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 to all developments within the Winston-Salem/Forsyth County Utilities service area.

**THIS DOCUMENT UPDATED:** April 2020

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: [https://www.cityofws.org/596/Publications](https://www.cityofws.org/596/Publications)
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SECTION I - GENERAL INFORMATION
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A. 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. Monday through Friday and 9:00 a.m. to 5:30 p.m. Saturday and Sunday. You may also e-mail CityLink311 at citylink@cityofws.org.

**Online Information**
Visit the City’s homepage at www.cityofws.org to find links at the top of the homepage for Business and Departments & Services. These links will take you to the various departments involved in the development process, contact information for departments and staff members, and forms and other publications of interest to developers.
B. PROCESS FLOWCHARTS

1. Construction Plan Review Process

Preliminary Plan Approval granted by Planning Board, City Council, Board of Commissioners

Engineer submits two (2) complete sets of construction plans, calculations & checklists to Engineering/Utilities

Construction Plan Review Fees are submitted

Application for Grading Permit is submitted through electronic plan review portal (IDT)

Application for Stormwater Management Permit is submitted through electronic plan review portal (IDT)

Plans reviewed by Engineering/Utilities staff and other departments as needed

Plan review comments are compiled and returned to Engineer of Record for corrections

Revisions are made and plans resubmitted to City staff with original mark-ups/comments

Plans ready for approval?

YES

Final construction plans are submitted to Utilities Admin staff along with Permit Application

Final construction plans are submitted to Utilities Admin staff along with Permit Application

Plans are signed by City Engineer & Utilities Director and utility permits are issued

Record Drawings are prepared and submitted to Engineering Records (see Record Drawings & Final Inspections flowchart page I-4)

Final payment & warranties verified

Engineering Field Manager issues Final Inspection memo

Final Inspection memo sent to Developer

City of Winston-Salem accepts maintenance of utilities and street infrastructure

Offsite easement required?

YES

Developer obtains all required easement(s)

NO

Developer signs/returns Application/Conveyance Agreement. Utilities Director recommends approval and sends item to Utilities Commission

Application and Conveyance Agreement sent to Developer

Record Drawings are prepared and submitted to Engineering Records (see Record Drawings & Final Inspections flowchart page I-4)

Final payment & warranties verified

NO

Signed plans are released and returned to Engineer of Record

Engineer of Record submits five (5) copies of signed plans to the City, plans are released for construction and sent to Engineering Field Office

Plats are submitted to Planning & Development Services staff for approval

Plats are recorded

All infrastructure requirements are met (See Platting flowchart page I-2)

Note: Developers are encouraged to meet with City staff prior to design reviews to facilitate discussion and design approval
2. Platting

Site Plan preparer submits Draft Final Plat to City’s electronic plan review portal (IDT)

Draft Final Plat distributed to respective Departments for review

Engineering
* see below

Tax Office
assigns PIN # to plat

Stormwater verifies stormwater requirements

Planning verifies title blocks and document requirements

MapForsyth verifies street names & assigns addresses

Utilities verifies utility easements

NCDOT verifies ROW dedication on State-maintained roads only

Approved

Review comments and mark-ups sent to site plan preparer for corrections

Site plan prepared make corrections and submits two (2) mylars for final signatures

Mylars are signed by respective Departments and review fee is paid

Final Plat with signatures is returned to site plan preparer

Final Plat is recorded in the Office of the Register of Deeds by applicant

Register of Deeds gives Planning staff recorded Plat Book and Page Number(s)

Copies of Final Plat are sent to Inspections, Utilities, Forsyth County Tax Office & MapForsyth

Final Plat received by Inspections and Building Permits are issued for lots

* Engineering Plat review includes:
  - City Surveyor verifies Plat meets minimum standards (GS 47-30)
  - Engineering Field Office verifies that the minimum required infrastructure is in place per UDOClearCode Section 3.2.5-B.2. and that phasing on plat matches phasing shown on approved plans
  - Engineering Field Office reviews scope of work and unit prices for estimate of incomplete items to be bonded
  - Cost Estimate for incomplete items approved by City Engineer or his/her designee
  - Engineering Records Supervisor prepares memo to City Attorney verifying the surety amount

City Attorney approves form of surety

Surety submitted to City CFO for filing

* Engineering Plat review includes:
3. Record Drawings & Final Inspection

Record Drawings, GIS data of Record Drawings, Construction Checklist, Plat & Engineer's Certification on each sheet

Engineering Records reviews record drawings & GIS data against existing information (previous record drawings, plats, easements, etc.)

Engineering Field Office Inspector receives record drawings

Engineering Field Office Inspector submits comments to Engineering Records

Engineering Records sends redlined comments to Engineer of Record for corrections

Engineer of Record submits corrected Record Drawings & GIS data to Engineering Records

Corrected Record Drawings & GIS data are reviewed against redlined comments

Redlined Comments Addressed?

YES

Record Drawings & GIS data accepted

Engineering Records notifies Engineering Field Office to conduct final inspection

Engineering Field Office conducts final inspection and issues Final Inspection memo

Final Inspection memo sent to Developer and affected City Departments

Record Drawings are scanned into City's database by Engineering Records, GIS data uploaded by Utilities GIS

NO

Engineer of Record corrects deficiencies and resubmits to Engineering Records

Engineering Field Office Inspector receives record drawings

Engineering Field Office Inspector submits comments to Engineering Records
4. Street/Alley Closure

Request for street closure is submitted to City Secretary’s Office

City Secretary’s Office sends request to Engineering Records to prepare maps, descriptions, etc.

Engineering Records distributes to respective Departments for review

Sanitation, City Surveyor, Planning, WSDOT

Is it a connecting road?

Engineering Records compiles comments and prepares Council Action Request Form

Staff recommendation provided to Assistant City Manager for Public Works

Assistant City Manager for Public Works sends to Public Works Committee

Approved?

Yes

Council item sets date for Public Hearing & Public Hearing is advertised

City Council acts on request at the Public Hearing

City Secretary’s Office waits 30 days for appeals

Approved?

Yes

Item returned to staff to address issues/concerns

NO

Acceptable agreement reached?

YES

Petition denied/closure not granted

NO

NO

Appeals?

Yes

Street Closure is recorded in the Office of the Register of Deeds. Tax Office assigns new lot numbers

NO

NO
5. Stormwater Permitting

Submittal of Permit Package

Design Review (30 calendar days per review allowed)

Revisions

Design Approved

Submit Plats to Planning Dept for approval and recording (if applicable)

Submit O&M Agreement (& Escrow Agreement if applicable) for review to Stormwater Dept

Attorney Office Review of Agreements and sign off (30 days typical)

Owner to record all Agreements - provide Stormwater Engineer with a copy

Submit Sealed Engineers Construction Cost Estimate of stormwater management system and if applicable sealed Engineers estimate of annualized HOA Operation and Maintenance Costs for review

Submit 4% surety for commercial projects or establish escrow account with initial 15% funding for residential projects

Stormwater Management Permit Issued
SECTION II - ADMINISTRATIVE REQUIREMENTS
A. SITE PLAN CHECKLIST

FORM 1 SITE PLAN SUBMITTAL CHECKLIST

This form is for your reference only. An electronic checklist is required as part of your online submittal. Submit ALL site plans for review electronically at [https://winston-salem.idtplans.com/secure](https://winston-salem.idtplans.com/secure).

Please use this checklist to ensure that UDO requirements for Form 1 site plan submittals have been satisfied. This checklist may also be used for Form 2 submittals (i.e., first phase of a two-phase rezoning). For Form 2 submittals, requirements shown in bold below may be omitted. If you have any questions, contact the Planning Division at (336)747-7070.

<table>
<thead>
<tr>
<th>SPECIAL SUBMITTAL INFORMATION</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a Traffic Impact Analysis (TIA) required? (If yes, include it with your site plan submittal.)</td>
<td></td>
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<tr>
<td>Does the request include partial PINs? (If yes, include a legal description with your site plan submittal.)</td>
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<tr>
<td>Have building elevations been included for multifamily residential requests or nonresidential requests including the use Retail Store?</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>GENERAL INFORMATION</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are ALL requested uses identified using UDO language? (Indicate the intended use(s), if known, for each building. If the request includes existing buildings, indicate both current and proposed use(s).)</td>
<td></td>
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<tr>
<td>Are the proposed uses allowed in the requested zoning district?</td>
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<tr>
<td>Is the plan drawn to an appropriate scale for the site acreage? (For sites 25 acres or smaller, use 1” = 50’ or smaller; use 1” = 100’ or smaller for sites larger than 25 acres.)</td>
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<tr>
<td>Is a location map included with an appropriate number of cross streets, a directional arrow, etc.?</td>
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<tr>
<td>Are the development name (including previous development names, dockets, etc.) and date of submittal provided?</td>
<td></td>
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</tr>
<tr>
<td>Are the name(s), address(es), phone number(s), and email address(es) of the owner(s)/applicant(s)/plan preparer(s) included?</td>
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</tr>
<tr>
<td>Is the PIN of the subject property indicated?</td>
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<tr>
<td>Are the bearings and distances for property boundaries shown? (Use survey benchmarks.)</td>
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</tr>
<tr>
<td>Are the ownership, zoning, property boundaries, and PINs of adjacent properties shown, including for those properties across any streets?</td>
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</tr>
<tr>
<td>Has the site plan been sealed and signed by the site plan preparer? (This is required for your official submittal and MUST be marked “Preliminary – NOT for construction.”)</td>
<td></td>
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<tr>
<td>Are a scale (text and graphic) and directional arrow included?</td>
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<tr>
<td>Is the total acreage listed? Are the lengths (in linear feet) of public/private streets included?</td>
<td></td>
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</tr>
<tr>
<td>If residential, are unit counts listed by type and density? (Provide specific information about the type of residential unit. Examples may include two-story townhouse, apartments with common access, etc.)</td>
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</tr>
<tr>
<td>If residential, are common open space and recreation area calculations shown?</td>
<td></td>
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<tr>
<td>Is the percentage of building coverage to land shown?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Is the percentage of paved/graveled surface to land shown?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the percentage of open space to land shown?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the total percentage of impervious surface on the site shown?</td>
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</tbody>
</table>
## FORM 1 SITE PLAN SUBMITTAL CHECKLIST

### GENERAL INFORMATION

| Are the proposed number of parking spaces and calculations for required parking minimums shown? | YES | NO | N/A |
| Are tree save calculations shown? (Use the Tree Save legend.) | | | |
| Is watershed designation information shown? | | | |
| Does the plan CLEARLY indicate whether public/private water, sewer, and streets are proposed? (Disclose the jurisdiction/entity for offers of dedication, or indicate the party responsible for maintenance of private infrastructure.) | | | |
| Does the plan indicate the zoning/municipal jurisdiction under which it falls? | | | |
| Does the plan include a purpose statement clearly outlining the request? | | | |

### PLAN-SPECIFIC INFORMATION

| Are streams, stream names, and stream buffers shown? | YES | NO | N/A |
| Are drainage ways and floodway/fringe areas shown? | | | |
| Are wooded areas and other natural features shown and labeled? | | | |
| Does the plan show existing/proposed topography (Use at least 4-foot contours and include finished floor elevations for buildings and grading. Provide elevations for the bottom and top of each proposed retaining wall.) | | | |
| Are natural features to remain labeled as such? | | | |
| Are existing and proposed buildings shown with use(s) and setbacks labeled? | | | |
| Are building dimensions and maximum height labeled? | | | |
| Are structures like signs, walls, and fences shown? | | | |
| Are rights-of-way and easements shown and labeled as public/private? (Provide details for any and all proposed roadway cross section(s), including sidewalk, utility, and street tree locations.) | | | |
| Are all proposed streets/roads named? (For State Roads, include the NCDOT designation.) | | | |
| Are motor vehicle surface areas (i.e., access drives/parking areas) shaded? (Label dimensions and surface types.) | | | |
| Are features like sign/utility/drainage easements, common areas, and open space labeled? | | | |
| Are parking and loading areas shown and labeled with typical dimensions? | | | |
| Are solid waste disposal facilities (e.g., dumpsters, compactors) shown and labeled? | | | |
| Are all existing/proposed above-ground or underground utility lines shown, including fire hydrant locations and hydrant spacing? (Distinguish proposed features by utilizing different line types/weights. For existing utilities, include City project numbers in a note.) | | | |
| Are adjacent parcels shown and labeled? | | | |
| Are all existing/proposed phase lines shown and labeled on the overall development plan? (Phase lines can be modified at the staff level during the construction plan approval process.) | | | |
| Is all existing/proposed storm drainage shown and labeled? | | | |
| Are all streets and driveways within 100 feet of the site shown? | | | |
| Are bufferyards, streetyards, and other required landscaping shown and labeled? (Include bufferyard and streetyard widths.) | | | |
| Have all use-specific conditions been met? | | | |
C. EROSION & SEDIMENTATION CONTROL PLAN CHECKLIST

PROJECT NAME: _____________________________________________________________
DATE: ___________________ AP# ________________

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

LOCATION INFORMATION

__ Vicinity Map __ Project location __ North arrow __ Scale

GENERAL SITE FEATURES

__ Property lines __ Legend
__ Existing contours __ Proposed contours
__ Limit and acreage of disturbed area __ Planned and existing building location(s) and elevation(s)
__ Planned and existing road location(s) and elevations __ Lot and/or building numbers
__ Land use of surrounding areas __ Wetland limits (if any)
__ Easements __ Streams, lakes, ponds, drainage ways, dams
__ Boundaries of the total tract __ Stockpiled topsoil or subsoil locations

SITE DRAINAGE FEATURES

__ Existing and planned drainage patterns (include off-site areas that drain through property)
__ Size and location of culverts and water and/or sanitary sewer mains
__ Design calculations for peak discharges of runoff (Q-10)
__ Design calculations and construction details for culverts 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)
__ Names of receiving watercourses
PROJECT NAME: ____________________________________

DATE: ___________________       AP# _____________________

EROSION CONTROL MEASURES

__Legend
__Location of temporary and permanent measures
__Construction drawings and details for temporary and permanent measures
__Design calculations for skimmer sediment basins and other measures
__Maintenance requirements during construction
__Person responsible for maintenance during construction

VEGETATIVE STABILIZATION

__Areas and acreage to be vegetative stabilized designated by time of stabilization as indicated in the State’s Ground Stabilization Criteria chart
__Planned vegetation with details of plants, seed, mulch and fertilizer
__Specifications for permanent and temporary vegetation
__Method of soil preparation
__Ground Stabilization Criteria Chart

OTHER REQUIREMENTS

__Narrative describing construction sequence
__Narrative describing the nature and purpose of the construction activity
__Completed Financial Responsibility Form for project. Form to be notarized and signed by person financially responsible for project. Original copy required
__Construction sequence related to Sedimentation and Erosion Control (latest revision). 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.
D. CONSTRUCTION PLAN CHECKLIST

City of Winston-Salem Engineering Division
Final Construction Plan Checklist
(Public and Private Roads)

- 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 the checklist. Submit one (1) set of plans when submitting for Utilities review only. 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 City/County Utilities Director, five (5) signed copies shall be submitted for distribution to the appropriate City staff (NO BLUE PRINTS WILL BE ACCEPTED). Original signed plans shall be returned.

In addition to the Checklist items below, the following are required with the first submittal:

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

2. Final Construction Drawing Checklist
   a. All items shall be checked or marked N/A. Ensure 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 Plan Review 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. Other approved documents (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 re-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 is required for signatures by the City Engineer and City/County Utilities Director.

For the final set for approval, submit one (1) set of approved plans for City signatures with original seal and PE signature. Plan set must be rolled (not folded). Folded plans will be returned without processing.

   _____ 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-F. 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, BST, 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, water, sewer, utility, drainage, sidewalk, etc.)

11. All plan sheets shall show existing and proposed curb and gutter, storm drain system, drainage structures and streams, driveway culverts, water and sewer mains and services (including hydrants, valves, manholes, fittings, meter boxes, cleanouts, etc.), 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 drain 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 drain 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.
14. Water and sewer service connections shall be shown adjacent to each other at the center of each lot or as directed by the Engineer 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 Erosion Control) 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 General Notes from Section III of the City of Winston-Salem Infrastructure Development Standards 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 pipe 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 NCDEQ 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: ___/___/___
E. FINAL INSPECTION CHECKLISTS

City of Winston-Salem, North Carolina
Department of Public Works – Engineering Division

Construction Checklist

Project Number: ___________________________ Contract Number: __________________

Project Name: _______________________________________________________________

☐ Proof of Payment has been submitted (please check prior to submitting checklist)

Owner/Contractor: ___________________________ Date: __________________

Construction Inspector: ___________________________ Date: __________________

Construction Inspector Supervisor: ___________________________ Date: __________________

This 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 2019
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>____</td>
<td>Meter boxes installed per spec, to grade, bride under box and cleaned inside</td>
</tr>
<tr>
<td>____</td>
<td>Valves for stub outs fully operated and left closed</td>
</tr>
<tr>
<td>____</td>
<td>All other valves fully operated and left open</td>
</tr>
<tr>
<td>____</td>
<td>Nuts centered in valve boxes</td>
</tr>
<tr>
<td>____</td>
<td>Structures - concrete collars 1” below final grade, asphalt around structures</td>
</tr>
<tr>
<td>____</td>
<td>Max. 1/8” gap between valve boxes and covers</td>
</tr>
<tr>
<td>____</td>
<td>Approx. 4” from riser pipes to top of valve boxes</td>
</tr>
<tr>
<td>____</td>
<td>Hydrants cleaned and touch-up painted as needed</td>
</tr>
<tr>
<td>____</td>
<td>Hydrant flanges 1” – 6” above ground</td>
</tr>
<tr>
<td>____</td>
<td>Breakable couplings moved up (hydrant extension)</td>
</tr>
<tr>
<td>____</td>
<td>Hydrants fully operated and left closed</td>
</tr>
<tr>
<td>____</td>
<td>Hydrants weep properly</td>
</tr>
<tr>
<td>____</td>
<td>Hydrant threads checked for national standard thread</td>
</tr>
<tr>
<td>____</td>
<td>Hydrant caps and chains in place</td>
</tr>
<tr>
<td>____</td>
<td>Blow-off installed per spec</td>
</tr>
<tr>
<td>____</td>
<td>Hydrants plumb</td>
</tr>
<tr>
<td>____</td>
<td>Water connections installed to right-of-way</td>
</tr>
<tr>
<td>____</td>
<td>3’ clearance around all hydrants</td>
</tr>
<tr>
<td>____</td>
<td>“Water” cast into manhole covers</td>
</tr>
<tr>
<td>____</td>
<td>Connections in front of proper lots</td>
</tr>
<tr>
<td>____</td>
<td>Angle valves approximately 12” to 18” below lid, both opened fully to make sure water is on</td>
</tr>
<tr>
<td>____</td>
<td>Inspector observed D.I. pipe (restrained joint) being installed inside encasement</td>
</tr>
</tbody>
</table>

Rev. November 2019
Sanitary Sewer

_____ Sewer connections installed per spec in front of the correct lot
_____ 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
_____ 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
_____ Sewer service on the right-of-way with a minimum 5’ tailpiece
_____ Inspector observed D.I. pipe (restrained joint) being installed inside encasement
_____ Sewer connections in driveways have a recessed cap

Rev. November 2019
Roadway

- Back of curb to back of curb distances match plan
- Crown and quarter point of road checked every 50’
- Soil densities attached
- Stone densities attached
- Asphalt densities attached
- 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 and tabs on the bottom of all grates so lids fit properly
- Grates checked to verify they lift up for maintenance access
- The number 840.03 and name of foundry cast on all frames and grates
- Broken curb and gutter, sidewalks and driveway aprons within right-of-way 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)
- All expansion joints cut and sealed per spec
- Inverts in all catch basins and ditch inlets mudded up

Rev. November 2019
F. POSTING OF SURETIES & PLAT RECORDATION

1. Plat Recordation
   Commercial or non-residential developments may bond 100% of the project. Residential developments are limited on the items that may be bonded as listed below.
   a) Requirement for Recording Final Plat (UDOClearCode Section 3.2.5-B.2.)
      (1) 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
      (2) If all construction is not complete, then an acceptable form of surety has been approved by the City Attorney for bondable items (see UDOClearCode Section 3.2.5-B.2.).
      (3) 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 25% contingency, as approved by the City Engineer or designee.
   
   b) Forms of Surety
      (1) Letter of Credit
         (a) Shall be irrevocable.
         (b) Must be issued in favor of the City of Winston-Salem, North Carolina
         (c) Must be issued from a major North Carolina Banking institution.
         (d) Must be payable at sight at a branch in Winston-Salem or payment delivered to the appropriate city office in Winston-Salem.
         (e) 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).
         (f) 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.
         (g) The name of the subdivision/project and a summarization of the improvements must be clearly referenced on the Letter of Credit.
         (h) 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.”

      (2) Performance Bond
         (a) Shall be in effect until such time as planned improvements have been completed.
         (b) 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.
         (c) 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).
         (d) The name of the subdivision/project and a summarization of the improvements must be clearly referenced on the bond.
(3) Cash Bond
   (a) A check made payable to the City of Winston-Salem.
   (b) Will be considered approved once the check has cleared the lending institution.
   (c) The cash bond will be held until the completion of the improvements. The developer will not be entitled to any interest.

c) 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.

d) 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.

e) 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.

2. Bondable Items
   a) Asphalt (tons or SY)
   b) Sidewalks (linear foot)
   c) Street Trees (type, number and size of trees)
   d) Landscaping (sq. yard)
   e) Minor Utility Adjustments
   f) Sewer Outfalls (Must be approved by City/County Utilities Director and cover materials and installation)
   g) Road Widening (ie. turn lanes into the subdivision)

3. Items Which Can Not Be Bonded for Residential Developments
   a) Utilities (Water and Sewer Mains, including connection and fittings)
   b) Drainage including curb and gutter
   c) Streets up to the stone base must be constructed (Note: The developer shall protect manholes, inlets, pipes, valves, hydrants and curb during building construction).

4. Administrative Fee
   The administrative 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 of Bond or Surety</th>
<th>Administrative Review 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>
G. RECORD DRAWINGS CHECKLIST

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

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

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

_____ 2. Show baseline and stations

_____ 3. Horizontal distances should scale within five (5) feet. Vertical distances should scale within six (6) inches.

_____ 4. All installed pipe sizes, pipe materials and pipe locations shall be indicated.

_____ 5. On the plan view, water connections shall be shown by dashed lines and sewer connections by solid lines.

_____ 6. If a water-only project, connections should be located by station from nearest mainline valve or hydrant valve (Ex: WM 2+00). 0+00 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.

_____ 7. If sewer-only or a water and sewer project, connections should be located by station from nearest downstream manhole (Ex: W&S 1+80).

_____ 8. 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)

_____ 9. 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.

_____ 10. Show as-built stations for all sanitary sewer and storm drainage manholes on plan view and profile view (Ex: MH Sta. 3+01.59).

_____ 11. 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.

_____ 12. Profile view shall have as-built manhole rim elevations for sanitary sewer outfalls (Ex: RIM 810.10).
13. 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.

14. 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%).

15. 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.

16. Show as-built grades, inverts, 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.

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

18. All drawings (Water, Sewer, Street and Drainage) need the “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).

19. 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)

20. 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.

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

22. A north arrow and scale on all sheets.

23. 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.

24. 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 and record drawing easement locations. Addresses and lot numbers can be shown in tabular format.
H. GIS DATA CHECKLIST

Digital GIS files shall be submitted along with Record Drawings for review and approval prior to requesting the final inspection. A Final Inspection Memo will not be issued until this requirement has been satisfied. For a complete list of requirements for GIS data corresponding to Record Drawings, please see the Winston-Salem/Forsyth County Utilities Digital Data Submission Standards and the associated Data Dictionary available online on the Engineering Division’s Publications page (https://www.cityofws.org/596/Publications).
SECTION III - CONSTRUCTION NOTES
The following 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 Winston-Salem/Forsyth County Utilities Division of the City of Winston-Salem. The General Notes section is required for all projects. The other sections are only required if the applicable infrastructure is going to be built to City standards.

A. GENERAL NOTES

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 North Carolina Department of Environmental Quality, Division of Energy, Mineral & Land Resources.

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)

5. Seeding mixtures other than those listed above must be approved by the City Inspector prior to seeding.
6. 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.

7. All work must carry a one-year warranty to cover all defects in materials and workmanship.

8. 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.

9. Prior to beginning any work, the contractor shall notify the City at least three (3) business days before the planned start of work. Any work performed prior to notifying the City is subject to rejection by the City. The contractor must also contact the Engineering Field Office at (336) 727-2362 to arrange for construction inspection.

B. WATER & 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. Water and sewer connections shall be beside each other at the center of each lot or as directed by the Engineer. 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. Orange safety construction fencing should be placed around the connections to protect them during lot construction activities. Water and sewer connections shall not be placed within a driveway or sidewalk.

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

4. Prior to requesting final inspection for water and/or sanitary sewer, the Owner shall submit Record Drawings, GIS data corresponding to the Record Drawings and Engineer’s Certification to the Engineering Division’s Record Center. Upon approval by the Record Center, Owner may request final inspection for water and/or sanitary sewer. Owner shall then submit the signed Construction Checklist for water and/or sanitary sewer to the City Inspector.

5. A Letter of Acceptance will be issued after the construction is inspected and after the developer provides Record Drawings, GIS data corresponding to the Record Drawings, any necessary easements (in a form satisfactory to the City) 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 Section VIII of this document for a sample easement form and Proof of Payment documents.

C. ROADWAY

1. The most current editions of the North Carolina Department of Transportation Standard Specifications for Roads and Structures, the North Carolina Department of Transportation Roadway Standard Drawings and the City of Winston-Salem Infrastructure Development Standards 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 except waffle walled structures which are not acceptable for new construction. 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 V4066-1 (E Grate); V4066-3 (F Grate); V4066-4 (G Grate)

   b) U.S. Foundry – 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. Minimum distance between the catch basins shall be 18” (outside wall to outside wall). ABC stone or other approved suitable material must be placed between the basins and compacted per City standards.

6. If a driveway location conflicts with a catch basin, the following frame and grate shall be used:
a) East Jordan Iron Works, Inc. – Catalog Number V4520 (Valley Curb Inlet Frame); V4520-1 (Valley Curb Grate)

b) U.S. Foundry – Catalog Numbers 5298 (Valley Gutter Inlet Frame); 6298 (Valley Gutter Grate)

7. When the top slab of a catch basin intrudes into the sidewalk, an expansion joint is required between the sidewalk and the slab.

8. 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 not acceptable). For subgrade under sidewalk, City Inspector will probe to determine if the subgrade is sufficiently compacted.

9. A proof roll is not required for stone base under curb and gutter on local streets (3”) prior to the pouring of curb and gutter unless there is a rainfall event after the stone base is placed. If rainfall occurs after the subgrade proof roll and the placement of stone base for curb and gutter but prior to pouring curb and gutter, the City Inspector and Engineering Field Manager will determine if additional testing and/or proof roll will be required.

10. All stone base shall be compacted to an average of 98% 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 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). If rainfall occurs after testing but prior to paving, the City Inspector and Engineering Field Manager will determine if additional testing and/or proof roll will be required.

11. The City Inspector reserves the right to test asphalt by core sampling or by nuclear methods at the Owner’s expense.
12. Tack coat to be applied to all existing asphalt surfaces prior to placing new asphalt.

13. Final lift of asphalt to match gutter (maximum ¼” above gutter). Asphalt below gutter is unacceptable. All utility structures (manholes, valve covers, etc.) within the roadway shall be no more than ¼” below the top of the final lift of asphalt.

14. 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.

15. Existing curb and gutter and pavement to be replaced or repaired as required to tie to sound material.

16. 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 848.05 and 848.06 for ramp construction details.

17. 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.

18. 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).

19. 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
20. All concrete shall be a minimum of Class A (3000 psi). Class B (2500 psi) shall not be used. The contractor shall provide test results for air content by chace indicator (AASHTO T-199), slump (AASHTO T-119/ASTM C-143), air content by pressure air meter (AASHTO T-152/ASTM C-231), temperature (ASTM C-1064) and test specimens (AASHTO T-23/ASTMC-31) for concrete sidewalks. Perform one set of tests within the first 10 cubic yards poured on the project. City Inspector may request additional testing thereafter.

D. 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 layer.

5. The final lift of 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 and Record Drawings showing all deviations from the approved construction plans for streets and sidewalks.

E. UTILITY CONNECTION NOTES FOR BUILDING PLANS
The following construction notes are to be placed on utility connection site plans associated with building applications. Plans shall be submitted to the Winston-Salem/Forsyth County Utilities Division of the City of Winston-Salem. Other notes may be 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 NCDEQ.

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 NCDOT at (336) 747-7900.
8. Contact Winston-Salem/Forsyth County Utilities Field Operations at (336) 650-7654 to arrange for construction inspection. A City Inspector will verify per the approved plans that the Backflow Preventer Type, vault, exact location, and inspection requirements have been satisfied. 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 current North Carolina Plumbing Code and The City of Winston-Salem Technical Specifications and Detail Drawings for Water Line and Sewer Line Construction.

10. Contact CityLink at (336) 727-8000 for street cut permit prior to performing 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 Winston-Salem/Forsyth County Utilities Division. Contractors and Developers can purchase meters at the Winston-Salem/Forsyth County Utilities Business Office off the lobby of the Bryce A. Stuart Municipal Building, 100 E. First Street.

13. Backflow prevention assembly size shall match the dimension of the water meter.

14. Engineer of Record is responsible for ensuring that the fire line from the back of the backflow preventer to the building is installed to the most current edition of the North Carolina Fire Code.

15. If work is to be done on an existing Fire Hydrant that is more than 30 years old, contact Winston-Salem/Forsyth County Utilities Field Operations to have the Fire Hydrant exchanged for a new hydrant.

16. Existing water connections not intended for reuse shall be terminated at the water main. ¾” through 2” connections shall be cut-off at the corporation and the copper service line cut through at the corporation. 3” through 10” connections shall have the tapping sleeve and valve or tee removed and replaced with mechanical joint
sleeves and ductile iron pipe installed to City of Winston-Salem standards. Vaults or boxes shall be properly removed or demolished. Connections intended for reuse are subject to assessment and upgrade. Contact the Winston-Salem/Forsyth County Utilities Meter Shop at (336) 771-5130 for assistance.

17. Underground fire lines from the backflow preventer to the property side must be inspected by Fire Department personnel prior to covering. Flushing of these lines must also be witnessed by Fire Department personnel. Please call (336) 734-1290 to schedule these activities. Fire lines from the public water main to the backflow preventer must be inspected by Winston-Salem/Forsyth County Utilities Field Operations. Call (336) 771-5130 to arrange for construction inspection prior to installation.

18. All Fire Department connections shall be provided with a Knox locking cap. Please visit https://www.knoxbox.com/winstonsalem or call (336) 734-1290 for ordering information.

**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 Winston-Salem/Forsyth County Utilities Field Operations 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 the requirements of the City of Winston-Salem’s Technical Specifications and Detail Drawings for Water Line and Sewer Line Construction, latest edition, including hydrant tee, valve, and threads. Private hydrants shall be equipped with a Reduced Pressure 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, GIS data corresponding to the 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 signed Construction Checklist for water and/or sanitary sewer to the City Inspector.

3. A Letter of Acceptance will be issued after the construction is inspected and after the developer provides Record Drawings, GIS data corresponding to the Record Drawings, any necessary easements (in a form satisfactory to the City) 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 Section VIII of this document for a sample easement form and Proof of Payment documents.
SECTION IV - DESIGN STANDARDS
# A. ROADWAY

## 1. Street Design Matrix

### STREET DESIGN MATRIX

<table>
<thead>
<tr>
<th>Street Classification</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 max</td>
<td>16' ribbon</td>
<td>20'</td>
<td>600'</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>
<td></td>
</tr>
<tr>
<td>Cul-de-Sac/Permanent Turnarounds</td>
<td>150 max</td>
<td>27' B-B (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>1,000 max</td>
<td>27' B-B (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</td>
<td>27' B-B (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</td>
<td>27' 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'-1,000'</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>
<tr>
<td>Minor Arterial</td>
<td>10-15 K</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Major Arterial</td>
<td>&gt;15 K</td>
<td>N/A</td>
<td>N/A</td>
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<td>N/A</td>
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<td>N/A</td>
</tr>
</tbody>
</table>

### NCDOT STANDARDS

Case By Case

### NOTES:

- **Pavement Width:** Street widths less than 27 feet back-of-curb to back-of-curb must be approved in writing by the Assistant City Manager of Public Works and appropriately signed for enforcement to restrict on-street parking.
- **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 the right-of-way where practicable. Exact locations to be determined through the subdivision review process.
- **40' Right-of-Way:** If 40' Right-of-Way is allowed, sidewalk shall be in a sidewalk and utility easement. This must be approved by the Assistant City Manager of Public Works or his/her designee.
- **Vehicle Trips/Day:** To be determined by the Winston-Salem Department of Transportation. 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.
- **For more information concerning Street Standards, please refer to UDO 142 as adopted.**
2. Public Streets
   a) 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 Construction Details.

   b) 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 a minimum Class A (3,000 psi or greater).

   c) Normal crown cross-slope shall be ¼” per foot.

   d) Minimum Residential pavement typical section shall be 1” S9.5B, 2” S9.5C 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.

   e) 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.

   f) Minimum 1% grade for all curb and gutter streets.

   g) 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.

   h) 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.

```
\begin{center}
\includegraphics[width=0.5\textwidth]{intersection_angles.png}
\end{center}
```
i) Except in unusual circumstances, street jogs with centerline offsets of less than one hundred twenty-five (125) feet shall not be approved. See below.

j) 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.

k) 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 WSDOT recommendations.

l) 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.

m) Curb and gutter shall be NCDOT Standard 846.01, 2’-6” curb and gutter. Valley curb and gutter will be allowed only on local or cul-de-sac streets. 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 Detail V-3 of this document for minimum design criteria.

n) Traffic islands are not recommended and may require a private maintenance agreement.
o) Guardrail shall be installed per AASHTO and NCDOT guidelines.

p) Dedication of additional right-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.

q) Cul-de-sacs and turnarounds shall be designed according to the Construction Details, Section V of this document.

r) A cul-de-sac or turnaround shall be required for all dead-end streets longer than 150 feet.

s) All driveway entrances must adhere to the design standards in Section IV-D.

t) NCDOT requirements must be met if driveways are located on the State Highway System. Driveway permits are required before construction is started.

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

v) 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. Where sidewalk abuts the back of curb and gutter, the width shall be a minimum 6'-0".

w) Chamfer or round all right-of-way and utility easements at roadway intersections.

x) In addition to City of Winston-Salem requirements, all applicable federal and state agency requirements shall be incorporated into the planning and design of all infrastructure.

3. **Private Streets and Drainage Systems**
   Private streets and drainage systems are permitted but must adhere to the design & construction standards for the City of Winston-Salem. This includes plan review/acceptance and certification requirements.
4. Storm Drain System
   a) Unless otherwise noted, storm drain systems shall be designed in accordance with the requirements of the North Carolina Department of Transportation Guidelines for Drainage Studies and Hydraulic Design, latest edition.

   b) The minimum pipe diameter shall be 15 inches.

   c) Reinforced Concrete Pipe (RCP) (minimum Class III) is required material for all slopes less than or equal to 10%. Corrugated aluminum pipe (CAP) may be used for slopes greater than 10%. CAP must have hugger band connectors with flat gaskets. Use of pipe materials other than RCP must be approved by the City Engineer and meet the requirements of the NCDOT Pipe Material Selection Guide.

   d) Proposed storm drain lines with less than 24” of cover must be approved by the City Engineer.

   e) Storm drain lines shall be designed to be deeper than the water mains but shallower than the sanitary sewer mains per the vertical and horizontal offset requirements from water and sewer lines outlined in Section IV-B.1. of this document. Publicly maintained drainage pipe shall be located within the right-of-way at intersections and under pavement/curb elsewhere in a street cross-section.

   f) Grate inlets shall be NCDOT 840.04 or 840.05.

   g) Catch basins are to be placed at a lot line.

   h) Blind boxes are not acceptable.

   i) Storm drain system shall be designed such that no water is allowed to flow across a roadway or intersection. No water shall be permitted to discharge across a roadway, sidewalk or driveway from a concentrated source (swale, ditch, pipe, etc.).

   j) Storm drain outfalls shall be conveyed 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 conveyance 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.
k) 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/streams may require a wider easement as shown below. Pipes over 20' in depth are discouraged and will be reviewed on a case-by-case basis.

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe Depth</th>
<th>Drainage Easement Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 42&quot;</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 &gt; 60”</td>
<td>Case-by-case review</td>
<td></td>
</tr>
</tbody>
</table>

l) 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 or other approved material for energy dissipation shall be used if required.

m) 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. Final storm drain system plans shall include summary tables with design criteria for pipe and structures.

n) The maximum width of spread shall be the lesser of 8' or ½ lane width + gutter width.

o) All ditches and swales shall be indicated on the drawings complete with spot elevations, slopes, typical sections and liner materials.
B. UTILITIES (WATER/SANITARY SEWER ONLY)

1. General

a) The most current edition of the City of Winston Salem Technical Specifications and Detail Drawings for Water Line and Sewer Line Construction will govern all water and sanitary sewer construction and installation in compliance with the rules and regulations of the NCDEQ, Division of Water Resources, Water Quality Section, and applicable plumbing codes. In cases where the City and State design criteria conflict, the more stringent shall apply.

b) Prior to approval of a Final Plat, the infrastructure requirements of UDOClearCode Section 3.2.5-B.2. must be met. Phasing of Final Plats must match the phasing approved at the permit stage. Utilities Plan Review will not approve a Final Plat that breaks a single Water and/or Sewer Line Extension permit into multiple sections.

c) 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 5’ horizontally from all storm sewers.

d) Vertical separation of water and sewer lines from storm drain lines shall be as follows:
   (1) 24" minimum between storm and sanitary.
   (2) 18" minimum between storm and water.

   If the 18" minimum between storm and water is not feasible, a concrete cradle must be provided around the water line. A variance from the minimum separation must be approved by Utilities Plan Review staff prior to permitting.

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

f) Proposed water and sanitary sewer lines shall be placed a minimum of 5 feet off edge of pavement on existing ribbon-paved roads. Mains placed within the right-of-way of other municipalities will be placed as directed by Winston-Salem/Forsyth County Utilities. Water lines shall be placed a minimum of 5 feet and sewer lines shall be placed a minimum of 7 feet from the right-of-way line. If the minimum is not met, a public water and/or sewer easement shall be provided for future maintenance.

g) 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).
h) 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.

i) The City has been authorized by the State of North Carolina (DEQ) to process all permits for water and/or sewer line extensions within the jurisdiction of the Winston-Salem/Forsyth County Utility Commission. The developer/engineer must submit a complete Permit Application for Water and/or Sewer Line Extensions to the City (Section VI-A of this document). The form is available from Utilities Plan Review section or online at: https://www.cityofws.org/596/Publications

j) The Permit Application for Water and/or Sewer Line Extensions must be signed by the Engineer of Record and the permit and Authorization to Construct must be signed by the City/County Utilities Director PRIOR to construction. 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 and permit approval to facilitate agreement preparation.

k) Water and sewer connections are limited to one set of connections per lot for residential developments.

l) 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 or as directed by the Engineer, with not more than thirty inches (30") of lateral separation between them (center to center spacing). Meter boxes and cleanouts shall not be placed within a driveway or sidewalk.

m) All utility easements for outfall or cross-country lines shall be shown on the plan sheet and labeled, "Public Water and/or Sewer Easement." Minimum width shall be 20 feet. Larger pipes, deep lines and steep terrain may require a wider easement as shown below. Pipes over 20' in depth are discouraged and will be reviewed on a case-by-case basis. Wider easement widths will be required when stormwater and water/sewer utility lines are co-located within overlapping easements. Easements required for private development must be acquired by the Owner/Developer.

<table>
<thead>
<tr>
<th>Pipe Size ≤ 42”</th>
<th>Pipe Depth ≤ 10’</th>
<th>Utility Easement Width 20’</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.01’ – 15’</td>
<td>30’</td>
<td></td>
</tr>
<tr>
<td>Pipe Size</td>
<td>Pipe Depth</td>
<td>Utility Easement Width</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>15.01’ – 20’</td>
<td>40’</td>
<td></td>
</tr>
<tr>
<td>≤ 10’</td>
<td>30’</td>
<td></td>
</tr>
<tr>
<td>10.01’ – 15’</td>
<td>40’</td>
<td></td>
</tr>
<tr>
<td>15.01’ – 20’</td>
<td>50’</td>
<td></td>
</tr>
</tbody>
</table>

n) Access easements a minimum of 15’ in width must be provided to all public water and/or sewer easements.

o) 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) 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 Section VIII of this document for a standard easement form and Proof of Payment documents. Until the Letter of Acceptance is issued detailing the warranty period, the developer shall be responsible for all maintenance and liability.

2. Water
   a) Pipe material shall be ductile iron.

   b) Minimum diameter pipe shall be 6 inches.

   c) Water mains shall have a minimum of 3 feet of cover.

   d) Valves shall be placed as follows:
      (1) Minimum 3 valves at each cross
      (2) Minimum 2 valves at each tee
      (3) 1 valve on each hydrant leg at the hydrant tee
      (4) Minimum of 1 main line valve every 2,000’

   e) 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.

   f) 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.
g) 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.

h) 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.

i) All dead-end mains (greater than 100’ long) must have a hydrant or a blow-off.

j) Hydrants are preferred. No connections shall be made beyond the hydrant or blow-off.

k) 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.

l) Direct service connections are allowed on mains 16” and smaller. No taps or services shall be made on pipes larger than 16” or larger transmission main unless approved by the City/County Utilities Director.

m) Water mains in streets shall be extended to the far reach of the property if it could be extended to serve future development. Hydraulic ties are required as directed by Winston-Salem/Forsyth County Utilities.

3. **Sanitary Sewer**
   a) Sewer design must be consistent with overall needs of the watershed as determined by Utilities Plan Review staff. The designer shall furnish topographic maps, zoning maps and design data to substantiate sizing of all major watershed outfalls.

   b) Minimum pipe diameter shall be 8”.

   c) Eight (8)-inch pipe shall be:
      1. Vitrified clay for cover of 3’ to 22’ (See Water and Sewer Technical Specifications and detail drawings - Bedding Requirements).
      2. 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.

   d) Bedding requirements shall be shown in the profile view.
e) 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>0.50%</td>
</tr>
<tr>
<td>12”</td>
<td>0.30%</td>
</tr>
<tr>
<td>15”</td>
<td>0.20%</td>
</tr>
<tr>
<td>18”</td>
<td>0.15%</td>
</tr>
<tr>
<td>21”</td>
<td>0.15%</td>
</tr>
<tr>
<td>24”</td>
<td>0.10%</td>
</tr>
<tr>
<td>27”</td>
<td>0.10%</td>
</tr>
<tr>
<td>30”</td>
<td>0.10%</td>
</tr>
<tr>
<td>36”</td>
<td>0.10%</td>
</tr>
</tbody>
</table>

f) Direct service connections are allowed on mains 15” and smaller. No taps or services shall be made on pipes larger than 15” unless approved by the City/County Utilities Director.

g) 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. Manholes deeper than 20 feet shall be 5-foot diameter.

h) 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.

i) 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.)

j) A maximum of 3 sewer connections is allowed into a single manhole.

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

l) 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 line must enter at the C/L elevation of the manhole. Show both top of drop and centerline invert elevations on plans.
m) 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.

n) Off-street sewers shall show bearings and distances with a minimum of 20-foot permanent easements. Easement widths shall meet the requirements of this document (see note above). All easements shall be on current forms provided by the City.

o) 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 if a Type 3 ring and cover is provided.

p) 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.

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

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

s) 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.

t) Aerial sewers are discouraged from use within the Winston-Salem/Forsyth County Utilities system. Aerial sewers for new construction must be approved as part of the permitting process. If allowed, the maximum unsupported clear span is 40'. Suspended joints shall be Mech-Lok Rigid Restained joint by Griffin (or equal). Piers or piles are required to support pipe for spans greater than 40'. See the Technical Specifications and Detail Drawings for Water Line and Sewer Line Construction, latest edition.
u) Sewer mains 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.

v) For development projects that cannot be designed for gravity flow and require a lift station, all sewer lines and the associated lift station will be privately maintained and not accepted for maintenance by Winston-Salem/Forsyth County Utilities.
C. STORMWATER MANAGEMENT
   Refer to the “Post Construction Stormwater Control Ordinance” which can be found on the City’s website at the following address:
   https://www.cityofws.org/794/Post-Construction-Stormwater-Management
D. DRIVEWAYS

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

a) **Access**: Ingress and egress to City roadways

b) **Buffer Area**: The border area between the traveled way and the right-of-way line and within the frontage boundary lines

c) **Corner Clearance (C)**: At an intersecting roadway, 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. Minimum required is 25 feet

d) **Distance Between Double Driveways (D)**: 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

e) **Driveway Angle (Y)**: The angle between the driveway centerline and the edge of the traveled way of 90 degrees or less

f) **Driveway or Island Returns (R and U)**:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R</strong></td>
<td>(Outside) The outside or larger curve radius on the edge of the driveway, used when ( Y &gt; 75 ) degrees. 3 feet minimum to 30 feet maximum</td>
</tr>
<tr>
<td><strong>U</strong></td>
<td>(Inside) The inside or smaller curve radius on the edge of the driveway, used when ( Y \leq 75 ) degrees or smaller. 3 feet minimum to 15 feet maximum</td>
</tr>
</tbody>
</table>

g) **Driveway Width (W)**: The narrowest width of the driveway within the buffer area measured parallel with the edge of the traveled way

h) **Frontage**: The length along the roadway right-of-way line of a single property tract or roadside development area between the edges of the property. Corner property at a roadway intersection has a separate frontage along each roadway.

i) **Frontage Boundary Line** (abbreviated as **FB line**): A line, perpendicular to the street centerline, at each end of the frontage, extending from the right-of-way line to the edge of the through-traffic lane

j) **Intersection Return**: The radius of the edge of the pavement between intersecting roadways.
k) **Right-of-way**: 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.

l) **Right-of-way Line Returns (J and K):**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>J</strong></td>
<td>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. 30 feet maximum</td>
</tr>
<tr>
<td><strong>K</strong></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. 10 feet maximum</td>
</tr>
</tbody>
</table>

m) **Setback (G)**: 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.

n) **Side Clearance (E)**: The minimum distance, parallel to the traveled way, between the frontage boundary line and the tangent projection of the nearest edge of the driveway. Minimum required is 5 feet.

o) **Traveled Way**: That portion of the right-of-way which is ordinarily available and open to the general public for vehicular travel.

2. **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, 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.

3. **Application**

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
NCDOT. NCDOT driveway permit forms can be obtained from either the City or the State.

b) **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.

4. **Approvals**
The approval of the application shall be subject to the following conditions:

a) The application shall be properly and clearly completed.

b) The location, design and construction of driveways shall meet the requirements of this document. Necessary provisions for drainage, pavement types and thickness, sight distance requirements and other details must meet minimum safety requirements.

c) The permit shall require that the applicant assume the following construction responsibilities:

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

   (2) **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.

   (3) **Paving:** The applicant shall bear the full cost of any stabilization and pavement placed on the driveway within the right-of-way.

   (4) **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 the City.

   (5) **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.

   (6) **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 gutter and sidewalk (if any), side ditches, etc. to City standards.
(7) Traffic control: It shall be the duty of the applicant and the person performing the work set forth in this section 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. Such person shall erect and maintain barricades, signs, lights and other appropriate warning devices at the proper locations where is in progress in accordance with the current standards for street construction and maintenance operations as established by the City Engineer and NCDOT.

5. Design Requirements

a) Location of driveways: Driveways should be located at a point that provides adequate sight distance to safely enter and exit the public street. 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) Driveway Width (W): The width of a driveway, measured parallel to the highway or street centerline, shall be within the minimum and maximum widths specified in the table below.

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

* Wider than 20/36’ require case-by-case review/approval

d) Driveway Angle (Y): Driveway angle with respect to the edge of pavement shall meet the following minimum requirements:

<table>
<thead>
<tr>
<th></th>
<th>Entrance – 30 degrees</th>
<th>Exit – 60 degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-Way</td>
<td></td>
<td>60 degrees</td>
</tr>
<tr>
<td>All Driveways to a Two-Way Street</td>
<td>60 degrees</td>
<td></td>
</tr>
</tbody>
</table>

e) Driveway Return (R and U): Driveway return radii shall meet the minimum and maximums as noted above. No portion of the driveway shall be constructed in front of adjacent properties. The radius return must lie within the extension of the property boundary. Flares shall be 2 feet for residential driveways and 3 feet for commercial driveways on each side of the driveway.
f) **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 shall not apply.

g) **Multiple Driveways:**
   1) **Double driveways:** Two (2) driveways entering on a particular roadway 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 (3) driveways entering on a particular roadway 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 (4) or more entering a single commercial establishment from a particular roadway shall not be permitted.

h) **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 UDO.

i) **Corner Islands:** The location of a driveway in relation to a street 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 25 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.

j) **Driveway Grades:** The grades of entrances and exits shall be constructed in accordance with Section V of this document. City Engineer/Driveway Inspector/Fire Marshall must approve any location where the physical conditions do not permit conformance with these details.
k) **Paving Material**

(1) All driveways shall be paved with 6” of 3,000 psi concrete over 6” of compacted ABC stone from the back of the curb for a distance of eight feet, or to the right-of-way line, whichever is greater. Heavy duty concrete aprons, when required, shall be paved with 8” of 4,000 psi concrete over 6” of compacted ABC stone.

(2) All single-family residence driveways which are constructed with concrete or asphalt shall have six inches of concrete or equivalent asphalt within the right-of-way. Continuous sidewalks crossing driveways shall be a minimum of 6” of concrete.

l) **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 roadway side ditches shall not be impeded, and the cost of providing suitable drainage structures shall be borne by the applicant.

m) **Alteration of Existing Facilities**: Existing driveways may not be altered in width, grade or location without first securing a new permit.

6. **Special Commercial Sites**

a) **Permit Application**: Property uses 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 applicable property uses are as follows:

(1) Shopping centers (defined as 2 or more adjoining commercial or service establishments planned or constructed)

(2) Restaurants

(3) Car Washes

(4) Apartments of 3 or more units

(5) Other uses which can be expected to attract large amounts of traffic

b) **Site Plans**: Site plans conforming to all of the requirements of the current UDO must be submitted along with the following information specific to the review of the proposed access point(s):

(1) All information required under Section 3. 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 submit two sets of the site plans to the City Engineer at least 30 days prior to the planned construction date along with a completed permit application and associated review fee.

c) **Design Considerations**: These special property uses can be expected to attract large volumes of traffic. Thus, special attention should be given to the following elements which enhance the smooth and orderly flow of traffic:

(1) **Parking Areas**
   (a) *Size*: The size and layout of the parking area and parking stalls shall be in accordance with the provisions of the current UDO.
   (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) *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 of adjacent streets. Storage on through traffic lanes or blockage of such lanes is not be permitted.
   (d) For areas containing 100 parking spaces or more, a minimum of 40’ from the existing edge of pavement is required prior to the first parking space or internal driveway or drive aisle intersection. This requirement may also be enforced for sites with high volumes during peak periods.

(2) **Driveways**
   (a) *Conflict Resolution*: 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.
   (c) *Grades*: Driveways should be as flat as possible to allow smooth entry and exit.
   (d) *Clearance from Utilities & Public Infrastructure*: No driveway approach shall be permitted to encompass any municipal or utility company facility such as traffic signal equipment and appurtenances, catch basins, fire hydrants, crosswalks, loading zones, utility poles, fire alarm supports or other necessary structures. No part of a driveway shall
be permitted within 3 feet of an existing catch basin. 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.

7. Control of Driveway Traffic
   a) Stop Signs: All vehicles emerging from driveways must stop before entering or crossing the sidewalk or sidewalk area. The only sign 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 conform to all of the requirements set forth in the current editions of the FHWA Manual on Uniform Traffic Control Devices for Streets and Highways and the NCDOT Standard Specifications for Roads and Structures.

8. Record Drawings
   a) Record Drawings in accordance with the requirements of the Infrastructure Development Standards must be submitted and approved prior to the City and/or NCDOT accepting such improvements for maintenance for all Driveway Permits that require improvements within the City or NCDOT right-of-way (turn lanes, widening, curb and gutter and sidewalk installation, etc.).

   b) For a complete list of requirements for Record Drawings, see Section II-G. of this document.
E. TREE PLANTING

1. Locations Specifications

   a) *Linear Spacing*: General spacing specifications are as follows:

<table>
<thead>
<tr>
<th>Mature Height</th>
<th>Linear Spacing Between Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 40’</td>
<td>40’</td>
</tr>
<tr>
<td>15 &lt; h &lt; 39</td>
<td>30’</td>
</tr>
<tr>
<td>&lt; 15</td>
<td>15’</td>
</tr>
</tbody>
</table>

   b) *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.

   c) *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. Tree plantings shall not occur within a zone of 20 feet from the edge of a driveway (A) to a tree (B) or within a zone 10 feet from the edge of a driveway (C) to a tree (D) as shown below.

   Residential driveways are those primarily for a single family or individual residents. In planning for tree planting near residential driveways, trees should be at least 10 feet from the edge of the driveway (C) to the centerline of the tree (D) as shown below.
d) **Minimum Linear Clearances**

<table>
<thead>
<tr>
<th>Object</th>
<th>Minimum Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidewalk</td>
<td>1’</td>
</tr>
<tr>
<td>Access or Courtesy Walk¹</td>
<td>5’</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 Sewer Lines²</td>
<td>10’</td>
</tr>
</tbody>
</table>

(1) A walk that is generally perpendicular to the street and is used to go from the street to a commercial or residential building

(2) Trees shall not be planted within sanitary sewer and/or water utility easements

e) **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.

f) **Minimum Distance from Structures**: The minimum distance from any structure should be equal to or greater than half of the total height of the tree being planted. Any exceptions must be approved by the City prior to planting.

g) **Minimum Distance from Street Lights**

<table>
<thead>
<tr>
<th>Mature Height</th>
<th>Min. Distance from Street Lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 40’ Spreading Crown</td>
<td>20’</td>
</tr>
<tr>
<td>&gt; 40’ Global/Pyramidal</td>
<td>16’</td>
</tr>
<tr>
<td>&gt; 40’ Columnar</td>
<td>10’</td>
</tr>
<tr>
<td>15 &lt; h &lt; 39</td>
<td>15’</td>
</tr>
<tr>
<td>&lt; 15</td>
<td>10’</td>
</tr>
</tbody>
</table>

h) **Minimum Planting Space Widths**

<table>
<thead>
<tr>
<th>Mature Height</th>
<th>Min. Planting Space Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 40’</td>
<td>40’</td>
</tr>
<tr>
<td>15 &lt; h &lt; 39</td>
<td>20’</td>
</tr>
<tr>
<td>&lt; 15</td>
<td>10’</td>
</tr>
</tbody>
</table>

2. **Tree Pits & Planters** - 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 within the City right-of-way, please request these specifications from the Urban Forester.
3. **Watering** - A process/plan must be in place to water plant material. Trees should receive, on average, 1” of water per week.

4. **Permits** - The tree planting permit application may be found in Section VI of this document.

5. **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 for all buffer yard plantings and street yard plantings. All landscape plans should be signed and sealed by a registered professional (RLA, PE or RA) licensed in North Carolina.

6. **Approved Species** – For a list of approved species or to verify a proposed species is allowed, please contact the City’s Urban Forester.
F. PUBLIC ALLEYS

1. Specifications

a) 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 the public welfare.

b) Public alleys shall 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 Assistant City Manager for Public Works.

c) 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’

d) 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”. “Inverted” crowns must be approved by the Assistant City Manager of Public Works. The maximum length of a public alley shall be 600’. A 5’ utility easement 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 STREETS

1. Specifications

a) Ribbon pavement may be used in the following cases:
   (1) Low-impact development
   (2) Minor in-fill in existing residential areas where no curb and gutter exists in the existing subdivision and where the in-fill development is not an extension to additional property for development.
   (3) Low density development locations where it is needed to comply with the water quality provisions of the City’s post-construction stormwater ordinance.

b) 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-year storm with 3” freeboard. 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.

c) The ditch section must accept the stormwater velocity without scour or erosion. As part of the design process, roadside ditches must be evaluated to determine if liners of any type are required to function properly.

d) Ribbon pavements shall be 20’ wide with 6’-6” shoulders and a minimum 50’ right-of-way. The right-of-way must contain the ditch section to the back of the ditch bank. Additional utility easement widths and/or right-of-way may be required. The use of ribbon pavement streets does not remove the requirements for sidewalks and lot trees. Sidewalks shall be installed beyond the ditch with the ditch placed between the road and the sidewalk. Trees will need to be planted on private property outside of the sidewalk area unless otherwise directed.

e) 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.

f) Roadway slopes for ribbon pavement streets should not exceed 8%.

g) 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. For the 25-year storm, the design must limit the HW/D to no more than 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.
h) Roadway ditches for ribbon pavement where grass is to be the primary liner shall be lined with sod and maintained for the duration of the one-year warranty as needed for continued growth.
SECTION V - CONSTRUCTION DETAILS
A. STREETS

1. 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

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

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 4/17/2020
2. 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: 8/7/2020

R:\Data\Streets\Street Details\streetdetails.dwg  V-2
3. CURB & GUTTER

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
4. TRANSITION FROM VALLEY CURB & GUTTER TO STANDARD HOOD, GRATE & FRAME

Note: Top of hood to be at same elevation as top of curb.
NOTE:
STANDARD CURB AND GUTTER MAY BE REQUIRED AT THE END OF PAVEMENT TO CONTROL DRAINAGE.
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
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: 10/23/19
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: 10/23/19
9. RESIDENTIAL CUL-DE-SAC

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED
10. 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.

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: 6" THICK (8" AT DRIVEWAYS)

MINIMUM DESIGN

1" S9.5B
2" S9.5C
7" ABC

CITY OF WINSTON-SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED 4/17/2020

R:\Data\Streets\Street Details\streetdetails.dwg V-10
11. TYPICAL SECTION PRIVATE ROADS

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" S9.5B

2" S9.5C

7" ABC

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED 4-17-20
12. PRIVATE ROADS

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.

CITY OF WINSTON—SALEM
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

N.T.S. REVISED
14. RESIDENTIAL DRIVEWAY

NOTES:
1. WHERE NO CURB & GUTTER 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
NOTE: IF APPLICABLE, STOCKPILE EXCESS GRANITE CURB ON R/W SAFELY FOR CITY PICKUP.

HEIGHT DETERMINED BY EXISTING CURB

SEAL JOINT AS DIRECTED

ROAD SURFACE

VARYS

CONCRETE (3000 P.S.I.)

BRICK BATS

BRICK BATS

1/4" PER FOOT

6"
B. WATER/SEWER

* Refer to the City of Winston-Salem’s Technical Specifications and Detail Drawings for Water Line and Sewer Line Construction, latest edition (available on the Engineering Division’s page at https://www.cityofws.org/596/Publications)
SECTION VI - PERMITS
A. WATER AND/OR SEWER LINE EXTENSIONS

Water/sewer permits in Winston-Salem Forsyth County are issued through our Utilities Plan Review section. Contact Utilities Plan Review at (336) 747-7499 for questions and information regarding issuance of utility permits. All permits expire 24 months from the date of issuance. No extensions will be considered. 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.
City of Winston-Salem/Forsyth County
Permit Application for Water and/or Sewer Line Extensions

1. Applicant Legal Name: __________________________________________ Project Contact: __________________________
   Main Office: __________________________ Business Address: __________________________________________
   (county / state) (mailing address / street / city / state / zip code)
   Phone: __________________________ Cell: __________________________ Email (or Fax): __________________________

2. Person(s) authorized to convey property (type or print):
   - Individual (married individuals must list spouse)
   - General Partnership
   - Limited Partnership
   - Limited Liability Company (LLC)
   - Corporation (submit operating agreement and articles of organization)

   (applicant) __________________________ (General Partner) __________________________
   (Manager) __________________________

   (applicant spouse) __________________________ (Member) __________________________
   (Manager) __________________________

   (Authorized Name, Title) __________________________
   (Attesting Name, Title) __________________________

3. Project Name: __________________________________________ Location: __________________________
   Address: __________________________________________
   __________________________________________

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

   PUBLIC: MH    HYD    6” GV    8” GV    12” GV
   Qty: _____ _____ _____ _____ _____

   Est. Total Average Daily Sewage Flow: _______ GPD
   (Calculate for this project only, not the watershed)

   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)

5. Project Description (linear feet, pipe type, diameter, etc):
   __________________________________________
   __________________________________________
   __________________________________________

6. Engineering Firm: __________________________________________ Phone: __________________________
   Address: __________________________________________ Cell: __________________________
   __________________________________________ Email: __________________________
   Engineer: __________________________ NC PE#: __________________________

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 NCDEQ 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
   Water Permit Number: ____________ Block and Lot: ____________ Subdivision or Project Number: ____________
   Sewer Permit Number: ____________ PIN: ____________ Assigned Flow – Sewer (MGD): ____________
B. DRIVEWAY PERMIT

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

PLAN REQUIREMENTS

___ Location Map Clearly showing proposed site and surrounding streets
___ Complete set of sealed plans for City of Winston-Salem review
___ 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)

GENERAL INFORMATION

Do not submit plans for approval prior to City Council rezoning approval. The owner’s 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 commercial driveways and private street tie-in to public streets within the City limits of Winston-Salem.

A signature for the local authority (City of Winston-Salem) is required for all connections to NCDOT streets within the City limits of Winston-Salem. If a site requires joint approval by City of Winston-Salem and NCDOT, the NCDOT permit application and check for review fee are submitted directly to NCDOT. NCDOT will obtain the City’s signature. The City will only sign the NCDOT permit if the City application has been received and approved.

VI-3
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 entrances 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.

Driveway permits that include improvements within the public right-of-way (turn lanes, storage lanes, median islands, etc.) must produce Record Drawings of said improvements prior to the acceptance of the improvements for maintenance by the City.

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

**Permit may be submitted online at** [https://winston-salem.idtplans.com/secure/](https://winston-salem.idtplans.com/secure/)

**OR hand delivered, mailed, or overnight delivery to:**
Ryan Newcomb, P.E.
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 at least **two (2) working days** prior to pouring concrete. Contact Steve Harper at (336) 995-2522 to schedule all required inspections.

**OWNER’S PRINTED NAME & TITLE**
________________________________

**OWNER’S SIGNATURE**
________________________________

**OWNER’S ADDRESS**
________________________________
________________________________
________________________________

**TELEPHONE WITH AREA CODE**
OFFICE ____________________________
CELL _____________________________
FAX ______________________________

**OWNER’S EMAIL ADDRESS**
________________________________

**DATE**
________________________________
Location of property: Street:

Distance from the intersection of ____________________ Street ______________ft.: N___S___E___W___

Property will be used for:____________________________________________________
Property Zoning:________________________________
Type of 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 *Infrastructure Development Standards* for the City of Winston-Salem and incorporated by reference into this Agreement. I agree to construct and maintain the 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 including any approach tapers, storage lanes, speed change lanes, or median openings as are deemed necessary which are incorporated by reference into this Agreement.

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 to produce Record Drawings showing all roadway improvements required within the public right-of-way as shown on the attached plans which are incorporated by reference into this Agreement.

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.

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Witness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: ___________</td>
<td>Name: ___________</td>
</tr>
<tr>
<td>Signature: _______</td>
<td>Signature: _______</td>
</tr>
<tr>
<td>Address: ____________</td>
<td>Address: ____________</td>
</tr>
<tr>
<td>Phone: ____________</td>
<td>Phone: ____________</td>
</tr>
</tbody>
</table>

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, checklist and the plans through IDT Plans. The $200 review fee is paid online. (https://winston-salem.idtplans.com/secure/) Approved: __________________________ Date: __________________________
C. STORMWATER MANAGEMENT PERMIT

Department of Public Works/Stormwater Division
Suite 53, City Hall,
101 North Main Street,
Winston-Salem, N.C. 27101
Telephone: (336) 747-7480
Fax: (336) 748-3173

CITY OF WINSTON-SALEM’S
POST CONSTRUCTION STORMWATER
MANAGEMENT PERMIT

PART 1: APPLICATION
PART 2: SUBMITTAL CHECKLISTS
PART 1

APPLICATION

(PLEASE READ AND COMPLETE ALL SECTIONS IN FULL)

UNCOMPLETED APPLICATION ITEMS WILL DEEM A SUBMITTAL INSUFFICIENT
1. Project/Site Information

Project/Site Name: __________________________________________
Project Location (Address): ____________________________________
PIN(s) (Parcel Identification Numbers): __________________________
Block/Lot(s): __________________________
Total Site Area (ac): ______
Total Proposed Disturbed Area (ac): ______
Existing Built-Upon Area (BUA): ______ (ac) ______ (sq.ft.)
Proposed BUA: ______ (ac) ______ (sq.ft.)
Proposed BUA (%): ______ (as a percentage of disturbed area)
Proposed BUA (%): ______ (as a percentage of parcel/site area – for master plans or when using the entire parcel to calculate the percentage)
Net Increase in BUA (if applicable): ______ (ac) ______ (sq.ft.)
For Subdivisions: Number of lots ______ Lot density (units/acre) ______
Low Density (for Water Quality) Development (<24% BUA or < 2 units/acre): YES _____ NO _____
High Density (for Water Quality) Development (>24% BUA or > 2 units/acre): YES _____ NO _____

Note - Exemptions to having to comply with certain provisions of the ordinance and/or having to obtain a permit:

A. If less than 1 acre is disturbed during construction and the development is NOT part of a larger common plan of development then the development is exempt from the Stormwater Quality Provisions of the City of Winston-Salem’s Post Construction Stormwater Management Ordinance. (Herein after referred to as “the ordinance” (see Section 75-105 (d)(1) and 75-105 (d)(2) of said ordinance for exemption details).

Does this apply: Yes______ No _____
(If “No” a stormwater permit that addresses the Quality Provisions must be applied for unless Item C answer is “Yes” below)

B. If the development creates less than 20,000 sq.ft. of a net increase in BUA (comparing proposed to existing) then the development is exempt from the Stormwater Quantity Provisions of the ordinance. (see Section 75-105 (d)(3) of the ordinance for exemption details).

Does this apply: Yes______ No _____
(If “No” a Stormwater permit that addresses the Quantity Provisions must be applied for)

C. Any development/redevelopment activity for which the proposed BUA is equal to, or less than, the existing BUA on the site is exempt from all provisions (Quality and Quantity) of the ordinance. (see Section 75-105 (d)(4) of the ordinance for details).

Does this apply: Yes______ No _____

Note: Sealed copies of the existing and proposed site plans and grading plans that include relevant information shown on them to verify if a development or redevelopment meets exemptions A and B, or C, of the above must be submitted to the Stormwater Division. If either of A or B does not apply then complete an application and the relevant checklist(s) that addresses completion of either a no adverse impact downstream study, hydrologic and hydraulic report/study for management for quality and/or management for quantity or whichever combination thereof applies and the checklist for the Stormwater management plan set(s).

2. Engineer/Designer Information

Engineer Name: __________________________________________ NC PE License #: _____________
Engineers Company/Firm: ________________________________________________________________
3. Project Owner Information

Owner/Developer Name (if an individual): ____________________________________________
Owner/Developer/Firm (if a company): ____________________________________________
Name of person signing and authorized to sign on behalf of a firm/company______________
Owner/Developer Address: ________________________________________________________

Office Phone: ____________________ Cell Phone: ____________________ Fax: ____________________
Owner/Developer Contact E-mail: ____________________________________________________

Owner/Developer Signature: ________________________________________________________ Date: ____________________

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

Contractor Name: ______________________________________________________________________
Contractor Address: ____________________________________________________________________

Office Phone: ____________________ Cell Phone: ____________________ Fax: ____________________
Contractor E-mail: ______________________________________________________________________

5. Application Review Fee (check box to indicate inclusion in submittal)

☐ Review Fee of $220 is included with the application. The review fee should be in a check made payable to “The City of Winston-Salem”. An application is not considered complete without submittal of the review fee at the time of the application.

6. Stormwater Management System Financial Surety

A non-refundable financial surety must be posted with the City of Winston-Salem prior to issuance of a Post Construction Stormwater Management permit for any development which has SCM’s (Stormwater Control Measures) also known as BMP’s (Best Management Practices) designed as part of the Stormwater Management Plan. A permit will not be issued until such a surety is in place

There are two types of surety accepted by the City and which one is submitted and established depends on the developer and their intent as regards the entity responsible for long term Operation and Maintenance of the Stormwater Management System. These are outlined as Options A and B that follow.

Select which option applies to your submittal:

☐ OPTION A - For all Stormwater Management Systems that are to be owned and maintained by a single owner (typically commercial or single owner developments): The developer must comply with the surety requirements outlined in Section 75-404 of the ordinance namely:
Submit a sealed engineer’s estimate, or, certified contractors bid tab for the construction cost of the Stormwater Management System to the Stormwater Division upon approval of the design phase of the permit (plans and report/study receiving approval from reviewer). This estimate or bid tab should include all items related to the cost of constructing the system including, but not limited to, grading, conversion costs from the erosion control phase and associated components of that phase of the project to the post construction phase, SCM component breakdown costs, stormwater conveyance system costs throughout the site that convey runoff to and from any SCM including any by-pass conveyances, landscaping costs etc.

Upon approval of the estimate or contractors bid tab by the Stormwater Division, the owner/developer must submit a check or other acceptable form of payment to The City of Winston Salem that is equal to 4% of this approved estimated construction cost.

□ OPTION B - For all Stormwater Management Systems that are to be owned and maintained by a homeowners association, property owners association, or similar entity (typically associated with residential subdivisions or other types of multi owner developments): The developer must comply with the surety requirements outlined in Section 75-402(b) of the ordinance namely:

- **Estimate A**: Submit a sealed engineer’s estimate, or, certified contractors bid tab for the construction cost of the Stormwater Management System to the Stormwater Division upon approval of the design phase of the permit (plans and report/study receiving approval from reviewer). This estimate or bid tab should include all items related to the cost of constructing the system including, but not limited to, grading, conversion costs from the erosion control phase and associated components of that phase of the project to the post construction phase, SCM component breakdown costs, stormwater conveyance system costs throughout the site that convey runoff to and from any SCM including any by-pass conveyances, landscaping costs etc. This estimate, once approved will be used in determining the developer’s escrow account contribution.

- **Estimate B**: Submit a sealed engineer’s estimate of the annualized cost of operation and maintenance of the Stormwater Management System to the Stormwater Division upon approval of the design phase of the permit. This estimate, once approved, will form the basis for future HOA or POA contributions to the escrow account

- The developer must establish a Home Owners Association (HOA), or similar type of entity, that will agree to operate, maintain, repair, inspect and if necessary reconstruct the Stormwater Management System as part of the permit application process. The City of Winston-Salem’s Attorneys must review all Association Articles of any such entity prior to establishment to ensure adequacy and proof of establishment is to be provided to the Stormwater Division after the fact.

- Establish an escrow account which shall be used to maintain, operate, repair, inspect or if necessary reconstruct the Stormwater management system

- The developer must pay into the escrow account, by depositing with the escrow agent, an amount equal to 15% of the approved “Estimate A” and provide proof of deposit of payment with the escrow agent to the Division

- Two-thirds of “Estimate B” required to fund the escrow account shall be deposited by the HOA, or, POA into the escrow account within the first five years and the full amount deposited within 10 years following the initial construction of the Stormwater Management System (from date of City of Winston-Salem’s As-Built plans approval)

The surety is not provided until the plans/design phase of the permit review has been approved as review comments may require changes to the design and hence cost. The above information is provided in order to enable the developer and his engineer to plan to take this phase of the permit process into account from the outset and to inform the Stormwater Division what option surety they will be submitting.
7. Stormwater Management System Operation and Maintenance Agreement and if applicable Escrow Agreements Information

A fully reviewed and recorded Operation and Maintenance Agreement, per Section 74-402 of the ordinance, must be in place and recorded for any development that has a Stormwater Management System designed and approved. **A permit will not be issued until such an agreement is recorded**

**Note:** In addition to the above, for residential developments an escrow agreement must also be submitted, reviewed, approved and recorded. This will also be required for any other type of development that will involve a HOA/POA. See further below for details. *

The following describes the process of the Operation and Maintenance Agreement submittal and requirements for its review:

Upon approval of the design phase of the permit the developer must submit to the Stormwater Division an appropriately signed and notarized Operation and Maintenance Agreement with all relevant exhibits attached. This agreement must be signed by the person, or, entity who is taking responsibility for all future operation and maintenance requirements for the Stormwater Management System. The Agreement shall consist of the following:

- The main body of the agreement including all signature pages signed and notarized appropriately by the owner/developer and if applicable the HOA/POA. The standard template and approved language of the Agreement is available upon request to the Stormwater Engineer. Please note that there is one template for single owner type developments and one for multi owner (HOA/POA) type developments and the appropriate template will be sent to the engineer upon request.

- **Exhibit A** is a legal description of the land on which the development is taking place. This exhibit (as with Exhibit B and C) should be included in the agreement following the main signature pages

- **Exhibit B** is either a recorded plat of the required Stormwater private access, drainage and maintenance easements for the Stormwater Management System, or, in lieu of a recorded plat/dedicated easements, a legal description of the blanket easement that encompasses the entire property on which the development is taking place. Please note that if a plat of dedicated easements is to be provided these easements must match what is shown on the approved design plans and the plat must be submitted through the City of Winston-Salem’s/Forsyth County Planning Department plat review process before ultimately recording the plat at the Forsyth County Register of Deeds. Only a copy of the recorded plat that shows the deed book and page number will be accepted as Exhibit B. An unrecorded plat is not acceptable.

- **Exhibit C** is the signed and notarized Operation and Maintenance Manual(s) for the specific SCM(s) designed. Some of the more frequently designed SCM manual templates that we accept may be found at the following location: [https://www.cityofws.org/794/Post-Construction-Stormwater-Management](https://www.cityofws.org/794/Post-Construction-Stormwater-Management). Other manuals that a developer or his engineer may choose to submit will be accepted by the City if they review them and find them appropriate to address all inspection and maintenance needs for a particular SCM

- *For residential and other types of multi owner type developments an Escrow Agreement must also, in addition to an O&M Agreement items above, be submitted to the Stormwater Division. The standard template and approved language of this agreement is available upon request to the Stormwater Engineer.*
Once all of the above applicable items are complete they should be submitted to the Stormwater Division for review. The Stormwater Director will sign the agreement(s) if they are deemed to be sufficient and then forward the agreement(s) to the City Attorney’s office for their own standard review and signature process. Once the Agreement(s) have been signed by all relevant City officials the City Attorney’s Office will contact the owner/developer to collect the agreement(s) for recording purposes. The owner/developer must record the agreement(s) at the Forsyth County Register of Deeds office and provide a copy of this recorded agreement(s) (showing the deed book and page number stamp) back to the Stormwater Division for their files. **Note: A permit will not be issued until the Stormwater Division is in receipt of a copy of the recorded applicable agreement(s).**

8. **As-Built records submittal - acknowledgement by owner/developer and design engineer of requirement to submit these records upon completion of construction**

We, the undersigned owner/developer and design engineer for this development, acknowledge that immediately after completion of the construction of the Stormwater management system and as it becomes operational, the system shall be inspected by the design engineer and a detailed set of as-built plans based on survey information of the Stormwater Management System and its design components and as-built calculations of the Stormwater Management System that verify the system has been built and is operating in accordance with the approved design, be submitted to the City of Winston-Salem’s Stormwater Division for their review and approval per the ordinance requirements. **Failure to submit this information as required will result in the development been placed under a Notice of Violation (NOV) at that time if necessary per provisions of the ordinance in Section 75 – Division 5 – Enforcement and Violation**

Owner/Developer Signature: ___________________________ Date: ______________

Design Engineer Signature: ___________________________ Date: ______________
PART 2

SUBMITTAL CHECKLISTS

(PLEASE CHECK APPROPRIATELY ALL BOXES IN THE VARIOUS CHECKLISTS OUTLINED BELOW TO INDICATE THE OPTION(S), OR COMBINATIONS THEREOF, THAT YOU INTEND PURSUING IN YOUR SUBMITTAL. WRITE N/A (NOT APPLICABLE) NEXT TO ANY BOX IF THAT IS THE SITUATION)

☐ 1. Concept Plan Meeting items if applicable

Report/Study Related Checklists

☐ 2. No Adverse Impact Downstream Study in lieu of management for quantity. Also complete appropriate checklist 3 and 4 items if the project is high density as it relates to water quality.

☐ 3. Hydrologic/Hydraulic Analysis Report/Study for developments that will incorporate a Stormwater management device(s). Checklist No.2 may also need to be filled out if a study is submitted in lieu of management for quantity.

Plan Set Related Checklists

☐ 4. Stormwater Management Plan items

☐ 5. Low Density Development Plan items if applicable to water quality (Complete checklist 4 if a SCM(s) is included for water quantity.

☐ 6. Master Plan items (typically submitted for campus style developments looking to stay within low density thresholds for water quality, in combination with all, or parts, of other checklists above to address low density water quality provisions and water quantity provisions.

UNCOMPLETED CHECKLISTS WILL DEEM A SUBMITTAL INSUFFICIENT
1. **Checklist for a Concept Plan Meeting** (items per Section 75-203(a) of the ordinance)

**NOTE:** This checklist only applies if a concept meeting may have been deemed appropriate at the request of the Stormwater Division staff or at the owners/design engineers request before a full submittal is made and is deemed complete. If a concept meeting is requested by any such party the following items should be prepared for the meeting by the owner/design engineer:

- Existing site plans showing at a minimum existing site layout, property boundaries, existing topography, perennial and intermittent streams, wetlands, existing drainage conveyances, floodplain/floodway limits, existing stormwater management systems, if applicable
- Proposed site plan showing at a minimum the proposed site layout, property boundaries, proposed topography, perennial and intermittent streams, wetlands, proposed drainage conveyances, floodplain/floodway limits, proposed stormwater management systems, if applicable
- Existing and proposed BUA percentages and areas and units/acre totals if available
- Pre and Post development drainage area delineation maps showing the location of proposed development and pertinent drainage areas, including off-site areas draining to the proposed development
- A conceptual plan for any proposed stormwater management system(s) that would enable the site to meet stormwater quantity and quality regulations as applicable. The plan should indicate the type of SCM(s) the engineer proposes using.
- If available and sufficiently advanced enough at the time of the meeting, preliminary calculations for the system regarding the quality and quantity design criteria of the ordinance should be provided for discussion and analysis. These should include hydrologic inputs such as soils data/groupings, curve number analysis and time of concentration methodology/analysis.
2. Checklist for a “No Adverse Impact Downstream Study” (items per Section 75-203(b)(2) of the ordinance)

**NOTE:** This checklist only applies if a no adverse impact downstream study is been submitted in lieu of management for the quantity design provisions of the ordinance and the site is either exempt from quality, or, is qualifying as a low density development in terms of the quality provisions. If the site has to comply with the high density provisions of the ordinance as it relates to water quality then those appropriate General Items, Hydrologic Section, Hydraulic Section and Water Quality Section items in Checklist No. 3 that should also be completed

Submit two copies of the report for review. Report to be spirally bound preferably. 3 ring binders WILL NOT BE ACCEPTED

**General Items:**

- Cover page with project title; project name and address; owner’s name, address, email and phone number; designers/preparer’s name, address, email and phone number; and designers seal, signature and date
- Table of contents (with sequential numbering of pages) indicating report sections, appendices, exhibits, tables and figures
- Project narrative – to include a description of project, a description of how the project will meet the ordinance requirements with regard to quality (if applicable) and quantity provisions of the ordinance, pre and post development site conditions, channel protection etc.
- A description of the downstream study point(s) and how it/they were chosen
- A description of the methodologies, assumptions and procedures used in preparing the analysis
- Summary of any previous hydrologic/hydraulic studies, if applicable – e.g. for a site that already has an existing Stormwater Management Plan in operation for development prior to this proposal or other information which may pertain to the development of the property
- A conclusion paragraph summarizing the findings of the study. Include tables of results comparing pre and post development peak discharges and increases, pre and post development conveyance capacity comparisons and velocity comparisons (for erosive impact analysis) and any other pertinent data you may have analyzed to ensure a no adverse impact situation. Also include your professional opinion of a “no adverse impact” statement with regard to all downstream properties and conveyances from the development of the property.
- Copies of all state and federal permits as applicable are included in the report if applicable. (Note: this would include for example any required US Army Corps of Engineer and North Carolina Division of Environmental Quality permits for work in regulated waters/wetlands such as 401/404 permit, State Dam Safety permits etc.)
- Include any Variance Petition Form(s), if applicable, 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 the ordinance for qualification requirements for a variance. Variance request forms may be found at the following web address: https://www.cityofws.org/794/Post-Construction-Stormwater-Management
Hydrologic information to be included (including maps and plans), data and quantities for pre and post development project conditions, should be as follows:

- Site and watershed topography – existing and proposed
- Delineated drainage areas and outfall points including offsite if applicable, mapped and quantified, for pre and post development conditions
- The location of the downstream study point(s) indicated on mapping.
- Land uses for pre and post development (mapped and quantified)
- Soils types (mapped and quantified, include hydrologic group classifications)
- Pre and post development drainage paths and lengths for each delineated drainage basin - mapped and quantified including start and finish points of sheet flow, shallow concentrated flow and concentrated flow along with lengths, conveyance sizes and all other relevant data used in the TR-55 time of concentration calculations. Explain choices of Manning’s coefficients.
- Precipitation data (most recent data from NOAA website)
- Time of concentration (TC) calculations for pre and post development conditions. Use TR-55 analysis. Include a description of any assumptions made if applicable. Note: Sheet flow lengths should not exceed 100 feet. Kirpich method may be accepted for smaller watersheds (2 acres or less). Use a 5 minute minimum time if calculated value is less than this.
- Composite Curve Number (CN) analysis and determinations for pre and post development conditions. Describe why each CN was chosen including references to type of ground cover
- Hydrographs for both pre and post development conditions used to analyze a no adverse impact conclusion. Must include peak flows and volumes for the 2, 10 and 25 year storm events of minimum 6 hour duration and the 1 year 24 hour event.

Perform a 2, 10, 25 and 100 year storm events of minimum 6 hour duration and 1 year 24 hour hydraulic performance analyses for off-site impacts for the following items:

- 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 Division Staff in advance of submittal or requested after submittal if deemed appropriate, but are less common. Refer to section 75-203(b)(2) of the ordinance for more details.
- Evaluate all road crossings between the site and the study point(s) for changes in service level due to the proposed development. Include capacity calculations and hydraulic grade line analysis with profiles of HGL’s.
- Evaluate impacts to existing and/or off-site impounding structures, if applicable
- Evaluate potential increases in downstream structural flooding impacts.
Evaluate capacity of receiving conveyances such as pipes, culverts, swales etc. Provide design information such as conveyance dimensions and existing type of lining specifications (for swales) and show increases in water surface elevations for receiving channels at suitable cross section intervals. These cross sections particularly of swales must be shown on the plans submitted with the report as well.

Describe how you determined or assumed the dimensions of the conveyances. Ideally they need to be field verified/measured/surveyed prior to the study.

Evaluate all overland flow areas on downstream properties and open channel conveyances for erosive velocities in the post development condition.

Per Section 75-303(f) of the ordinance, evaluate the receiving natural channel or waterbody (on site and/or offsite to the downstream study 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. Acceptable mitigation alternatives include on-site detention to reduce post construction runoff rates and volumes and natural channel stabilization measures to control channel degradation. Where allowed by other State and Federal agencies (e.g. US Army Corp of Engineers), armoring of receiving channels is permissible impact. Copies of permits from such agencies must be provided with the submittal as mentioned in the General Items section of this checklist. If the calculation shows detention systems are required to mitigate the impact then the no adverse impact study no longer applies and the designer should complete Checklist No. 3.

**Water Quality - Low Density Provision Items:**

Note: These items apply to projects submitting a no adverse impact study for quantity but that must still obtain a permit for complying with the low density development provisions of the ordinance as it applies to quality. High density projects should follow Checklist 3 requirements.

Built upon areas are 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 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 for a disturbed area of greater than 50 acres the buffer width shall be 100 feet. Perennial and intermittent surface waters shall be determined to exist if they are indicated on USGS and/or Soil Survey mapping. Designers may submit sealed documentation from NCDEQ or from NCDEQ certified professionals that prove otherwise, based on field determinations, if they choose to do so.

Vegetative conveyances are been used to the maximum extent practicable per the low and high density provisions of the ordinance.
3. Checklist for the Hydrologic and Hydraulic Analysis Report/Study for developments that will incorporate stormwater management device(s)

NOTE: This checklist only applies to the following design situations:

- A development that must manage for both quality and quantity provisions of the ordinance
- A development that is exempt from quality but must manage for quantity
  (Ignore the water quality items in this checklist)
- A development that is exempt from quantity but must manage for quality
  (Ignore the water quantity items in this checklist)
- A development that must manage for quality but in lieu of managing for quantity chooses to submit a no adverse impact downstream study. (In this case ensure all items regarding water quality in this checklist and all items in Checklist No.2 for the no adverse impact study are addressed and that the general items from both checklists are addressed as appropriate)

Submit two copies of the report for review. Report to be spirally bound preferably. 3 ring binders WILL NOT BE ACCEPTED

General Items:

- Cover sheet with project title; project name and address; owner’s name, address, email and phone number; designer/preparer’s name, address, email, and phone number; and designers seal, signature and date
- Table of contents (with sequential numbering of pages) showing report sections, appendices, exhibits, tables and figures
- Project narrative to include a description of project, a description of how the project will meet the ordinance requirements with regard to quality and quantity provisions (as applicable) of the ordinance, pre and post development site conditions, channel protection etc.
- A description of the methodologies, assumptions and procedures used in preparing the analysis
- Summary of any previous hydrologic/hydraulic studies, if applicable – e.g. for a site that already has an existing Stormwater Management Plan in operation for development prior to this proposal or other information which may pertain to the development of the property
- A conclusion paragraph summarizing the findings of the study/report. Include tables of results comparing pre and post development peak discharges and increases as well as routed discharges and drawdown times for applicable storm events
- Copies of all state and federal permits as applicable are included in the report. (Note: this would include for example any required US Army Corps of Engineer and North Carolina Division of Environmental Quality permits for work in regulated waters/wetlands such as 401/404 permits, State Dam Safety permits etc.)
- A sealed geotechnical engineering analysis report including details of subsurface exploration which shows the investigation of the location of the seasonally high groundwater elevation if this elevation is required to be ascertained per the North Carolina Division of Environmental Quality (NCDEQ) Stormwater Design Manual. Borings or other approved means of subsurface exploration, shall be taken at, or as close as practicable to the immediate vicinity of each
the proposed stormwater management device. Boring(s) should include the existing ground elevations at the boring location(s) as well as depths of boring(s).

- Include any 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 the ordinance for qualification requirements for a variance. Variance request forms may be found at the following web address: https://www.cityofws.org/794/Post-Construction-Stormwater-Management

**Hydrologic Section:**

- Location map showing the project in relation to adjacent properties, streets and nearby water features
- Site and watershed topography – existing and proposed
- Delineated drainage areas and outfall points including offsite if applicable, mapped and quantified, for pre and post development conditions
- Land uses pre and post development (mapped and quantified)
- Soils types (mapped and quantified, include hydrologic group classifications)
- Pre and post development drainage paths and lengths for each delineated drainage basin - mapped and quantified including start and finish points of sheet flow, shallow concentrated flow and concentrated flow along with lengths, conveyance sizes and all other relevant data used in the TR-55 time of concentration calculations. Include reasons for choice of a Manning’s coefficient(s) or assumptions of why you chose a certain coefficient
- Precipitation data (most recent data from NOAA website)
- Time of concentration (TC) calculations for pre and post development conditions. Use TR-55 analysis. Include a description of any assumptions made if applicable. Note: Sheet flow lengths should not exceed 100 feet. Kirpich method may be accepted for smaller watersheds (2 acres or less). Use a 5 minute minimum time if calculated value is less than this.
- Composite Curve Number (CN) analysis and determinations for pre and post development conditions. Describe why each CN was chosen including references to type of ground cover

**Hydraulics Section**

- Open channel conveyance capacity design for all designed swales including bypass conveyances. If the development has a SCM(s) 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.
- Provide adequate cross sections of the open channel conveyances with dimensions noted.
- Design information/calculation on the types of liner (vegetated, rip-rap etc.) to be used to ensure conveyances will not suffer erosion.
- Design computations for all culverts, storm drainage pipes and inlets (both for conveyances that carry runoff to a SCM(s) and for any bypass systems). Design shall include a labeled schematic of the storm drain network and pipe and inlet labels should match those on the design plans,
design discharges, pipe capacities, pipe sizes, slopes and lengths, profiles, outlet velocities, upstream and downstream invert elevations and hydraulic grade line information/profiles (for the 25 year event). 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. The systems may be designed for the 10 year storm event capacity as long as it can be shown that the HGL for the 25 year storm does not surcharge the system.

- Provide design calculations and design specifications for all rip-rap aprons or other forms of approved energy dissipaters

**Stormwater Management System Design Section:**

**Water Quality Items**

- Vegetative conveyances are been used to the maximum extent practicable per the low and high density provisions of the ordinance
- The SCM(s) designed must be approved device(s) for 85% TSS (Total Suspended Solids) removal and referenced in the NCDEQ Stormwater Design Manual. The manual can be found at the following link: [http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/stormwater-bmp-manual](http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/stormwater-bmp-manual)
- The design of the SCM(s) meets all of the MDC (Minimum Design Criteria) in the relevant chapter of the NCDEQ Stormwater Design Manual
- The SCM(s) are designed so that the first inch runoff volume is discharged at a rate equal to or less than the predevelopment discharge rate for the 1 year, 24 hour rainfall event per Section 75-302(b)(2) of the ordinance
- All SCM calculations are provided as necessary per the NCDEQ Stormwater Design Manual chapter requirements to verify the design, including drainage areas, built upon areas and percentages, surface area and volume calculations etc. as needed and that these match plan call outs
- All existing built upon areas onsite (that will remain) and offsite must also be accounted for and treated in the SCM(s) unless those area can be successfully bypassed.
- Built upon areas are 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 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 for a disturbed area of greater than 50 acres the buffer width shall be 100 feet. Perennial and intermittent surface waters shall be determined to exist if they are indicated on USGS and/or Soil Survey mapping. Designers may submit sealed documentation from NCDEQ or from NCDEQ certified professionals that prove otherwise, based on field determinations, if they choose to do so.
- If retaining walls are utilized as part of an SCM design, free body diagrams showing all forces, moments and computations are provided for determining factors of safety against sliding and overturning.
Water Quantity

☐ If the development or redevelopment disturbs 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 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 per Section 75-105(d)(6) of the ordinance. If this applies check the box and if not indicate “N/A”.

☐ The SCM(s) are designed and calculations/supporting design documentation such as model information as applicable including plotted hydrographs for pre and post development drainage basins, pond reports, reservoir routing stage storage information etc. provided, to show that the development is managing the 2, 10 and 25 year storm events of minimum 6 hour duration so that the post development routed peak discharge rates for those events are less than or equal to the pre development peak discharge rates for the site.

☐ The SCM(s) are designed and calculations/supporting design documentation such as model information including plotted hydrographs etc. provided, to show that the development detains the stormwater runoff volume at least equal to the difference between the pre and post development volume for the 25 year storm of 6 hour duration and that this volume difference is detained and released over a period of no less than 48 hours but no longer than 120 hours.

☐ All existing built upon areas onsite (that will remain) and offsite must also be accounted for and attenuated in the SCM(s) unless those area can be successfully bypassed.

☐ Calculations are provided to show that the development of the site does not increase flooding impacts to structures on properties upstream and downstream of the site during a 100-year flood event.

☐ Discharge from any on-site stormwater management system into any natural or surface drainage channel or feature has been evaluated to ensure that the discharge does not cause damage to the receiving system.

☐ 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. Proof of compliance with this requirement shall be provided by the applicant during the submittal.

☐ If retaining walls are utilized as part of an SCM design, free body diagrams showing all forces, moments and computations are provided for determining factors of safety against sliding and overturning.
4. **Checklist for Stormwater Management Plan Items**

**NOTE:** This checklist applies to plans incorporating an SCM(s) to meet the high density water quality and/or water quantity management provisions of the ordinance.

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

- Plan set should include the following at a minimum: Cover sheet with a list of plans sheets including; existing site plan; proposed site plan; stormwater management and grading and drainage plan; utility plan; erosion control plans, drainage area delineation sheets, details sheets as appropriate for stormwater management items etc. Other sheets may be required by the City of Winston-Salem if deemed necessary.

- All plans sheets are sealed and certified/signed by a registered North Carolina 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 as applicable on each plan sheet

- Appropriate scale(s)

- Appropriate legend identifying features and layers for all plan sheets.

- Established benchmark of known elevation indicated on the on existing site plan 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 names of the streets and if they are private or public on the plans.

- Existing and proposed zoning and land use

- Show ownership information for site and adjacent properties

- Note allowable limits on BUA % (if applicable).

- Existing and proposed impervious areas for the development in terms of area (acres and/or sq.ft.) and percentage of the site. Include references to any existing impervious area that may be existing and will remain or will be removed etc.

- State the number of units/acre, if applicable.

- Location(s) of existing easements (temporary and permanent, public and private) if applicable.

- Proposed private drainage and access easements shown and labeled for future maintenance of any stormwater management system(s). 20-ft minimum width required to surround all permanent SCM(s) and all conveyances to and from the SCM(s) and bypass conveyance systems and the maintenance and access easements must connect to a public right-of-way. If a blanket easement covering the entire property is proposed in lieu of platting dedicated easements then a note indicating the provision of such a blanket easement is to be provided on the stormwater management plan sheet.
- 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 utilities

- Existing and proposed stormwater discharge points (surface and subsurface flows). Show where and how the runoff from the developed site, including outflows from SCM(s) safely connects into a downstream receiving drainage system and/or open channel or streams.

- Delineated drainage area maps for pre and post development conditions provided showing all discharge points for all basins/sub-basins for pre and post development conditions including relevant off site areas contributing to the site. Show and quantify the impervious area within each basin.

- Pre and post development drainage paths and lengths for each delineated drainage basin - mapped and quantified including start and finish points of sheet flow, shallow concentrated flow and concentrated flow along with lengths, conveyance sizes and all other relevant data used in the TR-55 time of concentration calculations, or the Kirpich method (if permitted).

- Show all perennial and intermittent streams, lakes, ponds, impoundments, drainage swales, conveyances, regulatory floodplains (including 100-year floodplain identifying the Base Flood Elevations where available, 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.

- Show the required 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. **Note:** These buffers must be platted prior to permitting.

- Show and label all existing and proposed site topography. Utilize a contour interval that is appropriate for the site conditions, typically 2-ft unless specific site conditions dictate otherwise, and extend contours into adjacent properties as appropriate to be able to show discharge and off site drainage patterns.

- Identify and label all proposed and existing stormwater conveyance 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 berms etc.) Include all bypass systems as well. The conveyances must be designed to convey the 25 year event unless otherwise exempt.

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

- Cross sections/details with specifications of dimensions and type of lining of any permanent swales and/or swale/berm combinations

- Roof drainage directions and roof leader locations/specifications

- Estimated seasonal high groundwater elevation (documented in geotechnical report) in the vicinity of the SCM(s) if this elevation is required to be ascertained per the NCDEQ Stormwater Design Manual. Label this elevation in the profile/sectional views of the proposed SCM(s)
Construction notes, specifications and design details for any existing stormwater management system components if applicable. e.g. If an existing and already approved stormwater management plan is been modified to allow for a development expansion or addition.

Recommendations from any soils engineering or engineering geology report incorporated in the plans and/or specifications as needed e.g. required permeability testing/specifications, recommendations on liners etc.

Proposed limits of disturbance and the area of disturbance stated.

Erosion Control plans and detail sheets clearly specifying and showing how a site is to be transitioned from the erosion control phase to the permanent post construction stormwater management phase. Detailed sequencing must be provided that describes the steps required to convert a temporary sediment and erosion control device to a permanent SCM(s) situation. This sequencing should incorporate a note stating that the contractor is to contact the City of Winston-Salem’s Stormwater Engineer for a pre-construction site meeting and upon completion of construction of the Stormwater management system a set of as-built plans and calculations of the system prepared by the design engineer are to be provided to the City before the contractor leaves the site so that a “close out” meeting with the contractor and design engineer may be held with the City of Winston-Salem’s Stormwater Engineer to ensure the system is built per the City’s satisfaction and in accordance with the design/permit.

Specifications of all permanent energy dissipation devices

Details of all the components of the proposed stormwater management system that the engineer chooses to design. The SCM(s) used in a design to meet the water quality provisions of the ordinance must be approved and referenced for 85% TSS removal in the NCDEQ Stormwater Design Manual and meet all of the relevant MDC of that manual. The following items are examples of what is expected to be seen on the plans for the SCM(s) depending on the type of SCM(s) designed: Plan views of the SCM(s) location, detailed cross sections and profiles of the SCM(s) showing critical design specifications as applicable for such components as side slopes, soil/media, structural components such as risers/outlet control structures, design elevations, relevant peak design storm elevations and water quality elevations, orifice and weir information, bypass structures, underdrains and cleanout locations, forebay details, emergency spillway information, aquatic shelf information, details of inlet and outlet pipes/conveyances

Note: Other items may be required as necessary depending on the design chosen.

Provide landscaping plans and specifications in accordance with the NCDEQ Stormwater Design Manual if applicable for the SCM(s). Note: No trees or shrubs should be planted within 10 feet of inlet or outlet pipes, spillways or flow spreaders, or, on any dam areas

Provide details and specifications of all liners that may be required for a SCM(s) as applicable. If the designer does not choose to include a liner he must include and provide information on his plans and in geotechnical reports verifying that excluding a liner is warranted
5. **Checklist for Low Density Development Plan Items (if applicable to water quality)**

   **NOTE:** If a Stormwater Management Device(s) is to be designed for water quantity then Checklist 4 should be completed as this checklist will also cover the low density items for quality

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

- Plan set should include the following at a minimum: Cover sheet with a list of plans sheets included; existing site plan; proposed site plan; grading and drainage plan; erosion control plans. Other sheets may be required by the City of Winston-Salem if deemed necessary

- All plans sheets are sealed and certified/signed by a registered North Carolina 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 as applicable on each plan sheet

- Appropriate scale(s)

- Appropriate legend identifying features and layers for all plan sheets.

- Established benchmark of known elevation indicated on the on existing site plan 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 names of the streets and if they are private or public on the plans.

- Existing and proposed zoning and land use

- Show ownership information for site and adjacent properties

- Note allowable limits on BUA % (if applicable).

- Existing and proposed impervious areas for the development in terms of area (acres and/or sq.ft.) and percentage of the site. Include references to any existing impervious that may be existing and will remain or will be removed etc.

- State the number of units/acre, if 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 stormwater discharge points (surface and subsurface flows). Show where and how the runoff from the developed site, safely connects into a downstream receiving drainage system and or/open channel or streams

- Show all perennial and intermittent streams, lakes, ponds, impoundments, drainage swales, conveyances, regulatory floodplains (including 100-year floodplain identifying the Base Flood Elevations where available, 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.

☐ Show the required 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. **Note:** These buffers must be platted prior to permitting

☐ Show and label all existing and proposed site topography. Utilize a contour interval that is appropriate for the site conditions, typically 2-ft unless specific site conditions dictate otherwise, and extend contours into adjacent properties as appropriate to be able to show discharge and off site drainage patterns.

☐ Identify and label all proposed and existing stormwater conveyance 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 berms etc.)

☐ Hydraulic data summary for all proposed pipes and/or channels.

☐ Cross sections/details with specifications of dimensions and type of lining of any permanent swales or swale/berm combinations

☐ Proposed limits of disturbance and the area of disturbance stated.

☐ Specifications of all permanent energy dissipation devices

☐ Plans and design should follow the Low Density Guidance chapter of the NCDEQ manual and meet those requirements contained therein.
6. Checklist for Master Plans

**NOTE:** Master plans are most commonly submitted in the following scenario and submittal of them is at the choice of the owner/developer and his engineer:

Where a developer has a large tract of land but is only developing a portion of it and is wanting to use the entire tract area rather than using the site area (the area within the disturbed limits) in determining the built upon percentage in order to qualify the development as a low density project as it relates to the water quality provisions of the ordinance. Therefore instead of having to potentially manage the new built upon area for water quality purposes as it relates to the disturbed (site) area, they utilize the full tract, to fall under and only have to comply with, the low density provisions. The development may still have to comply with the water quantity provisions of the ordinance if more than 20,000 sq.ft. of net new BUA is created and if that is the case then the developer must submit a no adverse impact study, per Checklist 2, or, if they choose to manage for quantity for the developed portion, complete the relevant items of Checklist 3 and Checklist 4. A no adverse impact study can also be submitted which accounts for a greater amount of BUA than for what is currently proposed in order to allow for future build out within the approved master plan limits if the City of Winston-Salem Stormwater Division sees adequate. Updates to the master plan in the future can then reference this study. The developer/owner must realize that the master plan becomes a “living document” and it is their responsibility to ensure the most current copy is provided to the Stormwater Division Office for their files. They also need to keep a file in their own records. No credit is given to existing built upon area within the tract of land at the time of master plan submittal. Therefore, if there is already 15% build out then the developer has 9% left to develop to keep the site as a low density development which is any site that is less than 24% BUA or less than 2 units/acre. Should this 24% or 2 units/acre threshold be exceeded in the future the developer must not only manage for the increase in BUA at that time but also for all of the BUA previously permitted under the low density option since the time of creation of the Stormwater Master Plan and apply for a new permit at that time to meet all relevant ordinance criteria and provisions. The following items at a minimum should be submitted for a master plan:

- Sealed engineered site plan sheets titles “Stormwater Master Plan(s)” showing the full property parcel boundaries intended to be covered by the master plan. The plans must show and call out the existing BUA on the property at the time of submittal and the proposed BUA. The existing (current) BUA or units/acre should be referenced as well as the proposed BUA or units/acre. This master plan and BUA or units/acre call outs must be updated for any future additions to the property.
- Complete Checklist No.5 to ensure the low density water quality items are addressed on the master plan
- Complete Checklist No. 2 **IF** a no adverse impact study is to be submitted to meet the quantity provisions of the ordinance
- Complete the appropriate items in Checklists No’s 3 and 4 **IF** a SCM(s) is to be incorporated to meet the quantity provisions of the ordinance
- Provide a spreadsheet with the “running totals” of BUA and units/acre, as applicable, which becomes a “living document” and must be updated by the developer/owner for all future additions that may occur over time
D. TREE PLANTING PERMIT

Right of Way tree planting permits are issued through our Urban Forestry Section of the Vegetation Management Division. A permit to plant trees must be applied for prior to planting, as required by the City of Winston-Salem Code of Ordinances, 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 landscaping 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 Vegetation Management Division by calling (336) 734-1493 Monday through Friday between 7:00 AM and 4:00 PM. Submit all permit requests to Derek Renegar, Urban Forester – Vegetation Management, P.O. Box 2511, Winston-Salem, NC 27102 or by email at derekr@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.
Application to Plant a Tree
City of Winston–Salem

Please fill out this application (please print) and return to:
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…
E. GRADING PERMIT
Grading permits are issued through the Erosion Control division. As of May 1, 2018, all Erosion Control, Floodplain Development, and Watershed Protection Plan Review Submittals MUST be submitted electronically. For questions or additional information, please contact Matthew Osborne at (336) 747-7453.

Electronic Plan Review Application Portal:
https://winston-salem.idtplans.com/secure/

Electronic Plan Review Application Instructions:
https://winston-salem.idtplans.com/secure/project/plan_review/guide/
SECTION VII - DEVELOPMENT REVIEW SCHEDULE
A. WATER AND SANITARY SEWER

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 LF</td>
<td>$500 (minimum fee)</td>
</tr>
<tr>
<td>500 – 999 LF</td>
<td>$600</td>
</tr>
<tr>
<td>1,000 – 1,999 LF</td>
<td>$700</td>
</tr>
<tr>
<td>2,000 – 2,999 LF</td>
<td>$800</td>
</tr>
<tr>
<td>3,000 – 3,999 LF</td>
<td>$900</td>
</tr>
<tr>
<td>4,000 – 4,999 LF</td>
<td>$1,000</td>
</tr>
<tr>
<td>Greater than 5,000 LF</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. An additional $200 Sewer Network Trace Fee is required for all sewer line extensions or project that require a 3” or larger meter. Please contact Utilities Plan Review staff at (336) 747-7499 if you have any questions.

B. STORMWATER MANAGEMENT

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

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

1. 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.

2. Grading permits covering erosion control measures must be obtained from the City/County Erosion Control division before any land disturbing activity exceeding 10,000 SF can commence. Information required for the permit is listed in the Erosion and Sedimentation Control Checklist found in Section II-C. A pre-construction conference should be held on the proposed site with erosion control personnel of the Inspections Division.
D. DRIVEWAY PERMIT

Driveway permit fees are as follows:

<table>
<thead>
<tr>
<th></th>
<th>No permit required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Driveway</td>
<td>No permit required</td>
</tr>
<tr>
<td>City of Winston-Salem</td>
<td>$200</td>
</tr>
<tr>
<td>NC Department of Transportation (NCDOT)</td>
<td>$50</td>
</tr>
</tbody>
</table>

For projects within the City limits but on a State-maintained roadway, the NCDOT permit application and check for review fee are submitted directly to NCDOT. NCDOT will obtain the City’s signature. The City will only sign the NCDOT permit if the City application has been received and approved.
E. ACREAGE FEES

Stratford Road Impact Fee - $4,300/Acre (for rezoning of parcels only)
SECTION VIII - MISCELLANEOUS DOCUMENTS
A. **ESTIMATING SEWAGE FLOWS FOR PLANT ALLOCATION**

Per the Residential Flow Reduction Approval issued to the City of Winston-Salem dated July 28, 2005, **240 gallons per day** is to be used for residential dwelling units up to 3 bedrooms. This value shall be incremented by **80 gallons per day** per additional bedroom above 3.

The following information is taken from State of North Carolina Department of Environmental Quality, Administrative Code Section: 15A NCAC 02T .0114 – Wastewater Design Flow Rates:

(b) 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 shall increase the volume by 120 gallons per day. Each bedroom or any other room or addition that can function as 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.

(c) 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>Barber and beauty shops</td>
<td></td>
</tr>
<tr>
<td>Barber Shops</td>
<td>50 gal/chair</td>
</tr>
<tr>
<td>Beauty Shops</td>
<td>125 gal/booth or bowl</td>
</tr>
<tr>
<td>Businesses, offices and factories</td>
<td></td>
</tr>
<tr>
<td>General business and office facilities</td>
<td>25 gal/employee/shift</td>
</tr>
<tr>
<td>Factories, excluding industrial waste</td>
<td>25 gal/employee/shift</td>
</tr>
<tr>
<td>Factories or business with showers or food preparation</td>
<td>35 gal/employee/shift</td>
</tr>
<tr>
<td>Warehouse</td>
<td>100 gal/loading bay</td>
</tr>
<tr>
<td>Warehouse – self storage (not including caretaker residence)</td>
<td>1 gal/unit</td>
</tr>
<tr>
<td>Churches</td>
<td></td>
</tr>
<tr>
<td>Churches without kitchens, day care or camps</td>
<td>3 gal/seat</td>
</tr>
<tr>
<td>Churches with kitchen</td>
<td>5 gal/seat</td>
</tr>
<tr>
<td>Churches providing day care or camps</td>
<td>25 gal/person (child &amp; employee)</td>
</tr>
<tr>
<td>Fire, rescue and emergency response facilities</td>
<td></td>
</tr>
<tr>
<td>Fire or rescue stations without on-site staff</td>
<td>25 gal/person</td>
</tr>
<tr>
<td>Fire or rescue stations with on-site staff</td>
<td>50 gal/person/shift</td>
</tr>
<tr>
<td>Food and drink facilities</td>
<td></td>
</tr>
<tr>
<td>Banquet, dining hall</td>
<td>30 gal/seat</td>
</tr>
<tr>
<td>Bars, cocktail lounges</td>
<td>20 gal/seat</td>
</tr>
<tr>
<td>Caterers</td>
<td>50 gal/100 sq ft floor space</td>
</tr>
<tr>
<td>Restaurant, full service</td>
<td>40 gal/seat</td>
</tr>
<tr>
<td>Restaurant, single service articles</td>
<td>20 gal/seat</td>
</tr>
<tr>
<td>Restaurant, drive-in</td>
<td>50 gal/car space</td>
</tr>
<tr>
<td>Restaurant, carry-out only</td>
<td>50 gal/100 sq ft floor space</td>
</tr>
<tr>
<td>Institutions, dining halls</td>
<td>5 gal/meal</td>
</tr>
<tr>
<td>Deli</td>
<td>40 gal/100 sq ft floor space</td>
</tr>
<tr>
<td>Bakery</td>
<td>10 gal/100 sq ft floor space</td>
</tr>
<tr>
<td>Meat department, butcher shop or fish market</td>
<td>75 gal/100 sq ft floor space</td>
</tr>
<tr>
<td>Category</td>
<td>Water Requirement</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Specialty food stand or kiosk</td>
<td>50 gal/100 sq ft floor space</td>
</tr>
<tr>
<td>Hotels and Motels</td>
<td></td>
</tr>
<tr>
<td>Hotels, motels and bed &amp; Breakfast facilities, without in-room cooking facilities</td>
<td>120 gal/room</td>
</tr>
<tr>
<td>Hotels and motels with in-room cooking facilities</td>
<td>175 gal/room</td>
</tr>
<tr>
<td>Resort hotels</td>
<td>200 gal/room</td>
</tr>
<tr>
<td>Cottages, cabins</td>
<td>200 gal/unit</td>
</tr>
<tr>
<td>Self-service laundry facilities</td>
<td>500 gal/machine</td>
</tr>
<tr>
<td>Medical, dental, veterinary facilities</td>
<td></td>
</tr>
<tr>
<td>Medical or dental offices</td>
<td>250 gal/practitioner/shift</td>
</tr>
<tr>
<td>Veterinary offices (not including boarding)</td>
<td>250 gal/practitioner/shift</td>
</tr>
<tr>
<td>Veterinary hospitals, kennels, animal boarding facilities</td>
<td>20 gal/pen, cage, kennel or stall</td>
</tr>
<tr>
<td>Hospitals, medical</td>
<td>300 gal/bed</td>
</tr>
<tr>
<td>Hospitals, mental</td>
<td>150 gal/bed</td>
</tr>
<tr>
<td>Convalescent, nursing, rest homes without laundry facilities</td>
<td>60 gal/bed</td>
</tr>
<tr>
<td>Convalescent, nursing, rest homes with laundry facilities</td>
<td>120 gal/bed</td>
</tr>
<tr>
<td>Residential care facilities</td>
<td>60 gal/person</td>
</tr>
<tr>
<td>Parks, recreation, camp grounds, R-V parks and other outdoor activity facilities</td>
<td></td>
</tr>
<tr>
<td>Campgrounds with comfort station, without water or sewer hookups</td>
<td>75 gal/campsite</td>
</tr>
<tr>
<td>Campgrounds with comfort station, with water or sewer hookups</td>
<td>100 gal/campsite</td>
</tr>
<tr>
<td>Campground with dump facility</td>
<td>50 gal/space</td>
</tr>
<tr>
<td>Construction, hunting or work camps with flush toilets</td>
<td>60 gal/person</td>
</tr>
<tr>
<td>Construction, hunting or work camps with chemical or portable toilets</td>
<td>40 gal/person</td>
</tr>
<tr>
<td>Parks with restroom facilities</td>
<td>250 gal/plumbing fixture</td>
</tr>
<tr>
<td>Summer camps without food preparation or laundry facilities</td>
<td>30 gal/person</td>
</tr>
<tr>
<td>Summer camps with food preparation or laundry facilities</td>
<td>60 gal/person</td>
</tr>
<tr>
<td>Swimming pools, bathhouses and spas</td>
<td>10 gal/person</td>
</tr>
<tr>
<td>Public access restrooms</td>
<td>325 gal/plumbing fixture</td>
</tr>
<tr>
<td>Schools, preschools and day care</td>
<td></td>
</tr>
<tr>
<td>Day care and preschool facilities</td>
<td>25 gal/person (child &amp; employee)</td>
</tr>
<tr>
<td>Schools with cafeteria, gym and showers</td>
<td>15 gal/student</td>
</tr>
<tr>
<td>Schools with cafeteria</td>
<td>12 gal/student</td>
</tr>
<tr>
<td>Schools without cafeteria, gym or showers</td>
<td>10 gal/student</td>
</tr>
<tr>
<td>Boarding schools</td>
<td>60 gal/person (student &amp; employee)</td>
</tr>
<tr>
<td>Service stations, car wash facilities</td>
<td></td>
</tr>
<tr>
<td>Service stations, gas stations</td>
<td>250 gal/plumbing fixture</td>
</tr>
<tr>
<td>Car wash facilities</td>
<td>1,200 gal/bay</td>
</tr>
<tr>
<td>Sports centers</td>
<td></td>
</tr>
<tr>
<td>Bowling center</td>
<td>50 gal/lane</td>
</tr>
<tr>
<td>Fitness, exercise, karate or dance center</td>
<td>50 gal/100 sq ft</td>
</tr>
<tr>
<td>Tennis, racquet ball</td>
<td>50 gal/court</td>
</tr>
<tr>
<td>Gymnasium</td>
<td>50 gal/100 sq ft</td>
</tr>
<tr>
<td>Golf course with only minimal food service</td>
<td>250 gal/plumbing fixture</td>
</tr>
<tr>
<td>Country clubs</td>
<td>60 gal/member or patron</td>
</tr>
</tbody>
</table>
Mini golf, putt-putt................................................................. 250 gal/plumbing fixture
Go-kart, motocross................................................................. 250 gal/plumbing fixture
Batting cages, driving ranges.................................................. 250 gal/plumbing fixture
Marinas without bathhouse.................................................... 10 gal/slip
Marinas with bathhouse....................................................... 30 gal/slip
Video game arcades, pool halls........................................... 250 gal/plumbing fixture
Stadiums, auditoriums, theaters, community centers............. 5 gal/seat
Stores, shopping centers, malls and flea markets
  Auto, boat, recreational vehicle dealerships/showrooms with
    restrooms................................................................. 125 gal/plumbing fixture
  Convenience stores, with food preparation.......................... 60 gal/100 sq ft
  Convenience stores, without food preparation.................... 250 gal/plumbing fixture
  Flea markets............................................................. 30 gal/stall
  Shopping centers and malls with food service..................... 130 gal/1,000 sq ft
  Stores and shopping centers without food service............. 100 gal/1,000 sq ft
Transportation terminals – air, bus, train, ferry, port and dock... 5 gal/passenger
B. VITRIFIED PIPE FLOW

FLOW IN VITRIFIED PIPE FLOWING HALF FULL
Corresponding to Manning's Formula $N = 0.013$
C. PROOF OF PAYMENT ITEMIZED COST BREAKOUT SAMPLE

SAMPLE FORMAT: COST BREAKOUT

Project/Development: ________________________________

Developer: _______________________________________

Contractor: _______________________________________

<table>
<thead>
<tr>
<th>I. WATER</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. _______ LF of <em><strong><strong>&quot; D.I. Pipe @ $</strong></strong></em>___/LF</td>
<td>$</td>
</tr>
<tr>
<td>B. _______ LF of <em><strong><strong>&quot; D.I. Pipe @ $</strong></strong></em>___/LF</td>
<td></td>
</tr>
<tr>
<td>C. _______ Fire Hydrants @ $________/EA</td>
<td></td>
</tr>
<tr>
<td>D. _______ 6&quot; Gate Valves @ $________/EA</td>
<td></td>
</tr>
<tr>
<td>E. _______ 8&quot; Gate Valves @ $________/EA</td>
<td></td>
</tr>
<tr>
<td>F. _______ 6&quot;x 8&quot; Tee and 6&quot; Gate Valve @ $________/SET</td>
<td></td>
</tr>
<tr>
<td>G. Other</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>$_______</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. SANITARY SEWER</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. ___ LF of _<strong>&quot; V.C.Pipe____Depth @ $</strong>__/LF</td>
<td>$</td>
</tr>
<tr>
<td>B. ___ LF of _<strong>&quot; V.C.Pipe____Depth @ $</strong>__/LF</td>
<td></td>
</tr>
<tr>
<td>C. ___ LF of _<strong>&quot; D.I.Pipe____Depth @ $</strong>__/LF</td>
<td></td>
</tr>
<tr>
<td>D. ___ LF of _<strong>&quot; D.I.Pipe____Depth @ $</strong>__/LF</td>
<td></td>
</tr>
<tr>
<td>E. ___ Manholes @ $____/EA</td>
<td></td>
</tr>
<tr>
<td>F. Other</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>$_______</td>
</tr>
</tbody>
</table>
D. PROOF OF PAYMENT CERTIFICATION

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

This is to certify that ____________________________________________ furnished the labor and materials for the installation of the water and/or sewer improvements in the development known 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: ____________________________
E. SEWER EASEMENT

The following is a sample easement document for the City of Winston-Salem and Winston-Salem/Forsyth County Utilities. The actual easement document must be obtained from Utilities Plan Review.
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, expansion, extension 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 thereunto 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, expansion, extension 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.

VIII-8
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, expansion, extension 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 personally; 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 ______________________________ grant or(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____.

Lynne Johnson, Register of Deeds

By:___________________________ Assistant/Deputy

Probate fee $paid.
### F. REQUIRED SIGNATURE BLOCKS

<table>
<thead>
<tr>
<th>STREET &amp; UTILITY DESIGN APPROVED</th>
<th>UTILITY DESIGN APPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streets &amp; Drainage</td>
<td>Water &amp; Sewer</td>
</tr>
<tr>
<td>City Engineer</td>
<td>Utilities Director</td>
</tr>
<tr>
<td>Date</td>
<td>Date</td>
</tr>
</tbody>
</table>

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.

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.

CITY OF WINSTON-SALEM
BY: ____________________________

To be used for Water/Sewer design approval
ONLY
Placement shall be lower right corner of Overall and P&P sheets

CITY OF WINSTON-SALEM
BY: ____________________________

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

<table>
<thead>
<tr>
<th>RECORD DRAWINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: __________</td>
</tr>
<tr>
<td>BY: ____________</td>
</tr>
</tbody>
</table>

To be used on AS-BUILT drawings ONLY
Placement shall be on ALL Sheets
ENGINEER’S CERTIFICATION STATEMENT

I, <Name of Engineer>, P.E., a Professional Engineer, duly registered in the State of North Carolina, hereby state, based upon periodic inspections, that, to the best of my knowledge, information and belief, all public and private infrastructure required for <Project Name & Phase> have been installed in general conformance with the approved plans and current City and State standards and are ready to be placed in service.

Signature: ___________________ Date: ____________
P.E. Number: __________________

To be used on AS-BUILT drawings ONLY
Placement shall be on ALL Sheets
SECTION IX - REFERENCES
A. Winston-Salem/Forsyth County Unified Development Ordinance (UDO)

B. City of Winston-Salem, N.C. Department of Public Works Engineering Division, Technical Specifications and Detail Drawings for Water & Sewer Line Construction, latest edition

C. NCDOT, Roadway Standard Drawings, latest edition


F. NCDOT, Subdivision Roads Minimum Construction Standards, latest edition

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


I. City of Winston-Salem Code of Ordinances, Chapter 75 – Stormwater Management, Article IV – Post Construction Stormwater

J. NCDEQ Stormwater Design Manual


N. North Carolina Department of Environmental Quality (DEQ), Public Water Supply Section, July 1, 2019. 52 Revised Rules Within the Rules Governing Public Water Systems. Update to 15A NCAC 18c Regulations