CHAPTER 22
ASPHALT PAVING

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PART 1 - GENERAL

1.1 SUMMARY

A. Asphalt paving base course, binder course, and wearing course.

1.2 RELATED DOCUMENTS

A. CHARLOTTE WATER Water and Sewer Design and Construction Standards and Standard Details.

1.3 DEFINITIONS AND ABBREVIATIONS

A. See Sections iii and iv of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for common abbreviations and definitions.

1.4 REFERENCES

A. North Carolina Department of Transportation (NCDOT) “Standard Specifications for Roads and Structures,” latest edition.

B. Charlotte Land Development Standards Manual (CLDSM), latest edition.

C. CHARLOTTE DEPARTMENT OF TRANSPORTATION (CDOT) Utility Right of Way Management Program Standards and Provisions.

1.5 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

B. The Contractor shall submit to the Engineer and/or directly to CDOT/NCDOT a detailed traffic control plan for performing all phases of the work within one week prior to performing the work in residential roads and two weeks prior to working in major thoroughfares. The traffic control plan shall be specific to each road and the water/sewer infrastructure proposed for installation. The traffic control plan shall be modified as necessary in the field to accommodate unforeseen traffic control issues and problems and safety concerns. No work shall begin until the traffic control plan is reviewed and approved by the Engineer, Charlotte Water, CDOT and/or NCDOT, or the appropriate town controlling agency. The Contractor shall coordinate directly with CDOT and NCDOT or appropriate town controlling agency and advise the Engineer of all coordination efforts, correspondence, submittals and status.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NCDOT or CLDSM standard specifications.

B. Obtain materials from same source throughout.

C. Saw cutting of edges of existing pavement is necessary for pavement addition and renovation. This work will be performed by the more stringent method as either specified by NCDOT standard specifications Section 250-2, Pavement Removal and Disposal, or as indicated in this specification under Part 3, Execution.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: in accordance with NCDOT standard specifications.

B. Binder: In accordance with NCDOT standard specifications.

C. Tack Coat: In accordance with NCDOT standard specifications.

2.2 AGGREGATE MATERIALS

A. Base: General Aggregate Base Course in accordance with NCDOT standard specifications.

PART 3 - EXECUTION

3.1 GENERAL

A. All removal and restoration of pavement and road surfaces will be in accordance with the specifications approved by the Superintendent of Streets of the City of Charlotte or of the North Carolina Department of Transportation and Safety, Division of Highways, or appropriate town/city controlling agency, whichever applies.

B. All restored bituminous and concrete pavements shall be placed to existing cross-section and ride quality. Restored pavement will in all instances be flush and level with existing pavement at the sawed edges, and at existing gutter lines where applicable unless otherwise approved by the Engineer. When pavement repairs do not meet the above criteria or are not performed in a workmanship manner as determined by the Engineer, Superintendent of Streets of the City of Charlotte, North Carolina Department of Transportation, or appropriate town/city controlling agency, whichever applies, the contractor will remove and re-perform the restoration as specified.

C. When cuts are to be made in street rights-of-way under maintenance by the City of Charlotte, the Contractor shall contact the Superintendent of Streets or his designated representative before each separate pavement cut is made and secure a Street Cut permit.

D. Pavement will be replaced as follows. In all pavement cuts either the permanent pavement or a temporary pavement consisting of 1" of black asphaltic concrete (later to be replaced permanently) will be placed immediately upon completion of the subgrade unless otherwise approved by the Engineer.

1. Specifications for Cutting Pavement: Unless otherwise approved or required, concrete pavement shall be removed to the nearest expansion or contraction joint. The Contractor will contact the Superintendent of Streets and/or D.O.T.'s District Engineer for a determination of the limits of concrete replacement and location of joints. Where sawed joints are allowed, the depth of the sawed cut shall be at least

one (1) inch and shall extend at least 1/5 of the depth of the concrete. More depth may be required if necessary to prevent damage to surrounding pavement.

Bituminous pavement shall be cut in a smooth and straight line. Sawing is required on asphaltic concrete. The width of the existing pavement left between the edge of the utility cut/patch ditch and the existing edge of the pavement or the front line of the gutter, shall be at least 2 feet. The pavement cut shall be a straight line based on the widest point that pavement must be removed. Jagged offset edges shall not be allowed. Residual strips of pavement less than 2 feet in width must be removed and replaced. Existing pavement shall be removed on each side of the trench for at least 12 inches beyond top of trench.

The Contractor shall remove and replace pavement which, in the opinion of the Engineer, has been cracked or displaced by the operation of the Contractor.

2. Specification For Restoring Concrete Pavement: The concrete used to restore pavement shall have a minimum 28 day compressive strength of 3600 P.S.I. The concrete as placed shall conform to the shape, grade, and finish of the existing pavement and will be one (1) inch deeper than the original pavement including base, but in no instance less than six (6) inches.

3. Specification For Restoring Asphalt Pavement: All material above the sub-base level shall be hot-mix bituminous concrete conforming to North Carolina Department of Transportation Standard Specifications for Roads and Structures for both mix design and placement. The asphalt pavement as placed shall be one (1) inch deeper than the original pavement including the aggregate base, but in no instance less than six (6) inches within private roads, parking lots, driveways or alley ways, nine and one half (9.5) inches within City or town maintained roadways or thirteen (13) inches within state maintained roadways. The asphalt shall be placed in lifts not greater than 4 inches and shall be 6” B25.0C base course and 4” I19.0C intermediate course. The last three (3) inches in either instance shall be three (3) inches of S9.5C Surface Course, placed in two (2) lifts of 1.5 inches. Surface course S9.5C asphalt pavement resurfacing will be placed with paving machines and/or rollers of a size and type currently approved by the North Carolina Department of Transportation for use on resurfacing contracts.

If a bituminous surfacing overlays a concrete base, the Contractor, at the option of the Engineer, shall replace the concrete to its original thickness, or to a level 2 inches below the finished surface. The Engineer may direct the Contractor to omit all concrete and to replace the pavement with bituminous materials.

Tack coats shall be employed with each lift. Tack coats shall be placed on both horizontal and vertical surfaces (pavement cuts or face of concrete gutters).

Under normal conditions, asphalt base course and intermediate course will be placed in pavement cuts at the end of each work day. The final surface course shall be replaced weekly or within five days following completion of pipeline construction along a continuous section of pavement. During inclement weather, the Engineer may permit the use of temporary asphalt (cold mix) to seal the trench until permanent asphalt can be placed.

4. Use of Steel Plates to Cover Open Excavations: When a temporary excavation, vault or manhole within the Clear Zone is proposed to be left open, it shall not be exposed to errant vehicles (or pedestrians and other conditions as determined by NCDOT). If a temporary excavation, vault, or manhole is left exposed during any

period appropriate traffic control measures are absent, the Encroaching Party shall install a minimum Grade 36 steel plate without deformation to cover the hole. The steel plate must be placed and anchored to prevent displacement and shall be designed large enough to span the excavation and exceed it by a minimum of 15 inches on all sides of the excavation. The steel material meeting NCDOT Standards. For spans or trench widths less than 5'-3", the steel plate thickness shall be determined by Steel Plate Thickness Table below. For spans or trench widths greater than 5'-3", the design of the steel plate must be sealed by a North Carolina licensed Professional Engineer. If the steel plate is exposed to continuous traffic, the design must meet the AASHTO LRFD HL-93 loading criteria and appropriate signage must be installed in advance of the job site in accordance with the MUTCD for a bump and slippery when wet conditions.

a. Steel Plate Thickness

1) Maximum Clear Span or

Trench Width Minimum	Total Plate Thickness
1'-11"	3/4"
3'-5"	1"
5'-3"	1 3/4"

3.2 EXAMINATION

A. Verify compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.3 TACK COAT

A. Apply tack coat in accordance with NCDOT standard specifications.

B. Apply tack coat to contact vertical surfaces of curbs, gutters and drainage structures.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

3.4 ERECTION TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from Indicated Elevation: Within 1/2 inch

3.5 FIELD QUALITY CONTROL

A. Take samples and perform tests in accordance with NCDOT standard specifications.

3.6 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect paving from mechanical injury or until surface temperature is less than 140 degrees.

3.7 WORK WITHIN THE CHARLOTTE DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY

A. The Contractor's project manager, superintendents and/or foremen must be certified by the Charlotte Department of Transportation (CDOT) to perform any excavation work in CDOT roads. CDOT provides the certification through periodic certification courses. The Contractor and all subcontractors (as necessary) shall obtain the certification prior to performing any excavation in CDOT roads. The Contractor shall contact CDOT for certification course schedules and times.

B. A Street Cut Permit is required to perform excavation work in CDOT roads. The Contractor shall be responsible for providing the Owner with the required information associated with each street cut in order to properly obtain a valid Street Cut Permit from CDOT, including entering data in the required spreadsheet format. All information provided by the Contractor must be accurate and up-to-date (including the proposed schedules to perform the work). The Contractor shall obtain a copy of the latest revision of the "CDOT Street Maintenance Division, Regulations and Fee Schedule, Procedures for Working in Asphalt and Concrete Pavements" and maintain in their possession at all times when working in any CDOT Right-of-Way. All policies/procedures set forth in this document shall be adhered to at all times.

C. A CDOT Right of Way Use Permit, per the 2007 Right of Way Use Ordinance is required for any work within any CDOT right of way, even if all work is outside the pavement. The Right of Way Use Permit is in addition to the Street Cut Permit.

D. CDOT requires that all excavations in CDOT roads be paved by the end of each work day. The Contractor shall abide by this requirement and shall schedule the work activities as necessary to maintain compliance. If CDOT waives this requirement for any portion of the project, the Contractor shall obtain approval of the deviation from CDOT in writing. CDOT offers to perform pavement and concrete restoration for contractors. The Contractor may contact CDOT for current pricing for such work.

E. CDOT does not allow the use of their right-of-way for overnight storage of equipment and/or material. The Contractor shall abide by this requirement and shall schedule the work activities as necessary to maintain compliance. If CDOT waives this requirement for any portion of the project, the Contractor shall obtain approval of the deviation from CDOT in writing. CDOT may require the use of water filled barriers, drums, cones, etc. as a condition of this deviation.

F. All work necessary to adhere to CDOT's requirements for work in CDOT roads as specified herein shall be considered incidental to the work unless stated otherwise in project specific contract documents.

3.8 WORK WITHIN THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY

A. An encroachment agreement (or similar agreement) will be required when work occurs within the North Carolina Department of Transportation (NCDOT) rights-of-way. In such case, Charlotte Water will obtain the encroachment permit.

B. The Contractor shall hold on site at all times, all certifications required by the NCDOT for working in their road right-of-way, including traffic control, excavation, etc.

C. The Contractor shall perform all work within the Department of Transportation right-of-way in accordance with any project specific encroachments issued by NCDOT and these

specifications. A copy of the project specific encroachment agreement(s) shall be kept at the construction site at all times.

D. The Contractor is hereby advised that the encroachment shall govern over the Construction Plans as to pipeline location unless otherwise approved by the Engineer.

E. The Contractor will notify the NCDOT District Engineer at 980-523-000 and Charlotte Water three (3) business days prior to commencing any construction within the Department's right-of-way.

F. The Contractor is required to maintain all traffic, furnish all barricades and flashers, flagmen and pilot cars when necessary. Refer to the TRAFFIC CONTROL section of these specifications for additional requirements.

G. Open trenches are prohibited between dusk and dawn and at designated peak traffic hours unless special permission is received from the Department of Transportation's Division Engineer.

H. When cutting of pavement is permitted, only one-half of the road width shall be opened at any time. Full traffic flow is to be maintained between dusk and dawn and at other peak hours of traffic as required by the encroachment agreement or other Special Provision.

I. The Contractor and his suppliers are directed to contact the North Carolina Department of Transportation to verify axle load limits on State maintained roads and bridges which will be used for hauling of equipment or materials for this project. The Contractor and his suppliers shall do all that is necessary to satisfy the Department of Transportation requirements and will be responsible for any damage to roads and bridges resulting from this project.

3.9 NCDOT REQUIRED TRAINING FOR FLAGGERS AND WORK ZONE SUPERVISORS

A. In accordance with the NCDOT approved encroachment (11-046-N) included within these contract documents, “Effective July 1, 2010, all flagging operations within NCDOT Rights of Way require qualified and trained Work Zone Flaggers.” Also, “Effective July 1, 2011, qualified and trained Work Zone Traffic Control Supervisors will be required on Significant Projects.”

B. Training for this certification is provided by NCDOT approved training sources and by private entities that have been pre-approved to train themselves. Contact NCDOT at 919-814-5000 for approved training sources.

C. Charlotte Water also requires the contractor’s flaggers to be a NCDOT Qualified Work Zone Flagger and that the contractor’s Project Superintendent be a NCDOT Qualified Work Zone Supervisor who must be on the project site at all times. Both individuals need to have their NCDOT issued training card with them at all times on the project site.

3.10 TRAFFIC CONTROL

A. Warning signs, barricades and flagmen must be provided in accordance with the City of Charlotte Department of Transportation's "Work Area Traffic Control Handbook" (WATCH) and the North Carolina Department of Transportation's "Uniform Traffic Control Devices" at all times and places necessary.

B. The Contractor shall provide all appropriate signing and barricades and shall provide flaggers at all times and places necessary. Occupants must be notified a minimum of

two (2) hours in advance of private drive closings. Closure time will be limited to a maximum of 2 hours.

C. The Contractor will be required to furnish, maintain and relocate temporary precast concrete barriers to be placed around bore pits for safety precautions and in accordance with N.C. Department of Transportation requirements. The barriers shall be connected with pin type, tongue and groove or other system that insures the continuity of the barrier installation.

D. No roads shall be closed for construction activities. At least one lane of traffic will be safely maintained at all times when construction is in progress. Access to businesses and residences along the roads shall be maintained at all times. All lanes will be open when work is suspended for one hour or longer.

E. The Contractor shall provide all appropriate signage and barricades and shall provide flag persons at all times and places necessary. Traffic control will be strictly enforced while also providing fire and police protection to the area and access to drives while construction is in progress. Occupants must be notified a minimum of two (2) hours in advance of private drive closings. Closure time will be limited to a maximum of 2 hours. Where businesses have only one means of access, the Contractor shall provide an alternative means of access or perform work during hours when the business is closed.

F. Traffic will be maintained on all streets or private drives throughout the work. All matters related to traffic maintenance must be done in a manner approved by the City of Charlotte Department of Transportation and the North Carolina Department of Transportation. Warning signs and devices will be placed in advance of all construction activity in accordance with the City of Charlotte Department of Transportation's "Work Area Traffic Control Handbook" and the North Carolina Department of Transportation's "Uniform Traffic Control Devices.

G. A minimum of one lane of traffic must be maintained (safely) when construction is in progress. All lanes of traffic must be maintained (safely) at all times when construction is not in progress.

3.11 ASPHALT PAVEMENT

A. Unless project specific requirements direct otherwise, all asphalt pavement installed shall conform to the requirements of North Carolina Department of Transportation. When SUPERPAVE asphalt pavement is referenced, the following information is provided for reference:

1. Subgrade: ABC or CABC
2. B 25.0 C (3.0" – 5.5" Lift)
3. I 19.0 C (2.5" – 4.0" Lift)
4. S 9.5 C (1.5"-2.0" Lift)
5. Binder PG Grade 64-22
6. Binder PG Grade 70-22
7. Binder PG Grade 76-22

B. Under the SUPERPAVE mix design, the first letter of the mix type indicates the type of mix (Surface, Intermediate, and Base), the number indicates the nominal aggregate size in millimeters, and the letter at the end indicates the level of traffic loading (measured in

ESALs) which the mix is designed to carry. Traffic loading A represents lower traffic counts, and D represents extremely high traffic counts. The Binder is the asphalt binding agent (liquid asphalt cement) used in the mix. Binder PG Grade 64-22 should always be used with patch work, unless S9.5C, S12.5C, S12.5D, or I19.0D is specified.

C. In the absence of a project specific specification or a project specific encroachment, with more detailed asphalt paving requirements, use the following minimum standard:

D. The bituminous asphalt pavement shall be a minimum of one (1) inch deeper than the original pavement structure including stone base, but in no instance less than:

Pavement Type	**Minimum Asphalt Depth (inches)**
Driveway, private road or parking lot	Six (6)
City or Town maintained residential roadway	Nine and a half (9.5)
City or Town maintained minor or major thoroughfare	Ten (10)
NCDOT Secondary Roadway (SR #)	Thirteen (13)
NCDOT thoroughfare (NC #, US # or I #)	Thirteen (13)

Course Type	**Single Lift Thickness – (min-max)**	**Current NCDOT Standard SUPERPAVE**
Intermediate Course	1.5-inch - 2.0-inch lifts	I19.0C
Base Course	2.5-inch - 4.0-inch lifts	I19.0B
Base Course	3.0-inch - 5.5-inch lifts	B25.0C
Overlay (When Required)	1.5-inch - 1.5-inch lifts	S9.5C

E. The pavement shall consist of Base Courses as required to obtain the minimum depth requirements. The last 3 inches shall consist of two (2) 1.5 inch lifts of a Surface Course. Overlays shall only be used when directed by the Engineer. Tack coats shall be employed with each lift. Tack coats shall be placed on both horizontal and vertical surfaces (pavement cuts or face of concrete gutters). Minimum total asphalt depth shall be as specified above.

F. On non-NCDOT pavement cuts smaller than 35 square feet, the pavement may be patched with full depth S 9.5 C provided that it is placed in lifts not greater than indicated above. Minimum total asphalt depth shall be as specified above.

3.12 PAVEMENT MARKING PAINT

A. Marking paint shall be a ready mixed type paint product with spraying consistency suitable for use as reflective pavement markings on Portland cement concrete or bituminous pavement. The paint may be either one of the following two types:

1. A type in which glass beads are dropped by suitable pressurized means into the wet paint as it is applied to the pavement (hereinafter designated as the drop-on type), or

2. A type which combines the characteristics of premix and drop-on paints, i.e., having beads mixed in the paint and also requiring some beads to be dropped on the paint at the time of application by suitable pressurized means (hereinafter designated as the combination type).

3. After application to the pavement and proper drying, the marking paint under traffic shall comply with the following requirements:

a. Shall not be slippery when wet.

b. Shall not deteriorate by contact with sodium chloride, calcium chloride, mild alkalis or acids, cinders or other ice control materials, or by contact with oil drippings from vehicles.

c. Shall have a uniform cross section.

B. The paint shall be suited to application by means of spray-type pavement marking equipment, and when used with such equipment shall be capable of producing a solid, full width line of the required thickness.

C. The paint, when applied with its complement of glass beads to a concrete or bituminous pavement surface under normal field conditions at the required rate and at air temperatures above 50ºF and relative humidities less than 70%, shall dry sufficiently hard within 30 minutes after application so that there will be no pick-up, displacement, or discoloration under traffic.

D. The paint shall conform to U.S. Federal Specification Number (TT-P-115E) or its latest revision for standard yellow or white paint. The paint shall not contain any organic coloring matter and shall not discolor in sunlight.

E. Glass beads used in marking paint shall be a minimum of 80% true spheres and shall meet the following gradation requirements:

1. For beads premixed in the paint:

U.S. Standard Sieve Size	% Passing
No. 40	100
No. 60	80-100
No. 100	30-50
No. 200	0-5

2. For drop-on beads:

U.S. Standard Sieve Size	Minimum	Maximum
Passing #20		100%
Passing #20 and Retained on #30	5%	10%
Passing #30 and Retained on #50	40%	80%
Passing #50 and Retained on #80	10%	40%
Passing #8	0%	5%

F. The glass beads shall flow freely through the pressurized dispensing equipment in any weather suitable for marking the pavement.

G. The Contractor shall furnish a material certification demonstrating compliance with this specification for temporary pavement marking paint, including the glass beads used with the paint.

H. Construction Methods:

1. General: All marking paint shall be installed in accordance with the manufacturer's installation instructions, unless otherwise specified herein. All surface preparation, including surface cleaning and surface pretreatment, shall be done by the

Contractor in accordance with the manufacturer's recommendations, subject to the approval of the Engineer.

2. The pavement markings shall be applied as soon as the pavement has cooled enough to support traffic and shall be in place for sections surfaced by the end of each day's operation, unless otherwise approved by the Engineer and the controlling agency.

3. Pre-marking Requirements: The Contractor shall lay out and install all markings in their final proposed location and position prior to actual placement of the pavement markings. The pavement marking shall not be installed until pre-markings have been approved by the Engineer.

4. Lateral Deviation Requirements: Lines shall be of the length and longitudinal placement as shown on the plans, or to replace existing markings, or as directed by the Engineer and the controlling agency. The Contractor shall provide sufficient control points to serve as guides for application of markings. The marking shall be straight or of uniform curvature and shall conform uniformly with tangents, curves, and transitions. The finished lines shall be free from waviness. In judging waviness, the lateral deviation of the finished line shall not exceed ½ inch from the proposed location alignment at any point.

5. Any greater deviation may be sufficient cause for requiring the Contractor to remove and correct such markings at no cost to the Department.

6. Pavement Marking Paint Application and Equipment Requirements:

   a. All pavement marking lines shall be applied with one pass of the pavement marking equipment.

   b. The pavement shall be dry and free of glaze, oil, dirt, grease, or other foreign contaminants. The paint shall be applied only on clean, dry pavements, and at road surface temperatures above 50ºF and below 160ºF.

   c. Application equipment shall be so constructed as to assure continuous uniformity in the thickness and width of the stripe and shall be equipped with a cut-off device remotely controlled to provide clean square stripe ends when "skip" lines are being applied.

   d. The paint and beads shall be applied at the rate of 16.5 gallons per mile of 4-inch continuous stripes (wet film thickness of 15 mils). When the combination type paint is used at least 3½ pounds of glass beads per gallon of paint shall be premixed into the paint prior to application and drop-on glass beads shall be applied at the rate of 1½ to 3 pounds per gallon of paint. Drop-on beads shall be applied to drop-on type paint at the rate of at least 6 pounds per gallon of paint.

   e. Beads applied to the surface of the completed marking paint shall be applied by an automatic pressurized bead dispenser attached to the liner in such a manner that the beads are dispensed almost instantly upon the wet painted line. The pressurized bead dispenser shall be equipped with an automatic cut-off control synchronized with the cut-off of the paint. The beads shall be spread uniformly over the entire surface of the paint.

7. The Contractor shall protect the marking until dry by placing guarding or warning devices as necessary. In the event any vehicle crosses the wet marking, such

marking shall be reapplied, and tracks made by the moving vehicles shall be removed by the Contractor.

END OF SECTION