclosed and shall have a water sprinkling system around the reduction chamber for pollution control. Cold-milling machines shall have complete automation for slope control, when required by the Engineer.

The equipment for removing the bituminous surface shall be capable of accurately removing the bituminous surface, in one or more passes, to the grade and cross section shown on the Plans and as directed by the Public Services Director. The equipment shall also have an effective means for removing excess material from the surface and for preventing any dust resulting from the operation from escaping into the air.

2C. Concrete Pavement, Curb & Gutter, Sidewalk, and Drive Removal

The limits of removal of concrete pavement, curb, gutter, sidewalk, sidewalk ramps, drive openings and drives shall be as specified on the Plans and as directed by the Public Services Director, regardless of type and thickness.

The removal of pavement, curb & gutter of any type, sidewalks, sidewalk ramps, drive openings and drives shall include saw cutting at the removal limits, as indicated on the Plans and as directed by the Engineer. All cuts shall be made at the locations specified by the Engineer, and as marked for removal. Concrete pavement to be removed as a result of utility construction shall be removed to the nearest joint so as to provide for a replacement of not less than one foot wider and longer than the utility trench on each side. If the concrete pavement has a bituminous overlay, the removal limits shall be as required in **Section 2A, Bituminous Pavement Cutting and Removal**.

Reinforcement bars shall be left protruding at least two feet from the face of the cut and shall be bent out of the way in a manner which allows for their being properly spliced to new reinforcement. If the reinforcement bars are cut, the new reinforcement is to be doweled into the remaining concrete and secured by means of an anchor manufactured specifically for that purpose and approved by the Public Services Director.

Curb and gutter, sidewalk, sidewalk ramps, drive openings and drives shall be replaced within two working days of their removal. Areas which have been excavated and are not yet up to finish grade shall be adequately protected with lighted barricades or fencing at all times.

Removed materials not incorporated into the work shall become the property of the Contractor and shall be properly and immediately disposed of off-site by the Contractor at the Contractor's expense. Removed materials may not be stockpiled overnight on or adjacent to the site.

The removal of subbase or subgrade, not authorized by the Public Services Director, shall be replaced and compacted by the Contractor at the Contractor's expense, with materials specified by the Public Services Director.

2D. Subbase and Base Removal and Replacement

All contaminated subbase and/or base material beneath areas of bituminous or concrete pavement, shall be removed for the full depth of the contamination at the direction of the Public Services Director.

The contaminated material shall be replaced with material specified by the Public Services Director, and compacted to a density not less than that specified by the Public Services Director.

The removal of subbase or subgrade, not authorized by the Public Services Director, shall be replaced and compacted by the Contractor at the Contractor's expense, with materials specified by the Public Services Director.

3. SUBGRADE, SUBBASE, AND BASE CONSTRUCTION

3A. Pulverizing Bituminous Pavement

Equipment used for pulverizing shall have continuously variable depth control adjustments and shall be capable of accurately pulverizing, in a single pass, up to four inches of bituminous material to the grades and cross-sections shown on the Plans or as directed by the Engineer. The cutting drums shall be enclosed and shall have a sprinkling system around the reduction chamber for pollution control, and shall also have an effective means for removing excess material from the surface and for preventing any dust resulting from the operation from escaping into the air.

The bituminous pavement shall be scarified and uniformly pulverized to a maximum size of 1-1/2 inches, and to the depth indicated on the Plans or as specified by the Engineer. The pulverized material shall be graded, shaped and compacted to the line and grade specified on the Plans or as specified by the Engineer. Excess material not incorporated into the finished work shall become the property of the Contractor and shall be properly and immediately disposed of off-site by the Contractor at the Contractor's expense.

The Contractor shall perform final grading, compaction and proof rolling of the pulverized material.

Prior to placing a bituminous overlay over a pulverized bituminous pavement, the entire surface shall be compacted to not less than 98% of its maximum unit weight as determined by the AASHTO T-180 test, or as directed by the Engineer.

3B. Machine Grading

The Contractor shall construct earth grades by excavating and disposing of existing bituminous asphalt pavement, concrete pavement, culverts, soil, rock, vegetation (including trees, stumps, brush, shrubs, roots, and logs) or other deleterious materials; removing and salvaging or disposing of topsoil; full-depth saw cutting of pavements, sidewalks, curbs, and gutters at the removal limits; and by placing and compacting existing approved fill material or imported Class II granular fill material. The Contractor shall shape and prepare the subgrade to the grades and the typical and/or detailed cross-sections indicated on the Plans or as directed by the Engineer; test roll the subgrade; and perform all other work necessary so as to be ready for the placement of the sand subbase, aggregate base, or other work such as edge drains, any necessary subgrade undercuts, and all other items to be constructed. The subgrade shall be prepared so as to ensure uniform support for the pavement structure.

All areas of the work shall be kept well graded and drained at all times. All areas of the work which become damaged as a result of rain shall be repaired by the Contractor at the Contractor's expense.

In areas where the existing grade is to be cut to achieve the proposed subgrade grades (cut-sections), rubber-tired equipment, including scrapers, wheel loaders, and graders, may only be used to within two feet above the subgrade grade. After the grade has been cut to within two feet above the subgrade grade,

all proposed underground utilities and edge drains within a 1:1 influence of the proposed pavement section shall be installed. Following the installation of utilities, the remaining cutting shall be performed using only tracked equipment. The Contractor shall only excavate an amount of the "grade" that the Contractor can maintain and protect, and keep well drained at all times.

In areas where the existing grade is to be filled to achieve the proposed subgrade grades (fill-sections), filling shall not take place until all proposed underground utilities within a 1:1 influence of the proposed pavement have been installed. This requirement is to ensure subgrade preparation which will provide uniform support for the pavement structure. However, if the existing grade does not provide the required minimum cover (as specified elsewhere herein) for a portion of any utility, filling for the road subgrade shall be performed, as directed by the Public Services Director, to provide such minimum cover. This filling shall be for the entire width of the roadway (to one foot behind the curb), at a length as directed by the Public Services Director. Fill sections shall be constructed using suitable material obtained from the site where available or imported Class II granular material. Fill shall be placed only after topsoil and other unsuitable material as determined by the Engineer has been removed from the area to be filled. Fill shall be placed in 6 inch lifts and compacted to 95% of the maximum unit weight as determined by the AASHTO T-180 test.

The Contractor is advised that due to the phasing of the project and the probable unsuitability of some or all of the excavated material for use as approved fill material, there may be imbalances between the amount of earth cut which is suitable for reuse as fill, and the amount of earth needed to construct the lines and grades shown on the Plans or as directed by the Engineer. The Contractor shall make provisions for such imbalances and shall include in the bid price for this work the cost of importing/furnishing, placement and compaction of either Class II granular fill or approved clay/cohesive soil as directed by the Public Services Director, as well as the cost of all stockpiling and rehandling of imported and/or on-site materials as necessary to complete the work of constructing the subgrade cross-section as shown on the Plans.

The Contractor shall move the excavated material longitudinally and transversely where necessary, remove all excess and/or unsuitable material from the construction area, and recompact and proof-roll the subgrade as directed by the Engineer. The entire subgrade, whether in cut or fill sections, shall be compacted to not less than 95% of the maximum unit weight as determined by the AASHTO T-180 test, to a depth of at least 9 inches. The finished subgrade will be inspected by the Public Services Director for soft or uncompacted areas.

If in the opinion of the Public Services Director, the subgrade cannot be compacted to 95% as specified above, the Public Services Director may authorize or direct the use of other methods to attain compaction such as subgrade manipulation, scarifying, plowing or disking, or the Public Services Director may direct subgrade undercutting or other repair method (i.e. nonwoven fabric, stone, etc.).

The road bed shall be finished to the grade specified by use of tracked equipment. All intersections, approaches, entrances, and driveways shall be graded as shown on the Plans or as directed by the Engineer. The finished subgrade shall be constructed to the elevation(s) and/or depth(s) shown on the Plans, or directed by the Engineer. A tolerance that provides for gradual, isolated variations of no more than 3/4-inch above nor 1-inch below the specified grade will be allowed. These variations will be corrected with the placement of the successive granular subbase. The tolerances for the pavement structure strata are not additive.

Immediately following the completion of the grading and compaction of the subgrade as required above, the Contractor shall notify and allow the Engineer to inspect the finished subgrade surface for soft, or uncompacted areas, and for areas of unsuitable and deleterious soils. The Contractor shall "proof-roll" the grade or other surfaces as directed by the Public Services Director, as specified herein. Equipment for proof-rolling shall be a pneumatic-tired roller and shall have suitable body for ballast loading with such capacity that the gross load may be varied between 25 and 40 tons. The Contractor may use an appropriately loaded single axle or tandem axle dump truck in lieu of the specified roller to achieve the loads specified above. The proof-rolling vehicle

shall be operated at a speed between 2-1/2 and 5 miles per hour. The proof-roller shall make one complete coverage of the completed subgrade. Where proof-rolling shows the subgrade to be unstable, such areas shall be undercut and repaired, or manipulated as described above, as directed by the Public Services Director.

Following the completion and approval of all undercuts required as a result of the proof-rolling, the subgrade conditions shall be considered "established". The Contractor may elect to immediately begin placing the aggregate subbase as specified in **Section 3D., Construction of Subbase and Base Courses**. If the Contractor so elects, the Public Services Director shall issue to the Contractor a "Permit to Place" for the aggregate subbase. If the Contractor does not immediately place the aggregate subbase, the Contractor shall be solely responsible for the protection of the subgrade, and shall conduct its operation(s), and provide the necessary equipment, to ensure the satisfactory completion of the work without damaging the subgrade. This may require the transportation and movement of materials over additional distances, in lieu of driving upon the unprotected, or partially unprotected, subgrade. The Contractor shall not operate rubber-tired equipment on the "established" subgrade unless specifically authorized in writing by the Engineer. Any damage to the subgrade due to the Contractor's activities, or the activities of its subcontractors, shall be repaired by the Contractor at the Contractor's expense, including any additional undercuts required after the subgrade had been established. The Public Services Director shall have the authority to suspend the work wholly, or in part, for such periods of time as may be deemed necessary, due to unsuitable weather or such other conditions which are considered unfavorable for the prosecution of the work or for any other condition or reason deemed to be in the best interest of the project. The Contractor shall not suspend work without giving prior written notification to the Engineer.

The Contractor shall maintain access to all drive entrances, located within the construction limits, at all times.

Any and all necessary measures required to avoid interruption in the mail delivery, and garbage pick-up shall be taken by the Contractor (including temporary relocation of mailboxes, where required by the Public Services Director).

3C. Subgrade Undercutting

After the Contractor has stripped the topsoil in fill-sections; has excavated, trimmed and compacted to the proposed subgrade in cut-sections; or removed the pavement in areas of street patching/resurfacing, the Public Services Director shall inspect the grade and witness the proof-rolling to determine if undercutting is needed, and the limits of such undercutting. After the Contractor has excavated the undercut area to the depth directed by the Public Services Director, the excavated area shall be evenly graded and recompacted to not less than 95% of the soil's maximum unit weight as determined by the AASHTO T-180 test. Any excess removed material shall become property of the Contractor and shall be properly and immediately disposed of off-site by the Contractor at the Contractor's expense.

Undercuts required as a result of the Contractor's failure, in the opinion of the Public Services Director, to provide proper drainage, or protect the subgrade once it has been "established" as described in **Section 3B., Machine Grading** of these Specifications, shall be completed by the Contractor at the Contractor's expense. Subgrade Undercutting-Type I shall be backfilled with selected clay or other similar approved material, as approved by the Public Services Director.

Subgrade Undercutting-Type II shall be backfilled with Class II granular material, or other material(s), as approved by the Public Services Director. Type II Undercuts shall be constructed such that they are drained by available underdrain.

3D. Construction of Subbase and Base Courses

Prior to the placement of the granular subbase and/or the aggregate base course, the Contractor must obtain a "Permit to Place" from the Public Services Director. This "Permit to Place" shall be issued once the adjacent, underlying layer of soil has been approved by the Public Services Director as to its compaction and grading.

The subbase and base course material shall be placed in uniform layers to such a depth that when compacted, the course will have the thickness shown on the Plans, or directed by the Engineer. The loose measure of any layer shall not be more than 9 inches nor less than 4 inches.

Except for the use of vibratory rollers, the granular subbase shall be placed and finished with the use of tracked equipment. The finished granular subbase shall be constructed to the elevation(s) and thickness(es) shown on the Plans, or directed by the Engineer. A tolerance that provides for gradual, isolated variations of the top surface of no more than 1/2-inch above nor 1/2-inch below the specified grade will be allowed. These variations will be corrected with the placement of the successive aggregate base. The tolerances for the pavement structure strata are not additive. The granular subbase shall be compacted to 95% of its maximum unit weight as determined by the AASHTO T-180 test.

The aggregate base shall be placed and rough-graded with the use of tracked equipment. Fine grading may be performed with the use of either tracked equipment or a rubber-tired blade grader. The finished aggregate base shall be constructed to the elevation(s) and thickness(es) shown on the Plans, or directed by the Engineer. A tolerance that provides for gradual, isolated variations of the top surface of no more than 1/4-inch above nor 1/2-inch below the specified grade will be allowed. The aggregate base shall be compacted to 98% of its maximum unit weight as determined by the AASHTO T-180 test.

All granular materials shall be deposited and graded in a manner that will minimize segregation of material.

The base, subbase and subgrade shall be shaped to the specified crown and grade and maintained in a smooth condition. If the Contractor's equipment should cause any rutting or other damage in the base, subbase or subgrade, the equipment will be immediately restricted from the grade, and the Contractor shall restore the area to the satisfaction of the Engineer at the Contractor's expense.

The granular subbase or aggregate base course shall not be placed when there are indications that the mixture may become frozen before the specified density is obtained, and at no time shall the material be placed on frozen subbase or subgrade.

Manholes, valve boxes, monument boxes, inlet structures and curbs shall be protected from damage. Manholes and inlet structures shall be continuously cleaned of construction debris (or "maintained clean") and properly covered at all times during the construction. All inlet structures shall have inlet filters installed and continuously maintained. Upon completion of each days work, manholes, water valve boxes, inlets and catch basins shall be thoroughly cleaned of all extraneous material. The Contractor shall meet the requirements of **Division VIII, Soil Erosion and Sedimentation Control** at all times.

4. CONCRETE CURB & GUTTER, SIDEWALK, AND DRIVE CONSTRUCTION

4A. Concrete Curb & Gutter

Concrete curb and gutter shall be constructed as shown on the Plans and Details.

Concrete mixtures and curing compound shall meet the requirements of **Division III, Materials**, of these Specifications.

All curb and gutter is to be constructed prior to placement of street pavement, unless integral with a concrete

pavement. A minimum seven-day cure of the concrete curb and gutter shall be required before paving of adjacent bituminous pavement.

Prior to placing any concrete, the road base shall be completed within the limits of the work area. The road base shall be trimmed to final elevation before placing the curb and gutter. The curb and gutter shall not be placed on a pedestal or mound.

The road base and adjacent concrete shall be wet down prior to placement of concrete to prevent water loss through the road base, and to form a better bond between old and new concrete. If a construction joint is required, the existing concrete surface is to be cleaned with compressed air to expose the aggregate in the concrete.

The concrete curb and gutter shall be finished in a neat and workmanlike manner, with a light broom finish. The top-of-curb or edge-of-metal shall not vary by more than 3/16-inch in 10 feet when checked with a 10-foot straight edge. The balance of the exposed surfaces shall not vary more than 3/8 inch from the alignment and typical cross section. Variation from these requirements will be grounds for rejection and replacement of the curb and gutter. Water shall not be added to the concrete surface ("blessing" the concrete) to aid in finishing.

Three-quarter inch expansion joints shall be placed at all street returns, in line with all expansion joints in an abutting pavement, each side of all driveways (at radius points) and elsewhere at 300 foot maximum intervals.

Expansion joint filler shall extend to the full depth of the joint. After installation, the top shall not be above the concrete nor be more than 1/2 inch below it. No reinforcing steel shall extend through the expansion joint.

Control joints shall be placed to divide the structure into uniform sections, normally ten feet in length, with a minimum length of eight feet, and shall be placed opposite all control joints in an abutting concrete base course.

Control joints shall be formed by narrow divider plates, one-eighth of an inch thick, which shall extend three inches into the exposed surfaces of the curb or curb and gutter. Plates shall be notched, if necessary, to permit the steel reinforcement to be continuous through the joint.

After finishing operations have been completed, and immediately after the free water has left the surface, the surfaces shall be completely coated and sealed with a uniform layer of white membrane curing compound. This curing compound shall meet the requirements of **Division III Materials** of these Standards and shall be applied in accordance with the MDOT Specifications, Section 4.50.16.

The Contractor shall backfill behind the curb with approved excavated material or Class II granular material, compacted to 90% of the maximum unit weight as determined by the AASHTO T-180 method; and, restore all disturbed areas to better than or equal to their existing condition in accordance with **Division VIII, Landscaping and Restoration** of these Standards, within two working days, from the date of concrete placement. This includes the restoration of lawns and lawn extensions.

Any curb and gutter which is marked by graffiti, cracks other than at joints, or otherwise damaged before it has been accepted by the Public Services Director shall be replaced by the Contractor at the Contractor's expense.

4B. Concrete Sidewalk

Concrete sidewalk shall be constructed as shown on the Plans and Details.

Concrete mixtures and curing compounds shall meet the requirements of **Division III, Materials**, of these Specifications.

The base material and adjacent concrete shall be wet down prior to placement of concrete to prevent water loss through the base, and to form a better bond between old and new concrete. If a construction joint is required, the existing concrete surface is to be cleaned with compressed air to expose the aggregate in the concrete.

The concrete sidewalk shall be finished in a neat and workmanlike manner, with a light, broom finish.

Water shall not be added to the concrete surface ("blessing" the concrete) to aid in finishing.

Control joints shall be placed at 5 foot intervals and may be tooled or sawed. The method of forming joints and spacing shall be approved by the Public Services Director prior to construction.

Three-quarter inch thick expansion joints shall be placed through concrete sidewalk in line with all expansion joints in the abutting curb, gutter, or combination curb and gutter. Transverse expansion joints shall be placed through the sidewalks at all property lines.

One-half inch thick expansion joints shall be placed between the sidewalk and back of abutting curb or gutter, at the juncture of two sidewalks, at the juncture of a sidewalk and a drive approach, and between the sidewalk and buildings or other rigid structures.

After finishing operations have been completed and immediately after the free water has left the surface, the surfaces shall be completely coated and sealed with a uniform layer of white membrane curing compound. This curing compound shall meet the requirements of **Division III, Materials** of these Standards and shall be applied in accordance with MDOT Specifications Section 4.50.16.

The Contractor shall restore all disturbed areas to better than or equal to their existing condition in accordance with **Division VIII, Landscaping and Restoration** of these Standards, within two working days, from the date of concrete placement. This includes the restoration of lawns and lawn extensions which are to be restored.

Any sidewalk which is marked by graffiti, cracks other than at joints, or otherwise damaged before it has been accepted by the Public Services Director shall be replaced by the Contractor at the Contractor's expense.

4C. Concrete Drive

Concrete drives shall be constructed as shown on the Plans and Details.

Concrete mixtures and curing compounds shall meet the requirements of **Division III, Materials**, of these Specifications.

The base material and adjacent concrete shall be wet down prior to placement of concrete to prevent water loss through the base, and to form a better bond between old and new concrete. If a construction joint is required, the existing concrete surface is to be cleaned with compressed air to expose the aggregate in the concrete.

The concrete drives shall be finished in a neat and workmanlike manner, with a light, broom finish.

Control and expansion joints shall be located as called for on the Details. The method of forming plane of weakness and contraction joints shall be approved by the Public Services Director prior to construction.

After finishing operations have been completed and immediately after the free water has left the surface, the surfaces shall be completely coated and sealed with a uniform layer of white membrane curing compound. This curing compound shall meet the requirements of **Division III, Materials** of these Standards and shall be applied in accordance with MDOT Specifications Section 4.50.16.

The Contractor shall restore all disturbed areas to better than or equal to their existing condition in accordance with **Division VIII, Landscaping and Restoration** of these Standards, within two working days, from the date of concrete placement. This includes the restoration of lawns and lawn extensions which are to be restored.

Any drive which is marked by graffiti, cracks other than at joints, or otherwise damaged before it has set shall be rejected and shall be replaced.

5. BITUMINOUS PAVEMENT CONSTRUCTION

5A. Cleaning

Before placing the bond coat, the existing pavement surface including joints, cracks and edges shall be thoroughly cleaned to a minimum depth of one inch with compressed air, vac-all type equipment, or other approved mechanical or hand methods, to remove all dirt, debris, and all foreign material.

Immediately prior to placing the bond coat, the entire surface shall be cleaned with vac-all or similar equipment(s) approved by the Public Services Director. The equipment shall have an effective means for preventing any dust resulting from the operation from escaping into the air.

The Contractor is required to spray an approved weed killer (Round-Up by Monsanto or equal) on all vegetation, prior to placement of bituminous overlay.

5B. Bituminous Placement

The materials for this work shall meet the requirements of **Division III, Materials** of these Specifications. The job mix design formula must be submitted to, and approved by, the Public Services Director prior to commencement of paving operations.

Prior to the placement of the bituminous pavement, the Contractor must obtain a "Permit to Place" from the

Public Services Director. This "Permit to Place" shall be issued once the adjacent, underlying layer of the pavement section has been approved by the Public Services Director as to its compaction and grading. In addition, the final structure adjustments must be approved by the Public Services Director prior to the issuance of the "Permit to Place" for the wearing course.

The Contractor shall apply MDOT SS-1h bond coat, at a rate of 0.05 gal/sy, on all areas to be paved, except the gravel base, prior to the placement of bituminous material. Extra care shall be taken to apply a uniform bond coat on all of the surfaces which are to be paved and to avoid covering the face of curbs, sidewalk or other surfaces which are not to be paved. After September 15, SS-1h bond coat shall not be diluted by more than 25%.

The Contractor is not permitted to place bond coat or pave when rain is threatening or when the moisture on the existing surface would prevent satisfactory bonding. Paving operations shall be halted at any time of the day as the rain starts. Any quantity of unused bituminous material is the complete responsibility of the Contractor.

The Contractor shall schedule the paving operation to avoid longitudinal cold joints. In all cases, the Contractor shall pave the primary road's through-traffic lanes ("main line") first, from the point-of-beginning to the point-of-ending. All other paving including but not limited to acceleration and deceleration lanes, intersection approaches, and center left-turn lanes shall be paved following completion of the main line paving, unless authorized by the Engineer prior to pavement placement.

The Contractor shall have, at all times, a 10' long straight edge on each and every paver. Complete automation shall be required on all main line pavers. In addition to all MDOT requirements, the Contractor may be required by the Engineer to use two 30 foot grade referencing skis at any time during main line paving. The use of rubber-tired pavers must be approved by the Public Services Director, except for bituminous patching and bikepath paving.

The rate of the paver shall be such that the paving operation will be continuous, resulting in no transverse cold joints, but shall never exceed the rate of 50 feet per minute. The Contractor shall coordinate the paving operation so as to have enough trucks available to keep the paver(s) moving continuously at all times.

Wearing and leveling courses shall be placed in lifts of 1-1/2" to 2" in thickness and base material in lifts of 2" to 3" in thickness, as indicated on the Plans or as directed by the Engineer. The wearing course shall be placed with a 1/4" lip at the gutter edge-of-metal.

If the Engineer directs the Contractor to place a feather joint, it shall be constructed so as to vary the thickness of the asphalt from zero inches to the required paving thickness of approximately 1.5" over a 10 foot distance. The Contractor shall rake the larger pieces of aggregate out of feather joints prior to compaction.

All bituminous thickness dimensions are assumed to be compacted in place.

The Contractor and Engineer shall carefully observe the paving operation for signs of faulty mixtures. Points of weakness in the surface shall be removed or corrected by the Contractor, at the Contractor's expense, prior to paving any subsequent lift of bituminous material. Such corrective action may include removal and replacement of thin or contaminated sections of pavement, including sections which are weak or unstable. Once the Contractor or his/her representative is notified by the Engineer that the material being placed is out of allowable tolerances, or there is a problem with the paving operation, the Contractor shall stop the paving operation at once, and the Contractor will not be permitted to continue placing bituminous material until again authorized by the Engineer.

Each layer of bituminous mixture shall be compacted to at least 97% of the control density, as determined by using the MODIFIED MDOT MARSHALL TEST.

The temperature of the asphalt being placed shall meet the minimum requirements given below:
REQUIRED MINIMUM PLACEMENT TEMPERATURES+

Base* Temp. (°F)	Mat Thickness, in.					
	1/2	3/4	1	1 1/2	2	3**
20-32***	-----	-----	-----	-----	-----	300
+32-40***	-----	-----	-----	305	295	280
+40-50	-----	-----	310	300	285	275
+50-60	-----	310	300	295	280	270
+60-70	310	300	290	285	275	265
+70-80	300	290	285	280	270	265
+80-90	290	280	275	270	265	260
+90	280	275	270	265	260	255
Rolling completed after placing time, min.	4	6	8	12	15	15

* Base on which mix is placed (°C = 0.555 (°F-32))

** and greater

*** Written approval by Public Services Director required for asphalt placement at these temperatures.

+ From Additional Study of Cessation Requirements, C. R. Foster, National Asphalt Pavement Association, Riverdale, MD, 1971.

5C. Bituminous Finish Wedging

The material shall meet the requirements of **Division III, Materials** of these Specifications for bituminous mixture No. 1300T-36A.

The Contractor shall construct bituminous finish wedges as shown on the Plans and directed by the Engineer, and at all drive approaches, sidewalk ramps, and other areas where wedging is needed to make a good vertical and/or horizontal transition between old construction and the new pavement surface, and/or to eliminate areas of standing water in the wearing surface.

Prior to placement of wedging material the surface shall be cleaned with compressed air or vac-all type equipment.

The Contractor shall complete the wedging of driveway approaches within 2 days after the placement of the finished wearing course.

The Contractor shall construct feather joints at all wedges (including the raking out of large pieces of aggregate) so as to provide a high quality riding surface and appearance.

Each layer of bituminous mixture shall be compacted to at least 97% of the control density, as determined by using the MDOT MODIFIED MARSHALL TEST.

5D. Structure Adjustment

This work shall include repairing, adjusting and lowering manholes, inlets, or gate valve boxes and wells of Portland cement concrete and concrete block masonry, and replacing existing metal covers and/or castings including; excavation, backfill, compaction and patching.

After the removal of the casting, the structure's opening shall be covered by the required type of steel plate. The plate shall be properly placed in order to avoid any slippage due to traffic or construction machinery movements. The opening shall be covered so as to prevent construction debris from infiltrating into the structure. The plate shall be covered with 22-A gravel and asphalt to existing surface elevation as indicated on the Details. Steel plates shall be sufficiently strong and thick enough to carry the traffic and construction equipment without any deflection. Steel plates shall also be pegged as shown in the Plans and Details, in order to prevent their shifting and/or moving. Steel plates are the property of the Contractor and shall be removed by the Contractor upon completion of the work.

All City manhole and structure covers, monument boxes, water valve boxes and hand holes shall be adjusted to conform to the finished surface section and elevation. The Public Services Department-Engineering Division personnel shall be given the opportunity by the Contractor to witness all monuments prior to their being disturbed and/or adjusted. All covers shall be adjusted to grade after the leveling, skin leveling and/or patching course has been placed, but before the placement of the wearing course, unless otherwise provided or authorized by the Public Services Director. When the leveling course(s) is/are placed, the structures shall have their covers and castings removed, and the structures covered by a steel plate. This plate will be removed and the structure adjusted after the completion of all leveling courses.

All structures are to be adjusted to a level which results in their surface being flush with the finished grade. This work is to be accomplished with the use of Class A high early strength (9 sack) concrete, and checked by using a 10 foot straight edge parallel with the pavement centerline. Failure to meet these conditions will result in the readjustment of the structure and finish patching of the area, as directed by the Engineer, at the Contractor's expense.

Castings shall be pointed with mortar on the structure interior to a smooth, brushed finish.

All other utility structures (Edison, Gas, MBT, Cable TV, etc.) shall be adjusted by the Utility or their contractor. It is the sole responsibility of the Contractor to give adequate notice and to arrange for and coordinate any adjustment of structures or valves by these utilities.

The Contractor shall replace worn covers and/or castings, as directed by the Public Services Director.

All salvaged covers and castings (of any type) shall be returned by the Contractor, to the City's Yard at 2000 South Industrial Highway within two days from the date of their removal.

6. CONCRETE PAVEMENT CONSTRUCTION

6A. Concrete Placement

Concrete pavement may be constructed adjacent to new or existing concrete curb, curb and gutter, or with integral curb and gutter.

Where the new concrete pavement is to be constructed adjacent to curb of any type, the Contractor shall install mechanical anchors and hook bolts as indicated on the Plans or as directed by the Engineer, in accordance with these Specifications.

6B. Hot Joint Sealing

The Contractor shall clean, plow, and hot seal Portland cement concrete pavement joints and cracks at the locations specified by the Engineer.

All joints and cracks shall be sandblasted (vertical face) to a minimum depth of one inch and a minimum horizontal surface width of one inch either side of the crack or joint. The joints and cracks shall be plowed and blown out by using compressed air as necessary to remove all dirt, vegetation and old seal material. Compressed air shall be applied at a minimum pressure of 90 psi, at a rate of 150 cubic feet per minute at the nozzle.

The Contractor shall completely fill joints and cracks with rubber-asphalt, Hot Applied ASTM D1190 or AASHTO M173. The Engineer shall inspect all sealed joints and cracks for low spots and may direct the Contractor to reseal low spots with additional rubber asphalt material.

6C. Structure Adjustment

This work shall include repairing, adjusting and lowering manholes, inlets, or gate valve boxes and wells of Portland cement concrete and concrete block masonry; and replacing existing metal covers and/or castings including; excavation, backfill, compaction and patching.

After the removal of the casting, the structure's opening shall be covered by the required type of steel plate. The plate shall be properly placed in order to avoid any slippage due to traffic or construction machinery movements. The opening shall be covered so as to prevent construction debris from infiltrating

into the structure. The plate shall be covered with 22-A gravel to existing surface elevation. Steel plates shall be sufficiently strong and thick enough to carry the traffic and construction equipment without any deflection. Steel plates shall also be pegged as shown in the Plans and Details, in order to prevent their shifting and/or moving. Steel plates are the property of the Contractor and shall be removed by the Contractor upon completion of the work.

All City manhole and structure covers, monument boxes, water valve boxes and hand holes shall be adjusted to conform to the finished surface section and elevation. The Public Services Department-Engineering Division shall be given the opportunity by the Contractor to witness all monuments prior to their being disturbed and/or adjusted. Prior to placement of the Portland cement concrete pavement, all structures shall have their covers and castings removed, and the structures covered by a steel plate. This plate will be removed and the structure adjusted after the paving machine has passed over it, and before the concrete pavement has begun to set. All structures are to be adjusted to a level which results in their surface being flush with the finished grade. Failure to meet these conditions will result in the readjustment of the structure and finish patching of the area, as directed by the Engineer, at the Contractor's expense.

Castings shall be pointed with mortar on the structure interior to a smooth, brushed finish.

All other utility structures (Edison, Gas, MBT, Cable TV, etc.) shall be adjusted by the Utility or their contractor. It is the sole responsibility of the Contractor to give adequate notice and to arrange for and coordinate any adjustment of structures or valves by these utilities.

The Contractor shall replace worn covers and/or castings, as directed by the Public Services Director.

All salvaged covers and castings (of any type) shall be returned by the Contractor, to the City's Yard at 2000 South Industrial Highway within two days from the date of their removal.

6D. Installation of Mechanical Anchors and Hook Bolts

Prior to the installation of concrete pavement and/or concrete pavement repair, the Contractor shall install mechanical anchors and 3/4" diameter hook bolts as indicated on the Plans and Details or as directed by the Public Services Director.

The Public Services Director may delete the installation of mechanical anchors and hook bolts where, in his opinion, the existing concrete pavement is observed to be of poor quality.

7. PATCHING

7A. Bituminous Pavement Patching and Repair

The material used for this work shall be in accordance with the Plans and shall be either mix no. 700-20C or no. 1300T-20AAA, unless otherwise specified, as described in **Division III-Materials**, of these Specifications.

Prior to placing the bituminous patching mixture, the sand subbase and aggregate base shall be evenly graded, trimmed and compacted to 95% and 98% respectively, of their maximum unit weights, as determined by the AASHTO T-180 test. The surface of all pavement cuts shall be cleaned with compressed air or vac-all type equipment and then covered with M.D.O.T. SS-lh bond coat, applied at a rate of .05 gallons/s.y. The bond coat shall be applied with a power distributor hand sprayer.

Bituminous patching mixture shall be placed in lifts not exceeding 2 inches (approximately 2-1/2" loose). Each layer of bituminous mixture shall be compacted to at least 97% of the control density, as determined by using the MODIFIED MDOT MARSHALL TEST.

All areas excavated in one day shall be patched and compacted in that same day and opened to traffic.

The Contractor shall use an asphalt paver or spreader box to place the asphalt material. The Contractor shall not use a grader or front end loader or similar device for placing the bituminous material. For small areas, where approved by the Public Services Director, the Contractor may place the material by hand directly in the area intended to be patched. Under no circumstances shall the Contractor place bituminous material on adjacent pavement surfaces.

All patches shall be compacted with an approved roller, unless it is impossible to use a roller due to the patch size, in which case, the Contractor may use a vibratory plate compactor on the patch.

All patching shall be performed so as to provide a smooth riding surface.

7B. Concrete Pavement Patching and Repair

The Contractor shall patch existing concrete pavements in accordance with the Plans and Details.

Prior to placement of concrete, the Contractor shall install mechanical anchors and hook bolts in accordance with **Division V, Section 6D, Installation of Mechanical Anchors and Hook Bolts** of these Specifications.

The road base and adjacent concrete shall be wet down prior to placement of concrete to prevent water loss through the road base, and to form a better bond between old and new concrete. If a construction joint is necessary, the existing concrete surface shall be cleaned with compressed air to remove loose and unsound concrete, and to expose the aggregate in the concrete.

During the placement of concrete for the pavement repair, the Contractor shall use a high-frequency mechanical vibrator to consolidate the concrete to insure even placement, and to prevent voids or pockets of air from forming. The vibrator shall not be used to move the concrete within the patch limits. The vibrator shall be used minimally to avoid segregation of the aggregate.

7C. Brick Pavement Patching and Repair

The Class II sand subbase shall be placed from the bottom of the excavation to eight inches below the bottom of the brick pavement, compacted to 95% of its maximum unit weight, as determined by the AASHTO T-180 test. A seven inch Class A concrete base shall be placed on the evenly graded, trimmed and compacted subbase. The brick pavement shall then be placed on top of the concrete base, set in a minimum one inch thick dry mortar leveling bed (one part Portland Cement, four parts Class II granular material). The brick patch shall match the existing brick material and pattern.

7D. Flowable Fill

The temperature of the flowable fill mix as manufactured and delivered shall be at least 50°F.

Mixtures shall be transported to the point of placement in a revolving drum mixer or agitator. During placement operations around manholes and in utility trenches, care shall be used to avoid dislocating any pipes due to fluid pressure from the flowable fill by even placing of the material. The Contractor shall secure all pipes within the backfill area to avoid the buoyant effect of the flowable fill.

8. PAVEMENT MARKINGS

8A. Removal of Pavement Markings

Inappropriate or conflicting pavement markings shall be removed by the Contractor at locations as shown on the Plans, or as directed by the Engineer, prior to any change in traffic patterns. If pavement markings on an open roadway are to be obscured for more than 24 hours in advance of a change in traffic pattern, temporary markings shall be placed no later than the close of the workday in which said pavement markings were removed.

The removal of pavement markings shall be accomplished in a manner and by methods meeting the approval of the Engineer. Methods which can provide acceptable results are: sandblasting using water or air; high-pressure water; steam or superheated water; mechanical devices such as grinders, sanders, scrapers, and wire brushes.

Pavement markings shall be removed in such a manner as to cause as little damage as possible to the surface texture of the pavement.

Sand or other material deposited on the pavement as a result of removing traffic stripes or markings shall be removed as the work progresses. Accumulations of sand or other material which might interfere with drainage or which may constitute a hazard to traffic will not be permitted and shall be removed by the Contractor immediately.

Where blast cleaning is used for the removal of pavement markings or for the removal of objectionable material, and such removal operation is being performed within 10 feet of a lane occupied by public traffic, the residue, including dust, shall be removed immediately after contact between the sand and the surface being treated. Such removal shall be by a vacuum attachment operating concurrently with the blast cleaning operation, or by other equally effective methods meeting the approval of the Engineer.

8B. Temporary Pavement Markings, Type R

The Contractor shall place temporary, removable-type (Type R) pavement markings, as shown on the Plans and as directed by the Public Services Director.

Temporary pavement markings for bituminous surfaces over which traffic is to be maintained shall be made with reflectorized marking tape. Temporary pavement markings shall be placed after each days paving, or as directed by the Public Services Director.

All markings shall have a nominal width of 4 inches and shall be either white or yellow in accordance with the MMUTCD, or as directed by the Engineer. Dashed lines shall be two feet in length and spaced not greater than 40 feet nor less than 20 feet center to center of markings. Markings less than 2 feet in length shall be removed and replaced by the Contractor, at the Contractor's expense.

Markings shall be applied so that they adhere adequately to the pavement surface. The Contractor shall clean the pavement surface as necessary to affix the marking tape. Cleaning of the pavement surface for

placement of pavement markings shall be included in this item of work. Markings shall be of reflecting type, and those which do not function properly shall be removed and replaced by the Contractor at the Contractor's expense.

8C. Temporary Pavement Markings, Type NR

The Contractor shall place temporary, non-removal (Type NR) pavement markings, as shown on the Plans and as directed by the Public Services Director.

Temporary pavement markings for bituminous surfaces over which traffic is to be maintained shall be made with reflectorized marking tape or paint. Temporary pavement markings shall be placed after each days paving, or as directed by the Public Services Director.

All markings shall have a nominal width of 4 inches and shall be either white or yellow in accordance with the MMUTCD, or as directed by the Engineer. Dashed lines shall be two feet in length and spaced not greater than 40 feet nor less than 20 feet center to center of markings as directed by the Public Services Director. Markings less than 2 feet in length shall be removed and replaced by the Contractor, at the Contractor's expense.

Markings shall be applied so that they adhere adequately to the pavement surface. The Contractor shall clean the pavement surface as necessary to affix the marking tape or paint. Cleaning of the pavement surface for placement of pavement markings shall be included in this item of work. Markings shall be of reflecting type, and those which do not function properly shall be removed and replaced by the Contractor, at the Contractor's expense.

8D. Reflectorized, Fast-Dry Pavement Markings

The Contractor shall place reflectorized, fast-dry pavement markings, as shown on the Plans and as directed by the Public Services Director, in accordance with the current MDOT minimum specifications for fast-dry paint and standard glass beads.

Pavement markings shall be fast-dry paint. Markings shall be yellow or white, in the lengths and widths specified on the Plans or as directed by the Public Services Director.

Prior to the application of pavement markings, it shall be the Contractor's responsibility to see that the pavement surfaces are clear, dry, and free of all foreign materials. The Contractor shall be responsible for removal of heavy and/or hardened deposits of foreign materials. Permanent pavement markings shall not be applied for a minimum of **ten (10)** days following the placement of the wearing course.

All layout work necessary for the location and placing of pavement markings shall be the responsibility of the Contractor, and shall be subject to the approval of the Engineer.

8E. Hot-Applied, Thermoplastic Pavement Markings

The Contractor shall place hot-applied thermoplastic pavement markings, as shown on the Plans and as directed by the Public Services Director, in accordance with the current MDOT minimum specifications for hot-applied thermoplastic pavement markings. The pavement markings shall be placed before the end of the day following placement of the wearing course of asphalt.

Prior to the application of pavement markings, the Contractor shall clean the pavement surfaces, and these surfaces shall be dry and free of all foreign material.

All layout work necessary for the location and placing of pavement markings shall be the responsibility of the Contractor, and shall be subject to the approval of the Engineer.