Winston-Salem INFRASTRUCTURE DEVELOPMENT STANDARDS
FEBRUARY 2015

City of Winston-Salem
PUBLIC WORKS/ENGINEERING
P.O. Box 2511
Winston-Salem, NC 27102

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100 E. First St,
Winston-Salem, NC 27101

Phone: 336-727-8000
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www.cityofws.org
Infrastructure Development Standards

This document is a guide for the preparation and submittal of plans for infrastructure development projects within Winston-Salem and Forsyth County, N.C. In addition to using this guide, the design engineer should use sound engineering judgment in the design of each individual site.

The Winston-Salem Public Works Department will use these general standards as well as sound engineering principles to review the detailed engineering drawings. All engineers are encouraged to take these standards into consideration in the preliminary layout of infrastructure (streets, drainage, public water/sewer, etc.) so changes can be held to a minimum when the detailed construction drawings are reviewed.

The Infrastructure Development Standards apply to all developments within the City of Winston-Salem. The water and sewer standards apply.

THIS DOCUMENT UPDATED: February 2015

Periodic updates occur to this document. For the latest version, please visit the City’s website and navigate to the publications section of the Engineering Division’s webpage. The exact URL is:

http://www.cityofws.org/Home/Departments/Engineering/Articles/Publications
# INFRASTRUCTURE DEVELOPMENT STANDARDS

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SECTION I
GENERAL INFORMATION
INFRASTRUCTURE DEVELOPMENT CONTACT INFORMATION

CityLink 311

CityLink centralizes access to city information and services through one, easy-to-remember, easy-to-use telephone number. Call (336) 727-8000 or 311 (locally) to speak with a professional customer service representative who will answer your questions, provide information, or dispatch a service request for work to be completed. CityLink311 is open 7:00 a.m. to 7:00 p.m. weekdays, 9:00 a.m. to 5:30 p.m. weekends and all holidays with the exception of New Year’s Day, Thanksgiving Day, and Christmas Day. You may also e-mail CityLink311 at: citylink@cityofws.org.

Online Information

Visit the City’s homepage at: www.cityofws.org. You will find links at the top of the homepage for Development and Business. The Development link will take you to the various departments involved in the development process, provide contact information, and forms and other publications of interest to developers.
Note: Developers are encouraged to meet with City Staff prior to design reviews to facilitate Discussion and design approval
*Plat review by Engineering Staff includes:
  - City Surveyor verifying that Plat meets minimum standards, (GS 47-30)
  - Construction inspector verifies with Contractor that the minimum required infrastructure is in place for the proposed plat. Construction Inspector also verifies that phasing plan shown on the plat matches with phasing plan shown on the approved plans.
  - Construction Inspector reviews punchlist for incomplete items from Developer/Consulting Engineer.
  - Construction Field Office reviews scope of work and unit prices for estimate for incomplete cost items and verifies that minimum required infrastructure is in place.
  - Cost Estimate approved by City Engineer.
  - Records Center Staff and Inspectors verify that draft record drawings & Plat reflect what is on the ground. (ie: lots, easements, street names match plats, etc)
  - Engineering Records Center supervisor prepares memo to City Attorney verifying amount of Surety. (Records Center supervisor retains a copy of plats, cost estimates and bonding instructions for files).

Site Plan Preparer submits draft Final Plat (8 paper copies) to Planning Counter.

Draft copies of Final Plat are distributed to respective Departments for review.

Engineering Staff *see below

- City Attorney Approves form of Surety

- Surety submitted to City CFO for filing

Approved

Review comments & Plat mark-ups collected by Planning Staff and sent back to site plan preparer for corrections.

Site Plan Preparer after corrections submits two (2) mylars for final signatures.

NCDOT verifies R/W dedication on State maintained roads.

Final Plat received by Inspections Department and Building Permits are issued for the lots.
Record Drawings, Construction Checklist, Plat and Engineer’s Certification on each sheet is submitted for review to Engineering Records.

Engineering Records checks submitted record drawings against existing information (Previous record drawings, plats, easements, etc.)

Engineering Inspector receives record drawing/City Surveyor receives plats.

Construction Field Office reviews submitted record drawings. City Surveyor reviews submitted plats.

Engineering Records sends redlined comments to Construction Plan Preparer for corrections.

Construction Plan Preparer returns corrected plans to Engineering Records for final check.

Record Drawings are checked against redlined comments.

Are Redlined Comments Addressed?

<table>
<thead>
<tr>
<th>NO</th>
<th>Contractor corrects deficiencies and contacts Construction Inspector for follow-up inspection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>Construction Inspection Supervisor conducts final inspection.</td>
</tr>
</tbody>
</table>

Final Inspection written by Construction Field Office and sent to Developer and affected City Departments.

Record Drawings are scanned into City’s GIS Database by Records Center Staff and Utility GIS Staff.
FLOWCHART OF STREET AND ALLEY CLOSURE PROCESS

Request for street closure is sent to City Secretary's Office

Sanitation  Surveying  Planning  WS DOT  Police/Fire

City Secretary's Office sends request for closure to Engineering Records to prepare maps, descriptions, etc. Engineering Records Section then distributes to respective Department Staff for comments.

Is it a connecting road?

Engineering Records compiles comments from Staff & prepares Council Action Request Form

Staff recommendation given to Assistant City Manager for Public Works

Assistant City Manager for Public Works sends to Public Works Committee

Approved

Send back to Staff to work out problems

Acceptable Agreement Reached?

Project/Petition Denied. Project not Granted

NO

YES

Public Hearing advertised in paper.

Public Hearing - Council acts on request

Approved

NO

YES

City Secretary's Office waits 30 days for appeals.

Appeals

NO

YES

No

Yes

Public Hearing - Council acts on request

Approved

NO

YES

City Secretary's Office waits 30 days for appeals.

Street Closure is recorded in the Office of the Register of Deeds. Tax Office assigns new lot numbers and creates new map.
As-built drawings are submitted for all stormwater controls. Final Plat Recordation with maintenance agreements and dedicated easements.

Staff reviews Operations and Maintenance agreements, performance and maintenance securities, and escrow account statements.

Are documents ready for approval?

YES

As-built drawings are submitted for all stormwater controls. Final Plat Recordation with maintenance agreements and dedicated easements.

Final inspection of stormwater devices by City Staff.

Issuance of Certificate of Occupancy.

Annual Report submittal by qualified professional on stormwater devices along with final statement of escrowed funds.

NO

Submittal of Operation and Maintenance agreements, as well as any applicable performance and maintenance securities and/or escrow account information and initial payment.

Preliminary Plan submittal and approval by Planning Board and/or City Council.

Submittals of stormwater permit application with all completed components of the stormwater concept plan to address quality and quantity runoff requirements.

Plans are reviewed by City Staff.

Comments are complied and returned to developers engineer within 20 business days.

Corrections are made and resubmitted to City Staff with original markups and comments.

Are plans ready for approval?

YES

Stormwater and Grading permits are issued and approved stormwater plans are incorporated into engineering construction drawings.

NO

Submittals of all applicable stormwater permit review fees.

YES

Concept Plan meeting may be requested by the developer or the Stormwater Manager prior to the submittal of the stormwater permit application or preliminary plan submittal.

Preliminary Plan submittal and approval by Planning Board and/or City Council.

Submittals of stormwater permit application with all completed components of the stormwater concept plan to address quality and quantity runoff requirements.
SECTION II
ADMINISTRATIVE REQUIREMENTS
# FORM 1 SITE PLAN SUBMITTAL CHECKLIST

**Instructions:** Please use this checklist to insure that UDO requirements for Form 1 site plan submittals have been satisfied. This checklist can also be used for Form 2 submittals (1st phase of a 2-phase rezoning). For Form 2 submittals, items in bold font can be omitted.

## GENERAL INFORMATION (Include on this sheet and on Site Plans)

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT NAME:</td>
</tr>
<tr>
<td>PREVIOUS DOCKET # &amp; APPROVAL DATE</td>
</tr>
<tr>
<td>SUBMITTAL MONTH/DATE:</td>
</tr>
</tbody>
</table>

## SPECIAL SUBMITTAL INFORMATION -(put a “✓” or “x” in appropriate box)

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIS required for uses/square footage? If yes, is it submitted?</td>
</tr>
<tr>
<td>Are partial PIN #'s in the request? If so, is a legal description submitted?</td>
</tr>
<tr>
<td>If a multi-family residential project, are building elevations submitted?</td>
</tr>
</tbody>
</table>

## SITE PLAN SPECIFIC INFORMATION -(put a “✓” or “x” in appropriate box)

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANS - 25 FOLDED copies of plan (Only 3 for PRESUBMITTAL), with Title Block showing submitted?</td>
</tr>
<tr>
<td>LEGEND - Proposed uses (from UDO) listed on the plan?</td>
</tr>
<tr>
<td><strong>Note:</strong> Indicate the intended use, if known, for each building. If existing buildings, indicate both current and proposed use</td>
</tr>
<tr>
<td>Verify that proposed uses are allowed in requested zoning district?</td>
</tr>
<tr>
<td>Plan drawn to appropriate scale for site acreage? (1&quot;=50’ ≤ 25 acres; 1”=100’ &gt; 25 acres)</td>
</tr>
<tr>
<td>Location map shown with proper # of cross streets, north arrow, etc?</td>
</tr>
<tr>
<td><strong>TITLE BLOCK</strong> - Development name (including previous project names, docket #’s) and date of submittal provided?</td>
</tr>
<tr>
<td><strong>TITLE BLOCK</strong> - Name, address, phone #, fax # and email of owner/applicant/plan preparer?</td>
</tr>
<tr>
<td><strong>TITLE BLOCK</strong> - PIN# of subject property included?</td>
</tr>
<tr>
<td><strong>BOUNDARIES</strong> - The bearings and distances for boundaries shown?</td>
</tr>
<tr>
<td>Note: Use survey benchmarks</td>
</tr>
<tr>
<td><strong>ADJACENT</strong> - Ownership/zoning/property lines and PIN#’s of adjacent property?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Seal and signature of site plan preparer?</td>
</tr>
<tr>
<td><strong>Note:</strong> This MUST be marked: “Preliminary - NOT for construction”</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - The scale (text and graphic) and north arrow?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Total acreage listed? Linear feet of public/private streets included?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - If residential, are #/units by type &amp; density listed?</td>
</tr>
<tr>
<td><strong>Note:</strong> Provide specific information about the type of residential unit (i.e.2-story townhouse, 1-story townhouse, apartments with common access, etc.)</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - If residential, open space and rec. calcs. Shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Percent of building coverage to land shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Percent of paved/graveled surface to land shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Percent of open space to land shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Percent of total impervious surface for site shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - # of parking spaces and calculations shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> – Are tree save calculations shown (use Tree Save legend)?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Watershed/watershed designation information shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - CLEARLY Indicate public/private water, sewer, streets used?</td>
</tr>
<tr>
<td><strong>Note:</strong> Disclose the jurisdiction/entity for offer of dedication or who will have maintenance responsibilities (if not public)</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - CLEARLY note what area(s) the project is in (i.e., which corporate limits)</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Include a PURPOSE STATEMENT which CLEARLY outlines the request you are making with the submittal</td>
</tr>
</tbody>
</table>
## FORM 1 SITE PLAN SUBMITTAL CHECKLIST

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE PLAN - Streams and stream buffers shown, with stream name labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For help defining a stream go to <a href="http://portal.ncdenr.org/web/wq/swp/ws/401/waterresources/faqs#What_is_a_stream">http://portal.ncdenr.org/web/wq/swp/ws/401/waterresources/faqs#What_is_a_stream</a></td>
<td></td>
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<tr>
<td>SITE PLAN - Drainageways, floodway/fringe area shown?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Wooded areas &amp; other natural features shown and labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Existing/proposed topo (4’min) shown?</td>
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</tr>
<tr>
<td>Note: Include final finished elevations for buildings and grading and provide bottom and top elevations for proposed retaining walls</td>
<td></td>
<td></td>
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<tr>
<td>SITE PLAN - Natural features that are to remain labeled as such?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Buildings shown, with use and setbacks labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Building dimensions and maximum height labeled?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SITE PLAN - Structures like signs, walls, fences shown?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - ROWs and easements shown/labeled as public/private?</td>
<td></td>
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</tr>
<tr>
<td>Note: Disclose/show proposed roadway cross section, including typical sidewalk, utility, street tree locations</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SITE PLAN – Are proposed streets/roads named?</td>
<td></td>
<td></td>
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<tr>
<td>SITE PLAN - Access drives/parking areas shown as shaded, including dimensions and surface type labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Widths/curbcuts, names, labels shown for drives/streets?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Note: For state roads, include State Road #’s</td>
<td></td>
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<tr>
<td>SITE PLAN - Features, like easements, common areas, etc labeled?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Parking and loading area with typicals shown/labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Solid waste disposal facilities shown/labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - All existing/proposed utility lines over/under site and adjacent parcels shown/labeled, including fire hydrants/hydrant spacing?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: Differentiate between existing/proposed by changing line type/weight. Include “City Project #” in a note for existing utilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - All existing/proposed phase lines for development on overall project map shown/labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: Phase lines can be modified as staff level during construction plan approval process</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SITE PLAN - All existing/proposed storm drainage shown/labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - All streets, driveways within 100’ of site shown?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Bufferyards, streetyards (+ widths) shown/labeled?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE PLAN - Have the Specific UDO Use Conditions been met?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DISCLOSURE:** By signing below, I am acknowledging that I have included all applicable information required on the plan in order to be considered “Complete and ready for review.” If it is discovered that required information is not included on the plans or I have not provided some required information, I understand that the above referenced project may be deemed “Not ready for review” and held until the next cycle AND when I provide the required information.

Signature ___________________________ Date ______________
### SUBDIVISION SUBMITTAL CHECKLIST

**DIRECTIONS:** Fill this form out in its entirety and include with your submission.

<table>
<thead>
<tr>
<th>GENERAL INFORMATION (Include on this sheet and on Site Plans)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT NAME:</td>
</tr>
<tr>
<td>PREVIOUS DOCKET # &amp; APPROVAL DATE</td>
</tr>
<tr>
<td>SITE PLAN PREPARER (Name/Title/Company):</td>
</tr>
<tr>
<td>PHONE #, FAX #, and MOBILE #:</td>
</tr>
<tr>
<td>SUBMITTAL MONTH/DATE:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE PLAN SPECIFIC INFORMATION <em>(put a “√” or “x” in appropriate box)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>REQUIREMENT</td>
</tr>
<tr>
<td>* - Exceptions to these minimum requirements require written explanation at plan submittal and is subject to staff concurrence</td>
</tr>
<tr>
<td><strong>PLANS</strong> - 25 FOLDED copies of plan <em>(Only 3 for PRESUBMITTAL)</em>, with Title Block showing submitted?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Proposed uses (from UDO) listed on the plan?</td>
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<td><strong>Note:</strong> Indicate the intended use, if known, for each building. If existing buildings, indicate both current and proposed use</td>
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<tr>
<td>Plan drawn to appropriate scale for site acreage? <em>(1”=50’ ≤ 25 acres; 1”=100’ &gt; 25 acres)</em></td>
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<tr>
<td>Location map shown with proper # of cross streets, north arrow, etc?</td>
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</tr>
<tr>
<td><strong>TITLE BLOCK</strong> - PIN# and Plat/Deed Book and Page # of subject property included?</td>
</tr>
<tr>
<td><strong>TITLE BLOCK</strong> - Date the survey was made shown?</td>
</tr>
<tr>
<td><strong>BOUNDARIES</strong> - The bearings and distances for boundaries shown?</td>
</tr>
<tr>
<td>Note: Use survey benchmarks - no assumed in City of WS or gray area</td>
</tr>
<tr>
<td><strong>ADJACENT</strong> - Ownership/zoning/property lines and PIN#’s and Deed Book/Page#’s of adjacent property?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Seal and signature of site plan preparer?</td>
</tr>
<tr>
<td><strong>Note:</strong> This MUST be marked: “Preliminary - NOT for construction”</td>
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<tr>
<td><strong>LEGEND</strong> - The scale (text and graphic) and north arrow?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Total acreage listed? Linear feet of public/private streets included?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Is the # of lots &amp; density listed?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - If a Planned Residential Development is % of open space shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Watershed/watershed designation information shown?</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - CLEARLY Indicate public/private water, sewer, streets used?</td>
</tr>
<tr>
<td><strong>Note:</strong> Disclose the jurisdiction/entity for offer of dedication or who will have maintenance responsibilities (if not public)</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - CLEARLY note what area(s) the project is in (i.e., which corporate limits, gray area, pending annexation by, etc.)</td>
</tr>
<tr>
<td><strong>LEGEND</strong> - Include a PURPOSE STATEMENT which CLEARLY outlines the request you are making with the submittal</td>
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<tr>
<td><strong>SITE PLAN</strong> - Streams and stream buffers shown, with stream name labeled?</td>
</tr>
<tr>
<td><strong>SITE PLAN</strong> - Drainageways, floodway/fringe boundaries/elevations shown?</td>
</tr>
<tr>
<td><strong>SITE PLAN</strong> - wooded areas &amp; other natural features shown?</td>
</tr>
<tr>
<td><strong>SITE PLAN</strong> - Existing/proposed topo <em>(4’ min)</em> shown?</td>
</tr>
<tr>
<td><strong>Note:</strong> Include final finished elevations for buildings and grading and provide bottom and top elevations for proposed retaining walls, if applicable</td>
</tr>
<tr>
<td><strong>SITE PLAN</strong> - Natural features to remain labeled as such?</td>
</tr>
<tr>
<td><strong>SITE PLAN</strong> - Existing buildings/roads/driveways/ lots, etc., both on- and off-site shown as a ½ shade, with intention clearly labeled (i.e., “To Be Removed,” etc.)</td>
</tr>
</tbody>
</table>

**CONTINUED ON BACK**

REVISED – MAY 2009

Page 1 of 2
### SUBDIVISION SUBMITTAL CHECKLIST

**SITE PLAN SPECIFIC INFORMATION** — (put a “✓” or “✗” in appropriate box)

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE PLAN - Structures like signs, walls, fences shown?</td>
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<tr>
<td>SITE PLAN - ROWs and easements shown/labeled as public/private?</td>
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<tr>
<td><strong>Note:</strong> Disclose/show proposed roadway cross section, including typical sidewalk, utility, street tree locations</td>
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<td>SITE PLAN - Each proposed street labeled with the linear feet of street measurement, in feet?</td>
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<tr>
<td>SITE PLAN – Do streets have proposed names?</td>
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<tr>
<td>SITE PLAN - Access drives/parking areas shown as shaded, including dimensions and surface type labeled?</td>
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<tr>
<td>SITE PLAN - Widths/curbcuts, names, labels shown for drives/streets?</td>
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<td><strong>Note:</strong> For state roads, include State Road #'s</td>
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<tr>
<td>SITE PLAN - Lot lines, dimensions, and lot numbers shown/labeled?</td>
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<tr>
<td>SITE PLAN - Roadway cross section(s) shown/labeled?</td>
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<tr>
<td>SITE PLAN - Finished elevation on all center lines of new streets on site and any stub streets connection points off-site shown/labeled?</td>
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<tr>
<td>SITE PLAN - Easements, playgrounds, greenways, etc labeled?</td>
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<tr>
<td>SITE PLAN - All existing/proposed utility lines over/under site and adjacent parcels shown/labeled, including fire hydrants/hydrant spacing?</td>
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<tr>
<td><strong>Note:</strong> Differentiate between existing/proposed by changing line type/weight. Include &quot;City Project #&quot; in a note for existing utilities</td>
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<tr>
<td>SITE PLAN - All existing/proposed phase lines for development shown?</td>
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<tr>
<td><strong>Note:</strong> Phase lines can be modified at staff level during construction plan approval process</td>
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<tr>
<td>SITE PLAN - If a Planned Resid. Dev., is “common open space” labeled?</td>
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<tr>
<td>SITE PLAN - All existing/proposed storm drainage shown/labeled?</td>
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<tr>
<td>SITE PLAN - All streets, driveways within 100’ of site shown?</td>
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<tr>
<td>SITE PLAN - All adjacent/potential stub streets within 500’ of site shown?</td>
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<td>SITE PLAN - Bufferyards, streetyards (+ widths) shown/labeled?</td>
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<tr>
<td>SITE PLAN – Make sure that a typical building footprint and square footage is included (make sure to include any associated impervious areas).</td>
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</tbody>
</table>

### OTHER ISSUES OR EXPLANATIONS (Listed Below)

CLEARLY note what area(s) the project is in (i.e., corporate limits, gray area, annexation)

**DISCLOSURE:** By signing below, I am acknowledging that I have included all applicable information required on the plan in order to be considered “Complete and ready for review.” If it is discovered that required information is not included on the plans or I have not provided some required information, I understand that the above referenced project may be deemed “Not ready for review” and held until the next cycle AND when I provide the required information.

________________________           ________________
Signature                             Date
City of Winston-Salem Inspections Division
Erosion and Sedimentation Control Plan Checklist

The following items should be incorporated with respect to specific site conditions, in an erosion and sedimentation control plan:

A. LOCATION INFORMATION
   ______ Project location map
   ______ Roads, streets
   ______ North arrow
   ______ Scale
   ______ Adjoining lakes, streams or other major drainage ways
   ______ Tax block and tax lot numbers

B. GENERAL SITE FEATURES
   ______ North arrow
   ______ Scale
   ______ Property lines
   ______ Legend
   ______ Existing contours
   ______ Proposed contours
   ______ Limit and acreage of disturbed area
   ______ Planned and existing building(s), location(s) and elevation(s)
   ______ Planned and existing roads location(s) and elevations
   ______ Lot and/or building numbers
   ______ Land use of surrounding areas
Rock outcrops
Seeps or springs
Wetland limits
Easements
Streams, lakes, ponds, drainage ways, dams
Boundaries of the total tract
If the same person conducts the land-disturbing activity, then any related borrow or waste activity shall constitute part of the land-disturbing activity. This is unless the borrow or waste activity is regulated under the Mining Act of 1971 or is a landfill regulated by the Division of Solid Waste management. If the land-disturbing activity and any related borrow or waste activities are not conducted by the same person, they shall be considered separate land-disturbing activities.
Stockpiled topsoil or subsoil location
Street profiles
Planned retaining walls exceeding ten (10) feet in height.

C. SITE DRAINAGE FEATURES
Existing and planned drainage patterns (include off-site areas that drain through project)
Size of Areas to be disturbed (Acreage)
Size and location of culverts, and water and/or sanitary sewer mains
Soils information (type, special characteristics)
Design calculations for peak discharges of runoff (including the construction phase and final runoff coefficients of the site)
Design calculations and construction details for culvert and storm sewers
Design calculations, cross sections and method of stabilization of existing and planned channels (include temporary linings)
Design calculations and construction details of energy dissipaters below culverts and storm sewer outlets (for rip-rap aprons, include stone sizes (diameters) and apron dimensions (length, width, and depth of stone)
Soil information below culvert and storm sewer outlets
Design calculations and construction details to control groundwater, i.e. seeps, springs, high water table, etc.

Design names of receiving watercourse or name of municipal operator (only where storm water discharges are to occur.)

D. EROSION CONTROL MEASURES

Legend

Location of temporary and permanent measures

Construction drawings and details for temporary and permanent measures

Design calculations for sediment basins and other measures

Maintenance requirements during construction

Person responsible for maintenance during construction

Maintenance requirements and responsible person(s) of permanent measures

E. VEGETATIVE STABILIZATION

Areas and acreage to be vegetatively stabilized

Planned vegetation with details of plants, seed, mulch, fertilizer

Specifications for permanent and temporary vegetation

Method of soil preparation

NOTE: Should include provisions for ground cover on exposed slopes within 15 working days or 30 calendar days following completion of any phase of grading, permanent ground cover for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

F. OTHER REQUIREMENTS

Narrative describing construction sequence (as needed)

Narrative describing the nature and purpose of the construction activity

Completed Financial Responsibility/Ownership Form (to be signed by person financially responsible for project)
Bid specifications regarding erosion control

Construction sequence related to sedimentation and erosion control (include installation of critical measures prior to initiation of the land disturbing activity and removal of measures after areas they serve have been permanently stabilized).
STORMWATER MANAGEMENT PLAN CHECKLIST

See Stormwater Management Permit in Section VI for Stormwater Plan Checklist.
City of Winston-Salem Engineering Division
Final Construction Drawing Checklist
(Public and Private Roads)

Construction Document Submittal

Required with first submittal

1. Letter of transmittal
   a. Show list of all items submitted.
   b. Delineate if review is for Engineering, Utilities, etc.

2. Final Construction Drawing Checklist
   a. All items shall be checked or marked N/A. Insure all items are on plan set.
   b. PE seal and signature

3. Three (3) sets of plans complete with seal/signature marked preliminary (Engineering 2 sets, Utilities 1 set). Final approved set for signatures will not be marked “preliminary”. Submit only one (1) set of plans when submitting for Utilities only review

4. Gutter spread computations

5. Also should be provided with first submittal (if completed)
   a. Copy of approved preliminary plan
   b. Copy of approved grading/erosion control plan (shall be included in Construction Dwgs.)
   c. Copy of approved Storm Water Management Plan (shall be included in Construction Dwgs.)

6. Redlined comments from previous submittal (if applicable) for subsequent submittals.

Please note that all redline comments should be addressed either by correction or by justification in the event of disagreement. Re-submittals shall include original red lined drawings, two (2) sets of corrected drawings for engineering and utility review (if not sent separately) and copies of all computations requested. When reviews are completed and all matters of the plan review process have been addressed, a final set for signatures will be requested for signatures by the City Engineer and Utilities Director.
Final set for approval

One (1) set of approved plans for City signatures shall be submitted with original seal and PE signature and must be rolled (not folded). Folded plans will be returned without processing.

- All applicants are strongly encouraged to schedule pre-submittal discussions as needed on key design issues.

- The applicant shall review this checklist and sign in the space below to ensure that the submitted plans are in accordance with these standards. Incomplete plans or plans submitted without completed and signed checklist will be returned to applicant without review.

- Two (2) sets of plans shall be submitted to the Engineering Division for initial review along with a signed copy of checklist. Submit one (1) set of plans when submitting for Utilities only review. Separate submissions may be made for Utility review and Engineering review.

- Engineering staff will review the plans and provide one set of redlined comments and/or written comments and return these to the applicant. Utility staff will do the same with plans submitted to them.

- Once the plans have been revised per the initial review, the applicant shall re-submit one revised set of plans along with the original redlined comments.

- Upon receipt of the complete revised plans, and verification that all comments have been addressed, plans will be signed and released for construction. Plans must be rolled and contain original seals and PE signatures.

- Upon signature by the City Engineer and Utility Director five (5) signed copies shall be submitted for distribution to city staff (NO BLUE PRINTS WILL BE ACCEPTED). Original signed plans shall be returned.

1. Construction plan sets shall have a cover sheet that includes project name, vicinity map, north arrow, list of all drawings in the set of plans, and an overall project map that includes the entire project area. This map shall identify existing and proposed features including (roadways, lots, phase lines, corporate limits, on and offsite easements/utilities, etc). For multi-phase developments this map shall be updated with each plat and previous phase submitted and shall include all changes to phasing to date including plats recorded.

2. All construction plan/profile sheets shall be 24”x 36” plan over profile. The scale of plan/profile sheets shall be 1”=40’ horizontal scale and 1”=4’ vertical scale. Each plan/profile sheet shall include matchlines with adjacent plan/profile sheets.
3. Each drawing shall have the following information in the title block. Project and street name(s), project limits, horizontal and vertical scale, submittal and revision dates, drawing number, Initials of the designer, drafter and checker of the plans. Each drawing shall be sealed, signed and dated by a professional engineer registered in the state of North Carolina. The seal, signature and date shall be placed within or near the title block on each sheet.

4. An approval signature block shall be located near the title block on each sheet. The state water and sewer permit numbers along with erosion control block will be shown on the first plan/profile sheet only. See section VIII-6 for Required Signature Blocks.

5. All elevations shall be based on actual field survey and on mean sea level datum. Elevations in profile view shall be labeled in 10 foot intervals. As required below, grading and erosion control plans shall show existing and proposed contours on 2 foot intervals. Benchmarks shall be shown on each plan and plan/profile sheet.

6. All plan sheets shall show all existing and proposed property, boundary, R/W and lot lines and frontages. Existing property corners shall be so labeled. Right-of-way lines shall be labeled “R/W.” Right-of-way widths shall be clearly labeled on each sheet.

7. Existing centerline profiles shall be shown for a minimum of 300 feet from the end of proposed streets and street stubs, even if off site, to allow proper design for existing and future roadway extension.

8. All existing and proposed features within the limits of proposed subdivision and construction limits, including offsite utilities and or drainage, shall be clearly shown.

9. All sheets shall show all approved street names prior to construction approval. Changes in street names, lot numbers, phase lines, etc. as shown on final plats shall be reflected on final record drawings. State road numbers shall be shown as applicable. The plan and profile view shall indicate the material for all existing streets (asphalt, concrete, gravel, etc.)

10. The right of way, roadway (back of curb to back of curb), and easement widths shall be indicated on all streets on all sheets. The type of right of way and easement shall also be indicated. (public, private, access, negative-access, utility, drainage, sidewalk, etc.)

11. All plan sheets shall show existing and proposed curb and gutter, storm sewers, drainage structures and streams, driveway culverts, water and sewer mains and services, including hydrants, valves, manholes, fittings, meter boxes, cleanouts, existing street trees, proposed street tree species, and tree locations. All available elevations shall be shown on the profile view. Direction of flow arrows shall be shown on the plan view for all (existing and proposed) sanitary sewer and storm drainage systems.
12. Existing utility lines (water, sewer, drainage, gas, telephone, power, cable) and contour lines shall be indicated by lighter, thinner dashed lines as opposed to proposed lines that shall be indicated by heavier, thicker, solid lines.

13. Existing and proposed water, sewer, and storm drainage pipe shall be shown in plan and profile along with the material types and sizes of pipes appropriately labeled. Existing and proposed pipe elevations, slopes, length, design flows, etc. shall be shown in the profile view. Storm drainage shall be shown on each applicable sheet using a tabular format that indicates drainage areas, runoff coefficients, pipe sizes, etc. (See sample drainage chart section VIII-10).

14. Water and sewer service connections shall be shown adjacent to each other at the center of each lot per the construction notes. (if applicable)

15. Existing paved roads shall be bored. The developer shall obtain NCDOT permit/Encroachment Agreements on NCDOT streets as necessary. In the case of city streets that are low volume and in poor condition, the city may at its discretion, allow open cut installations.

16. Profile view shall show existing right, left, and centerline elevations as well as proposed centerline elevations.

17. Complete street curve data including intersection radii, vertical curve length, PVI, PVC, and PVT station and elevation, approaching and departing slopes, k values, low/high point stations and elevations, horizontal curve length, tangent, centerline radius and delta, PC and PT shall be shown on all plan/profile sheets.

18. Existing centerline elevations shall be shown on 50 foot intervals and proposed centerline elevations should be shown on 50 foot intervals. Profile shall be projected directly below the corresponding plan view whenever possible.

19. Stations shall be labeled every 100 feet on plan and profile views. Stations shall be labeled on plan view along survey baseline. (Baseline is generally along street centerline.) Stationing shall be continuous along the length of any street with equality stations at all street intersections. Sewer and storm drain outfalls shall have separate stationing with equality stations at first/last manholes within the street right-of-way.

20. Grading and erosion control plans shall show existing and proposed contours. Contours shall NOT be shown on plan profile sheets. Detailed erosion control/grading sheets (as approved by Inspections Division) shall be included in submitted/approved construction plans and shall show all existing and proposed utility lines. Erosion control structures shall not be placed over or be in conflict with these utility lines.

21. 100 Year flood elevations shall be indicated on all sewer outfall and street plan/profile sheets that lie within flood plain/floodway. Boundaries of flood plain/floodway shall be shown on grading and erosion control plan.
22. The most current Winston-Salem general notes shown in Section III shall be included in the plan set.

23. Detail sheets showing construction notes, Section III and all applicable construction details, Section V and street tree planting details. (Note: construction notes may also be placed on overall project sheet).

24. All phases shall be clearly indicated on all drawing sheets (overall and plan/profile sheets).

25. Provide gutter spread computations for the project (may be included in the pipe chart).

26. Provide pipeflow chart on plan sheet(s).

27. Landscape plan including details, plant list, buffer plantings, spacing sealed by a N.C. Professional Landscape Architect, Civil Engineer or Architect.

28. All properties shall be coordinated with NCDENR to determine the presence of wetlands and/or jurisdictional waters prior to final approval.

**COMPLETENESS CERTIFICATION:**

I, _______________________, PE have reviewed the attached plans prepared under my supervision. Furthermore, I certify that they, along with supporting calculations, are in conformance with this checklist and are adequate for final construction plan review.

(seal)
Signed_________________________________ Date:___/___/____
City of Winston-Salem, North Carolina
Department of Public Works Engineering Division

Construction Checklist

Project Number: ___________________________ Contract Number: __________________

Project Name: _______________________________________________________________

Owner/Contractor: ____________________________________ Date: __________________

Construction Inspector: ________________________________ Date: __________________

Construction Inspector Supervisor: _______________________ Date: __________________

The following list includes the minimum requirements for final inspection. Other items not on
this list may be required in order to comply with Engineering Division specifications. Items that
do not apply will be marked “N/A”. All other items should have check marks. The checklist
consists of three sections (Water, Sanitary Sewer, and Roadway). Attach only the section(s) that
apply to this project. This list is to be filled out and signed by the Owner for subdivisions or the
Contractor for City contracts, prior to requesting a final inspection. After all items are verified by
the Engineering Division, the Inspector and his Supervisor will sign the checklist and include it
with the Final Inspection Report.

Rev. November 2008
Water

- Stub outs pressure tested to plug
- Valves for stub outs fully operated and left closed
- All other valves fully operated and left open
- Nuts centered in valve boxes
- Structures - concrete collars, 1” below final grade, asphalt around structures
- Max. 1/8” gap between valve boxes and covers
- Approx. 4” from 8” riser pipes to top of valve boxes
- Hydrants field painted
- Hydrant flanges 1” – 6” above ground
- Breakable couplings moved up (hydrant extension)
- Hydrants fully operated and left closed
- Hydrants weep properly
- Hydrant threads checked for W-S standard
- Hydrant caps and chains in place
- Hydrants restrained to main
- Hydrants plumb
- Hydrants blocked and #57 stone placed properly
- 3’ Clearance around all hydrants
- “Water” cast into manhole covers
- Connections in front of proper lots
- Angle valves approximately 12” below ground
- Inspector observed D.I. pipe (restrained joint) being installed inside encasement
- Angle valves opened fully to make sure water is on for each connection

Rev. November 2008
Sanitary Sewer

- MH lift holes plugged
- Outside MH joints sealed w/ min. 6” wide butyl tape
- MH steps in proper place (not over pipe)
- No infiltration in MH’s or pipe
- Structures - concrete collars, 1” below final grade, asphalt around structures
- MH type matches plan
- Type 2 rings bolted to cone
- Type 2 covers bolted down (2 bolts)
- Type 3 covers bolted down (4 bolts)
- Type 3 gaskets in place
- Type 2 & 3 bolts tested w/magnet
- Outfall MH’s 2’ above ground (flush w/ground in yards)
- Type B MH’s 1’ above ground
- Vent pipes at proper elevation
- Fence gates w/padlocks installed
- MH’s and pipe inside permanent easement and/or R/W
- Cleanouts flush w/ground in yards, 3’ above ground on outfalls
- Cleanouts min. 4’ deep
- Cleanout inverts are visible
- Connections in front of proper lots
- Tailpieces extended to R/W or easement
- Inspector observed D.I pipe (restrained joint) being installed inside encasement

Rev. November 2008
Roadway

______ Back of curb to back of curb distances match plan
______ Crown and quarter point of road checked every 50’
______ Stone densities attached
______ Soil density reports attached
______ Asphalt densities attached
______ Structures - concrete collars 1” below final grade, asphalt around structures
______ Front inside wall of catch basins flush with front of frames (within 3”)
______ Proper grates in place
______ The number 840.03 and name of foundry cast on all frames and grates
______ Broken curb and gutter replaced
______ Asphalt thickness matches plan
______ Not trapping water (gutter, street, etc.)
______ Catch basins, manholes, and pipe free from sediment, stone, etc.
______ Backfill behind all curb
______ Asphalt matches gutter (max. ¼” above, but not below)
______ Shoulder width and slope matches plan
______ Seeding and mulching complete prior to final 1” of asphalt
______ Wheelchair ramps properly installed (including raised truncated domes)

Rev. November 2008
DRIVEWAY PERMIT
CHECKLIST

APPLICATION FORM

__ Type of Construction
__ Current Zoning
__ Proposed Zoning
__ Owners Signature
__ Witness Signature
__ Check for Two Hundred Dollars ($200.00) payable to City of Winston-Salem
__ Check for Fifty Dollars ($50.00) NCDOT (if applicable)

PLAN REQUIREMENTS

__ Location Map Clearly showing proposed site and surrounding streets
__ Three (3) complete sets of sealed plans for City of Winston-Salem review
__ Five (5) complete sets of Sealed Plans NCDOT (if applicable)
__ One (1) Copy of Approved Rezoning (if applicable) available from Planning Department
__ One (1) Copy of Approved Erosion Control Plan (if applicable)
__ One (1) Copy of Approved Storm Water Plan (if applicable)
__ Copy of Contractors bond held by the City of W-S available from City of Winston-Salem Treasurer’s Office

GENERAL INFORMATION

Do not submit plans for approval prior to City Council rezoning approval. The owners name shall be clearly legible on the driveway permit application along with all other pertinent contact information, office, cell, and fax telephone numbers.

Submittal is for driveways and private streets only.
Public street to public street does not require permitting by City of Winston-Salem, but is required by NCDOT.

Complete set of plans includes ALL site infrastructures:

Cover sheet, water, sewer, storm drainage, street plan and profiles, detail sheets, all building locations, landscape plan, traffic study (if applicable), roadway improvements including plan and profile, and existing site conditions.

Temporary construction driveway shall be installed in the location indicated on the approved Erosion Control plan. Any variance from approved Erosion Control plan location shall be on a case-by-case basis.

If site requires joint approval by City of Winston-Salem and NCDOT, both approval packets shall be delivered to the City of Winston-Salem Engineering Division. Upon approval by the City of Winston-Salem Engineering Division the packet shall be forwarded to NCDOT for approval.

Checklist shall accompany plans and permits for approval. Plans will not be processed without completed checklist.

Contents of Application – Information that must be supplied with the application is listed below. Additional information will be required for special commercial property uses.

1. Location of property: The location must be identified clearly enough for the proposed site to be located in the field.

2. Identification of property owner and applicant: Complete names and addresses of the property owner and the applicant must be provided.

3. Property use: The planned property use must be indicated on one of the following.

   a. Commercial: Property used for a single commercial or industrial establishment.
   b. Cultural and Institutional: Public and private schools, churches, hospitals, etc. (requirements for these uses are identical to those for commercial uses.)
   c. Special Commercial Property: See Section IV, Pg. 23.

Plans: Eight sets of plans for driveways located on the state highway system or three sets of plans for driveways located on the City street system shall be submitted which clearly indicate the character and extent of the work proposed, including:

   a. The location of all existing or proposed buildings.
   b. Retaining walls, drainage, poles and other physical features which affect the driveway location.
   c. Pavement and right-of-way widths.
   d. Roadway alignment and channelization.
   e. Location of control of access.
f. Off-street parking locations using the proposed driveways.
   Plans are not required for driveways to single family residences; however, a permit
   is required and all applicable requirements shall be adhered to.
g. Plan shall show the driveway width, concrete apron as well as curb/gutter if
   existing and sidewalk.
h. The maximum slope into a commercial establishment is 10%. Driveways in excess
   of 10% shall require the consent of the Fire Marshall and the City Engineer.
SURETY PROCEDURES FOR
RECORDING PLATS

Plat Recordation
Commercial or non-residential developments may bond 100% of the project. Residential developments are limited on the items that may be bonded see list below.

1) Requirement for recording final plat (UDO 154)
   A. The improvements required for the area covered by the plat must be constructed according to approved plans on file in the Public Works Department of the City of Winston-Salem and the final inspection has been completed.
   OR
   B. If all construction is not complete, then an acceptable form of surety has been approved by the City Attorney for bondable items (see UDO 154).
   C. Before incomplete items are allowed to be bonded, a detailed itemized list of work, including pricing, must be submitted to the Engineering Division by the project engineer. The amount of the surety shall be the estimated cost of the improvements plus a minimum of a 25% contingency, as approved by the City Engineer or designee.

2) Forms of Surety
   A. Letter of Credit –
      i. Shall be irrevocable.
      ii. Must be issued in favor of the City of Winston-Salem, North Carolina
      iii. Must be issued from a major North Carolina Banking institution.
      iv. Must be payable at sight at a branch in Winston-Salem or payment delivered to the appropriate city office in Winston-Salem.
      v. Shall be in effect for a minimum of one (1) year from the time of issuance and must be automatically extended, without amendment, for one (1) year from its expiration date (or any future expiration date).
      vi. If the Letter of Credit is not to be renewed, the financial institution must notify the City, by registered mail, at least sixty (60) days prior to the expiration date. Note: the City may draw on the Letter of Credit if the developer fails to renew the Letter of Credit and the planned improvements have not been completed.
      vii. The name of the subdivision/project and a summarization of the improvements must be clearly referenced on the Letter of Credit.
      viii. Statements required for the City to draw on the Letter of Credit shall not have any burdensome conditions (an acceptable statement is: “(developer name) has not complied with the development agreement with the City of Winston-Salem.”)
B. Performance Bond –
   i. Shall be in effect until such time as planned improvements have been completed.
   ii. Shall provide that the City may institute suit on the bond for breach of any term(s) or conditions(s) in all respects within one (1) year from the end of the stipulated period during which the work required is to be performed.
   iii. To execute such bonds, the bonding company must be licensed under the laws of North Carolina to execute such bonds and a resident North Carolina registered agent must sign the bond (name and address shall appear on the bond).
   iv. The name of the subdivision/project and a summarization of the improvements must be clearly referenced on the bond.

C. Cash Bond –
   i. A check made payable to the City of Winston-Salem.
   ii. Will be considered approved once the check has cleared the lending institution.
   iii. The cash bond will be held until the completion of the improvements. The developer will not be entitled to any interest.

3) Reduction in Surety - A one time reduction in surety is permitted after the project engineer submits an updated itemized list of work left to be completed. Once the new surety has been submitted and accepted by the City Attorney, the original surety will be released.

4) Release of Surety – After all construction has been completed, a construction final has been approved by the Engineering Division, and all warranty repairs have been completed, the developer can request that the City release his surety.

5) Default – Upon default, the City may request payment from the financial institution to complete improvements or request the bonding company to complete the incomplete work. The City shall return, to the developer, any funds not spent on completing the improvements. The developer shall be billed for any costs which exceed the surety amount. Default on a project does not release the developer from the responsibility and liability for completion of the project.

Bondable Items

1) Asphalt (tons or SY)
2) Sidewalks (linear foot)
3) Street Trees (type, number and size of trees)
4) Landscaping (sq. yard)
5) Minor Utility Adjustments
6) Sewer Outfalls must be approved by City/County Utilities Director (Materials and installation).
7) Road Widening (ie. turn lanes into the subdivision)
Items Which Can Not be Bonded for Residential Developments

1) Utilities (Water and Sewer Mains, including connection and fittings)
2) Drainage including curb & gutter
3) Streets up to the stone base must be constructed (Note: The developer shall protect manholes, inlets, pipes, valves, hydrants and curb during building construction).

Administrative Fee - The review fee for filing of Bonds or other forms of Surety shall be based on the amount of the surety. The following is the fee schedule:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 0 - $10,000</td>
<td>$50</td>
</tr>
<tr>
<td>$10,001 - $50,000</td>
<td>$100</td>
</tr>
<tr>
<td>$50,001 - $150,000</td>
<td>$150</td>
</tr>
<tr>
<td>$150,001 and Higher</td>
<td>0.1%</td>
</tr>
</tbody>
</table>
Record Drawings Checklist

Record Drawings ("As-builts") shall include Water, Sanitary Sewer, Storm Sewer, and Street construction. Record drawings must be submitted and accepted by the Engineering Records Center prior to final inspection.

Record drawings should meet the items listed for detailed design drawings as well as:

_____ 1. Erase "Proposed" from all manholes, pipes, etc.

_____ 2. Horizontal distances should scale within five (5) feet. Vertical distances should scale within six (6) inches.

_____ 3. All installed pipe sizes, pipe materials and pipe locations shall be indicated.

_____ 4. On the plan view, water connections shall be shown by dashed lines and sewer connections by solid lines.

_____ 5. If water-only project, connections should be located by station from nearest mainline valve or hydrant valve (Ex: WM 2+00). 0+0 will be labeled at the valve where stationing begins with an arrow indicating the direction that stations run. Stations should generally run in the same direction for each street.

_____ 6. If sewer-only or water and sewer project, connections should be located by station from nearest downstream manhole (Ex: W&S 1+80).

_____ 7. On the plan view, show distances between all water line valves, tees, bends, etc. (Ex: 500' valve to tee). This should be shown on each leg of the water line. Also, show blow-up detail for tees and hydrants (i.e. showing tee to valve, valve to hydrant distances)

_____ 8. Water mains shall have a separate detail sketch on the plan view above all intersecting water mains and fire hydrants showing as-built distances between valves, fittings, hydrants, etc. The detail sketch will be shown on all sheets that the intersecting water mains and fire hydrants appear on.

_____ 9. Show as-built stations for all sanitary sewer and storm drainage manholes on plan view and profile view (Ex: MH Sta. 3+01.59).

_____ 10. Plan view for sanitary sewer and storm drainage shall have as-built manhole-to-manhole distances (Ex: 301.59 V.C. MH to MH). Distances shall be measured in the field from center of manhole cover to center of manhole cover and should be shown in the plan view for each leg of sewer.

_____ 11. Profile view shall have as-built manhole rim elevations for sanitary sewer outfalls (Ex: RIM 810.10).
12. Profile view shall have as-built elevation for the invert at the center of all sanitary sewer and storm drainage manholes (Ex: C/L MH INV 800.10). Elevations will be shown for the invert at the top of the drop pipe for an outside drop manhole and for the vent pipe on a Type B manhole.

13. As-built MH-to-MH distances and invert elevations shall be used to compute as-built grades. Grades shall be carried out to two decimal places (Ex: 5.06%).

14. Major horizontal alignment changes shall be indicated on the plan view. For sanitary sewer, survey parties need to turn angles for major changes only. All sewer outfall sections shall have bearings, distances, and easements noted.

15. Show as-built grades, invert, lengths, sizes and locations of all storm drainage structures, (storm lines, catch basins, yard inlets, etc). Strike out the proposed information with a line and add as-built information. Do not delete original design information until final record drawing submittal is ready.

16. Any horizontal or vertical changes in the street alignment or profile will be shown.

17. All drawings need the (Water, Sewer, Street and Drainage) “Record Drawings” label with date and signature shown on the first page of the drawings. This notes that the system has been installed in accordance with the approved plans and specifications. Signatures, dates, and permit numbers shall appear on original “Record” drawings (each sheet).

18. Street names, lot numbers, frontages, right-of-way and street widths, etc. shall be labeled in plan view. At breaklines, along with sheet number, note the name of the next intersecting street. (E.g. Sheet 4 of 5, to Vernon Drive)

19. Profile view for sanitary sewer and storm drainage will have as-built manhole-to manhole distances, pipe sizes, pipe materials, and grades. (Ex. 301.59’ - 8” VC @ 5.06%) Strike out the proposed information with a line and add as-built information. Do not delete original design information until final record drawing submittal is ready.

20. If lots appear on more than one sheet, show the connection and station for water and/or sewer on all sheets.

21. A north arrow and scale will be placed on all sheets.

22. Please return marked up (red-lined plans) along with the original plans (bond or mylars) to Engineering Records to be scanned. This will assist in speeding up the review process if more than one review is required.

23. For each submittal of a phased development, an up-to-date record drawing shall show the following at a minimum: phase lines, street names, addresses, lot numbers, record drawing easement locations. Addresses and lot numbers can be shown in tabular format.
SECTION III
CONSTRUCTION NOTES
The following construction notes are to be placed on the overall site plan or on a separate detail sheet for all construction plans submitted to the Engineering Division and/or the Utilities Division of the City of Winston-Salem. The General section is required for all projects. The Water and/or Sanitary Sewer, Roadway, and Roadway Final Inspection Procedure sections are only required if the applicable infrastructure is going to be built to City standards.

General:

1. Contractor is responsible for locating all existing utilities prior to start of construction.

2. All erosion control devices shall be constructed and maintained in accordance with the most current standards of the Land Quality Section of the NCDENR.

3. Stabilization stone under piping to be placed as required by City Inspector when conditions warrant.

4. As a minimum requirement, all graded areas not under pavement and within the right-of-way and/or easements shall be prepared, fertilized and limed, seeded, and mulched immediately upon completion of construction as follows (Application rate PER 1,000 SQUARE FEET):

   **Type I Seeding (Lawns or other focal areas)**

   100 lbs. of lime
   20 lbs. of 10-20-20 or 20 lbs. of 10-10-10 in combination with 4 lbs of 0-46-0
   5 lbs. of tall fescue, containing a blend of 2 or more tall fescues
   1 lb. of Kenblue or Kentucky Bluegrass
   1 lb. of winter annual rye (November 1 to March 1)

   **Type II Seeding (General or low maintenance areas)**

   100 lbs. of lime
   15 lbs. of 10-20-20 or 15 lbs. of 10-10-10 in combination with 3 lbs. of 0-46-0
   4 lbs. of tall fescue, containing a blend of 2 or more tall fescues
   1 lb. of sericea lespedeza (use unscarified seed August 15 to February 1)
   ¼ lb. of German millet (May 1 to August 15)
   1 lb. of rye grain (prior to May 1 or after August 15)

   Seeding mixtures other than those listed above must be approved by the City Inspector prior to seeding.

5. Prior to requesting a final inspection, the Owner must submit Record Drawings and Engineer’s Certification to the Engineering Division’s Record Center. The Owner must also submit the construction checklist to the City Inspector.

6. All work must carry a one-year warranty to cover all defects in materials and workmanship.
7. Prior to beginning any work within NCDOT right-of-way, the Contractor must have a copy of the three-party encroachment agreement on the job site.

8. Prior to beginning any work, the contractor must notify the Engineering Field Office (727-2362) to arrange for construction inspection.

**Water and/or Sanitary Sewer:**

1. The most current edition of the *The City of Winston-Salem Technical Specifications and Detail Drawings for Water Line and Sanitary Sewer Line Construction* will govern all water and sanitary sewer construction.

2. Water and sewer connections shall be beside each other at the center of each lot. Connections are to be spaced not more than 30" center to center and have wooden stakes placed on each side. Stakes should be flagged or painted for visibility.

3. Density tests by an independent testing lab are to be made as directed by the City Inspector at the Owner’s expense.

**Roadway:**

1. The most current editions of *The North Carolina Department of Transportation Standard Specifications for Roads and Structures* and *The North Carolina Department of Transportation Roadway Standard Drawings* will govern all roadway construction unless otherwise specified herein.

2. All storm sewer pipe shall be reinforced concrete pipe (RCP) (15” min. diameter) unless otherwise noted. RCP shall be minimum Class III and joints must have O-rings or flexible joint material. Metal pipe shall be corrugated aluminum pipe (CAP). CAP must have Hugger band connectors with flat gaskets. AASHTO M197 and/or ASTM B744 must be clearly marked on all CAP.

3. All drainage structures must meet NCDOT standards. Solid wall, precast concrete structures conforming to NCDOT 840.45 are acceptable (no waffle walls). All pipe openings in precast structures must be cast or cored. Catch basins for curb and gutter must conform to NCDOT 840.01 or 840.02 and NCDOT 840.03. NCDOT approved precast concrete manholes are accepted as substitutes for catch basins.

4. Frames, grates and hoods shall be manufactured by one of the following:

   (A) East Jordan Iron Works, Inc. – Catalog Numbers V-4066-1 (E Grate); V-4066-3 (F Grate); V-4066-4 (G Grate)

   (B) U.S. Foundry & Manufacturing Corp. – Catalog Numbers 5181 – 6420 (E Grate); 5181-6425 (F Grate); 5181-6430 (G Grate)
The number 840.03 and the name of the manufacturer must be permanently cast on the frame and on the grate.

5. Double catch basins shall be two separate basins with RCP between the basins. The RCP shall be greater than or equal to the size of the outlet pipe.

6. If a driveway location conflicts with a catch basin, the following frame and grate shall be used:

   East Jordan Iron Works, Inc. – Catalog Number V-4510

7. All subgrade under paved areas, curb and gutter, sidewalk, and roadway shoulders shall be compacted to at least 95% of the maximum dry density as determined by AASHTO T99 and the NCDOT. The final 12” of subgrade under paved areas and under curb and gutter shall be compacted to 100%. Density tests by an independent testing lab are to be made as directed by the City Inspector at the Owner’s expense. The subgrade shall be proof rolled (min. 25 tons) and witnessed by the Inspector prior to placement of stone or asphalt base. The proof roll shall provide a non-yielding surface (pumping, rutting, saturated soil, etc. are unacceptable).

8. All stone base shall be compacted to 100% (± 1.5%) of the maximum dry density as determined by AASHTO T180 and the NCDOT. The unit weight and optimum moisture content will be the latest numbers on file at the quarry from which the ABC stone is obtained. On-site tests (at Owner’s expense) may be required to verify the unit weight and moisture numbers. Stone from different quarries shall not be mixed. Density will be tested with a nuclear density gauge by the City Inspector. The Inspector’s results are final. Moisture content (as tested by the Inspector) must be no more than ½ of the optimum moisture content prior to paving. The stone base shall also be proof rolled (min. 25 tons) and witnessed by the Inspector prior to paving. The proof roll shall provide a non-yielding surface (pumping, rutting, saturated stone, etc. are unacceptable.)

9. The City Inspector reserves the right to test asphalt by core sampling or by nuclear methods at the Owner’s expense.

10. Tack coat to be applied to all existing asphalt surfaces prior to placing new asphalt.

11. Final lift of asphalt to match gutter (maximum ¼” above gutter). Asphalt below gutter is unacceptable.

12. Sub-drains to be constructed as required by City Inspector to stabilize the subgrade. Method to be determined by Owner’s testing lab or Owner’s Engineer.

13. Existing curb and gutter and pavement to be replaced or repaired as required to tie to sound material.
14. Wheelchair ramps are required for standard curb and gutter intersections and at locations shown on the construction drawings. Each ramp shall have a 24”x 48” area of detectable warning domes. This area shall be a one piece panel (no concrete blocks or stamped concrete). Cast-in-place composite panels shall be ADA Solutions, Armor-Tile, or approved equal. Color shall be black. Painting of the products will not be allowed. See NCDOT Standard Drawings 848 for ramp construction details.

15. Guardrail to be installed (per NCDOT Standard Drawings) as required by City Inspector and at locations shown on the construction drawings. Reflective end of road markers shall be installed (per NCDOT 1264) behind guardrail at turnarounds and dead end streets.

16. All expansion joints for concrete to be sealed with silicone or polyurethane per NCDOT specifications. Hot applied joint sealer shall not be used. Color must be gray or a color that matches the concrete (not black).

17. Sidewalks shall be installed in the thicknesses as follows:
   a. Residential: 4” thick
      6” thick from PC to PT at intersections including HCR.
      6” thick across all driveways
   b. Commercial 6” thick
   c. Industrial 6” thick
      8” thick across all driveways

18. All concrete shall be a minimum of Class A (3000 psi). Class B (2500 psi) shall not be used.

**Roadway Final Inspection Procedure:**

1. Owner puts down 2” asphalt and raises structures to final grade (including concrete collars 1” below final grade). Asphalt is to be placed around structures to prevent damage.

2. Owner submits Record Drawings and Engineer’s Certification to the Engineering Division’s Record Center.

3. Upon approval by the Record Center, Owner may request final inspection for water and/or sanitary sewer. Owner shall then submit the construction checklist for water and/or sanitary sewer to the City Inspector.

4. Prior to the placement of the final 1” of asphalt, the following must occur:
   
   100 % of houses must be built or one year has lapsed since the approval of the 2” asphalt.

5. The final asphalt must be placed after two (2) years have lapsed since approval of the 2” asphalt layer. Surety must be approved by the City to cover the 2 year period.
6. After placement of the final asphalt, the Owner may request final inspection for the roadway. Owner must also submit the construction checklist for roadway to the City Inspector.
NOTES FOR UTILITY CONNECTIONS

The following construction notes are to be placed on utility connection site plans associated with building applications. Plans shall be submitted to the Utilities Division of the City of Winston-Salem. Other notes maybe required specific to each site.

General:

1. Contractor is responsible for locating all existing utilities prior to start of construction.
2. All erosion control devices shall be constructed and maintained in accordance with the most current standards of the Land Quality Section of the NCDENR.
3. Stabilization stone under piping to be placed as required by City Inspector when conditions warrant.
4. As a minimum requirement, all graded areas not under pavement and within the right-of-way and/or easements shall be prepared, fertilized and limed, seeded, and mulched immediately upon completion of construction as follows (Application rate PER 1,000 SQUARE FEET):

   Type I Seeding (Lawns or other focal areas)

   100 lbs. of lime
   20 lbs. of 10-20-20 or 20 lbs. of 10-10-10 in combination with 4 lbs of 0-46-0
   5 lbs. of tall fescue, containing a blend of 2 or more tall fescues
   1 lb. of Kenblue or Kentucky Bluegrass
   1 lb. of winter annual rye (November 1 to March 1)

   Type II Seeding (General or low maintenance areas)

   100 lbs. of lime
   15 lbs. of 10-20-20 or 15 lbs. of 10-10-10 in combination with 3 lbs of 0-46-0
   4 lbs. of tall fescue, containing a blend of 2 or more tall fescues
   1 lb. of sericea lespedeza (use unscarified seed August 15 to February 1)
   ¼ lb. of German millet (May 1 to August 15)
   1 lb. of rye grain (prior to May 1 or after August 15)

   Seeding mixtures other than those listed above must be approved by the City Inspector prior to seeding.

5. Prior to requesting a final inspection, the Owner must submit Record Drawings and Engineer’s Certification to the Engineering Division’s Record Center. The Owner must also submit the construction checklist to the City Inspector.
6. All work must carry a one-year warranty to cover all defects in materials and workmanship.
7. Prior to beginning any work within NCDOT right-of-way, the Contractor must have a copy of the three-party encroachment agreement on the job site. Contact 336-703-6600.
8. Contact Construction and Maintenance at 336-771-5130 to arrange for construction inspection. A City Inspector will approve Backflow Preventer Type, vault, exact location, and inspection requirements prior to installation. A City Inspector shall be present when making or terminating water and sewer connections into new or existing water and sewer lines.

9. All construction, materials, and sanitation procedures shall meet or exceed the requirements of the North Carolina Plumbing Code and The City of Winston-Salem Technical Specifications and Detail Drawings.

10. Call CityLink at 336-727-8000 for street cut permit and prior to any street cuts.

11. Cross-connection control protection devices are required based on degree of health hazard involved as listed in Appendix B of the rules governing Public Water Systems in North Carolina. These guidelines are the minimum requirements. The devices shall meet American Society of Sanitary Engineering (ASSE) Standards or be on the University of Southern California approval list. The devices shall be installed and tested (both initial and periodic testing thereafter) in accordance with the manufacturer’s recommendations or the local cross-connection control program, whichever is more stringent.

12. As of July 1, 2011, all meters shall be purchased through the City/County Utilities Division. Contractors and Developers can purchase meters at the Utilities Business Office off the lobby of the Stuart Municipal Building, 100 E. First Street.

Water and/or Sanitary Sewer:

1. The most current edition of The City of Winston-Salem Technical Specifications and Detail Drawings for Water Line and Sanitary Sewer Line Construction will govern all water and sanitary sewer construction.

2. Acceptable working conditions of sanitary sewer structures and piping shall be verified by the contractor and all conditions found to be unacceptable shall be reported to Utilities Construction and Maintenance at 336-727-8000, prior to any connections, extensions, or structures being installed. The Contractor shall be responsible for cleanup and repair of unacceptable conditions that result from failure to report such conditions prior to commencing work or that result from work being performed.

3. Sanitary Sewer connections shall be service weight cast iron soil pipe with 4-inch cleanouts and shall meet City of Winston-Salem specifications.

4. Proposed public or private hydrants installed or relocated shall meet or exceed City of Winston-Salem’s specifications and detail VII-39 to include hydrant tee, valve, and Winston-Salem threads. Private hydrants shall be equipped with a double check detector assembly and shall be painted red.

5. Density tests by an independent testing lab are to be made as directed by the City Inspector at the Owner’s expense.
Final Inspection Procedure:

1. Owner submits Record Drawings and Engineer’s Certification to the Engineering Division’s Record Center.

2. Upon approval by the Record Center, Owner may request final inspection for water and/or sanitary sewer. Owner shall then submit the construction checklist for water and/or sanitary sewer to the City inspector.
SECTION IV

DESIGN STANDARDS
# RESIDENTIAL STREET DESIGN MATRIX

<table>
<thead>
<tr>
<th>Street Classifications</th>
<th>Vehicle Volume v.p.d.</th>
<th>Pavement Width ( &quot;B-B&quot; )</th>
<th>Right-of-way width</th>
<th>Length</th>
<th>Design Speed</th>
<th>Horizontal Centerline Radius (Max)</th>
<th>Vertical Curves Min ( &quot;K&quot; ) Value</th>
<th>Max Grade</th>
<th>Tang Length</th>
<th>Min. Utility Easement</th>
<th>Corner Radius</th>
<th>Curb &amp; Gutter</th>
<th>Sidewalk</th>
<th>Street Trees</th>
<th>Bike Lane</th>
<th>On Street Parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alley (Public Double Frontage)</td>
<td>200 v.p.d. Max</td>
<td>16' ribbon</td>
<td>20'</td>
<td>600'</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>10%</td>
<td>N/A</td>
<td>5' each side</td>
<td>5' radius &amp; taper</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N</td>
</tr>
<tr>
<td>Cul-de-Sac/ Permanent Turn-around 1S max lots</td>
<td>150 v.p.d. Max</td>
<td>27' BB (22' ribbon)</td>
<td>50'</td>
<td>800' max</td>
<td>20 mph</td>
<td>125'</td>
<td>7 Crest 17 Sag</td>
<td>10%</td>
<td>N/A</td>
<td>5' min each side</td>
<td>15'</td>
<td>30' std or Valley</td>
<td>1 Side</td>
<td>Y</td>
<td>1/lot min</td>
<td>N</td>
</tr>
<tr>
<td>Local Street</td>
<td>1000 v.p.d. Max</td>
<td>27' BB (22' ribbon)</td>
<td>50'</td>
<td>600' Max (block length)</td>
<td>30 mph</td>
<td>225'</td>
<td>19 Crest 37 Sag</td>
<td>10%</td>
<td>500' max</td>
<td>5' min each side</td>
<td>15'</td>
<td>30' std or Valley</td>
<td>1 Side</td>
<td>Y</td>
<td>1/lot min</td>
<td>N</td>
</tr>
<tr>
<td>Local Collector</td>
<td>1-3 K v.p.d.</td>
<td>27' BB (22' ribbon)</td>
<td>50'</td>
<td>600'</td>
<td>35 mph</td>
<td>225'</td>
<td>29 Crest 49 Sag</td>
<td>10%</td>
<td>0/500'</td>
<td>5' min each side</td>
<td>20'</td>
<td>30' std</td>
<td>1 Side</td>
<td>Y</td>
<td>1/lot min</td>
<td>N</td>
</tr>
<tr>
<td>Minor Thoroughfare</td>
<td>3-10 K v.p.d.</td>
<td>27' BB plus turn lanes @ intersections or major driveway connections</td>
<td>60'</td>
<td>N/A</td>
<td>40 mph</td>
<td>450'</td>
<td>44 Crest 64' Sag</td>
<td>8%</td>
<td>500'-1000'</td>
<td>5' min each side</td>
<td>30'</td>
<td>30' std</td>
<td>Both sides</td>
<td>Y</td>
<td>1/lot min</td>
<td>N</td>
</tr>
</tbody>
</table>

| Minor Arterial | 10K - 15K v.p.d. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Case By Case | N | Y | N |
| Major Arterial | >15K v.p.d. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | Case By Case | N | Y | N |

## NCDOT STANDARDS

**Ribbon Pavement**
The City Standard is curb and gutter. Ribbon pavement may be authorized only on a site specific basis by the Assistant City Manager of Public Works. Additional re-widening or slope easements may be required.

**Sidewalks**
All sidewalks are to be a minimum of 5 feet in width and located at the back edge of right-of-way where practicable. Exact locations to be determined through subdivision review process.

**Vehicle Trips/Day**
To be determined by Winston-Salem DOT. Exact classification based on existing and projected traffic volumes to be determined through the subdivision review process.

**Street Trees**
Exact location, size, and variety of street trees to be determined through the subdivision review process.

**Block Length**
Maximum block length shall be as noted above. Exceptions shall be considered case by case on a hardship basis. Any exception shall be determined through the site plan review process.

- Street widths less than 27'BC-BC must be approved in writing by the Assistant City Manager for Public Works and appropriately signed for enforcement to restrict parking.
- Sidewalk shall be in a sidewalk and utility easement if allowed to use 40' Right-of-way. This should be approved by the Assistant City Manager of Public Works or his Designee.
- For more information concerning Street Standards, please refer to UDO 142 as adopted.
A. ROADWAY

b. Public Streets

The Street Design Matrix along with the following criteria, are the minimum acceptable standards for roadway design in the City of Winston-Salem. Please refer to Section V of this document for detailed construction drawings.

1. Curb and gutter (Standard or Valley) is required for all new street construction, unless otherwise approved by the Assistant City Manager for Public Works. Standard curb is required if no driveways are to be connected. All concrete shall be class A (3000 psi or greater).

2. Normal crown cross-slope shall be \( \frac{1}{4} \)” per foot.

3. Minimum Residential pavement typical section shall be 1”SF 9.5A, 2”S9.5B and 7” ABC or as determined by the Engineering Division. Pavement design shall be based on projected traffic volumes. For streets in the thoroughfare plan or industrial zoned areas, the Engineering Division will require a special pavement design review.

4. Streets that are multi-lane and/or divided will require special design reviews. Right-of-way widths will be adjusted to maintain side shoulder widths.

5. Minimum 1% grade for all curb and gutter streets.

6. Grades should not exceed 3% for the first 300 feet from the centerline of any publicly maintained road for a local collector classification and higher. Grades should not exceed 5% for the first 100 feet from the centerline of any publicly maintained road for local streets and lower classifications.

7. Streets shall be designed so as to intersect as nearly as possible at ninety (90) degree angles. No street shall intersect any other street at an angle less than sixty (60) degrees. See below.

8. Except in unusual circumstances, street jogs with centerline offsets of less than one hundred twenty-five (125) feet shall not be approved. See below.
9. All new subdivisions will have triangular sight distance easements shown in dashed lines at all street intersections and so noted on the final plat map. These easements will remain free of all structures, trees, shrubbery, driveways, and signs, except utility poles, fire hydrants, and traffic control signs. Sight easements shall be ten (10) feet by seventy (70) feet minimum running from the intersection along the right-of-way of the pertinent street. See below. Sight distances will be shown based on NCDOT requirements. Computations of sight distances for intersections shall be submitted when requested with appropriate profiles.

10. Turn lanes shall have a minimum width of 12 feet and be incorporated when required by traffic considerations. Tapers shall be designed to meet design speed criteria and W-S DOT recommendations.

11. Plans for all widening shall show that the contractor will saw and remove the existing pavement a minimum of 12" from the edge, or as directed by the City, and place new pavement over the existing base (See Construction Detail, Section V of this document for minimum design criteria).

12. Curb and gutter shall be NCDOT Standard 846.01, 2 feet-6 inch curb and gutter. Valley curb and gutter will be allowed only on local or cul-de-sac streets (See Construction Details, Section V of this document for minimum design criteria). If Valley curb is used, a detail drawing shall be shown on the plans for transition from Valley curb to Standard hood, grate and frame. (See Construction Details, Section V of this document for minimum design criteria)

13. Traffic islands are not recommended and may require a private maintenance agreement.

14. Guardrail shall be installed per AASHTO and NCDOT guidelines.

15. Dedication of additional rights-of-way, widening, or other improvements to existing public streets upon which the property fronts or which provide access to new subdivisions may be required of the developer.

16. Cul-de-sacs and turnarounds shall be designed according to detail drawings.

IV-3
17. A cul-de-sac or turnaround shall be required for all streets longer than 150 feet.

18. Half-streets, i.e. rights-of-way one-half the standard or required width, shall not be approved except where essential to the reasonable development of the subdivision or of adjacent land. Any half-street approved shall be dedicated as an easement for half of a future public street and so noted on the final plat. Also noted on the final plat will be a statement that the owner of the half an easement for a future public street shall dedicate the easement as public right-of-way once the adjoining property owner has received preliminary subdivision approval and is ready to construct the new public street.

19. All driveway entrances must adhere to the design standards herein and meet current City of Winston-Salem Driveway Entrance Regulations, 1971, or as subsequently amended. N.C. Department of Transportation requirements must be met if driveways are located on the State Highway System. Driveway permits are required before construction.

20. Round-abouts shall be designed to permit safe truck, bus and trash collection vehicular access without wheel encroachment on the curb or shoulder. Design of round-abouts where the speed limit is over 25 mph shall be submitted with all computations included.

21. Sidewalks shall be a minimum of 5’-0” wide and 0’-4” thick. The thickness of the sidewalk shall be increased to 6” at all driveways and from tangent to tangent at all intersection radii.

22. Chamfer or round all R/W/UE’s at roadway intersections.

c. **Private Streets and Drainage Systems** :

Private streets and drainage systems are permitted but must adhere to design & construction standards for the City of Winston-Salem. This includes plan review/acceptance and certification requirements.

d. **Storm Sewer** :

1. Drainage structures shall be sized using Rational Method. Calculations used for drainage design shall be submitted to both the City Engineering Division and the Inspections Division. Storm sewers shall be sized to carry a maximum of 90% capacity. Pipe systems and open channels shall be designed using the Manning formula. Should backwater conditions occur controlling flow conditions, the City Engineer shall approve the design methodology.

2. The minimum pipe diameter shall be 15 inches. The minimum slope on all 15” pipe shall be 1.0%. Storm drain pipes larger than 15” should have a slope such that a 2.5 fps minimum velocity is obtained for the 2-yr storm flow. Maximum pipe velocity for pipe outlets is 16 fps.

3. RCP (minimum Class III) is required material for all slopes less than or equal to 12%. Other pipe material may be used only with specific approval by the City. Corrugated aluminum pipe must be used for slopes greater than 12%. CAP must have hugger band
connectors with flat gaskets.

4. Culverts shall be appropriately sized based on inlet or outlet control. Flood elevations or ponding may be the controlling factor in outlet controls. In no case shall the HW/D exceed 1.5 and flooding shall not affect adjacent property improvements unless approved by the City Engineer.

5. Storm sewer lines shall be at least 5’ horizontally from all water and sanitary sewer mains. Publicly maintained drainage pipe shall be located within the right-of-way at intersections and under pavement/curb elsewhere in street cross-section.

6. Storm sewer lines shall be placed with a minimum of 24 inches of cover. Pipe diameters 30” and larger shall be deep enough to accommodate drainage structures.

7. Storm sewers shall be designed to be deeper than the water mains but shallower than the sanitary sewer mains and shall have vertical clearance from water and sanitary sewer mains as shown on Note 2, Page IV-8.

8. Yard inlet catch basins shall be NCDOT 840.04 or 840.05.

9. Catch basins are to be placed at a lot line. Blind boxes are unacceptable.

10. The grade of the street and flow will determine acceptable catch basin placement and spacing.

11. Catch basin placement and gutter design should be such that no water is allowed to flow across a roadway or intersection.

12. Adequate drainage controls shall be provided at all street intersections, usually upstream of the intersection.

13. All storm drain systems should be analyzed to establish the hydraulic grade line. No storm drain system should be under pressure.

14. In addition to City of Winston-Salem requirements, all federal and state agency requirements shall be incorporated into the planning and design of all drainage features.

15. Storm drain outfalls shall be piped to the rear of any possible buildings and released in a natural drainage ditch or stream. In certain cases, it may be necessary to extend piping to the boundary of the subdivision or stormwater BMP. It may be necessary to cross intervening property and to obtain private drainage easements to insure discharge into a natural water course. All costs for storm drainage (on and offsite) shall be borne by the Developer/Owner.

16. All storm drainage easements shall be shown on the plan sheet and labeled, "Private Storm Drainage Easement." Minimum width shall be 20 feet. Larger pipes, deep lines and ditches/streems may require a wider easement as shown. Pipes over 20’ in depth are discouraged and will be reviewed on a case by case basis.
Drainage Easement

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Depth</th>
<th>Easement</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 42”</td>
<td>≤ 10’</td>
<td>20’</td>
</tr>
<tr>
<td></td>
<td>10.01-15’</td>
<td>30’</td>
</tr>
<tr>
<td></td>
<td>15.01-20’</td>
<td>40’</td>
</tr>
<tr>
<td>48” – 60”</td>
<td>≤ 10’</td>
<td>30’</td>
</tr>
<tr>
<td></td>
<td>10.01-15’</td>
<td>40’</td>
</tr>
<tr>
<td></td>
<td>15.01-20’</td>
<td>50’</td>
</tr>
<tr>
<td>Multiple pipe or over 66”</td>
<td>Case by case review</td>
<td></td>
</tr>
</tbody>
</table>

17. Flared-End-Sections shall be used (and labeled on plan view) on the inlet/outlet end of any pipe receiving or discharging surface water (i.e.: to or from a ditch, channel or creek). Rip-rap will be used in addition as necessary.

18. Storm drainage pipe and structure information shall be listed on each sheet of plan and profile drawings. This information shall include pipe diameter, material, grade, inverts, structure type, grate type, and the drainage area and flow into the pipe structure. This information should be written in a table format with corresponding pipe or structure numbers shown in plan view. (See Sample Storm Drainage Chart, Section VIII-10).

19. Pipe sizing, inlet location, storm drainage capacities and gutter spread for any drainage from offsite areas shall be analyzed using a minimum runoff coefficient of C=0.6. (When analyzing the total area including offsite and onsite drainage, the C value shall be weighted). For all on site drainage where residence/impervious areas are not shown a C = 0.60 shall be used.

20. The storm drain pipe system is to be designed using the appropriate intensity (See below). Lower intensities may be used if the calculated time of concentration is more than 10 minutes.

   a) Storm Sewer Collector (Use 10-yr Storm): I=5.75 inches/hr. The minimum pipe diameter shall be 15 inches. NPDES Phase II ordinance requires the storm drains be designed for the 25 yr. storm where BMP’s are utilized (I = 6.66 in./hr.)

   b) Cross drainage on all local streets and below roads (Use 25-yr storm): I=6.66 inches/hr. The minimum pipe diameter on cross pipes shall be 18 inches.

   c) All culverts (conduits under/through the roadway) for local collectors shall be designed for the 25-year design storm with HW/D less than or equal to 1.5. Effects of the 100-year design storm should be analyzed.

   d) Cross drainage on Primary Roads including minor thoroughfares and above (use 50- yr Storm): I=7.00 inches/hr. The minimum pipe diameter on cross pipes shall be 18 inches.
21. Roadway inlet locations and gutter spread is to be analyzed using a standard rainfall intensity of 4.0 inches/hr. At no point shall the contained gutter spread (both sides) leave less than 12.00 LF of roadway clear of stormwater.

22. The maximum width of spread = the lesser of 8’ or ½ lane width + gutter width.

23. All ditches and swales shall be indicated on the drawings complete with spot elevations, slopes, cross sections and liner materials (grass, matting, rip-rap, concrete, etc.) shown. Computations and liner information shall be provided.

24. No water shall be permitted to discharge across a roadway, sidewalk or driveway from a concentrated source (swale, ditch, pipe, etc.).
B. UTILITIES (Water/Sanitary Sewer Only)

a. General:

1. There should be either a 10’ horizontal separation or an 18” vertical separation (Water over Sewer) between water and sewer mains. Water and sewer mains should be at least five (5) feet horizontally from all storm sewers.

2. Vertical separation of lines shall be as follows:
   1.) 24” minimum between storm and sanitary.
   2.) 12” minimum between storm and water.
   3.) 18” minimum between water and sanitary.

3. Water and Sewer mains shall be placed under the pavement for all public and private streets except where prohibited by NCDOT or other municipalities.

4. Proposed water and sanitary sewer lines shall be placed a minimum of 5 feet off edge of pavement of all NCDOT roads and existing ribbon-paved roads. Mains placed within the right-of-way of other municipalities will be placed as directed by City/County Utilities.

5. Water and sewer structures in a private road shall be installed and adjusted in the same manner as in publicly maintained streets (including the construction of concrete collars).

6. If the City is to participate in the cost of water or sanitary sewer mains, three (3) bids based on a specific bid sheet must be received and opened in the presence of City personnel.

7. In cases where City and State design criteria conflict, the more stringent shall apply.

8. The City has been authorized by the State of North Carolina (DENR) to process all permits for water and/or sewer line extensions within the jurisdiction of the City/County Utility Commission. The developer/engineer must submit a complete Permit Application for Water and/or Sewer Line Extensions to the City. (See sample form in Section VI of these guidelines.) The form is available from the Utilities Division plan review section or online at: http://www.cityofws.org/Home/Departments/Engineering/Articles/Publications.

9. The Permit Application for Water and/or Sewer Line Extensions must be signed with the City PRIOR to construction to ensure that the City agrees to take over maintenance upon project completion. The Request to Extend Water and/or Sanitary Sewer Information Sheet (See Section VI of this document, Permits) must be correctly completed and returned to the City (along with pertinent information; i.e., operating agreement, articles of organization and annual report) prior to plan signing to facilitate agreement preparation.

10. A Letter of Acceptance will be issued after the construction is inspected and after the developer provides record drawings, any necessary easements (in a form satisfactory to the City: see Exhibit, Section VIII of these guidelines for a standard form) and proof of payment (indicating water and sanitary sewer costs separately, excluding connections.
costs, along with an itemized breakdown of the actual cost of installed materials.) (See suggested format in Section VIII of these guidelines). Until the Letter of Acceptance is issued detailing the warranty period, the developer shall be responsible for all maintenance and liability.

b. Water:

1. Pipe material shall be ductile iron.

2. Minimum diameter pipe shall be 6 inches.

3. Water mains will have a minimum of 3 feet of cover.

4. Valves shall be placed as follows:
   a. Minimum of three valves at each cross.
   b. Minimum two valves at each tee.
   c. One valve on each hydrant leg at the hydrant tee.
   d. Minimum of one main line valve every 2000’.

5. A list of fittings, valves, hydrants, hydrant tees, etc., shall be shown on the plan view for all intersecting water mains and at fire hydrants. Bends shall be labeled on the plan and profile views. Use hydrant tees for hydrants and 6” stub-outs. Valves shall be gate valves.

6. Hydrants in a single-family residential area shall be placed so that the centers of all lots are within 350 feet of a hydrant and not more than 700 feet between hydrants as measured along the water main.

7. Hydrants in a commercial/industrial or other area shall be placed so that the centers of all lots are within 250 feet of a hydrant and no more than 500 feet between hydrants as measured along the water main.

8. Hydrants are to be placed at a lot line. Hydrants will normally be required at all intersections and at the end of all cul-de-sacs. Existing hydrants shall be shown in order to properly space the proposed hydrants.

9. Hydrants, water meters, and sewer cleanouts are to be placed as indicated in the Construction Notes (See Section III of this document). Meter box and cleanout placement should be beside each other at the center of each lot as applicable, with not more than thirty inches (30”) of lateral separation between them (center to center spacing).

10. All dead-end mains (greater than 100 feet long) must have a hydrant or a blow-off. Hydrants are preferred. No connections shall be made beyond the hydrant or blow-off.

11. Existing stub-outs shall be shown on plan view with as-built distances. Water mains shall be extended in such a manner to accommodate future development.
c. **Sewer:**

1. Sewer design must be consistent with overall needs of the watershed as determined by utilities staff. The designer shall furnish topographic maps, zoning maps and design data to substantiate sizing of all major watershed outfalls.

2. Minimum pipe diameter shall be 8 inches.

3. Eight (8)-inch pipe shall be:
   
   - Vitrified clay for cover of 3' to 22' (See Water and Sewer Technical Specifications and detail drawings - Bedding Requirements).
   - Ductile iron for all other, including creek crossings and drop manholes (the last joint of pipe into the top of the drop pipe). All ductile iron shall be hatched or shaded on the profile view.

4. Bedding requirements shall be shown in the profile view.

5. Grades shall be a minimum of 1.0% for dead-end lines where low flows are expected. Grades along with manhole to manhole distances shall be shown on the profile view. The minimum grades on sewer are as follows:

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Minimum Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>8”</td>
<td>.50%</td>
</tr>
<tr>
<td>12”</td>
<td>.30%</td>
</tr>
<tr>
<td>15”</td>
<td>.20%</td>
</tr>
<tr>
<td>18”</td>
<td>.15%</td>
</tr>
<tr>
<td>21”</td>
<td>.15%</td>
</tr>
<tr>
<td>24”</td>
<td>.10%</td>
</tr>
<tr>
<td>27”</td>
<td>.10%</td>
</tr>
<tr>
<td>30”</td>
<td>.10%</td>
</tr>
<tr>
<td>36”</td>
<td>.10%</td>
</tr>
</tbody>
</table>

6. Manholes shall be placed a maximum of 350 feet apart and at all angle points. Pipes shall run straight between all manholes. End manholes shall extend to the center of last lot served. Manholes shall be a minimum of 7 feet deep. (Exceptions will be considered for utility conflicts, low points, etc.) Manholes are required at the end of every line.

7. Manhole stations shall be shown on plan and profile view (Ex: MH Sta. 10+00.00). All manholes are to be numbered in the plan/profile view.

8. All manholes shall have centerline (center of manhole) invert (not invert in & invert out) and rim elevations shown on profile view ONLY (Ex: C/L Inv. 800.50, Rim 807.50.)

9. Sanitary sewer shall be designed to avoid spilling inverts since these can lead to odor and maintenance problems. Drop manholes may be required.

10. Outside drop manholes are required where the vertical distance between outgoing and incoming lines is 30 inches or more. If the distance is less than 30 inches, the incoming
11. Sanitary sewer lines shall not be located less than 25 feet from a private well or 50 feet from a public water supply well. Sewer lines less than 100 feet from a well shall be constructed of ductile iron.

12. Off-street sewers shall show bearings and distances with a minimum of 20-foot permanent easements. Large pipes or deep sewers may require a wider easement. All easements shall be on current forms provided by the City.

13. The top of manholes on sanitary sewer outfalls shall be 2 feet above the finished grade (unless Type B manhole is used) and have a Type 2 ring and cover. Manholes in a yard may be flush with the ground.

14. Type B manholes with a Type 3 ring and cover (water tight) shall be used within the 100 year flood plain. The top of the Type B manholes shall be 1 foot above the ground. The vent pipe opening shall be two (2) feet above the 100-year flood elevation. Vent pipes are to be placed on every other manhole (maximum of 1,000’). Type B manholes may be required in areas that are subject to flooding but not covered by the FEMA mapping.

15. Rings and covers shall be:
   - Type 1 for manholes in the street right-of-way.
   - Type 2 for outfall manholes not in a 100-year floodplain (bolt downs).
   - Type 3 for Type B outfall manholes in a 100-Yr floodplain (water tight and bolt downs).

16. Label in the profile view for all outfalls the type of ring and cover and if manholes are Type B manholes.

17. When connecting to an existing manhole, show C/L invert elevation, shelf elevation, top of manhole elevation, and vent pipe elevation (outfalls and MHs in floodplain/floodway). Size and alignment of existing line and name and project number for existing line shall also be shown.

18. Aerial sewers will be allowed where cover cannot be maintained over sewer line. The maximum unsupported clear span is 40’. Suspended joints shall be Mech-Lok Rigid Restrained joint by Griffin (or equal). Piers or piles are required to support pipe for spans greater that 40’. See Standard Water and Sewer Specifications.

19. Sewer main in streets shall be extended to the far reach of property if it could be extended in the future to serve the remainder of the drainage basin. Sewer outfalls serving a drainage basin shall also be extended to the upstream property line.
C. STORM WATER MANAGEMENT

Refer to the “Post Construction Stormwater Control Ordinance” which can be found on the internet as follows: http://www.cityofws.org/Home/Departments/Stormwater/post-construction/Articles/Postconstruction.
D. DRIVEWAYS

A. Definitions

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Access means ingress and egress to land bordering on city or state streets and highways;
Buffer area means the border area between the traveled way and the right-of-way line and within the frontage boundary lines;
Corner clearance (C) means, at an intersecting street or highway, the minimum dimension parallel to the traveled way between the intersection of the two right-of-way lines and the tangent projection of the nearest edge of the driveway;
Distance between double driveways (D) means the distance measured along the right-of-way line between the tangent projections of the inside edges of two adjacent driveways to the same frontage;
Driveway angle (Y) means the angle between the driveway centerline and the edge of the traveled way of 90 degrees or less;
Driveway or island returns (R and U).

TABLE INSET:

<table>
<thead>
<tr>
<th>R</th>
<th>(Outside) The outside or larger curve radius on the edge of the driveway, used when Y is larger than 75 degrees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>(Inside) The inside or smaller curve radius on the edge of the driveway, used when Y is 75 degrees or smaller.</td>
</tr>
</tbody>
</table>

Driveway width (W) means the narrowest width of the driveway within the buffer area measured parallel with the edge of the traveled way;
Edge clearance (E) means the minimum distance, parallel to the traveled way, between the frontage boundary line and the tangent projection of the nearest edge of the driveway;
Frontage means the length along the highway right-of-way line of a single property tract or roadside development area between the edges of the property; Corner property at a highway intersection has a separate frontage along each highway.
Frontage boundary line (abbreviated as FB line) means a line, perpendicular to the highway centerline, at each end of the frontage, extending from the right-of-way line to the edge of the through-traffic lane;
Intersection return means the radius of the edge of the pavement between intersecting roadways.
Letter meanings.
TABLE INSET:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C.</td>
<td>Corner clearance, 25 feet minimum.</td>
</tr>
<tr>
<td>D</td>
<td>Distance between driveways:</td>
</tr>
<tr>
<td></td>
<td>Two driveways, 20 feet minimum.</td>
</tr>
<tr>
<td></td>
<td>Three driveways, 50 feet minimum.</td>
</tr>
<tr>
<td>E</td>
<td>Side clearance, five feet minimum.</td>
</tr>
<tr>
<td>G</td>
<td>Setback, as noted.</td>
</tr>
<tr>
<td>H</td>
<td>Curb setback, as noted.</td>
</tr>
<tr>
<td>J</td>
<td>Right-of-way line return radii, 30 feet maximum.</td>
</tr>
<tr>
<td>K</td>
<td>Right-of-way line return radii, ten feet maximum.</td>
</tr>
<tr>
<td>R</td>
<td>Outside driveway or island return radii, three to 30 feet.</td>
</tr>
<tr>
<td>S</td>
<td>Shoulder, six feet maximum.</td>
</tr>
<tr>
<td>U</td>
<td>Inside driveway or island return radii, three to 15 feet.</td>
</tr>
<tr>
<td>W</td>
<td>Driveway width:</td>
</tr>
<tr>
<td></td>
<td>Commercial One-way, 12 to 36 feet.</td>
</tr>
<tr>
<td></td>
<td>Two-way, 20 to 36 feet.</td>
</tr>
<tr>
<td></td>
<td>Residential 12-20 feet</td>
</tr>
<tr>
<td>Y</td>
<td>Driveway angle:</td>
</tr>
<tr>
<td></td>
<td>One-way:</td>
</tr>
<tr>
<td></td>
<td>Entrance, 30 degrees minimum.</td>
</tr>
<tr>
<td></td>
<td>Exit, 60 degrees minimum.</td>
</tr>
<tr>
<td></td>
<td>Two-way, 60 degrees minimum.</td>
</tr>
<tr>
<td></td>
<td>All driveways to a two-way roadway, 60 degrees minimum.</td>
</tr>
</tbody>
</table>

*Right-of-way* means the land within legally defined property boundaries whose title vests in the state or the city and which is designated or intended for street or highway purposes.

*Right-of-way line returns (J and K).*

TABLE INSET:

<table>
<thead>
<tr>
<th></th>
<th>The curb radius at the right-of-way line, if the angle between the line and the edge of the driveway is equal to or greater than 90 degrees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>The curb radius at the right-of-way line, if the angle between the line and the edge of the driveway is less than 90 degrees.</td>
</tr>
<tr>
<td>K</td>
<td>The curb radius at the right-of-way line, if the angle between the line and the edge of the driveway is less than 90 degrees.</td>
</tr>
</tbody>
</table>

*Setback (G)* means the lateral distance between the right-of-way line and structure, display stand or other object, the use of which will result in space for vehicles to stop or park between such facilities and the right-of-way line.
Traveled way means that portion of the right-of-way which is ordinarily available and open to the general public for vehicular travel.

B. Regulations

(a) Any person desiring to construct a driveway or other connection or place any obstruction within the street right-of-way of a public street or highway in the city shall, before beginning such construction, must secure a permit from the city authorizing construction on the public right-of-way.

(b) Any person constructing a driveway on a street or highway right-of-way without a permit as required under this article shall be guilty of a misdemeanor. In addition, such driveway shall be subject to removal at the owner's expense if it does not meet the requirements of this article.

(c) When an existing street or highway is improved by reconstruction or maintenance, existing connections to the street or highway shall be reviewed and altered to conform to the standards set forth in this article to the extent practicable. Any driveways which are not in use at the time of reconstruction or maintenance shall be closed.

C. Application for driveway permit; issuance.

(a) Submission of application, driveway permit and checklist; required approvals. Applications for permits for driveway connections shall be submitted to the Engineering Division. Driveways located on streets and highways which are a part of the state highway system must be approved by both the city and the state highway commission. The state highway commission driveway permit forms can be obtained from either the city or the state. For failure to submit completed driveway permit and checklist the permit shall be returned for completion.

D. Approvals

Conditions for approval; construction responsibilities. The approval of the application shall be subject to the following conditions:

(1) The application shall be properly and clearly completed.
(2) The location, design and construction of driveways shall meet the general and geometric requirements stated in this article. Necessary provision for drainage, pavement types and thickness, sight distance requirements and other details must be found by the assistant city manager/public works to meet minimum safety requirements.
(3) The permit shall require that the applicant assume the following construction responsibilities:

a. Existing open ditch. The applicant shall furnish all required pipe of size, type and quantity as is necessary adequately to accommodate drainage.

b. Existing curbed streets. The applicant will bear all costs of driveway construction, including the cost of replacing all sections of damaged infrastructure (curb, sidewalk, inlets, utilities, etc.) during construction.

c. Paving. The applicant shall bear the full cost of any stabilization and pavement placed on the driveway within the right-of-way.

d. Alterations or additions. No alteration or addition shall be made to any driveway within the right-of-way without first securing a new permit from Public Works Engineering Division.
e. **Right of city to inspect work and to stop work for noncompliance.** The city reserves the right of inspection, by its authorized representatives, of any driveway construction within the right-of-way. In the event of failure to comply with the terms of the permit, faulty workmanship or faulty materials, the city shall have the right to stop the work until such time as the objectionable conditions are corrected. All costs incurred in the removal and correction of noncompliance with design, defective workmanship and defective materials shall be borne by the applicant.

f. **Closing of driveways no longer used; restoration of curb and sidewalk, etc.** Upon completion of the driveways authorized in the permit the applicant shall be responsible for closing any driveways which are no longer used and for restoring the curb and sidewalk (if any), side ditches, etc. to their normal state.

**E. Permit Preparations**  
Permits to be issued only to licensed professional plan preparer or contractor. Any person may prepare plans for and apply for driveway connections in accordance with the provisions of this article; however, permits for construction can only be issued to persons who are properly licensed and bonded to work within the street or highway right-of-way.

**F. Design Requirements.**

(a) **Location of driveways.**

(1) Driveways should be located at a point along the frontage where it is possible for drivers of vehicles entering the highway to see in both directions along the traveled way far enough to allow entering the highway without creating a hazardous situation. At an intersection, no driveway shall be allowed within the return of the intersecting roadways and for a clearance distance as specified below.

(b) **Side clearance.** All portions of the driveway, including the returns, shall be between the two frontage boundary lines. The side clearance, measured parallel to the edge of the pavement of the street, from the frontage boundary line to the nearest point on the projected edge of the driveway, shall be a minimum of five feet. This restriction does not apply to joint driveways.

(c) **Width.** The width of a driveway, measured parallel to the highway or street centerline, shall be within the minimum and maximum widths specified in table I below.

**TABLE I. DRIVEWAY WIDTHS**

<table>
<thead>
<tr>
<th></th>
<th>Minimum (feet)</th>
<th>Maximum (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>12</td>
<td>16 20’ *</td>
</tr>
<tr>
<td>Commercial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-way driveway</td>
<td>12</td>
<td>36 *</td>
</tr>
<tr>
<td>Two-way driveway</td>
<td>20</td>
<td>36</td>
</tr>
</tbody>
</table>

* Wider than 20/36’ reviewed case by case
(d) **Driveway angle (Y).** The minimum angle of the driveway with respect to the pavement edge shall be as follows:

1. One-way entrance driveway (from a one-way roadway), 30 degrees minimum.
2. One-way exit driveway (to a one-way roadway), 60 degrees minimum.
3. Two-way driveway, 60 degrees minimum.
4. All driveways to a two-way roadway, 60 degrees minimum.


**TABLE II. DRIVEWAY OR ISLAND RETURN RADII**

| Outside radii (R) – No portion of the driveway shall be constructed in front of adjacent properties. |
| Minimum: 3 feet. |
| Maximum: 30 feet. |
| Inside radii (U): |
| Minimum: 3 feet. |
| Maximum: 15 feet. |
| Flares: 2’ east side of driveway |

(e) **Joint driveways.** Landowners of adjacent property may, by written mutual agreement, construct a joint driveway to service both properties. All requirements of this article shall be met with the exception that the side clearance restriction G(b) above shall not apply.

(f) **Multiple driveways.**

1. **Double driveways.** Two driveways entering on a particular highway from a single commercial establishment or residence may be permitted if all other requirements of this article are met and if the minimum distance (D) between the two driveways equals or exceeds 20 feet.

2. **Triple driveways.** Three driveways entering on a particular highway from a single commercial establishment or residence may be permitted if all other requirements of this article are met and if the minimum distance (D) between adjacent driveways equals or exceeds 50 feet.

3. **Four or more driveways.** Four or more driveways entering a single commercial establishment from a particular street shall not be permitted.

4. **Control of access.**

   a. **Partial control of access.**
   1. **One-way roadways.** No more than one entrance and one exit driveway shall be permitted to enter a one-way roadway where partial control of access has been purchased, unless otherwise specified in the agreement.
   2. **Two-way roadways.** No more than one driveway shall be permitted to enter a two-way roadway where partial control of access has been purchased, unless otherwise specified in the agreement.

   b. **Full control of access.** No portion of a driveway or driveway return shall be permitted to encroach upon the control of access area.

(g) **Setback.** The area to which the driveway provides access shall be sufficiently large to store any vehicles using the driveway completely off the right-of-way and must be of sufficient size to allow the necessary functions to be carried out completely on the private property. This requires
that buildings and similar structures be set back from the right-of-way line in accordance with the provisions of the current zoning ordinance of the city.

(h) *Corner islands.* The location of a driveway in relation to a highway intersection shall conform to the following limits:

1. When there is no reserved sight distance area, no driveway will be allowed in the area between the edge of the pavement and the right-of-way for a minimum corner clearance, measured parallel to the edge of the pavement from the intersection of the right-of-way lines of the two highways or streets. The minimum corner clearance shall be 15 feet. The corner clearance may have to be increased so that no driveway return may encroach on the radius of the intersection return.
2. When a reserved sight distance area has been purchased or acquired by deed, no access will be allowed through the reserved area.

(i) *Driveway grades.* The grades of entrances and exits shall be constructed in accordance with Section V. In places where the physical conditions do not permit conformance with these details the City Engineer/Driveway Inspector/Fire Marshall shall set forth the proper grades for the driveway and sidewalk areas, based on the grade that would best promote safety and general welfare.

(j) *Paving material.*

1. All driveways, single-family residence entrances and exits etc., shall be paved with six inches of 3,000 psi concrete from the back of the curb for a distance of eight feet, or to the right-of-way line, whichever is greater.
2. All single-family residence driveways which are constructed with concrete or asphalt shall have six inches of concrete or equivalent asphalt. Continuous sidewalks crossing driveways shall be a minimum of 6” of concrete.

(k) *Drainage.* The provisions for the drainage of the right-of-way shall be such as to promote proper drainage as determined by the City Engineer/Driveway Inspector, and the cost shall be borne by the applicant. The drainage in highway side ditches shall not be impeded, and the applicant shall provide suitable drainage structures at his own expense.

(l) *Alteration of existing facilities.* Existing driveways may not be altered in width, grade or location without first securing a new permit.

G. Special commercial property.

(a) *Submission of permit application.* Property use designated as special commercial will require study to a greater depth than other commercial property uses. This is due to the possibility of greater traffic generation. The permit application shall be submitted sufficiently in advance of the planned construction date to allow a minimum of 30 days for review. The different types of property uses that come under this heading are as follows:

1. Shopping centers (defined as two or more adjoining commercial or service establishments planned or constructed).
2. Restaurants
3. Carwashes.
(4) Apartments of three or more units.
(5) Other uses which can be expected to attract large amounts of traffic.

(b) Contents of site plans. The following items of information, with the exceptions noted, must be shown on the site plans before the application can be considered:

(1) All information required under paragraph C(b) above.
(2) A complete plot plan showing the buildings and parking space layouts.
(3) The proposed driveway locations and widths.
(4) The distances between the following items:
   a. Driveway centerline to centerline of nearest intersecting street.
   b. Driveway centerline to existing crossovers in the median, if applicable.
   c. Driveway centerline to adjacent streams, bridges, etc.
   d. Edge of pavement, curb and gutter and right-of-way line.
(5) The width of the pavement and right-of-way for each adjacent road.
   The applicant should present seven prints of the site plans to the City Engineer/Driveway Inspector at least 30 days prior to the planned construction date.

(c) Design considerations. These special property uses can be expected to attract large numbers of people and therefore large numbers of vehicles. This is especially true for shopping centers and restaurants. Thus the design of these, as well as the other uses listed, requires that special attention be given to those elements which enhance the smooth and orderly flow of traffic. Two of the areas which demand special design attention are:

(1) Parking area design.
   a. Size. The size of the parking area shall be in accordance with the provisions of the current zoning ordinance of the city.
   b. Circulation pattern. Vehicles must be able to perform all necessary circulation within the parking area without exiting onto a street and reentering the parking area.
   c. Parking stall layout. The orderly layout of parking stalls and aisles is a necessity for efficient parking.
   d. Storage lanes. Storage lanes should provide the necessary space for vehicles waiting to enter the roadway to wait in space separated from the areas used for parking and circulation. Storage lanes should also provide space for vehicles entering the parking area to be stored outside the through traffic lanes. Storage on through traffic lanes or blockage of such lanes shall not be permitted.
   e. For areas containing 100 parking spaces or more a minimum of 40’ from the existing E.R. is required prior to the first parking spaces or driveway intersection. This requirement may also be enforced for sites with high volumes during short time periods.

(2) Driveway design.
   a. Conflict reduction. The choice of the proper location for access facilities (driveways or streets) must involve consideration of the amount of conflict which can be expected both within the parking area and on the abutting roadway. One primary concept which should be followed is to reduce the choice of connections
to a practical minimum, thus providing fewer locations where conflicts may occur.

b. *Visibility.* Driveways and streets should be clearly visible to approaching traffic. This allows the drivers to be alert to the possible maneuvers to be expected at such a driveway or street.

c. *Grades.* Driveways and streets should be relatively flat to allow smooth entry and exit.

d. *Clearance from municipal and utility company facilities.* No driveway approach shall be permitted to encompass any municipal or utility company facility such as traffic signal standards, catchbasins, fire hydrants, crosswalks, loading zones, utility poles, fire alarm supports or other necessary structures. No part of a driveway shall be permitted within three feet of an existing catchbasin. Where the city determines that it is consistent with the accomplishment of the purposes of this article, the city will move such facilities upon request of the applicant. The cost of moving and restoring any such facilities shall be borne by the applicant.

**H. Control of driveway traffic.**

(a) *Stop signs.* All vehicles emerging from buildings or private driveways stop before entering or crossing the sidewalk or sidewalk area; therefore, the only sign which shall be allowed to control traffic entering a street from a driveway shall be a stop sign. Such signs are generally not required, but may be placed at the applicant's expense.

(b) *Other signs; reflectors.* Standard one-way or do not enter signs may also be used where driveways are intended for one-way traffic. All stop, one-way and do not enter signs shall be fully reflectorized and shall conform to all of the requirements set forth in the current Manual on Uniform Traffic Control Devices for Streets and Highways.

**I. Protection of public safety; liability bond.**

(a) Whenever any person shall do or undertake to do any of the things set forth herein, it shall be the duty of such person to protect from harm and damage all persons who may be using any street or sidewalk or other public place where such activity is in progress; and, to that end, such person shall erect and maintain suitable barricades, signs, lights and other appropriate warning devices at the proper locations where such work is in progress in accordance with the current policy and regulations for street construction and maintenance operations as established by the City Engineer/Driveway Inspector.

(b) No permit for driveway connections shall be issued until a liability bond is executed and filed with the city treasurer.
E. TREE PLANTING STANDARDS

Location Specifications

A landscape plan with planting details should be submitted with the construction drawings for subdivisions or site plans and shall include a listing of all plant materials to be used and showing their location on the plan including buffer yard plantings and street yard plantings.

Linear Spacing

General spacing specifications are as follows:

- Trees reaching mature height over 40’ 40’ spacing between trees
- Trees between 15’ and 39’ at maturity 30’ spacing between trees
- Trees of less than 15’ at maturity 15’ spacing between trees

Trees Planted Near Street Intersections

Trees shall not obscure the sight distances at intersections. The minimum dimensions of a sight distance are determined at different intersections by the City of Winston-Salem Department of Transportation. The distance for a given intersection will be given at the time of permit request for the requested location. In no case will newly planted trees be allowed within 25 feet of an intersection or within sight triangle easements.

Driveways

Commercial driveways are those that access a business or a location that is frequented by the general public or used to enter a parking lot. It is important in the planning for a tree planting near commercial driveways that you do not plant within a zone of 20 feet from the edge of this driveway (A) to the tree (B) as shown in the illustration below. Do not plant a tree (D) within 10 feet of the edge of the driveway (C).

Residential driveways are those primarily for a single family or individual residents. In planning for tree planting near residential driveways, one should keep the tree at least 10 feet from the edge of the driveway (C) to the centerline of the tree (D), as illustrated below.
**Minimum Linear Distance from Walks, Curbs, and Utilities**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Distance (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidewalk</td>
<td>1'</td>
</tr>
<tr>
<td>Access or Courtesy Walk</td>
<td>5'</td>
</tr>
<tr>
<td>(Note: This refers to a walk that is generally perpendicular to the street and is used to go from the street to a commercial building or residential house).</td>
<td></td>
</tr>
<tr>
<td>Face of Curb</td>
<td>1'</td>
</tr>
<tr>
<td>Manholes or Catch Basins</td>
<td>10'</td>
</tr>
<tr>
<td>Fire Hydrants</td>
<td>10'</td>
</tr>
<tr>
<td>Water Meters and Other Utility Boxes</td>
<td>5’</td>
</tr>
<tr>
<td>Sanitary sewers *</td>
<td>10’</td>
</tr>
</tbody>
</table>

*Trees shall not be planted within sewer/water utility easements*

**Overhead Utility Lines:**

No tree with the potential of reaching a mature height of more than 35 feet shall be planted in the right of way under overhead wires. Consideration should be given to the height of existing wires when designating trees for planting.

**Minimum Distance from Structures:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Distance (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees of greater than 40’ at maturity</td>
<td>10’</td>
</tr>
<tr>
<td>Trees between 15’ and 39’ at maturity</td>
<td>7’</td>
</tr>
<tr>
<td>Trees of less than 15’ at maturity</td>
<td>5’</td>
</tr>
</tbody>
</table>

**Minimum Distance from Streetlights:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Distance (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees over 40’ tall at maturity</td>
<td></td>
</tr>
<tr>
<td>- spreading crown</td>
<td>20’</td>
</tr>
<tr>
<td>- global/pyramidal</td>
<td>16’</td>
</tr>
<tr>
<td>- columnar</td>
<td>10’</td>
</tr>
<tr>
<td>Trees between 15’ and 39’ at maturity</td>
<td></td>
</tr>
<tr>
<td>Trees less than 15’ at maturity</td>
<td>15’</td>
</tr>
</tbody>
</table>

**Minimum Planting Space Widths:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Distance (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees over 40’ at maturity</td>
<td>40’</td>
</tr>
<tr>
<td>Trees between 15’ and 39’ at maturity</td>
<td>20’</td>
</tr>
<tr>
<td>Trees less than 15’ at maturity</td>
<td>10’</td>
</tr>
</tbody>
</table>

**Tree Pits and Planter Specifications:**

Trees planted in planters and/or paved areas have a specific set of guidelines to follow. If your landscape plan includes planting in planters and/or paved areas, along the city right of way, please request these specifications from the Urban Forester.
Watering

A process/plan must be in place to water plant material. Trees should receive, on average, 1” of water per week.

Permits

A tree planting permit application may be found in Section VI.

Plans

A landscape plan with details shall be included with all construction plans submitted including subdivision plans, site plans, etc. Landscape plans shall show the location of all plants showing type and quantity and shall include a list of plants with caliper size, planting height, full size, botanical and common name, and other pertinent information. All landscape plans should be sealed by a registered professional (RLA, PE or RA) licensed to do business in North Carolina.

Species

The City Forrester has a list of approved plants for the City of Winston-Salem.
F. PUBLIC ALLEYS

Public alleys may be used in the following conditions:

1. Central business district
2. Commercial or residential areas located on local collector streets or above where trash collections, deliveries or on street parking would be detrimental to public safety and where driveway access is restricted or prohibited.
3. In specified areas where the City of Winston-Salem determines on street trash collection to be contrary to public welfare.

Public alleys will not contain public water or public sanitary sewer and storm drainage facilities shall be kept to the least required. Garages may be connected to public alleys for residential use however, no commercial parking areas may access public alleys without written permission of the Director of Public Works.

Public alleys are primarily for the use of trash collection (non-dumpster) and access for emergency vehicles and are not to be used as short cuts for the traveling public. Lots accessing public alleys must have widths not less than 70’.

Public alleys must have a minimum of 20’ of R/W and a minimum of 16’ of pavement. Curb and gutter will not be required however; stormwater must not cross public alleys to adjacent properties. Public alleys should be constructed using a “normal crown” but “inverted” crowns will be considered. The maximum length of a public alley shall be 600’. A 5’ UE shall be included on each side of the alley for use of dry utilities such as telephone, power, gas and cable services.

G. RIBBON PAVEMENT

Ribbon pavement may be used in the following cases:

1. Low impact developments
2. Minor fill-in in existing residential subdivision where no C&G exists in the existing subdivision and where the fill-in is not an extension to additional property for development.
3. In low density development locations where it is needed to comply with the water quality provisions of the City’s post construction stormwater ordinance.

Use of ribbon pavement requires the design of roadside ditches for stormwater runoff. While a standard flat bottom ditch is shown in the details, computations are required to show the ditch section can contain the 10 yr. storm with 3” freeboard and the ditch section can accept the stormwater velocity without scour or erosion. Roadside ditches may require various types of liners to operate successfully.

In no way will the use of ribbon pavements delete the requirements for sidewalks and lot trees. The sidewalks however, will need to be installed beyond the ditch which will be between the road and the sidewalk and trees will need to be planted on private property outside of the sidewalk area unless otherwise directed.
Ditches shall be designed so that the velocity in the ditch does not exceed 9 fps. Where this velocity is exceeded pipe systems may be required.

Roadway slopes where ribbon pavement is used should not exceed 8%.

Ditches shall be designed for the 10 year storm with a minimum freeboard of 3”. Ditch design should be checked using the 25 year storm. The water surface of the 25 year storm shall not encroach upon the roadway shoulder.

Intersection and driveway pipes shall be designed so that the pipes pass the 10 year storm at an HW/D of 0.9 or less and the 25 yr. storm shall not have an HW/D in excess of 1.2 and shall not encroach upon the roadway shoulder or pass over the driveway. (The 50 year storm may not encroach upon the roadway pavement.)

Roadway ditches for ribbon pavement where grass is to be the primary liner shall be lined with sod and maintained for a period of the one-year warranty as needed for continued growth.

Ribbon pavements shall be 20’ wide with 6’-6” shoulders. R/W’s shall be a minimum of 50’ and must contain the ditch to the back of the ditch bank. This may require additional UE widths and/or additional R/W.
SECTION V
CONSTRUCTION DETAILS
TYPICAL SECTION
LOCAL STREETS & CUL-DE-SACS

(REFER TO THE STREET DESIGN MATRIX TO OBTAIN THE DIMENSIONAL
AND STREET ELEMENTS FOR OTHER STREET CLASSIFICATIONS)

ALTERNATE STANDARD 1

ALTERNATE STANDARD 2

MINIMUM DESIGN
1" SF 9.5A
2" S 9.5B
7" ABC

NOTE:
CABLE TV, GAS, PHONE
AND POWER SHALL BE
LOCATED WITHIN THE 10'
UTILITY EASEMENTS.

APPROVAL OF CROSS-SECTIONS UNDER THIS ALTERNATIVE ARE SUBJECT TO INDIVIDUAL REVIEW AND APPROVAL
BY PUBLIC WORKS/ENGINEERING STAFF SO AS TO AVOID SITUATIONS WHERE THE DESIGN RESULTS IN SIGHT
DISTANCE, PAVEMENT STRUCTURE OR NECESSARY UTILITY PLACEMENTS BEING COMPROMISED.

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED
APPROVED BY:

V-1
TYPICAL STREET WIDENING

SAW AND REMOVE EXISTING PAVEMENT A MINIMUM OF 12" FROM EDGE, OR AS DIRECTED BY THE ENGINEER. MILL EXISTING PAVEMENT A MINIMUM OF 1 1/2" DEEP AND 2' FROM SAW CUT. WEDGE NEW SURFACE OVER EXISTING SURFACE. PAVEMENT DESIGN AND EXISTING CROSS SLOPE MAY VARY FOR EACH PROJECT. IF WIDENING IS 6' OR GREATER, 6" ABC STONE BASE MAY BE USED IN LIEU OF 3" B25B (IF APPROVED BY THE ENGINEER).

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED: 2/4/13

APPROVED BY:

streets\street details\streetdetails.dwg

V-2
2’–6” CURB AND GUTTER
(NCDOT STANDARD NO. 846.01)

NOTES:

1. CONTRACTION JOINTS ARE TO BE PLACED EVERY 10’ (15’ IF CURB MACHINE IS USED) AND EXPANSION JOINTS EVERY 90’.

2. BOTTOM OF A.B.C. UNDER CURB TO BE AT SAME LEVEL AS A.B.C. UNDER ASPHALT.

CITY OF WINSTON–SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED 1/13/12
APPROVED BY:

streets\street details\streetdetails.dwg

V–3
TRANSITION
FROM VALLEY CURB & GUTTER
TO STANDARD HOOD, GRATE & FRAME

NOTE:
TOP OF HOOD TO BE AT SAME
ELEVATION AS TOP OF CURB.

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S.  REVISED 10–28–05

APPROVED BY:

streets\street details\streetdetails.dwg  V–4
"T" TURNAROUND
PERMANENT

NOTE:
STANDARD CURB AND GUTTER MAY BE REQUIRED AT
THE END OF PAVEMENT TO CONTROL DRAINAGE.

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED
APPROVED BY:

streets\street details\streetdetails.dwg V-5
OFFSET TURNAROUND

PERMANENT

NOTE:
STANDARD CURB AND GUTTER MAY BE REQUIRED AT THE END OF PAVEMENT TO CONTROL DRAINAGE.

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:
VALLEY CURB "T" TURNAROUND

TEMPORARY

NOTE:
STANDARD CURB AND GUTTER MAY BE REQUIRED AT
THE END OF PAVEMENT TO CONTROL DRAINAGE.

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED APPROVED BY:
OFFSET VALLEY CURB TURNAROUND

TEMPORARY

NOTE:
STANDARD CURB AND GUTTER MAY BE REQUIRED AT THE END OF PAVEMENT TO CONTROL DRAINAGE.

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:
RESIDENTIAL CUL–DE–SAC

C/L

5' UTILITY-EASEMENT (MIN.)

45' R

27' B–B

50' R/W (MIN.)

5' UTILITY EASEMENT (MIN.)

CITY OF WINSTON–SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:
TYPICAL SECTION
RIBBON PAVEMENT
FOR USE WHERE APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

APPROVAL OF CROSS SECTIONS UNDER THIS ALTERNATIVE ARE SUBJECT TO INDIVIDUAL REVIEW AND APPROVAL BY PUBLIC WORKS / ENGINEERING STAFF SO AS TO AVOID SITUATIONS WHERE THE DESIGN RESULTS IN SIGHT DISTANCE, PAVEMENT STRUCTURE OR NECESSARY UTILITY PLACEMENTS BEING COMPROMISED.

MINIMUM DESIGN
1" SF 9.5A
2" S 9.5B
7" ABC

CONCRETE SIDEWALK REQUIRED ON ONE SIDE (MIN.)

THICKNESS OF S/W TO BE AS FOLLOWS:
RESIDENTIAL: 4" THICK (6" FROM PC TO PT AT INTERSECTION RADI & ACROSS DRIVeways)
COMMERCIAL: 6" THICK
INDUSTRIAL: 8" THICK (8" AT DRIVeways)

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
N.T.S. REVISED
APPROVED BY:

streets\street details\streetdetails.dwg V-10
TYPICAL SECTION
PRIVATE ROADS

STREET TREES
ONE TREE / LOT
(TYPICAL)

CONC. SIDEWALK

CABLE TV

SANITARY SEWER

WATER

MIN. 6’-0”

MIN. 6’-0”

MAX. 3’-6”

MAX. 5’-0”

MINS. 1’-0”

1/4”/FT.

1/4”/FT.

1/4”/FT.

1/2”/FT.

1/2”/FT.

2’-6”

A.B.C.

10’-0”

SIDEWALK & UTILITY EASEMENT & TREE SETBACK

10’-0”

OR ACCESS EASEMENT

40’ MIN. R/W

27’-0”

B-B

CABLE TV

PHONE

ELEC.

GAS

PHONE

MAX. 3’-1”

MAX. 3’-1”

ELEC.

MAX. 1’-2”

MAX. 1’-2”

1/2”

1/2”

1’-0” MIN.

1’-0” MIN.

6’-0” MIN.

6’-0” MIN.

APPROVAL OF CROSS SECTIONS UNDER THIS ALTERNATIVE ARE SUBJECT TO INDIVIDUAL REVIEW AND APPROVAL BY PUBLIC WORKS / ENGINEERING STAFF SO AS TO AVOID SITUATIONS WHERE THE DESIGN RESULTS IN SIGHT DISTANCE, PAVEMENT STRUCTURE OR NECESSARY UTILITY PLACEMENTS BEING COMPROMISED.

MINIMUM DESIGN

1” SF 9.5A

2” S 9.5B

7” ABC

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:
NOTES:

1. PRIVATE ROADS MUST MEET CITY STREET CONSTRUCTION REQUIREMENTS.

2. R/W SHALL BE A MIN. OF 40’ OR A 26’ PUBLIC ACCESS EASEMENT.

3. ALL PRIVATE ROADS REQUIRE DESIGN REVIEW AND ACCEPTANCE BY THE CITY ENGINEER FOR PAVEMENT, STORM DRAINS, GRADES, ALIGNMENT, ETC.

4. ALL PRIVATE ROADS REQUIRE A CITY DRIVEWAY PERMIT.

5. ALL PRIVATE ROADS SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER TO BE CONSTRUCTED AS DESIGNED.
COMMERCIAL DRIVEWAY

TAPERED ENTRANCE
25'-0" MIN. TO R/W LINE ON CORNER LOTS

R/W

10' UTILITY EASEMENT
MAX. 3:1 SLOPE

1/4"/FT TO 1/2"/FT

CURB & GUTTER

SEE DWG V- FOR ALLOW DRIVEWAY GRADES

NOTE: SIDEWALKS IF EXISTING OR REQUIRED SHALL BE ADJUSTED TO MEET ADA REQUIREMENTS AT DW AND SHALL BE 6" THICK DW PERMIT REQUIRED.

6" CONCRETE APRON (3000 PSI) MIN. OVER 6" ABC

8' OR TO R/W LINE WHICHEVER IS GREATER

OPTIONAL TURN DOWN CURB 3'-0" (TYP.)

MMAINTAIN FLOWLINE

20'-36' (TWO WAY)

RADII ENTRANCE

R/W

16'-20' (ONE WAY)

R=5'-10'

6" CONCRETE APRON (3000 PSI) MIN. OVER 6" ABC

R=5'-10'

MMAINTAIN FLOWLINE

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:
RESIDENTIAL DRIVEWAY

P/L

2' MIN.

CORNER LOTS
25' MIN. TO P/L

R/W

12'-20'

R/W

6" THICK CONCRETE APRON (3000 PSI MIN.)

3'-0" TURN DOWN CURB (TYP.)

SLOPE

B'

Curb & Gutter
Asphalt

2' Flare

EDGE OF ASPHALT

Maintain Flowline

NOTES:
1. WHERE NO CURB & CUTTER EXISTS, THE APRON BEGINS AT THE EDGE OF ASPHALT.
2. INSPECTION OF FORMWORK REQUIRED PRIOR TO INSTALLATION OF CONCRETE.
3. A 5' RADIUS MAY BE USED IN LIEU OF FLARE WHERE APPROVED BY THE CITY ENGINEER.
4. SIDEWALKS WHERE EXISTING MUST BE ADJUSTED TO MEET ADA REQUIREMENTS.
5. DRIVEWAYS OVER 20' WIDE MUST BE APPROVED BY THE CITY ENGINEER.
6. DRIVEWAY MUST EXTEND 20' FROM R/W LINE TO STRUCTURE (MIN.).

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:
DRIVEWAY GRADES

CONCRETE APRON (MONOLITHIC)

10' (MIN.)
(TO GRADE)

EXIST. GROUND

6" ABC (MIN.)

COMPACTED SUBGRADE

EXISTING CURB FLOW LINE SHALL BE MAINTAINED

DRIVEWAYS SHALL BE DESIGNED BY ENGINEER FOR PROPOSED CONDITIONS.

IF NO CURB & GUTTER EXISTS OR IS REQUIRED APRON BEGINS AT EDGE OF PAVEMENT.

EXISTING CURB FLOW LINE SHALL BE ADJUSTED TO MEET DRIVEWAY FLUSH IN ACCORDANCE WITH ADA REQUIREMENTS.

COMMERCIAL ENTRANCES

10' APRON (MIN.) (MONOLITHIC)

8' (MIN.)

EXIST. GROUND

+2.08%

-4% MAX.

+10% (MAX.)

6" CONC. (MIN.) (3000 PSI)

COMPACTED SUBGRADE (STONE BASE RECOMMENDED)

EXISTING CURB FLOW LINE SHALL BE MAINTAINED

DRIVEWAYS SHALL BE DESIGNED BY ENGINEER AS NECESSARY.

IF NO CURB & GUTTER EXISTS, APRON BEGINS AT EDGE OF PAVEMENT.

SIDEWALKS IF EXISTING SHALL BE ADJUSTED TO MEET DRIVEWAY FLUSH AND SHALL MEET ADA REQUIREMENTS.

RESIDENTIAL ENTRANCES

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED
APPROVED BY:

V-15
NOTE:
STOCKPILE EXCESS GRANITE CURB
ON R/W SAFELY FOR CITY PICKUP.

HEIGHT DETERMINED BY EXISTING CURB

SEAL JOINT AS DIRECTED

ROAD SURFACE

VARIES

CONCRETE (2500 P.S.I.)

BRICK BATS

BRICK BATS

6"

PER FOOT

GRANITE CURB

SUBGRADE

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED

APPROVED BY:

V-16
SECTION VI

PERMITS
## City of Winston-Salem/Forsyth County
### Permit Application for Water and/or Sewer Line Extensions

<table>
<thead>
<tr>
<th>Column</th>
<th>Value</th>
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<tbody>
<tr>
<td>1. Applicant Legal Name:</td>
<td>Project Contact:</td>
</tr>
<tr>
<td>Main Office: (county / state)</td>
<td></td>
</tr>
<tr>
<td>Business Address: (mailing address / street / city / state / zip)</td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
</tr>
<tr>
<td>Email (or Fax):</td>
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</tbody>
</table>

| 2. Person(s) authorized to convey property (type or print):          |                                                                        |
| □ Individual (married individuals must list spouse)                   | □ General Partnership                                                 |
| □ General Partnership                                                | □ Limited Partnership                                                |
| □ Limited Partnership                                                |                                                                        |

| 3. Project Name:                                                    | Location:                                                           |
| Address:                                                             |                                                                      |

| 4. Check all that apply: Water System                               | Sanitary Sewer System                                              |
| □ PUBLIC Extension                                                  | □ PUBLIC Extension                                                 |
| □ PRIVATE Service                                                   | □ PRIVATE Service                                                  |
| □ Domestic Meter(s)                                                 | □ Domestic Wastewater                                               |
| □ Sprinkler System(s)                                               | □ Industrial Wastewater                                             |
| □ Private Hydrant(s)                                                | □ Other:                                                           |

| 5. Project Description (linear feet, pipe type, diameter, etc):      | Estimated Total Average Daily Sewage Flow: GPD                      |
| PUBLIC: MH HYD 6" GV 8" GV 12" GV                                    | (Calculate for this project only, not the watershed.)              |
| Qty:                                                                 | Number/Type of Units or Means of Calculation:                      |
|                                                                      | (Attach additional details as necessary)                           |
|                                                                      | Discharge to: □ Elledge WWTP (Salem Creek)  -OR- □ Muddy Creek WWTP (Yadkin River) |

| 6. Engineering Firm:                                                | Phone:                                                              |
| Address:                                                             | Cell:                                                               |
| Email:                                                              | N.C.P.E. #                                                          |
| Engineer:                                                           |                                                                     |

| 7. Applicant agrees that the proposed works will be constructed,    |                                                                        |
| supervised, and operated (as applicable) in accordance with approved |                                                                        |
| plans and specifications or approved revisions thereto. For private  |                                                                        |
| systems, applicant agrees to adhere to rules governed by NCDENR Public |                                                                        |
| Water Supply Section and Division of Water Quality. No construction  |                                                                        |
| shall be undertaken, and no contract for construction, alteration,   |                                                                        |
| or installation shall be entered into until a Permit and Authorization |                                                                        |
| to Construct is issued.                                             |                                                                        |

| Signature:                                                          | Date:                                                               |
|                                                                   |                                                                     |

### CITY USE ONLY

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Water Permit Number:</td>
<td>Block and Lot:</td>
</tr>
<tr>
<td>Subdivision or Project Number:</td>
<td></td>
</tr>
<tr>
<td>Sewer Permit Number:</td>
<td>PIN:</td>
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<tr>
<td>Assigned Flow - Sewer (MGD):</td>
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</tr>
</tbody>
</table>
A. Water/Sewer Permits

Water/sewer permits in Winston-Salem Forsyth County are issued through our Utilities Plan Review section. Contact our Engineer at 336/747-6992 for questions and information regarding issuance of utility permits. Plans can be hand delivered, or overnight delivery to: Utilities Plan Review, City of Winston-Salem, 100 E. First Street, Suite 235, Winston-Salem, NC 27101.

B. Driveway Permits

Driveway permits in the City of Winston Salem are issued through our Engineering Office. Contact our Engineer at 336-747-6846 for questions and information regarding issuance of driveway permits.

All driveway aprons must be inspected prior to concrete placement.

Permit may be hand delivered, mailed, or overnight delivery to

Driveway Permit Officer
City of Winston-Salem
100 E. First Street, Suite 235
Winston-Salem, North Carolina 27102

C. Grading Permits

Grading permits are issued through our Inspections Office in Erosion Control. Contact Inspections Office at 336-727-2388 for questions and information regarding issuance of grading permits.

D. Right of Way Tree Planting Permits

Right of Way tree planting permits are issued through our Urban Forestry Division in Vegetation Management. A permit to plant trees must be applied for prior to planting, as required by city ordinance section 74-302. A drawing or map of the proposed planting site(s) shall be provided with the construction drawings and with the permit. Planting permits must meet all applicable planting standards and specifications described in the planting standards. All permit requests must provide the following information:

- Name of person requesting permit and contact number
- Location(s) and map/drawing of desired planting(s) area(s)
- Name of tree(s) to be planted – Number of trees – Size of plant material. Include location of plantings by tree type
- Owner of property name and contact number if different than name on permit
- Location of utilities, driveways, and other site features in the planting area. Include distance trees will be from these features.
- Distance of tree spacing and width of planting median
- Warranty details on planted material

The landscape plan shall be included with the construction drawings and shall include all of the above and appropriate planting details.
All applications for tree permits can be obtained from the City of Winston-Salem’s Vegetation Management Division by calling (336) 748-3019 Monday through Friday, between 7:00a and 4:00p. A permit can be requested in writing by sending the request to J. Keith Finch, Urban Forester – Vegetation Management, PO Box 2511, Winston-Salem, NC 27102. A request can also be submitted by E-Mail to keithf@cityofws.org.

Following a permit request, staff will arrange a site visit to determine appropriateness and qualification. A written response to the permit (whether approved or disapproved) will normally be issued within seven (7) working days after a permit request is received. Master permits may take longer depending on the circumstance.

Stormwater management permits in the City of Winston-Salem are issued through our Stormwater Office. Contact our engineer at 336/747-6961.
Application to Plant a Tree  
City of Winston–Salem

Please fill out this application (please print) and return to us at:

Vegetation Management – Urban Forester  
City of Winston-Salem  
PO Box 2511  
Winston-Salem, NC  27102

When we receive your application, we will make a site visit to check the planting areas and adherence to the planting standards. We try to complete the permit within 7 working days from getting the application.

Street Tree Planting Questionnaire

Name: ________________________________________________________________________________

Mailing Address (include zip code): ________________________________________________________

Phone Number: ________________________________________________________________________

Planting address if different from mailing address: ___________________________________________

Site and Utility Information

1. Will trees be planted on the City of Winston-Salem’s right of way? __________

2. What is the width of the planting strip? (Measure from the inside edge of the curb to the edge of the sidewalk). 
   ____________________________________________________________________________

3. Does the planting strip have overhead telephone, cablevision and/or power lines running parallel to the curb? 
   _____

4. Are there utilities (water meter, hydrant, light pole, etc…) within the planting area? _______________
   *Refer to planting standards for distance trees must be planted from utilities.

5. What is the ground cover on the planting strip (grass, gravel, dirt, concrete, etc…)? _______________

6. How many and what kinds of trees are you proposing to plant? (Refer to Tree Planting Standards) *Include tree 
   types and their locations on map.  
   ____________________________________________________________________________
   ____________________________________________________________________________

7. What will be the spacing between trees? ____________________________________________________________________________

8. Who will be the contractor in charge of the tree planting? ____________________________

9. What is the size of the tree(s) being planted? (Dia., height, container or B&B) 
   ____________________________________________________________________________

10. Warranty on plant material _______________________________________________________
    * A process/plan must be in place to provide 1” of water per tree per week for the first year.  
    * Please include a map of the project with planting sites listed. Include driveways, utilities, etc…
CITY OF WINSTON-SALEM
DRIVEWAY PERMIT CHECKLIST

APPLICATION FORM

__ Type of Construction
__ Current Zoning
__ Proposed Zoning
__ Owners Signature
__ Witness Signature
__ Check for Two Hundred Dollars ($200.00) payable to City of Winston-Salem
__ Check for Fifty Dollars ($50.00) NCDOT (if applicable)

PLAN REQUIREMENTS

__ Location Map Clearly showing proposed site and surrounding streets
__ Three (3) complete sets of sealed plans for City of Winston-Salem review
__ Five (5) complete sets of Sealed Plans NCDOT (if applicable)
__ One (1) Copy of Approved Rezoning (if applicable) available from Planning Department
__ One (1) Copy of Approved Erosion Control Plan (if applicable)
__ One (1) Copy of Approved Storm Water Plan (if applicable)
__ Copy of Contractors bond held by the City of W-S available from City of Winston-Salem Treasurers Office

GENERAL INFORMATION

Do not submit plans for approval prior to City Council rezoning approval. The owners name shall be clearly legible on the driveway permit application along with all other pertinent contact information office, cell, and fax telephone numbers.

VI-5
Submittal is for commercial driveways and private street tie-in to public streets within the City limits of Winston-Salem.
City of Winston-Salem Driveway Inspectors signature is required for all connections to NCDOT streets within the City limits of Winston-Salem.

Complete set of plans includes **ALL** site infrastructures:
Cover sheet, water, sewer, storm drainage, street plan and profiles, detail sheets, all building locations, landscape plan, traffic study (if applicable), roadway improvements including plan and profile, and existing site conditions.

Temporary construction driveway shall be installed in the location indicated on the approved Erosion Control plan. Any variance from approved Erosion Control plan location shall be on a case-by-case basis.

If site requires joint approval by City of Winston-Salem and NCDOT, both approval packets shall be delivered to the City of Winston-Salem Driveway Inspector. Upon approval by the City of Winston-Salem Driveway Inspector packet shall be forward plans to NCDOT for approval.

**Checklist shall accompany plans and permits for approval. Plans will not be processed without completed checklist.**

**Permit may be hand delivered, mailed, or overnight delivery to**
Al Gaskill, PE
City of Winston-Salem Engineering Division
Suite 235, Bryce A. Stuart Municipal Building
PO Box 2511
Winston-Salem North Carolina 27102

Driveway aprons shall be inspected prior to installation of concrete. Applicant or his agent shall call for inspection of the forms and stone base two (2) working days prior to pouring concrete. Contact Erick Smith at (336) 462-7050.
Location of property: Street:______________________________________________________

Distance from the intersection of ____________________ Street ______________ft.:  N___S___E___W___

Property will be used for:___________________________________________________________________

Property Zoning:________________________________

Type Construction (building, parking lot, etc.):__________________________________________________

Provide sketch showing proposed building, existing buildings, driveways, pavement width, right-of-way width, street features, storm drainage details, and other related information.

**AGREEMENT**

I, the undersigned property owner, request permission to construct driveway(s) on public right-of-way at the above location. I agree to construct and maintain the driveway(s) in absolute conformance with the current *Manual on Driveway Entrance Regulations* as adopted by the City of Winston-Salem and incorporated by reference in this Agreement. I agree to construct and maintain driveway(s) in a safe manner so as not to interfere with or endanger public travel.

I agree that no signs or objects will be placed on or over the public right-of-way.

I agree that the driveway(s) will be constructed as shown on the sketch on the attached plans which are incorporated by reference into this Agreement.

I agree that driveway(s) as shown in this Agreement includes any approach tapers, storage lanes, speed change lanes, or median openings as are deemed necessary.

I agree that if any future improvements to the roadway become necessary, the portion of the driveway located on public right-of-way will be considered the property of the City of Winston-Salem and I will not be entitled to reimbursement or have any claim for present or future expenditures for additional driveway construction that might be necessary.

I agree that this permit becomes null and void if construction of the driveway(s) is not completed within **one year** after the approval date below.

I agree to indemnify, save and hold harmless the City, their agents, servants, and employees from and against all claims, damages, loss, expense or liability arising from or in any way growing out of the granting of this permit.

**Property Owner:**
Name:  ______________________________
Signature: ______________________________
Address: ______________________________
Phone:        ______________________________

**Witness:**
Name:  ______________________________
Signature: ______________________________
Address: ______________________________

**Driveways:**
1. Width:_____________feet, located on ____________________ Street, street pavement
   width:__________feet, right-of-way width:_____________feet.
2. Width:_____________feet, located on ____________________ Street, street pavement
   width:__________feet, right-of-way width:_____________feet.
3. Width:_____________feet, located on ____________________ Street, street pavement
   width:__________feet, right-of-way width:_____________feet.
4. Width:_____________feet, located on ____________________ Street, street pavement
   width:__________feet, right-of-way width:_____________feet.

**FOR CITY USE ONLY:**

Note: Submit this application and three (3) copies of your plans, **along with a check for $200** made payable to the **City of Winston-Salem.**

Approved: ______________________________
Date: ______________________________
APPLICATION

1. Project/Site Information

Project/Site Name: ____________________________________________________________

Project Location (Address): ______________________________________________________
________________________________________________________________________________

Block/Lot(s): ___________________________________________________________________

Total Site Area (ac): _______________ Total Proposed Disturbed Area (ac): _______________

Existing Built-Upon Area, BUA (ac): _____ Proposed BUA (ac): _____ Proposed BUA (%): _____

For Subdivisions: Number of lots __________ Lot density ______________

Site within a Water-Supply Watershed: Y N Low Density Development: Y N

2. Engineer/Designer Information

Engineer Name: _______________________________________ NC PE License #: _______________

Engineers Company/Firm: _______________________________________________________________________

Engineers Company/Firm Address: _______________________________________________________________________

Office Phone: ____________________ Cell Phone: ____________________ Fax: _______________

E-mail: _____________________________________________________________________________

Engineers Signature: ______________________________________________ Date: ________________
3. **Project Owner Information**

Owner Name: ________________________________________________________________

Owner Company/Firm: ____________________________________________________________

Owner Company/Firm Address: ______________________________________________________

__________________________________________________________

Office Phone: ____________________ Cell Phone: ____________________ Fax: _________________

E-mail: ___________________________________________________________________________

Owner Signature: ____________________________ Date: _____________________

4. **Contractor Information (if available at time of application)**

Contractor Name: ________________________________________________________________

Contractor Company/Firm: __________________________________________________________

Contractor Company/Firm Address: ______________________________________________________

__________________________________________________________

Office Phone: ____________________ Cell Phone: ____________________ Fax: _________________

E-mail: ___________________________________________________________________________

5. **Posting of Financial Security for Required Stormwater Control Structure(s)**

Applicant/Owner must provide adequate financial assurance in the form of a performance bond and/or other cash security for required stormwater control structure(s) prior to issuance of SWM Permit.] Refer to sections 75-402 and 75-404 of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance for details.

Applicant/Owner shall file with the City of Winston-Salem one of the following (check one):

- Performance bond
- Irrevocable letter of credit issued by a bank
- Establishment and funding of an escrow account

Amount of Financial Security Posted: $________________________________

Date Financial Security provided to City of Winston-Salem: _____________________________

- Not applicable [No required stormwater control structure(s)]
6. **Information Needed for SWM Concept Meeting (See section 75-203(a) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance for more details)**

*Check the boxes to verify that the item has been addressed/submitted*

- ☐ Plan of the proposed development site with approximate locations of property boundaries, roads, land use, topographic features, streams, water bodies, wetlands and any feature related to stormwater
- ☐ Drainage area map showing approximate location of proposed development and pertinent drainage areas, including off-site areas draining to the proposed development
- ☐ A conceptual plan for proposed stormwater management features that would enable the site to meet stormwater quantity and quality regulations. Note that this concept plan need only indicate what the designer plans to do to manage stormwater. For simple sites, a verbal description may suffice.

7. **Submittal Requirements for Evaluation of a Downstream No Adverse Impact Study (See section 75-203(b)(2) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance for more details).**

*Submit two copies of the report for review (Report to be spirally bound preferably. 3 ring binders not accepted)*

*Check the boxes to verify that the item has been addressed/included in the report*

- ☐ Cover sheet with project title; project name and address; owner’s name, address, email and phone number; preparer’s name, address, email and phone number; and preparer’s seal, signature and date
- ☐ Table of contents (with sequential numbering of pages) showing report sections, appendices, tables and figures
- ☐ Project narrative – brief description of project, pre and post development site conditions, hydrologic and hydraulic study
- ☐ Description of the methodologies, assumptions and procedures used in preparing the analysis
- ☐ Summary of any previous hydrologic/hydraulic studies or other information which may pertain to the development of the property
- ☐ Hydrologic information (including maps and plans), data and quantities for pre and post project conditions
  - ☐ Site and watershed topography
  - ☐ Drainage areas (mapped and quantified)
  - ☐ Land uses (mapped and quantified)
  - ☐ Soils types (mapped and quantified, include hydrologic types)
  - ☐ Drainage paths and lengths (mapped and quantified)
  - ☐ Precipitation data (most recent data from NOAA website)
☐ Time of concentration (Tc) calculations for existing and proposed site conditions and drainage features

☐ Curve Number (CN) and/or Rational C analysis and determinations for existing and proposed site conditions (also show on the SWM Plan or separate map)

☐ Peak flows and hydrographs (as applicable) used to analyze to a no adverse impact conclusion

☐ Calculations and procedures used to determine a no adverse impact conclusion regarding downstream properties and conveyances with regard to flooding, erosion and also capacity of conveyances for events up to and including the 25 year, 6 hour rainfall event

☐ Provide hard copy summary information, digital hydrologic and hydraulic models, and any other stormwater analysis and design calculations as appropriate for the site to satisfy ordinance requirements

Hydraulic performance analyses for off-site impacts.

☐ Analyze to a suitable downstream point – typically the 10% point which is defined as the point downstream where the proposed site development or redevelopment represents less than 10% of the total watershed area draining to that point. Other study analysis points may be used if approved by the Stormwater Engineer in advance of submittal, but are less common. Refer to section 75-203(b)(2) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance for more details.

☐ Evaluate road crossings for changes in service level due to proposed development. Write N/A in check box if not applicable

☐ Evaluate impacts to existing and/or off-site impounding structures. Write N/A in check box if not applicable

☐ Evaluate potential increases in structural flooding impacts. Write N/A in check box if not applicable

☐ Evaluate capacity of receiving conveyances such as pipes, culverts, swales etc. Provide design information and show increases in water surface elevations for receiving channels at suitable cross section intervals.

☐ Has the receiving natural channel or waterbody (on site and/or offsite to the 10% point) been evaluated to ensure that the downstream conveyances are not eroded and/or degraded by altered stormwater flows from the development or re-development? Mitigation measures shall be implemented where the volume of runoff from a post development 2 year, 1 hour rainfall event is 10% greater than the volume of the runoff from a predevelopment 2 year, 1 hour rainfall event. Calculations must be provided to validate no impacts. If mitigation is required detention systems are a satisfactory means to mitigate the impact. If the calculation shows detention systems are needed then the no adverse impact study no longer applies and the designer should follow the requirements of Section 8, 9, 10 and 11 of this application.

8. Submittal requirements for the Hydrologic and Hydraulic Analysis Report/Study for Non-Exempt Sites (Sites that will incorporate a stormwater management device) Note: Upon mutual agreement with the designer, the City will review hydrologic data and analysis prior to hydraulic analysis and design.
Submit two copies of the report for review. (Report to be spirally bound preferably. 3 ring binders not accepted)

Check the boxes to verify that the item has been addressed/included in the report

☐ Cover sheet with project title; project name and address; owner’s name, address, email and phone number; preparer’s name, address, email, and phone number; and preparer’s seal, signature and date

☐ Table of contents (with sequential numbering of pages) showing report sections, appendices, tables and figures

☐ Project narrative – brief description of project, pre- and post-development site conditions, hydrologic and hydraulic study, and proposed SWM plan

☐ Description of the methodologies, assumptions and procedures used in preparing the analysis

☐ Summary of any previous hydrologic/hydraulic studies or other information which may pertain to the development of the property

☐ Geotechnical Engineering Analysis Report including details of subsurface exploration which shows the location of the seasonally high groundwater elevation. Borings or other approved means of subsurface exploration, shall be taken at, or as close as practicable to the immediate vicinity of each proposed stormwater management device

8.(a) Hydrologic Section: Hydrologic information (including maps and plans), data, and quantities for pre and post-project conditions

Check the boxes to verify that the item has been addressed/included in this section of the report

☐ Location map showing project in relation to adjacent properties, streets and nearby water features

☐ Site and watershed topography

☐ Drainage areas and site outfalls (mapped and quantified)

☐ Land uses (mapped and quantified)

☐ Soils types (mapped and quantified, include hydrologic types)

☐ Drainage paths and lengths (mapped and quantified)

☐ Precipitation data (most recent data from NOAA website)

☐ Time of concentration (Tc) calculations for existing and proposed site conditions and drainage features

☐ Curve Number (CN) and/or Rational C analysis and determinations for existing and proposed site conditions (also show on the SWM Plan or separate map)

☐ Peak flows and hydrographs (as applicable) to analyze and design site stormwater management features

☐ Calculations and procedures used to design permanent structural stormwater BMPs/controls (note: analysis and design of stormwater quality BMPs must be based on the latest version of the State of NC DWQ Stormwater BMP Practices Manual)
Hydrologic data sheets, for both pre and post development conditions for each runoff concentration point including time of concentration calculations, rainfall intensities, runoff coefficients and curve numbers and peak discharges.

Summary table listing all runoff concentration points, corresponding drainage area, calculated peak discharges for pre and post development conditions and differences in discharges.

For sites that will have stormwater management quality devices, but for which the designer is submitting a downstream no adverse impact study to satisfy the quantity aspect of the site, a summary table for the downstream hydrologic analysis must be provided. This must include the drainage area, calculated peak discharges for pre and post development conditions and differences in discharges at the outfall(s) of the site, each downstream tributary junction and each public or major private downstream stormwater conveyance structure to the suitable downstream analysis point – typically the 10% point which is defined as the point downstream where the proposed site development or redevelopment represents less than 10% of the total watershed area draining to that point must be provided. Designer should reference and also complete section 7 of this checklist if this applies. Write N/A in check box if not applicable.

8.(b) Hydraulics Section – Note: vegetative conveyances should be designed and used to the maximum extent practicable.

Check the boxes to verify that the item has been addressed/included in this section of the report.

Open channel design and capacity computations (for swales etc.) Note: if the development has a stormwater device designed for quantity controls for the 2, 10 and 25 year, 6 hour rainfall event, then the conveyance capacity designs must be based on the 25 year, 6 hour rainfall event. Also provide design information on type of liner to be used. Permanent diversions conveying off-site runoff around the site been developed must also meet the aforementioned design criteria.

Design computations for all culverts, storm drains and inlets. Storm drain design shall include a labeled schematic of the storm drain network, design discharges, pipe capacities, pipe sizes, slopes and lengths, profiles, outlet velocities, upstream and downstream invert elevations and hydraulic grade line information. Note: if the development has a stormwater device designed for quantity controls for the 2, 10 and 25 year, 6 hour rainfall event, then the conveyance capacity designs must be based on the 25 year, 6 hour rainfall event. Permanent diversions conveying off-site runoff around the site been developed must also meet this design criteria.

All supporting data, printouts, tables, nomographs, etc., which are referenced in the report.

Provide design calculations for all rip-rap aprons and include determination of rip-rap length, width, depth, D50 size and class of stone to be used. If other means of energy dissipation are used similar adequate design information is required to be provided in the report.

Provide hard copy summary information, digital hydrologic and hydraulic models, and any other stormwater analysis and design calculations as appropriate for the site to satisfy ordinance requirements.

8.(c) Stormwater Management System Section

Check the boxes to verify that the item has been addressed/included in this section of the report.

Description of how the overall stormwater management plan and facilities design(s) will comply with the City of Winston-Salem’s post construction stormwater ordinance regarding water quality, water quantity and release rates and channel protection.

Water Quality
Does the development or redevelopment cumulatively disturb less than one acre and is not part of a larger common plan of development or sale. (If yes then development is exempt from water quality requirements). Write Y for yes or N for no in the check box

Does the development or redevelopment cumulatively disturb less than one acre but the activity is part of a larger common plan of development or sale, even though multiple, separate or distinct activities take place at different times and on different schedules. (If yes then development is not exempt from water quality requirements) Write Y for yes or N for no in the check box

Is the project a low density or high density development? Low density is defined as a project that has no more than 2 dwelling units per acre or 24% built upon area for all residential development and nonresidential development. Low density projects must comply with section 75-302(a) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance. High density projects must comply with section 75-302(b) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance. Write L for low density or H for high density in the check box

Is the structural BMP(s) designed to treat the runoff volume leaving the project site for the first 1” of rain and is the BMP an approved device contained and referenced in the latest version of the State of NC DWQ Stormwater BMP Practices Manual. Provide detailed calculations in the report. Write Y for yes or N for no in the check box (If No then project is not in compliance and will need to be redesigned)

For high density projects is the first inch storage volume from the BMP(s) discharged at a flow rate equal to or less than the predevelopment discharge flow rate for the 1 year, 24 hour rainfall event? Write Y for yes, N for no or N/A for not applicable (if it’s a low density project) in the check box (If No then project is not in compliance and will need to be redesigned)

Does the BMP(s) comply with and meet with all of the requirements of the State of NC DWQ Stormwater BMP Practices Manual for the chapter(s) relating to that particular BMP(s), including but not limited to the Major Design Elements section of the chapter? For example, one of the criteria for a wet pond design, is designing the pond for the runoff to drawdown in no less than 48 hours but no more than 120 hours? Provide detailed calculations in the report to satisfy all applicable major design elements of the chosen BMP(s). Write Y for yes or N for no in the check box (If No then project is not in compliance and will need to be redesigned).

If a wet pond is chosen as the BMP(s) to serve the development or re-development has a level spreader and filter strip been designed at the outlet from the pond? Provide design calculations for them in the report. Note: if the wet pond is designed for 90% TSS (Total Suspended Solids) removal efficiency then the combination of the level spreader and filter strip is no longer required to be designed at the outlet and an energy dissipater device such as a rip-rap should be designed and provided at the outlet pipe. Write Y for yes, N for no, or “90%” if pond is designed for that removal efficiency rate (If No and the pond is designed for 85% TSS removal then project is not in compliance and will need to be redesigned to include a level spreader and filter strip or redesigned for 90% TSS removal)

If a wet pond is chosen as the BMP(s) is the volume of the forebay equal to 20% of the total pond volume? Provide detailed calculations in the report. Write Y for yes or N for no in the check box (If No then project is not in compliance and will need to be redesigned).

Are all volume and surface area calculations provided? Check the box to verify that the item has been addressed/included in this section of the report

Is data such as total site area and total impervious surface area provided? Check the box to verify that the item has been addressed/included in this section of the report

Is there and overflow device or emergency spillway provided in the design? Verify for what storm event it is designed for and provide appropriate design data. Check the box to verify that the item has been addressed/included in this section of the report
[Box to check] Are all built upon areas meeting the landward buffer requirements for all perennial and intermittent surface waters, as stipulated in section 75-302(2) for low density projects and section 75-302(5) for high density projects, in the City of Winston-Salem’s Post Construction Stormwater Management Ordinance? Note: the buffer widths are based on disturbed area. Therefore if the plans show less than 10 acres disturbed during the construction of the development or redevelopment then the required landward buffer width, as measured from the top of stream bank, shall be 30 feet and the undisturbed buffer width (within the landward buffer and measured from the top of creek back) shall be 15 feet. For a disturbed area of 10 to 50 acres the buffer width shall be 50 feet and 25 feet respectively, etc. **Check the box to verify that the item has been addressed/included in this section of the report**

[Box to check] Is the site located within the Salem Lake Water Supply Watershed? (If yes all requirements associated with the water supply watershed ordinance must be met.) **Write Y for yes or N for no in the check box**

[Box to check] Is stormwater runoff conveyed in and from the development via vegetated conveyances to the maximum extent practicable? **Check the box to verify that the item has been addressed/included in this section of the report**

Flow splitter designs or other means of bypassing flows must be provided with calculations used to determine weir wall elevations etc. (For example in the case of using a bio-retention cell to treat for the first inch or runoff and bypassing the flow above the first inch to a manifold device for quantity control). **Check the box to verify that the item has been addressed/included in this section of the report or write N/A in the box if not applicable**

### Water Quantity

[Box to check] Does this development or redevelopment cumulatively create less than 20,000 square feet for both residential and non-residential uses? **Write Y for yes or N for no in the check box** (If yes, then development is exempt from quantity management)

[Box to check] If the project is a redevelopment activity, is the proposed impervious area equal to or less than the preexisting impervious area? **Write Y for yes or N for no in the check box** (If yes, then development is exempt from quantity management.)

[Box to check] Does the development or redevelopment disturb less than 3 acres and is not part of a larger common plan of development, redevelopment or sale and is less than 24% built upon area? **Write Y for yes or N for no in the check box** (If yes, then the standards for stormwater quantity shall be limited to controlling only the pre versus post development peaks for the 2 and 10 year design storms. If no, then the pre versus post development peaks for the 2, 10 and 25 year design storms must be controlled as well as managing the difference between the pre versus post development increase in the 25 year design storm volume)

[Box to check] Is the BMP designed to manage the 2, 10 and 25 year storm events of minimum 6 hour duration? Provide detailed calculations in the report. **Check the box to verify that the item has been addressed/included in this section of the report**

[Box to check] Is the BMP designed to limit the post development peak discharge rates to equal to or less than the pre development rates for the 2, 10 and 25 year storm events? Provide detailed calculations in the report. **Check the box to verify that the item has been addressed/included in this section of the report**

[Box to check] Is the BMP designed to detain the stormwater runoff volume equal to the difference between the pre and post development volume for the 25 year storm of 6 hour duration and is the volume detained released over a period of no less than 48 hours but no longer than 120 hours? Provide detailed calculations in the report. **Check the box to verify that the item has been addressed/included in this section of the report**

[Box to check] Does the development of the site increase flooding impacts to affected structures in the 100-year flood event for properties upstream and downstream of the site? **Check the box to verify that the item has been addressed/included in this section of the report**

VI-15
□ Description and calculations provided of measures taken to prevent discharge from any stormwater collection system or structure into any natural or surface drainage channel or feature that may cause damage to the receiving system? If designer anticipates no damage then adequate calculations must be provided to validate his/her opinion. **Check the box to verify that the item has been addressed/included in this section of the report**

□ Has the receiving natural channel or water body (on site and/or off site) been evaluated to ensure that downstream conveyances are not eroded and/or degraded by altered stormwater flows from the development or redevelopment? Mitigation measures shall be implemented where the volume of runoff from a post development 2 year, 1 hour rainfall event is 10% greater than the volume of the runoff from a predevelopment 2 year, 1 hour rainfall event. Calculations must be provided to validate no impacts. Note: Detention systems shall satisfy this requirement. If no detention is provided then calculations need to be provided to validate his/her opinion. **Check the box to verify that the item has been addressed/included in this section of the report**

□ Detailed reservoir routing stage storage and other calculation sheets for all required design storms provided. **Check the box to verify that the item has been addressed/included in this section of the report**

□ Plotted inflow and outflow hydrographs (preferable superimposed) provided. **Check the box to verify that the item has been addressed/included in this section of the report**

□ Are any water impounding structures (dams) designed in accordance with NC Dam Safety standards and if required reviewed and approved by the NC Dam Safety Engineer? **Write Y for yes or N for no in the check** (If yes, provide a copy of approval from the State)

□ If retaining walls are utilized, are free body diagrams showing all forces, moments and computations provided for determining factors of safety against sliding and overturning. **Check the box to verify that the item has been addressed/included in this section of the report**

9. **Submittal requirements for the Site/Stormwater Management Plan set**

Submit two copies of the plans for review (Plan sheets should be 36” x 24”)

**Check the boxes to verify that these items have been addressed/included at a minimum in the submitted proposed Site/Stormwater Management plan sets. More information may be required by the City of Winston-Salem as directed.**

□ Plan sheet(s) clearly labeled as “Stormwater Management Plan(s)” on cover sheet. Plan sets must include the following sheets at a minimum: Existing site plans, proposed site plan, grading and drainage plan, utility plan, stormwater management plan, easement plan, erosion control plans, details sheets for stormwater management and other relevant drainage conveyances to the stormwater management system, drainage delineation sheets etc. Other sheets may be required by the City of Winston-Salem if necessary

□ Sealed and certified plan set: All plan sheets shall be signed and sealed by a professional engineer or landscape architect, to the extent that the General Statutes, Chapter 89A, allow

□ Date(s) of preparation and all revisions

□ Vicinity map (upper right corner of top sheet)

□ North arrow

□ Appropriate scale

□ Appropriate legend identifying features and layers for all plan sheets.
- Established benchmark of known elevation to which every other elevation is referenced
- Property boundary lines for the proposed development/redevelopment site, along with adjacent property lot lines and street right of way lines. Indicate if streets are private or public on the plans.
- Existing and proposed zoning and land use
- Location(s) of existing easements (temporary and permanent, public and private). **Write N/A in check box if not applicable**
- Proposed access locations/easements for future maintenance of stormwater management facilities (15-ft minimum maintenance and access easements required for and to surround all permanent stormwater BMP(s) and all conveyances to the BMP(s) and the maintenance and access easements must connect to a public right-of-way)
- Existing and proposed utilities
- Existing and proposed stormwater discharge points (surface and subsurface flows)
- Existing and proposed drainage basins, sub basins and land use boundaries. (Contributing basins that extend beyond the site boundaries may be delineated on a separate map)
- Drainage paths and lengths used to determine the time of concentration. Include items depending on method used (rational, TR55 etc.) such as upper and lower elevations, length of sheet flow, shallow concentrated flow, channel flow, land slope, channel slope, dimensions of channel (piped and open channel), surface descriptions (paved/unpaved) etc.
- Identify and delineate drainage area and flow paths of runoff to each structural BMP/control, where applicable
- Streams, lakes, ponds, impoundments, drainage swales, conveyances, floodplains (including 100-year floodplain, floodway fringe, 50% flood fringe line (also called the “floodplain no fill line”, etc.)) wetlands, natural storage and other physical or environmentally sensitive features within or adjacent to the project area. **Write N/A in check box if not applicable**
- Delineation of all existing and proposed impervious surfaces including locations of buildings, roads, parking areas and other permanent impervious structures or ground coverings.
- Existing and proposed site topography showing existing and proposed drainage patterns, including drainage area boundaries and flow patterns (Note: utilize a contour interval appropriate for the site conditions, typically 2-ft unless specific site conditions dictate otherwise, and extend contours a minimum of 200 feet beyond the limits of the proposed development.)
- Identify and label all proposed stormwater drainage systems including but not limited to storm drainage inlets, catch basins, junction boxes etc. showing their location, details, profiles, cross-sections and other specifications as necessary to be able to construct all of the proposed major and minor stormwater management conveyance systems (Indicate type and size of conveyance, e.g. storm drainage pipe, grass swale, diversion, channel lining, storm sewer etc.) Note the conveyances must be designed for the 25 year event unless otherwise exempt.
- Roof drainage directions and roof leader locations
- Proposed limits of disturbance
Estimated seasonal high groundwater elevation (documented in geotechnical report) in areas to be used for stormwater retention, detention or infiltration. Show this elevation in the profile view of the proposed BMP(s)

Hydraulic data summary for all proposed pipes and/or channels. (Designed for 25 year event unless otherwise exempt)

Construction notes, specifications and design details for any existing stormwater system components if applicable. Write N/A in check box if not applicable

Recommendations from any soils engineering or engineering geology report incorporated in the plans and/or specifications if applicable. Write N/A in check box if not applicable

Dates and reference number of the soils report(s) together with the names, addresses and phone numbers of the firm(s) or individual(s) who prepared the report(s). Write N/A in check box if not applicable

Details of all components of the proposed stormwater management system including:

- Plan views showing the proposed BMP(s) locations, in combination with the site plan map.
- Detailed cross-sections and profiles for each BMP showing critical design features, side slopes, structural components, soil profiles, design elevations including temporary water quality elevations, 2, 10 and 25 year event peak elevations, spillway elevations, riser dimensions and elevations, orifice and weir dimensions elevations and details, seasonal high water table elevations etc. Details shown on the profile can vary depending on type of BMP chosen. For instance, a wet pond will typically entail all of the aforementioned items as it can attenuate for both quality and quantity. However a bio-retention cell for example, is typically designed to provide quality control for the first inch of runoff only. Therefore the volume and peak attenuation is typically achieved by bypassing the overflow above the first inch to another BMP designed to control for quantity such as an underground manifold device. Therefore detailed profiles will be required for both the biocell and manifold device with applicable design elevations referenced in each profile. Details of flow splitters/bypass weirs etc. should also be provided on the plans.
- If the chosen BMP(s) requires a forebay per the State of NC DWQ Stormwater BMP Practices Manual, ensure it is shown and labeled and the surface area and volume are shown on the plan for both the forebay and the entire device. For example in the case of a wet pond the forebay volume must be 20% of the total pond volume, therefore the total pond volume as well as the forebay volume must be indicated
- Average water depth (if applicable to your chosen BMP(s)
- Permanent pool surface area (if applicable to your chosen BMP(s)
- To avoid short circuiting of a wet pond (if that is one of the BMP(s) utilized on site) ensure that the plans show that the length of flow path between the inlet and the outlet is maximized. Baffles may be required in certain designs.
- Details of inlet pipes/conveyances.
- Provide a detailed landscaping plan for the BMP(s) that clearly follow all State of NC DWQ Stormwater BMP Practices Manual specifications. Reference the chapter relating to the chosen BMP for landscaping requirements and also specifically to Chapter 6 of the Manual for landscape and soil composition specifications. Section 6.4.1 of Chapter 6 must be referenced for items that are required be shown on the landscape plan.
- No trees or shrubs must be planted within 10 feet of inlet or outlet pipes, or manmade drainage structures such as spillways or flow spreaders.
For wet ponds, no trees must be planted on the pond shelf or on any of the pond embankment, interior or exterior.

Show locations and specifications for sediment depth indicators where applicable.

Proposed outfall conveyance system with size, lengths, slopes and grades.

Show and provide specifications for all permanent energy dissipation devices on the stormwater management plans.

If a wet pond is chosen as a BMP(s) and is designed for 85% TSS removal a level spreader and vegetated filter strip combination must be provided at the outlet from the pond and detailed specifications provided for each that meets the requirements of Chapter 8 of the State of NC DWQ Stormwater BMP Practices Manual. This item is not necessary for a wet pond designed for 90% TSS removal.

Aquatic shelf dimensions (where applicable, e.g. in the case of a wet pond) and elevations, slope etc. must be referenced on the plan and profile view of the BMP.

If a bio-retention cell is chosen as a BMP to treat for water quality, clearly indicate if the cell shall be landscaped/mulched or sodded and show details as appropriate to meet the requirements of the State of NC DWQ Stormwater BMP Practices Manual. If the cell is to be sodded, then clearly show on the plans provisions and specifications for the sign(s) to be permanently posted at the cell(s) with the words “DO NOT FERTILIZE” clearly readable on the sign(s). These signs must be large enough and located in a position where they can be easily seen and read by a landscape contractor. Indicate the locations of the postings on the stormwater management plan.

Detailed construction and sequencing notes explaining necessary procedures to be followed to properly implement the plan, including planting and landscaping specifications, timing and sequencing of construction and any temporary measures needed to protect BMP’s during the construction phase as well as detailed notes explaining the transitioning and sequencing of a BMP(s) that is used as a sediment and erosion control device to a permanent stormwater control BMP(s).

The following statement is required on all stormwater management plans “The developer shall contact the City Stormwater Engineer when the best management practice(s) are constructed and about to become operational so an inspection to determine compliance with the approved plan can be performed”.

The following statement is required on all stormwater management plans “Adequate drainage, erosion and sediment control measures, best management practice(s) and/or other stormwater management facilities shall be provided and maintained at all times during construction. Damages to adjacent property and/or the construction site caused by the contractor’s or property owner’s failure to provide and maintain adequate drainage and erosion/sediment control for the construction area shall be the responsibility of the property owner and/or contractor”.

Show ownership information for site and adjacent properties

Show existing and proposed built-upon areas and other proposed site improvements

Note existing and proposed built-upon area in terms of total acreage and % built-upon area

Designated water-supply watershed classification, if applicable. Write N/A in check box if not applicable

Note allowable limits on BUA % (if applicable). Write N/A in check box if not applicable

Show landward buffer widths from all perennial and intermittent surface waters and also indicate the undisturbed buffer widths as measured from top of bank (if applicable). Write N/A in check box if not applicable
Regulatory floodways and floodplains (as applicable). Identify and label 100-year Base Flood Elevations (BFEs) where available. Show limits of both the floodway and floodplain along with BFEs where available. Write N/A in check box if not applicable

Note if site drains to a 303(d) listed stream identified by the North Carolina Division of Water Quality (see NC DWQ Website for more information - http://h2o.enr.state.nc.us/tmdl/). Write N/A in check box if not applicable

Identify and note the watershed area for any off-site runoff that flows onto the proposed development site (note: applicant must also provide watershed delineation and mapping for any off-site runoff that flows onto the proposed site). Write N/A in check box if not applicable

Show and label where runoff from the developed site (including outflows from BMPs, where applicable) safely connects into downstream receiving drainage systems and/or open stream channels

Identification of the entity responsible for long-term maintenance of permanent structural stormwater BMP(s)/control(s). Show preferably on the stormwater management sheet

10. Other Items Required prior to issuance of a Stormwater Management Permit

A signed and sealed Operation and Maintenance Agreement must be provided prior to City issuance of a Stormwater Management Permit. The Agreement must also be filed and recorded with the Forsyth County Register of Deeds, in accordance with Section 75-402 of the City of Winston-Salem’s Post Construction Stormwater Ordinance. Note: Typically it is advisable to wait until the plans and design have been approved before submitting the Operation and Maintenance Agreement for signatures as changes to the plans/design may impact or require changes to the Agreement. However, it can be submitted at any time if the designer chooses to do so. A copy of the standard agreement may be found on the stormwater divisions website at the following web address: http://www.cityofws.org/Home/Departments/Stormwater/Post-Construction/Articles/PostConstruction

An Operation and Maintenance Manual shall be provided by the applicant/developer for each permanent structural stormwater BMP/control, where applicable, to accompany the Operation and Maintenance Agreement, indicating what operation and maintenance actions are needed, what specific quantitative criteria will be used for determining when those actions are to be taken and, consistent with the Operation & Maintenance Agreement, who is responsible for those actions. The Plan shall also clearly indicate the steps that will be taken for restoring a stormwater control structure to design specifications if a failure occurs. The Operation and Maintenance Manual once signed and notarized, must be referenced and included as an exhibit to the Operation and Maintenance Agreement. A manual must be submitted for each BMP used in the stormwater management plan. Note: Typically it is advisable to wait until the plans and design have been approved before submitting the Operation and Maintenance Manual for approval as changes to the plans/design may impact or require changes to the Manual – e.g. elevations may change in the plan review period directly impacting changes to the manual. However, it can be submitted at any time if the designer chooses to do so but it may be subject to re-submittal if changes are required. Copies of various BMP manuals (wet pond manual, sand filter manual etc.) may be found on the stormwater divisions website at the following web address:

http://www.cityofws.org/Home/Departments/Stormwater/Post-Construction/Articles/PostConstruction

Check the box to verify that you are aware that this item will need to be addressed and will be, or has already been submitted for review
☐ All of the proposed easements that will be required to allow for maintenance and access of the stormwater management system must be reviewed and recorded prior to issuance of a stormwater management permit. The easements must be referenced as an exhibit in the Operation and Maintenance Agreement.  **Check the box to verify that you are aware that this item will need to be addressed and will be, or has already been submitted for review**

☐ A review fee of $220, in the form of a check, made payable to “The City of Winston-Salem” needs to be included with the application. Submittal of a package without a review fee is not complete and review will not begin until the fee is received. **Check the box to indicate that the fee has been submitted with the application**

☐ Variance Petition form(s) to request a variance granting permission to use land in a manner otherwise prohibited by The City of Winston-Salem’s Post Construction Stormwater Management Ordinance, if applicable. See Section 75-306 of that ordinance for qualification requirements for a variance. Variance request forms may be found at the following web address: [http://www.cityofws.org/Home/Departments/Stormwater/Post-Construction/Articles/PostConstruction](http://www.cityofws.org/Home/Departments/Stormwater/Post-Construction/Articles/PostConstruction)  **Write N/A in the check box if not applicable**

11. **Requirements Prior to Issuance of Certificate of Occupancy**  

   **Check the boxes to verify that the designer and owner are aware that the following items will need to be addressed prior to issuance of a certificate of occupancy by the building inspector**

☐ Certified as-built plans of the site and stormwater management BMPs/controls shall be submitted to the Stormwater Division for review. The as-built plans should show the final design specifications for the entire stormwater management system, including the field location, size depth and planted vegetation of all structural BMP(s) and other measures, controls, conveyances and devices as installed. Refer to Section 75-203(d) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance for more details.

☐ Final inspection of the site and stormwater management BMPs/controls scheduled with and completed by the City Stormwater Director. This inspection shall occur before the release of any performance securities. Refer to Section 75-203(d) of The City of Winston-Salem’s Post Construction Stormwater Management Ordinance for more details.

☐ Copies of any/all applicable local, state, and federal permits/permit applications must be submitted.  (Note: this would include 404/401 permits for work in regulated waters/wetlands, State Dam Safety permits, floodplain development permits, and/or other as applicable)
SECTION VII
DEVELOPMENT REVIEW FEE SCHEDULE
NOTICE

A. WATER AND SEWER UTILITY REVIEW FEES

Plan review fees for water and sewer utilities will be based on the following fee schedule:

<table>
<thead>
<tr>
<th>Total length of W&amp;S Lines</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-499 linear feet</td>
<td>$500 (minimum fee)</td>
</tr>
<tr>
<td>500 l.f. – 999 l.f.</td>
<td>$600</td>
</tr>
<tr>
<td>1,000 l.f. – 1,999 l.f.</td>
<td>$700</td>
</tr>
<tr>
<td>2,000 l.f. – 2,999 l.f.</td>
<td>$800</td>
</tr>
<tr>
<td>3,000 l.f. – 3,999 l.f.</td>
<td>$900</td>
</tr>
<tr>
<td>4,000 l.f. – 4,999 l.f.</td>
<td>$1,000</td>
</tr>
<tr>
<td>Greater than 5,000 l.f.</td>
<td>$1,100</td>
</tr>
</tbody>
</table>

The engineer must submit an estimate of the total length of water and sewer lines on a project submitted for review. Please contact Utilities Staff at 747-6992 if you have any questions.

B. STORM WATER MANAGEMENT REVIEW FEES

The issuance of the grading permit for the proposed development is contingent upon approval of the storm water management plan. The Stormwater Management review fee is $220.00 made payable to the City of Winston-Salem.

C. EROSION CONTROL/GRADING PERMITS

Grading permit fees for erosion control will be based on the following:

- Effective as of October 1, 2005, the minimum erosion control fee up to and including 1 acre is $642, plus $202 for each additional acre with a maximum fee of $8,040.

- Grading permits covering erosion control measures must be obtained from the City/County Inspections Division before any land disturbing activity exceeding 10,000 S. F. can commence. Information required for the permit is listed in the Erosion and Sedimentation Control Checklist. A preconstruction conference should be held on the proposed site with erosion control personnel of the Inspections Division.
D. OTHER FEES

- SEE Exhibits VIII-13-15 – Impact/Acreage/Capacity Fees

- Driveway Permits
  - Residential – No Fee
  - City of Winston-Salem $200
  - N.C. Dept. of Transportation $50

For projects in the City send both permits to the City Inspector with separate checks made out to the City of Winston-Salem and to NCDOT if driveway is on a State highway.
A. WATER/SEWER

ESTIMATING SEWAGE FLOWS FOR PLANT ALLOCATION

The following information is taken from State of North Carolina Department of Environment, Health & Natural Resources, Division of Environmental Management, Administrative Code Section: 15A NCAC 02T + .0114 – Wastwater Design Flow Rates.

Wastewater Flow Rates:

(1) In determining the volume of sewage from dwelling units, the flow rate shall be 120 gallons per day per bedroom. The minimum volume of sewage from each dwelling unit shall be 240 gallons per day and each additional bedroom above two bedrooms will increase the volume by 120 gallons per day. Each bedroom or any other room or addition that can reasonably be expected to function as a bedroom shall be considered a bedroom for design purposes. When the occupancy of a dwelling unit exceeds two persons per bedroom, the volume of sewage shall be determined by the maximum occupancy at a rate of 60 gallons per person per day.

(2) The following table shall be used to determine the minimum allowable design daily flow of wastewater facilities. Design flow rates for establishments not identified below shall be determined using available flow data, water-using fixtures, occupancy or operation patterns, and other measured data.

<table>
<thead>
<tr>
<th>Type of Establishments</th>
<th>Daily Flow For Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airports, also RR Stations, bus terminals (not including food service facilities)</td>
<td>5 gal/passenger</td>
</tr>
<tr>
<td>Barber Shops</td>
<td>50 gal/chair</td>
</tr>
<tr>
<td>Bars, Cocktail Lounges (not including food services)</td>
<td>20 gal/seat</td>
</tr>
<tr>
<td>Beauty Shops</td>
<td>125 gal/booth or bowl</td>
</tr>
<tr>
<td>Bowling Alleys</td>
<td>50 gal/lane</td>
</tr>
<tr>
<td>Businesses (other than those listed in this table)</td>
<td>25 gal/employee</td>
</tr>
<tr>
<td>Camps (construction or work camps)</td>
<td>60 gal/person</td>
</tr>
<tr>
<td>Summer camps</td>
<td>60 gal/person</td>
</tr>
<tr>
<td>Campgrounds Without water and sewer hookups</td>
<td>100 gal/campsite</td>
</tr>
<tr>
<td>Travel trailer/recreational vehicle park with water and sewer hookup</td>
<td>120 gal/campsite</td>
</tr>
<tr>
<td>Churches (not including food service, day care and camps)</td>
<td>3 gal/seat</td>
</tr>
<tr>
<td>Country Clubs:&lt;br&gt; Resident Members</td>
<td>60 gal/person</td>
</tr>
<tr>
<td>Nonresident Members</td>
<td>20 gal/person</td>
</tr>
<tr>
<td>Day Care Facilities</td>
<td>25 gal/person</td>
</tr>
<tr>
<td>Factories (exclusive of industrial wastes) - per shift</td>
<td>25 gal/person</td>
</tr>
<tr>
<td>Add for showers - per shift</td>
<td>10 gal/person</td>
</tr>
<tr>
<td>Food Service Facilities Restaurants (including fast food)</td>
<td>40 gal/seat or 40-gal/15 sq ft of dining area, (whichever is greater)</td>
</tr>
<tr>
<td>24-hour Restaurants</td>
<td>50 gal/seat</td>
</tr>
<tr>
<td>Single-Service (exclusive of fast food)</td>
<td>25 gal/seat</td>
</tr>
</tbody>
</table>
Food Stands
(1) Per 100 square feet of total floor space ......................................................... 50 gal
(2) Add per employee ......................................................................................... 25 gal
Hospitals .............................................................................................................. 300 gal/bed
Laundries (self-service) .................................................................................... 500 gal/machine
Marinas ............................................................................................................. 10 gal/boat slip
with bathhouse ......................................................................................... 30 gal/boat slip
Meat Markets
(1) Per 100 square feet of total floor space ......................................................... 75 gal
(2) Add per employee ......................................................................................... 25 gal
Motels/Hotels .................................................................................................... 120 gal/room
with cooking facilities in room .................................................................... 175 gal/room
Nursing/Rest Homes - With laundry ............................................................... 120 gal/bed
Without laundry ............................................................................................ 60 gal/bed
Offices - per shift .............................................................................................. 25 gal/person
Residential Care Facilities ........................................................................... 60 gal/person
Resort (e.g. condominiums, apartments, motels, hotels) .......... 200 gal/room
Schools
Day Schools
With cafeteria, gym, and showers ................................................................. 15 gal/student
With cafeteria only ........................................................................................ 12 gal/student
With neither cafeteria or showers ............................................................... 10 gal/student
Boarding ........................................................................................................ 60 gal/person
Service Stations ............................................................................................. 250 gal/water closet
or Urinal
Stadiums, Auditoriums, Theaters, Drive-ins ............................................... 5 gal/seat or space
Stores, shopping centers and malls - Note: if food service is included,
add 40 gal/seat .................................................................................................. 130 gal/1000 sq ft
Swimming Pools and Bathhouses ................................................................... 10 gal/person
# SAMPLE FORMAT: COST BREAKOUT

**Development:** ______________________________________________________________

**Developer:** ________________________________________________________________

**Contractor:** ________________________________________________________________

## I. WATER

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Unit Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>_______</td>
<td>LF of _____&quot; D.I. Pipe</td>
<td>@ $_______/LF</td>
<td>$_______</td>
</tr>
<tr>
<td>B.</td>
<td>_______</td>
<td>LF of _____&quot; D.I. Pipe</td>
<td>@ $_______/LF</td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td>_______</td>
<td>Fire Hydrants</td>
<td>@ $_______/EA</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td>_______</td>
<td>6&quot; Gate Valves</td>
<td>@ $_______/EA</td>
<td></td>
</tr>
<tr>
<td>E.</td>
<td>_______</td>
<td>8&quot; Gate Valves</td>
<td>@ $_______/EA</td>
<td></td>
</tr>
<tr>
<td>F.</td>
<td>_______</td>
<td>6&quot;x 8&quot; Tee and 6&quot; Gate Valve</td>
<td>@ $_______/SET</td>
<td></td>
</tr>
<tr>
<td>G.</td>
<td>_______</td>
<td>Other</td>
<td></td>
<td>$_______</td>
</tr>
</tbody>
</table>

**TOTAL** $_______

## II. SANITARY SEWER

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Unit Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>_______</td>
<td>LF of _<em><strong><strong>&quot; V.C.Pipe</strong></strong></em> Depth</td>
<td>@ $_____/LF</td>
<td>$_______</td>
</tr>
<tr>
<td>B.</td>
<td>_______</td>
<td>LF of _<em><strong><strong>&quot; V.C.Pipe</strong></strong></em> Depth</td>
<td>@ $_____/LF</td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td>_______</td>
<td>LF of _<em><strong><strong>&quot; D.I.Pipe</strong></strong></em> Depth</td>
<td>@ $_____/LF</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td>_______</td>
<td>LF of _<em><strong><strong>&quot; D.I.Pipe</strong></strong></em> Depth</td>
<td>@ $_____/LF</td>
<td></td>
</tr>
<tr>
<td>E.</td>
<td>_______</td>
<td>Manholes</td>
<td>@ $_____/EA</td>
<td></td>
</tr>
<tr>
<td>F.</td>
<td>_______</td>
<td>Other</td>
<td></td>
<td>$_______</td>
</tr>
</tbody>
</table>

**TOTAL** $_______

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*VIII-4*
City of Winston-Salem, NC
Proof of Payment Certification
(You must also attach an itemized breakdown)

This is to certify ________________________ furnished the labor and materials for the installation of the water and/or sewer improvements in the development know as _______________ located at _______________________________, Township, Forsyth County, North Carolina.

That the total cost (excluding connections) for the water improvements was:
$ __________________ (water cost, excluding connections)

That the total cost (excluding connections) for the sanitary sewer improvements was:
$ __________________ (sanitary sewer cost, excluding connections)

That ________________________ has been paid in full by ________________________________ for these improvements and all contractors and subcontractors of ________________________________ have been paid in full.

This the _____ day of ________________, 20_____.

I certify this to be true and correct.

__________________________________________
Company Name

By: _______________________________________

Title: _______________________________________

Phone # ____________________________________

Sworn to and subscribed before me this ______day of ________________, 20_____.

________________________________________
Notary Public

My commission expires: ________________

VIII-5
Approval by the Utilities Director of the water and sewer infrastructure depicted in these plans does not constitute approval for any other purpose than that set forth in Section 64 of the Water System Policy and Section 36 of the Sewer System Policy of the City/County Utility Commission. To the extent other permits, licenses, permissions or the like must be obtained to complete this project, such are specifically not granted by this approval and must be obtained by the Developer and/or his designee.

To be used for Street/Drainage & Water/Sewer Design Approval
Placement shall be lower right corner of Overall and P&P sheets

Approval of these water & sanitary sewer plans does not constitute approval for construction. Approval of construction must be in formal written agreement. Failure to obtain such agreement prior to beginning of construction will relieve the City of any financial participation in this project whatsoever.

To be used for ALL Design Approval
Placement shall be lower right corner of Overall and P&P sheets

To be used for ALL Design Approval
Placement shall be lower right corner of first P&P sheet ONLY

VIII-6
NOTE: A 3” MARGIN IS REQUIRED FOR REGISTER OF DEEDS STAMP

NORTH CAROLINA  )
) FORSYTH COUNTY  )

THIS GRANT OF EASEMENT, made this _____ day of _________________,20____, by ___________________________________ of Forsyth County, North Carolina, parties of the first part, hereinafter called the Grantors, to the CITY OF WINSTON-SALEM, a municipal corporation of Forsyth County, North Carolina, party of the second part, hereinafter called the Grantee;

W I T N E S S E T H:

That the Grantors, in consideration of One Dollar ($1.00) and other valuable consideration to them paid by the Grantee, the receipt of which is hereby acknowledged, have bargained and sold and by these presents do bargain, sell and convey unto the Grantee, its successors and assigns, an easement or right-of-way across the property of the Grantors for the construction, operation, repair, maintenance, replacement and/or removal by the Grantee, its agents, successors or assigns, of a sanitary sewer line, said property of the Grantors being situated in _____________ Township, Forsyth County, North Carolina, and the easement or right-of-way hereby conveyed being described as follows:

The above-described being the description of a permanent _____ foot sewer easement as shown on attached map, prepared by__________________________________, their map no._________, dated __________, entitled “__________________________”. This easement description also being part of a utility project, commonly known as “__________________________”, City project number ____________.

Also, the Grantors hereby grant to the Grantee a temporary easement or right to use such additional property of the Grantors on either or both sides of the afore said permanent easement or right-of-way as the Grantee, its agents or contractors, may need in connection with the initial construction and laying of the sewer line, provided, however, that at no point shall the combined temporary and permanent easements or right-of-way exceed ____________ feet in width.

TO HAVE AND TO HOLD the aforesaid easement or right-of-way and all privileges and appurtenances there unto belonging to the Grantee and its successors and assigns, including, but not limited to, the free and full right of ingress and egress over and across said easements and the right from time to time to cut all trees, undergrowth and other obstructions in the easement that in the opinion of the Grantee, its successors or assigns, may injure, endanger or interfere with the construction, operation, repair, maintenance, replacement and/or removal of said sewer line. Any temporary construction easement or right-of-way conveyed by this instrument will continue until the completion of ___________________________ at which time the temporary construction easement will terminate.
The Grantors covenant that they are seized of the aforesaid premises in fee and have the right to convey the easements or rights-of-way hereby granted; that the same are free from encumbrances; and that they will warrant and defend said title to said easements or rights-of-way against the claims of all persons whatsoever.

The Grantors agree that the consideration herein above recited includes payment for any and all damage of whatsoever nature done or to be done to any structure or to trees, crops or other vegetation within the boundaries of said easements or rights-of-way in connection with the survey for and/or construction said sewer line; and the Grantors agree, for themselves, their heirs and assigns, that they shall neither have nor make any claim for further damages by reason thereof. The Grantee agrees to repair any fences damaged in connection with the construction of the sewer line.

The Grantors, their heirs and assigns, may use the property within the boundaries of the easements conveyed herein in any manner consistent with, and not in derogation of, the use or purposes to which said easements may be put by the Grantee. By way of example, the Grantors may cultivate the soil within the boundaries of said easement, provided such cultivation shall not interfere with the construction, repair, maintenance, replacement, or removal of said sewer line. In further limitation of the right of the Grantors to use the property within the boundaries of said easements, it is agreed that Grantor and their heirs and assigns shall not, within the boundaries of said easement, (1) plant or cultivate any trees or vineyards, (2) erect any buildings or permanent, non-movable structures, (3) cause or allow water to pond, or (4) place any fill thereon without the Grantee’s prior written permission.

After said sewer line has been constructed, the Grantee will pay the Grantors, their heirs or assigns, for any damage to their growing crops, within or without the boundaries of the said right-of-way, that may from time to time be caused by leaks in said sewer line or by the repair, maintenance or replacement of said sewer line by the Grantee, its agents or employees; provided, however, that the mere existence of said sewer line and any effects that its presence and ordinary operation may have upon the soil and/or crops within the boundaries of said easement or right-of-way or upon the property of the Grantors outside the boundaries of the easement or right-of-way, or any replacement of the line may have upon the soil, shall not entitle the Grantors to any damages. Further, the Grantors shall not be entitled to any damages for trees hereafter cut by Grantee, its agents or employees, within the boundaries of said easement or right-of-way. Compensation for all the above is included in the consideration hereinbefore recited.

Said sewer line shall at all times be deemed personalty; it shall not become a part of the realty through or across which it passes.

It is agreed that this grant covers all the agreements between the parties, and no representations or statements, verbal or written, have been made modifying, adding to or changing the terms of this agreement.

IN TESTIMONY WHEREOF the said parties of the first part have hereunto set their hands and seals.

_______________________ (SEAL)                    _______________________(SEAL)

STATE OF NORTH CAROLINA - Forsyth County

I, ________________________, a Notary Public of Forsyth County, North Carolina, do hereby certify that
grantor(s), personally appeared before me this day and acknowledged the execution of the foregoing instrument.

WITNESS my hand and notarial seal or stamp, this the ______ day of ________________, 20__.  

My Commission Expires: __________________________  

                                              , Notary Public  
                                              Notary Seal/Stamp

STATE OF NORTH CAROLINA - Forsyth County

I, ______________________, a Notary Public of Forsyth County, North Carolina, do hereby certify that ____________________________grantor(s), personally appeared before me this day and acknowledged the execution of the foregoing instrument.

WITNESS my hand and notarial seal or stamp, this the ______ day of ________________, 20__.

My Commission Expires: __________________________  

                                              , Notary Public  
                                              Notary Seal/Stamp

STATE OF NORTH CAROLINA - Forsyth County

The foregoing certificate(s) of ____________________________

_________________________________________________________________

_________________________________________________________________

is (are) certified to be correct.

This the _____ day of _______________________ 20__.

Dickie C Wood, Register of Deeds

By:______________________________  
       Assistant/Deputy

Probate fee $___________ paid.
## SAMPLE STORM DRAINAGE CHART

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>ROADWAY</th>
<th>Inlet No.</th>
<th>Inlet Type</th>
<th>Grade</th>
<th>Cross Slope</th>
<th>Inlet Drain Area</th>
<th>Cumulative Drainage Area</th>
<th>Runoff Coef.</th>
<th>Time of Conc.</th>
<th>Rainfall Intensity</th>
<th>Discharge From D.A.</th>
<th>Discharge Carryover</th>
<th>Total Discharge</th>
<th>Spread</th>
<th>Intercept</th>
<th>Inlet Efficiency</th>
<th>Bypass</th>
<th>Drainage from Accum. Areas</th>
<th>Pipe Slope ft/ft</th>
<th>Min. Diameter</th>
<th>Min. Req. Pipe Size</th>
<th>Actual Pipe Size Used</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
STRATFORD ROAD IMPACT FEE $ 4,300.00 / ACRE
HANES MALL BOULEVARD ACREAGE FEE $ 512.99 / ACRE
LEAK CREEK ACREAGE FEE $ 425.00/ ACRE
LOWER ABBOTTS CREEK ACREAGE FEE $ 2,196.15 / ACRE
References

Winston Salem Forsyth County Unified Development Ordinance (UDO)

NCDOT, Subdivision Roads Minimum Construction Standards, January 2000

NCDOT, Highway Design Branch Roadway Standard Drawings, July 1995


City of Winston-Salem, N.C. Department of Public Works Engineering Division, Technical Specifications and Detail Drawings, June 2011

Federal Highway Administration, Drainage of Highway Pavements, FHWA, Washington, D.C., 1984


Storm Water BMP Manual


Permitting of Pump Stations and Force Mains, City of Winston-Salem, North Carolina Utilities Division; December 2009.