Manual of Standard Designs and Details

The City of Greenville, NC
Engineering Department
Greenville, North Carolina 27834
www.greenvillenc.gov

City of Greenville Manual of Standard Designs and Details

Introduction

The following details and specifications are intended to be used in conjunction with the NCDOT Roadway Standard Drawings and NCDOT Standard Specifications for Roads and Structures for all development within the City of Greenville unless otherwise directed by the City Engineer.

All work and materials shall conform to the latest edition of the North Carolina Department of Transportation Standard Specifications for Roads and Structures and the NCDOT Roadway Standard Drawings unless otherwise specified in this manual.

The effective date of this revision to the City's Manual of Standard Designs and Details shall be September 1, 2023. The City Engineer as authorized and directed by City of Greenville Ordinance No. 960 does hereby enact these revisions upon the aforementioned effective date.

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Sedimentation & Erosion Control Details

Street Standard Details

Driveway Details

Parking Details

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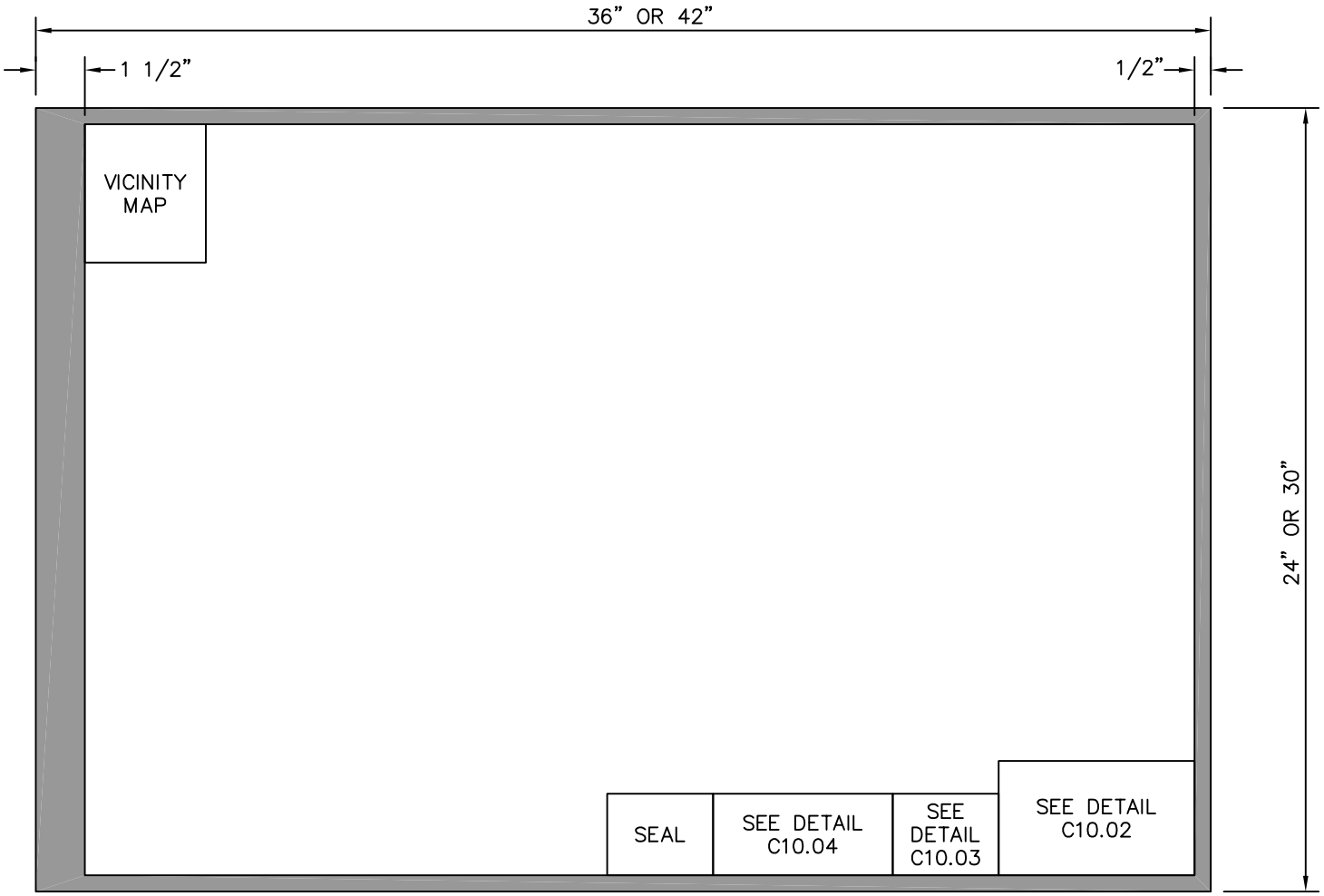

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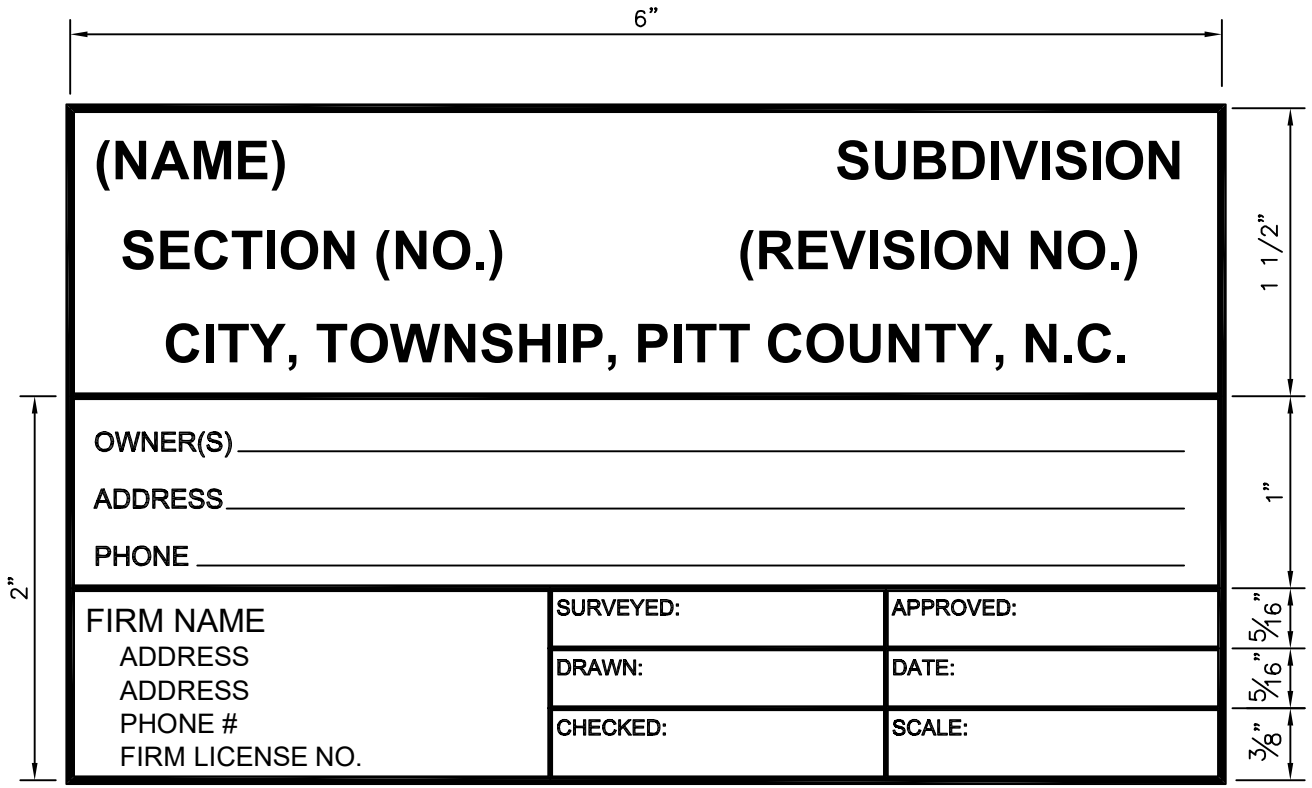
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

STANDARD PRELIMINARY PLAT LAYOUT

Scale: not to scale

Sheet #: 1 of 1

Detail # **C10.01**



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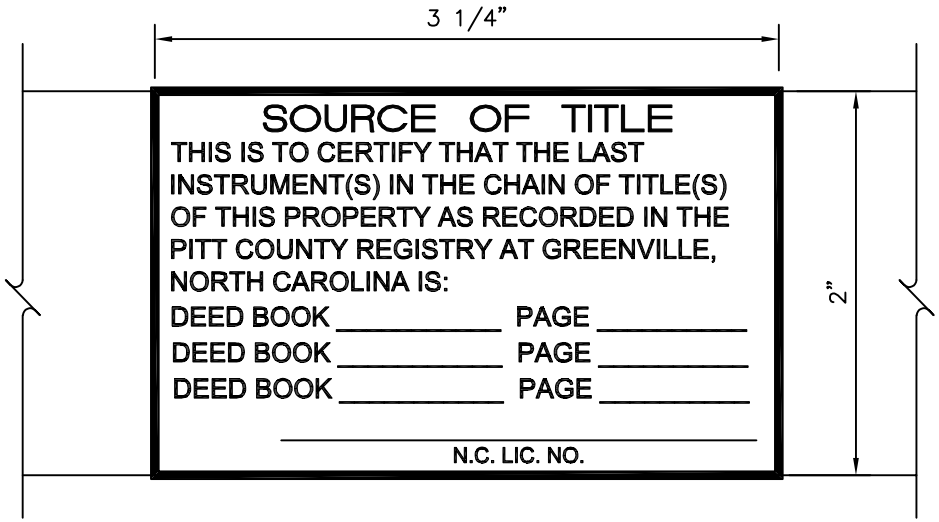
1	9/1/23	APPROVAL	L. KIRBY

STANDARD TITLE BLOCK FOR PRELIMINARY PLAT

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C10.02



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STANDARD "SOURCE OF TITLE" INFORMATION BLOCK

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C11.03

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY TRADITIONAL SURVEY METHODS; FOR SURVEYS PERFORMED USING BOTH TRADITIONAL AND GPS SURVEYING METHODS USE MSDD STANDARD C13.05. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

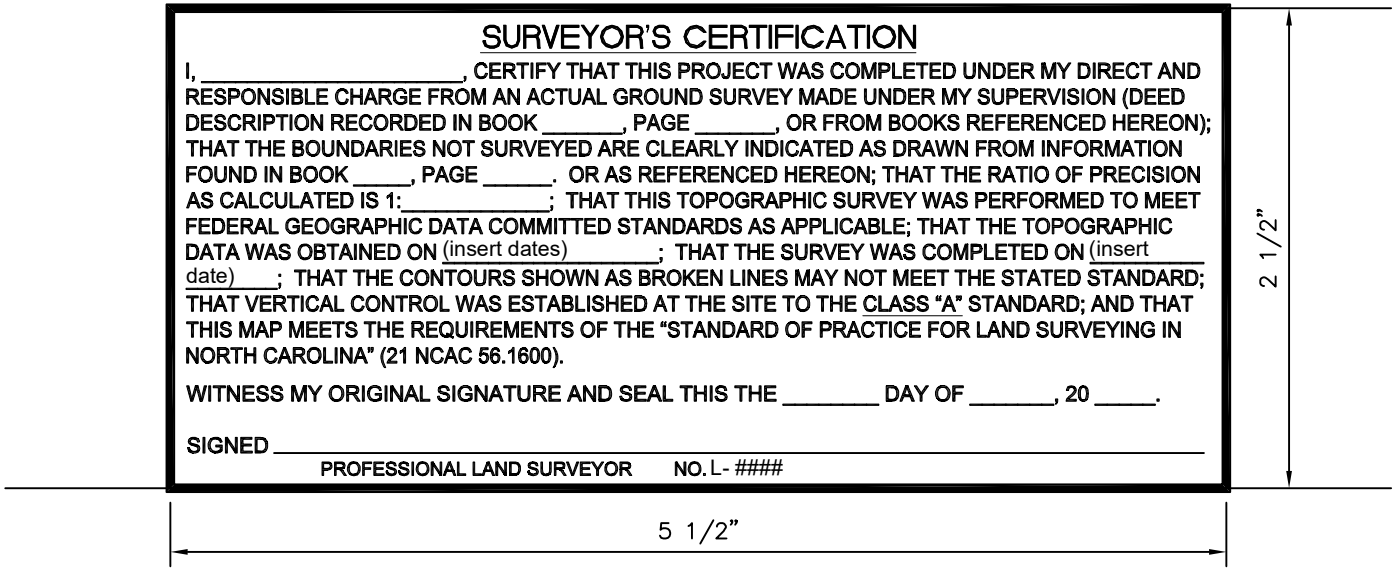
HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+)
VERTICAL: "URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A"
(Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____. OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:_____; THAT THIS TOPOGRAPHIC SURVEY WAS PERFORMED TO MEET FEDERAL GEOGRAPHIC DATA COMMITTED STANDARDS AS APPLICABLE; THAT THE TOPOGRAPHIC DATA WAS OBTAINED ON (insert dates)_____; THAT THE SURVEY WAS COMPLETED ON (insert date)____; THAT THE CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD; THAT VERTICAL CONTROL WAS ESTABLISHED AT THE SITE TO THE CLASS "A" STANDARD; AND THAT THIS MAP MEETS THE REQUIREMENTS OF THE "STANDARD OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA" (21 NCAC 56.1600).

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20 _____.

SIGNED _____
PROFESSIONAL LAND SURVEYOR NO. L- ####



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PRELIMINARY PLAT SURVEYOR'S CERTIFICATION USING TRADITIONAL ONLY SURVEY METHODS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C10.04

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY BOTH TRADITIONAL AND GPS SURVEY METHODS. FOR TRADITIONAL ONLY SURVEYS USE MSDD STANDARD C10.04. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+), GPS (0.07 feet+/- 50PPM or less).

VERTICAL: ""URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A" (Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

REFERENCE INFORMATION REQUIRED FOR GPS SURVEYS IN THE CERTIFICATION. (REF, NCBELS BOARD RULE 21 NCAC 56.1607).

(1) POSITIONAL ACCURACY:_____ (0.07 feet +/- 50PPM or less).

(2) TYPE OF GPS FIELD PROCEDURE:_____ (STATIC, REAL-TIME KINEMATIC, REAL-TIME KINEMATIC NETWORK, ONLINE POSITION USER SERVICE).

(3) DATE(S) OF SURVEY:_____

(4) DATUM / EPOCH: _____ (HORIZONTAL (NAD83/86, NAD83(NSRS2007), etc.; VERTICAL (NAVD88)).

(5) PUBLISHED / FIXED-CONTROL STATIONS USED: _____ (INCLUDE: STATION NAMES, HORIZONTAL POSITION (NORTHING AND EASTING), ELEVATION, DATUM AND EPOCH).

(6) GEOID MODEL USED:_____ (GEOID03, GEOID06, GEOID09, etc.).

(7) COMBINED GRID FACTOR(S):_____

(8) UNITS:_____.

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____. OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:_____; THAT THIS TOPOGRAPHIC SURVEY WAS PERFORMED TO MEET FEDERAL GEOGRAPHIC DATA COMMITTED STANDARDS AS APPLICABLE; THAT THE TOPOGRAPHIC DATA WAS OBTAINED ON (insert dates)___; THAT THE SURVEY WAS COMPLETED ON (insert dates)_____; THAT THE CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD; THAT VERTICAL CONTROL WAS ESTABLISHED AT THE SITE TO THE CLASS "A" STANDARD; THAT A GLOBAL POSITIONING SYSTEM (GPS) SURVEY WAS PERFORMED TO ESTABLISH THE HORIZONTAL AND VERTICAL CONTROL FOR THE PROJECT; THAT THE (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT THE CLASS "A" ACCURACY CLASSIFICATION (95% CONFIDENCE) AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE GPS SURVEY:

POSITION ACCURACY:_____ TYPE OF GPS FIELD PROCEDURE:_____ DATE(S) OF SURVEY: _____

DATUM / EPOCH:_____ GEOID MODEL: _____ UNITS:_____

PUBLISHED / FIELD CONTROL MONUMENTS USED: _____ _____

AND THAT THIS MAP MEETS THE REQUIREMENTS OF "THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROINA" (21 NCAC 56.1600).

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS TIME _____ DAY OF _____, 20___.

SIGNED _____

PROFESSIONAL LAND SURVEYOR NO. L- ####

2 1/2"

9 1/4"

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PRELIMINARY PLAT SURVEYOR'S CERTIFICATION USING TRADITIONAL AND GPS SURVEY METHODS

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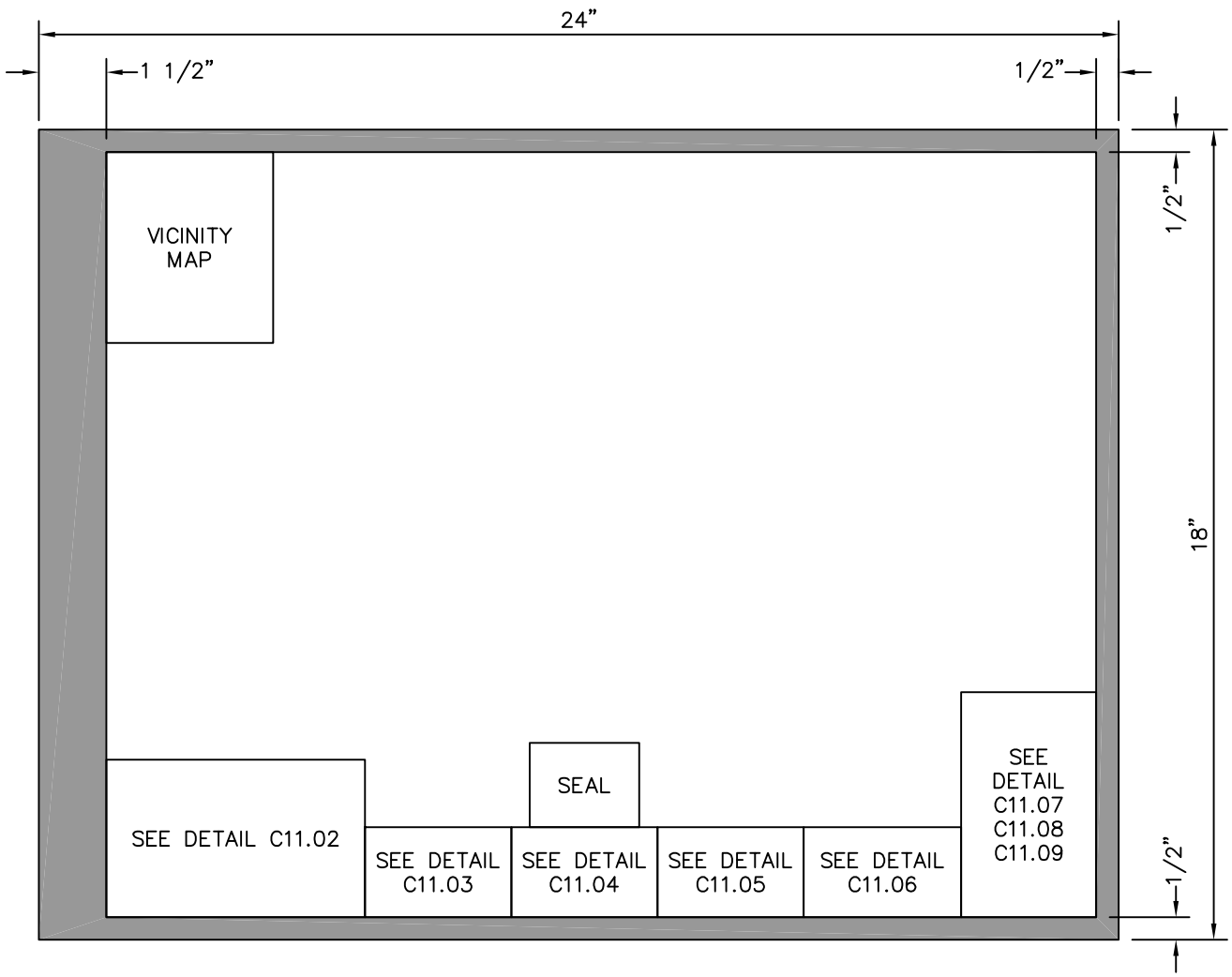

NOTES:

1. Original to be on mylar, 0.003-0.004 inch thickness.
2. Reserve area for Register of Deeds sticker.

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STANDARD FINAL PLAT LAYOUT

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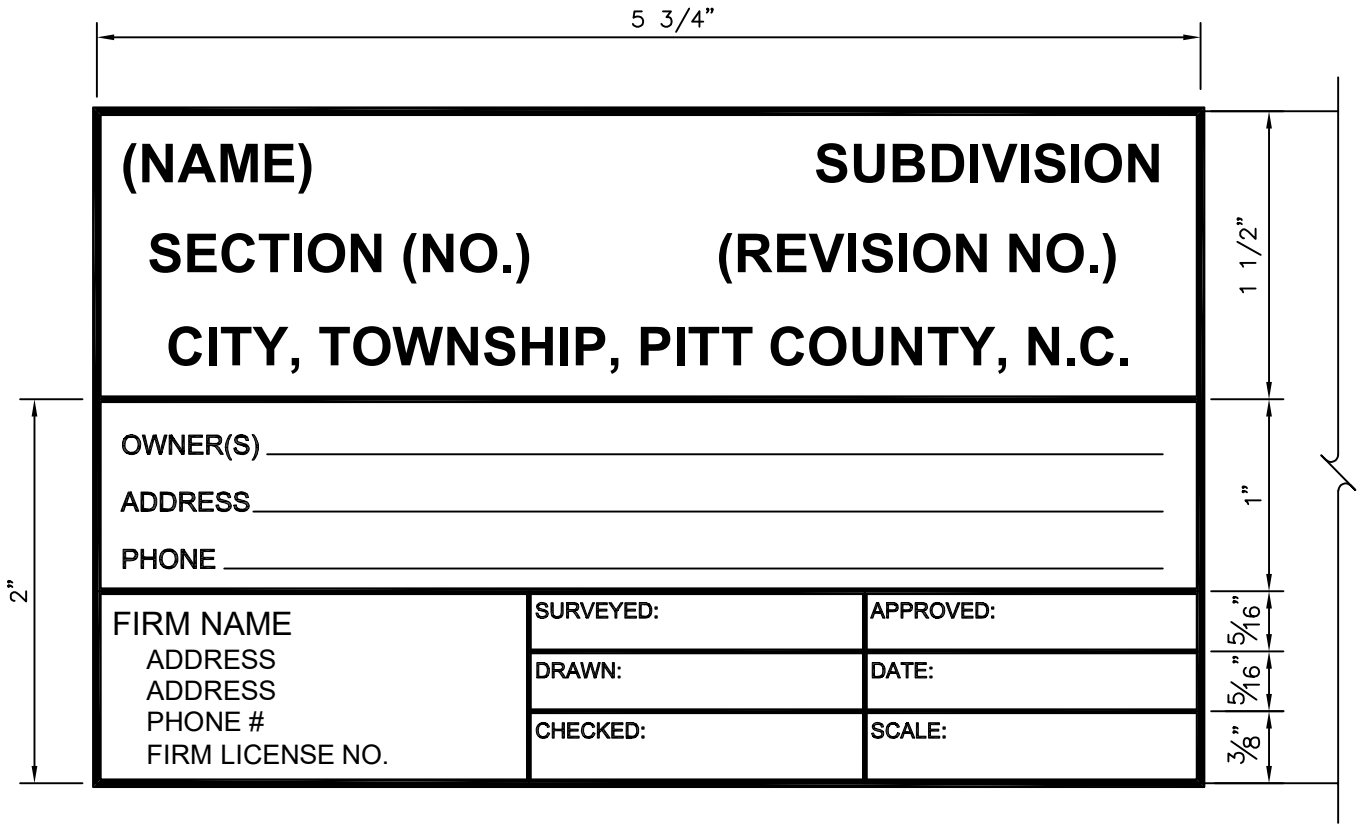

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STANDARD TITLE BLOCK FOR FINAL PLATS

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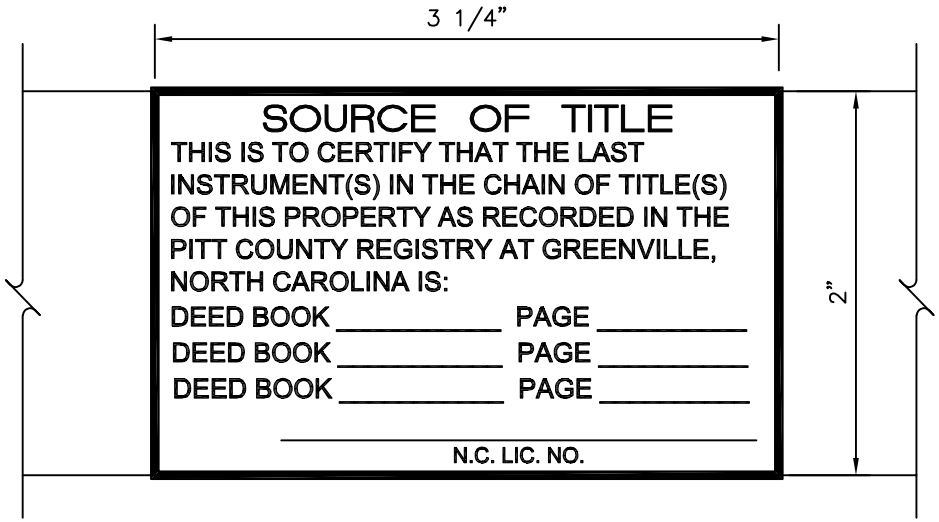

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STANDARD "SOURCE OF TITLE" INFORMATION BLOCK

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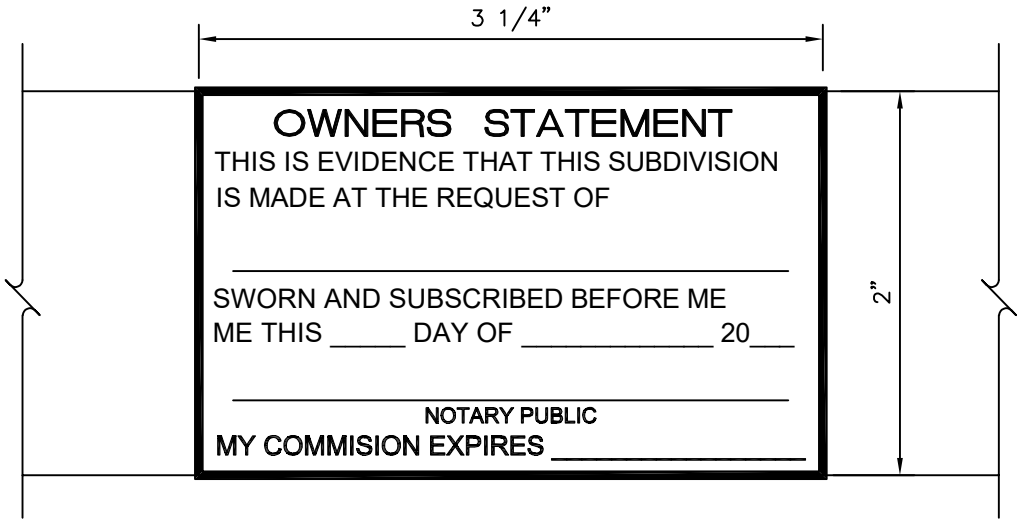

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STANDARD OWNERS STATEMENT BLOCK

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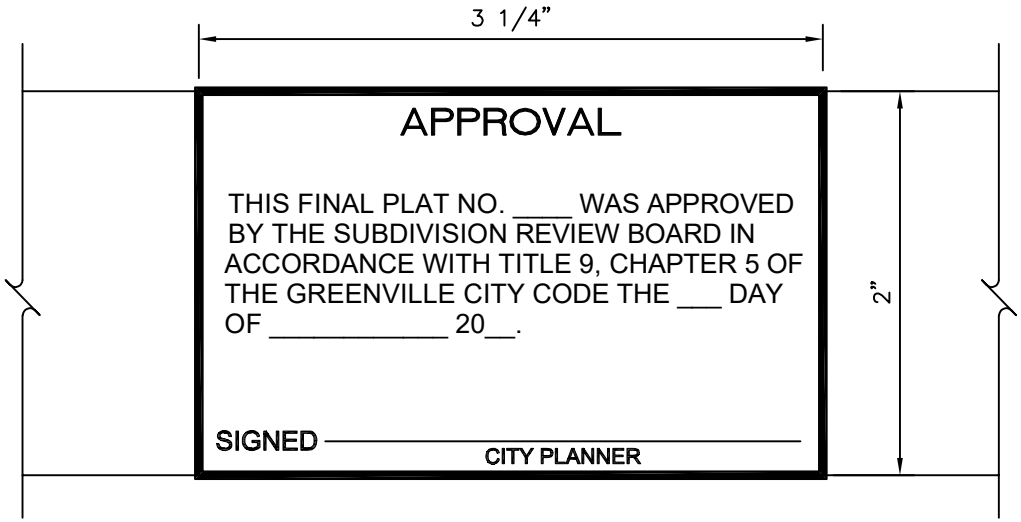

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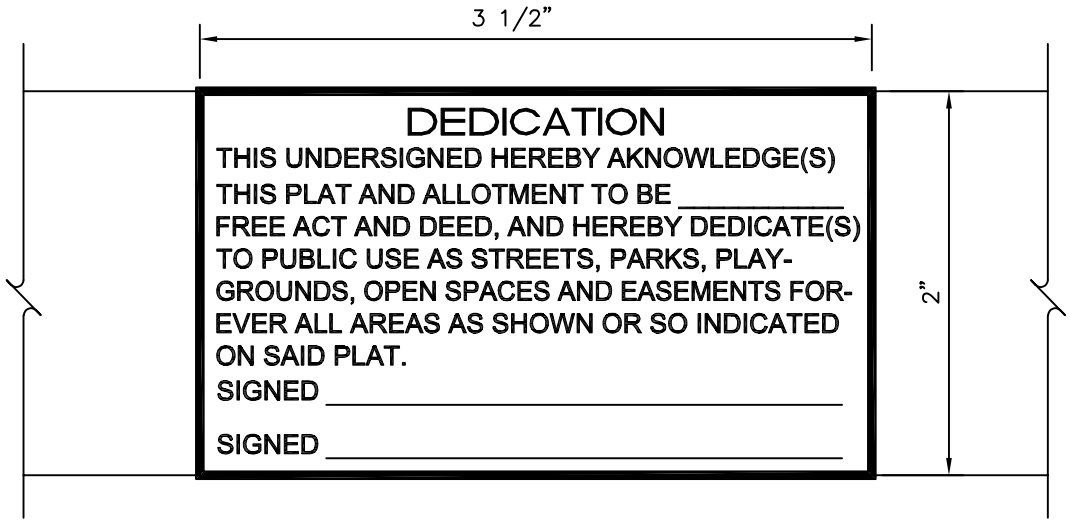

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STANDARD DEDICATION INFORMATION BLOCK

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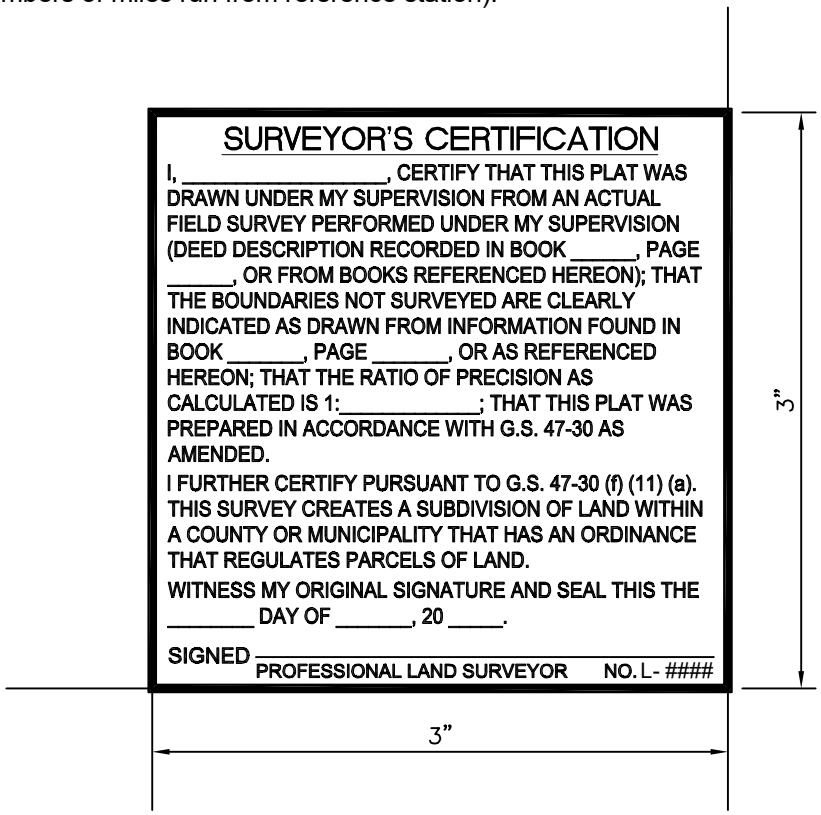
COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY TRADITIONAL SURVEY METHODS; FOR SURVEYS PERFORMED USING BOTH TRADITIONAL AND GPS SURVEYING METHODS, USE MSDD STANDARD C11.08. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+)
VERTICAL: "URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A"
(Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).



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FINAL PLAT SURVEYOR'S CERTIFICATION - TRADITIONAL ONLY SURVEY METHODS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C11.07

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY TRADITIONAL AND GPS SURVEY METHODS. FOR TRADITIONAL ONLY SURVEYS USE MSDD STANDARD C11.07. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+)

VERTICAL: "URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A" (Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

REFERENCE INFORMATION REQUIRED FOR GPS SURVEYS IN THE CERTIFICATION. (REF, NCBELS BOARD RULE 21 NCAC 56.1607).

(1) POSITIONAL ACCURACY:_____ (0.07 feet +/- 50PPM or less).
(2) TYPE OF GPS FIELD PROCEDURE:_____
(STATIC, REAL-TIME KINEMATIC, REAL-TIME KINEMATIC NETWORK, ONLINE POSITION USER SERVICE).
(3) DATE(S) OF SURVEY:_____
(4) DATUM / EPOCH: _____
(HORIZONTAL (NAD83/86, NAD83(NSRS2007), etc.; VERTICAL (NAVD88)).
(5) PUBLISHED / FIXED-CONTROL STATIONS USED: _____
(INCLUDE: STATION NAMES, HORIZONTAL POSITION (NORTHING AND EASTING), ELEVATION, DATUM AND EPOCH).
(6) GEOID MODEL USED:_____
(GEOID03, GEOID06, GEOID09, etc.).
(7) COMBINED GRID FACTOR(S):_____
(8) UNITS: US SURVEY FOOT .

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL FIELD SURVEY PERFORMED UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____, OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION FOR TRADITIONAL SURVEY METHOD IS 1:_____; THAT THE GLOBAL POSITIONING SYSTEM (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT THE CLASS "A" ACCURACY CLASSIFICATION (95% CONFIDENCE) AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE GPS SURVEY:

POSITION ACCURACY: _____
TYPE OF GPS FIELD PROCEDURE:_____
DATE(S) OF SURVEY: _____
DATUM / EPOCH: _____
PUBLISHED / FIELD CONTROL MONUMENTS USED:
_____
_____
GEOID MODEL:_____
COMBINED GRID FACTOR:_____
UNITS:_____

THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I, FURTHER CERTIFY PURSUANT TO G.S.47-30(f)(11)(a), THIS SURVEY CREATES A SUBDIVISION OF LAND WITHIN A COUNTY OR MUNICIPALITY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND.

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20 ____.

SIGNED _____
PROFESSIONAL LAND SURVEYOR NO. L- ####

5 1/2"

3"

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FINAL PLAT SURVEYOR'S CERTIFICATION - TRADITIONAL & GPS SURVEY METHODS

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FINAL PLAT REVIEW OFFICER'S CERTIFICATION

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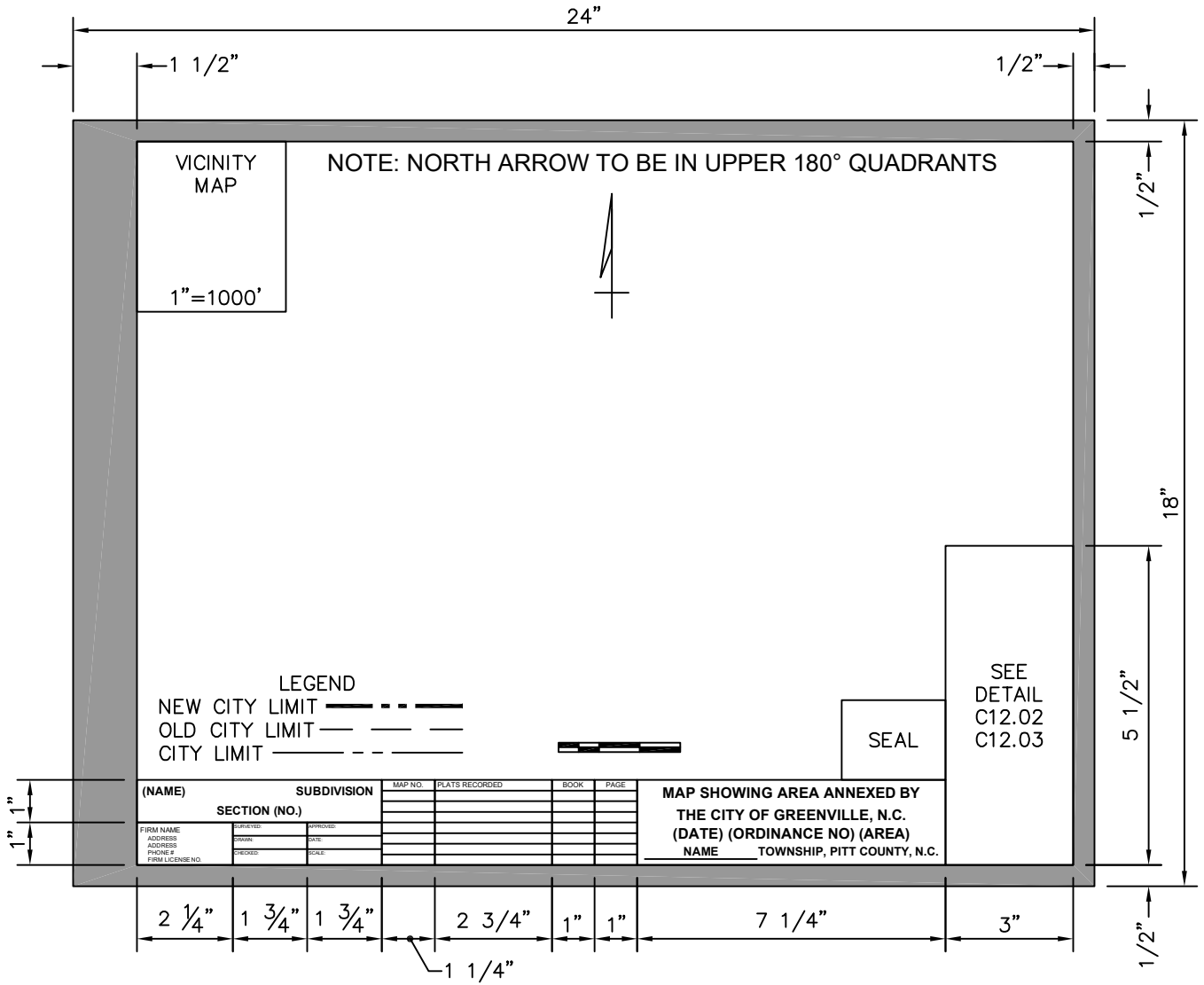

NOTES:

1. Original to be on drafting film, 0.003-0.004 inch thickness
2. One film copy for city files.
3. Reserve area for Register of Deeds sticker.

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STANDARD FORMAT ANNEXATION MAP

Scale:	Sheet #:	Detail #
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COMMENTS:

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REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+)

VERTICAL: "URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A" (Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

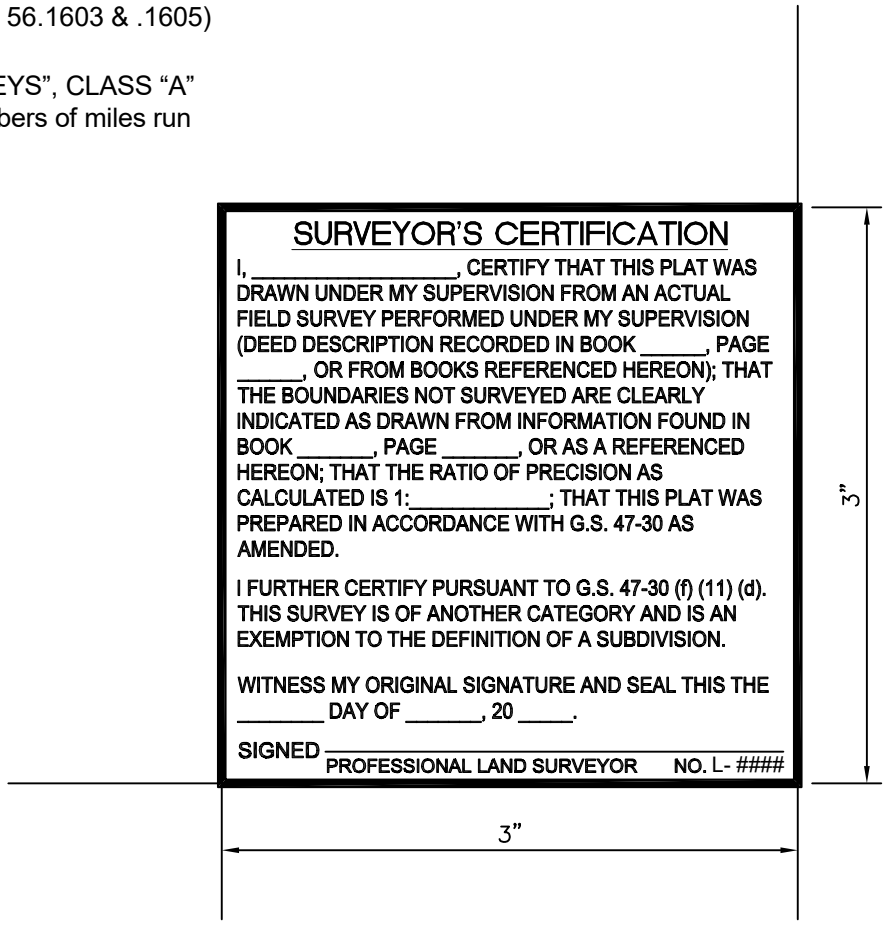
SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL FIELD SURVEY PERFORMED UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____, OR AS A REFERENCED HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:_____; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I FURTHER CERTIFY PURSUANT TO G.S. 47-30 (f) (11) (d). THIS SURVEY IS OF ANOTHER CATEGORY AND IS AN EXEMPTION TO THE DEFINITION OF A SUBDIVISION.

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20 _____.

SIGNED _____
PROFESSIONAL LAND SURVEYOR NO. L- ####



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ANNEXATION MAP SURVEYOR'S CERTIFICATION - TRADITIONAL ONLY SURVEY METHODS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C12.02

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY BOTH TRADITIONAL AND GPS SURVEY METHODS. FOR TRADITIONAL ONLY SURVEYS USE MSDD STANDARD C12.02. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

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REFERENCE INFORMATION REQUIRED FOR GPS SURVEYS IN THE CERTIFICATION. (REF, NCBELS BOARD RULE 21 NCAC 56.1607).

(1) POSITIONAL ACCURACY:_____ (0.07 feet +/- 50PPM or less).
(2) TYPE OF GPS FIELD PROCEDURE:_____
(STATIC, REAL-TIME KINEMATIC, REAL-TIME KINEMATIC NETWORK, ONLINE POSITION USER SERVICE).
(3) DATE(S) OF SURVEY:_____
(4) DATUM / EPOCH: _____
(HORIZONTAL (NAD83/86, NAD83(NSRS2007), etc.; VERTICAL (NAVD88)).
(5) PUBLISHED / FIXED-CONTROL STATIONS USED: _____
(INCLUDE: STATION NAMES, HORIZONTAL POSITION (NORTHING AND EASTING), ELEVATION, DATUM AND EPOCH).
(6) GEOID MODEL USED:_____
(GEOID03, GEOID06, GEOID09, etc.).
(7) COMBINED GRID FACTOR(S):_____
(8) UNITS: US SURVEY FOOT .

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL FIELD SURVEY PERFORMED UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____, OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION FOR TRADITIONAL SURVEY METHOD IS 1:_____; THAT THE GLOBAL POSITIONING SYSTEM (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT THE CLASS "A" ACCURACY CLASSIFICATION (95% CONFIDENCE) AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE GPS SURVEY:

POSITION ACCURACY: _____
TYPE OF GPS FIELD PROCEDURE:_____
DATE(S) OF SURVEY: _____
DATUM / EPOCH: _____
PUBLISHED / FIELD CONTROL MONUMENTS USED:
_____
_____
GEOID MODEL:_____
COMBINED GRID FACTOR: _____
UNITS:_____

THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I FURTHER CERTIFY PURSUANT TO G.S. 47-30 (f) (11) (d). THIS SURVEY IS OF ANOTHER CATEGORY AND IS AN EXEMPTION TO THE DEFINITION OF A SUBDIVISION.

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20 _____.

SIGNED _____
PROFESSIONAL LAND SURVEYOR NO. L- ####

5 1/2"

3"

ENGINEERING DEPARTMENT
Greenville, North Carolina 27834

CITY OF GREENVILLE, N.C. www.greenvillenc.gov

Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

ANNEXATION MAP SURVEYOR'S CERTIFICATION - TRADITIONAL & GPS SURVEY METHODS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C12.03

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Greenville, North Carolina 27834

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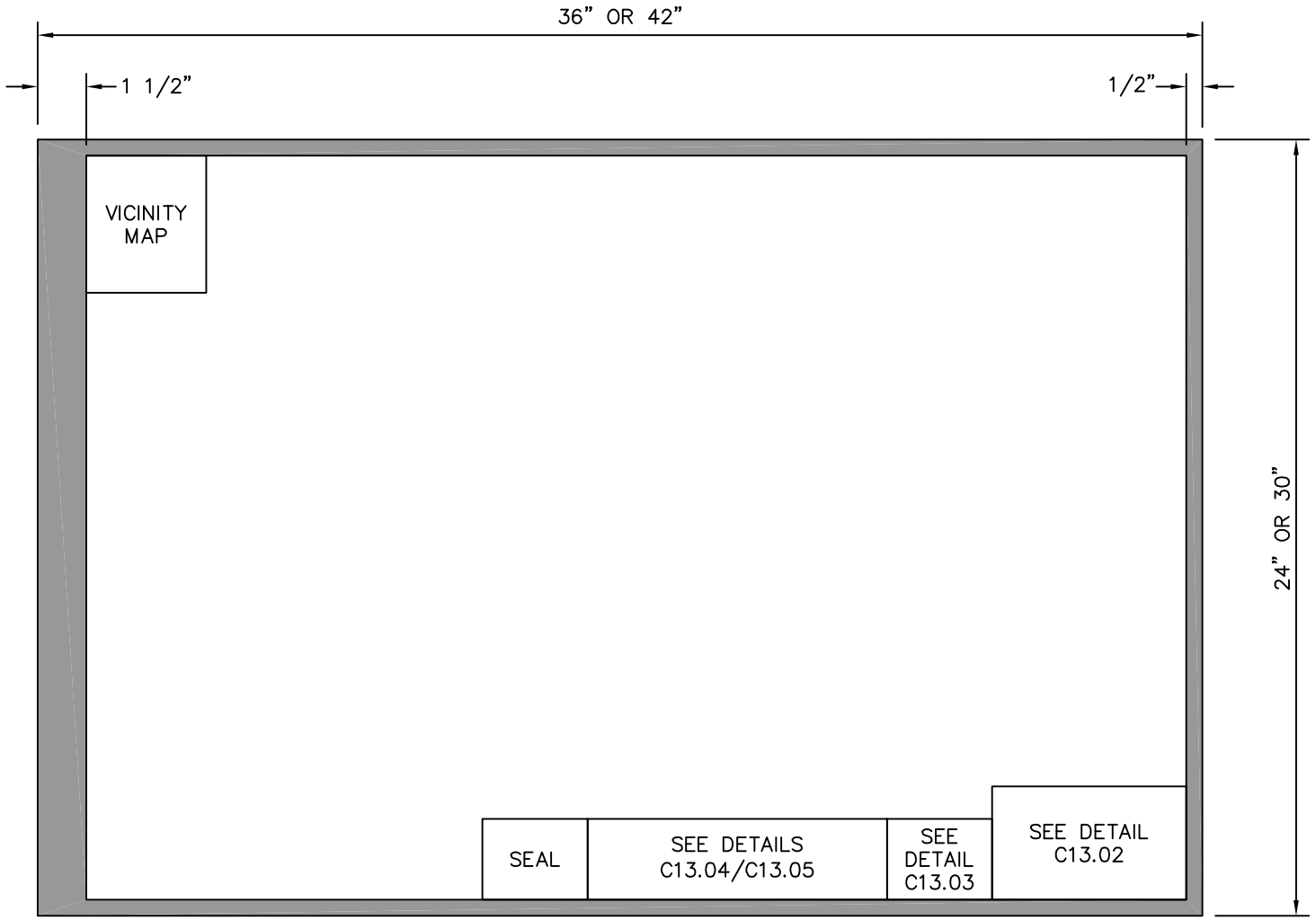
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

ANNEXATION MAP REVIEW OFFICER'S CERTIFICATION

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C12.04



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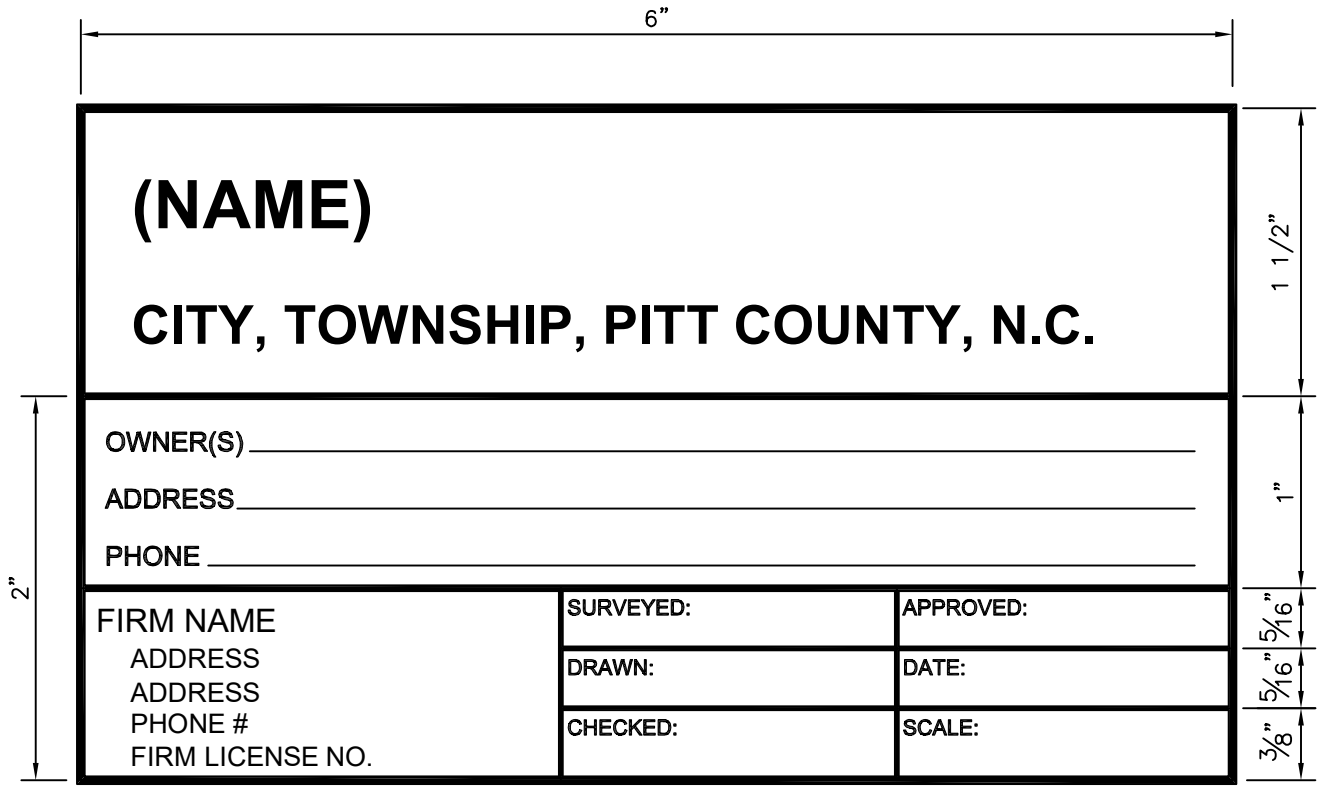
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

STANDARD P.U.D. LAND USE PLAN LAYOUT

Scale: not to scale

Sheet #: 1 of 1

Detail # **C13.01**



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Rev.	Date	Description	Approved
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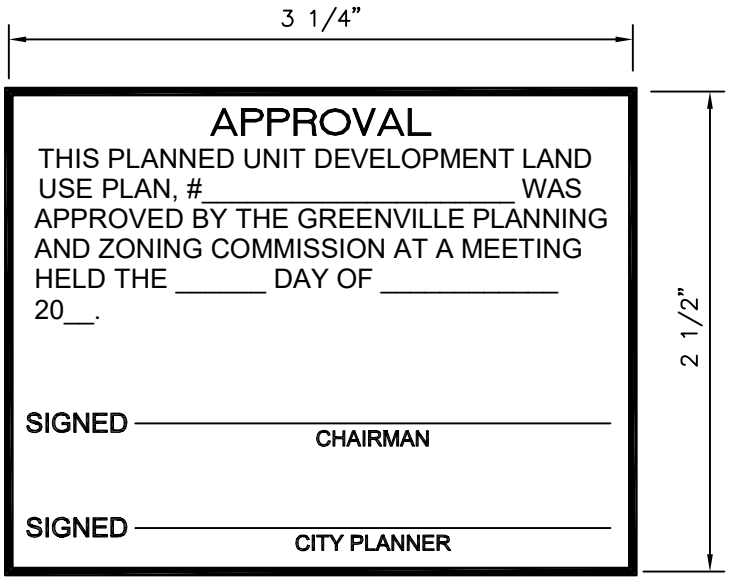
STANDARD TITLE BLOCK FOR P.U.D. LAND USE PLAN

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C13.02



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Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

STANDARD "APPROVALS" INFORMATION BLOCK

Scale: not to scale

Sheet #: 1 of 1

Detail # C13.03

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY TRADITIONAL SURVEY METHODS; FOR SURVEYS PERFORMED USING BOTH TRADITIONAL AND GPS SURVEYING METHODS USE MSDD STANDARD C13.05. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+)
VERTICAL: "URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A"
(Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____. OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:_____; THAT THIS TOPOGRAPHIC SURVEY WAS PERFORMED TO MEET FEDERAL GEOGRAPHIC DATA COMMITTED STANDARDS AS APPLICABLE; THAT THE TOPOGRAPHIC DATA WAS OBTAINED ON (insert dates)_____; THAT THE SURVEY WAS COMPLETED ON (insert date)____; THAT THE CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD; THAT VERTICAL CONTROL WAS ESTABLISHED AT THE SITE TO THE CLASS "A" STANDARD; AND THAT THIS MAP MEETS THE REQUIREMENTS OF THE "STANDARD OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA" (21 NCAC 56.1600).

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20 _____.

SIGNED _____
PROFESSIONAL LAND SURVEYOR NO. L- ####

2 1/2"

5 1/2"

COMMENTS:

THE SURVEYOR'S CERTIFICATION SHALL BE SUBSTANTIALLY IN THE FORM SHOWN FOR SURVEYS MADE BY BOTH TRADITIONAL AND GPS SURVEY METHODS. FOR TRADITIONAL ONLY SURVEYS USE MSDD STANDARD C13.04. THE SURVEYOR SHOULD REFER TO AND COMPLY WITH THE CURRENT NCBELS RULES 21 NCAC 56.1600, "STANDARDS OF PRACTICE OF LAND SURVEYING IN NORTH CAROLINA", AND G.S. 47-30 FOR ANY RULE AMENDMENTS. www.ncbels.org

REQUIRED MINIMUM ACCURACY STANDARDS: (21 NCAC 56.1603 & .1605)

HORIZONTAL: "URBAN LAND SURVEYS", CLASS "A" (1:10,000+), GPS (0.07 feet+/- 50PPM or less).

VERTICAL: ""URBAN AND SUBURBAN VERTICAL CONTROL SURVEYS", CLASS "A" (Error not to exceed 0.10 times the square root of the numbers of miles run from reference station).

REFERENCE INFORMATION REQUIRED FOR GPS SURVEYS IN THE CERTIFICATION. (REF, NCBELS BOARD RULE 21 NCAC 56-1607).

(1) POSITIONAL ACCURACY:_____ (0.07 feet +/- 50PPM or less).

(2) TYPE OF GPS FIELD PROCEDURE:_____ (STATIC, REAL-TIME KINEMATIC, REAL-TIME KINEMATIC NETWORK, ONLINE POSITION USER SERVICE).

(3) DATE(S) OF SURVEY:_____

(4) DATUM / EPOCH: _____ (HORIZONTAL (NAD83/86, NAD83(NSRS2007), etc.; VERTICAL (NAVD88)).

(5) PUBLISHED / FIXED-CONTROL STATIONS USED: _____ (INCLUDE: STATION NAMES, HORIZONTAL POSITION (NORTHING AND EASTING), ELEVATION, DATUM AND EPOCH).

(6) GEOID MODEL USED:_____ (GEOID03, GEOID06, GEOID09, etc.).

(7) COMBINED GRID FACTOR(S):_____

(8) UNITS: US SURVEY FOOT .

SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK _____, PAGE _____, OR FROM BOOKS REFERENCED HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____. OR AS REFERENCED HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:_____; THAT THIS TOPOGRAPHIC SURVEY WAS PERFORMED TO MEET FEDERAL GEOGRAPHIC DATA COMMITTED STANDARDS AS APPLICABLE; THAT THE TOPOGRAPHIC DATA WAS OBTAINED ON(insert dates)___; THAT THE SURVEY WAS COMPLETED ON (insert dates)_____; THAT THE CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD; THAT VERTICAL CONTROL WAS ESTABLISHED AT THE SITE TO THE CLASS "A" STANDARD; THAT A GLOBAL POSITIONING SYSTEM (GPS) SURVEY WAS PERFORMED TO ESTABLISH THE HORIZONTAL AND VERTICAL CONTROL FOR THE PROJECT; THAT THE (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT THE CLASS "A" ACCURACY CLASSIFICATION (95% CONFIDENCE) AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE GPS SURVEY:

POSITION ACCURACY:_____ TYPE OF GPS FIELD PROCEDURE:_____ DATE(S) OF SURVEY: _____

DATUM / EPOCH:_____ GEOID MODEL: _____ UNITS: _____

PUBLISHED / FIELD CONTROL MONUMENTS USED: _____ _____

AND THAT THIS MAP MEETS THE REQUIREMENTS OF "THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROINA" (21 NCAC 56.1600).

WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS THE _____ DAY OF _____, 20___.

SIGNED _____

PROFESSIONAL LAND SURVEYOR NO. L- L- ####

2 1/2"

9 1/4"

ENGINEERING DEPARTMENT
Greenville, North Carolina 27834

CITY OF GREENVILLE, N.C. www.greenvillenc.gov

Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

P.U.D. LAND USE PLAN SURVEYOR'S CERTIFICATION - TRADITIONAL & GPS SURVEY METHODS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C13.05

TABLE OF DETAILS

CONSTRUCTION PLAN PREPARATION

CONSTRUCTION PLAN REQUIREMENTS

A. FORMAT

1. Provide cover sheet at scale of 1” = 100' or larger. Use same scale as preliminary plat.
2. Construction plans to be scale 1” = 50' or larger. Include graphic scale on plans.
3. Size shall be 24” x 36” or 30” x 42”. Use same size as preliminary plat.
4. Boundary lines shall be distinctly and accurately represented, all bearings and distances shown with an accuracy of closure of not less than one (1) in 10,000+ and in accordance with the Standards of Practice for Land Surveying in North Carolina.
5. Elevation and bench markers shall be referenced to NAVD 88.
6. All drawings shall be prepared and sealed by a professional engineer and/or land surveyor.
7. Multiple sheets shall be collated and stapled. Match lines shall be clearly indicated.
8. Construction plans and associated calculations should be submitted online at the City of Greenville's Customer Self Service Portal.
9. Profiles shall be drawn at a scale of not less than one (1) inch equals fifty (50) feet, horizontal, and one (1) inch equals 5 (five) feet, vertical.

B. GENERAL INFORMATION (PROVIDE ON COVER SHEET AND PLAN AND PROFILE SHEETS)

1. Subdivision name.
2. The name(s) of the city, township, county, and state in which the subdivision is located.
3. Name, address, and telephone number of land owner(s).
4. Name, address, and telephone number of subdivider and/or developer.
5. Name, address, and telephone number, and registration number & seal of the engineer preparing the plan.

C. PLAN INFORMATION

I. Cover Sheet

1. The cover or title sheet shall be in accordance with Section 9-5-45 of the City Code.

II. Plan and Profile Sheets

1. North arrow and delineation as to whether true, grid or magnetic including date.
2. Existing, platted and proposed streets, their names and numbers (if state marked routes), right of way and/or easement widths, pavement widths, tangent distance between reverse curves, centerline curve and corner radius data, also include sight distance triangle and typical cross sections.
3. Proposed and existing lot lines within the subdivision showing approximate dimensions.
4. Proposed and existing property lines.
5. Proposed and existing water courses, streams, or ditches including but not limited to centerline elevations, and cross sections.
6. Proposed lot grading (contours, spot elevations, flow arrows, etc.)
7. Floodplain boundaries, flood hazard area designation, and floodway boundaries and designation, including base flood elevations and FIRM panel reference.
8. Elevation of proposed and existing ground surface at all street intersections and points of major change along centerline of streets, together with proposed grade lines connecting therewith.
9. The profile of each proposed street shall show clearly and accurately the proposed new street grades and their relation to the existing street grades with which they connect.
10. The profiles shall show the finished elevation of the top of curb or street centerline for non-curb and gutter street sections.
11. The profiles of each street shall contain at least one (1) typical section, indicating the particular section to which the proposed profile grade refers. Each profile shall show the percentage of grade, the length of vertical curve, the P.V.C. and the P.V.T. Station, the P.V. I. Station, elevation, and midordinate.
12. The profiles of each storm sewer and sanitary sewer system shall contain the percentage of grade and the top and invert elevation of each catch basin and manhole.

D. SUPPORTING TECHNICAL INFORMATION

1. All storm drainage design shall be in accordance with Section 9-9 of the City Code and Series 680 of this manual.

TABLE OF DETAILS

Street and Storm Drainage "Record Drawings" Submittal Requirements

The following identifies the requirements, information, and format for submitting Record Drawings to the Engineering Department for review and approval. Record Drawings shall be submitted for any street and storm drainage infrastructure proposed for maintenance by the City of Greenville. Record Drawings shall be submitted and approved prior to scheduling of the pre-final street acceptance inspection.

All Record Drawings shall include, but not necessarily be limited to, the following:

1. Streets:
   - A. Centerline horizontal location and final surface elevation:
     - a. intersections - crossing of street centerlines
     - b. points of vertical inflection (pvi) - street centerline at point of inflection
     - c. radius points of cul-de-sacs
     - d. radius points for "hammerheads"
     - e. beginning of pavement construction (street centerline)
     - f. end of pavement construction (street centerline)

2. Stormwater System:
   - A. Stormwater Pipes (Including flared end sections)
     - a. Size
     - b. Shape
     - c. Material
     - d. Length
     - e. Slope

   - B. Structures (Junction Box, Drop Inlets, Catch Basins, Interference Boxes, Outlet Structures)
     - a. Rim/hood elevation
     - b. All pipe invert elevations
     - c. Material

   - C. Level Spreaders / Flow Diffusers
     - a. Length
     - b. Material
     - c. Depth
     - d. Width

The following standards shall be followed for collection and submittal of all record drawings:

Data Collection:

- Survey data collection can utilize conventional surveying methods, GNSS/GPS surveying methods, or a combination of both.
- Coordinate System: State Plane North Carolina 3200.
- Horizontal Datum: NAD 83 (2011); Vertical Datum: NAVD 88. GEOID Model: GEOID12B or the current Model as published by National Geodetic Survey (NGS).
- Unit of Measurement: US Survey Foot.
- All work shall be “Class A” (1:10,000) surveying standard and performed in compliance with the Standards of Practice for Land Surveying in North Carolina, 21 NCAC 56.1600.
- When using GNSS/GPS for data collection of structure control points, the observation to be a minimum of 180 epochs with a tolerance of 0.04' horizontal, and 0.07' vertical.
- The North Carolina Real-time Kinematic Network or NGS published stations with NAD 83 (2011) positions are to be utilized for control.
- Storm Water System Data Collection:
  - Each drainage structure is to be located by a single “Structure Control Point” for horizontal and vertical position. The point is to be marked with paint in the field. Control point observations are not required for inverts of pipes within structures. Measuring down from the control point to the inverts is a generally accepted surveying practice.

    - Catch Basin - center of the hood at back of curb line
    - Drop Inlet or Yard Inlet - center of the grate
    - Junction or Conflict Box - center of the manhole cover
    - Pond Outlet Structure - top center of the structure, grate or manhole cover
    - FES - top of the pipe section before the start of the flare
    - Pipe End, bell or socket - top of pipe at pipe end
    - Headwall - top center of the headwall above the pipe(s)
    - Level Spreader - top center of the structure

Certification:

- The Professional Land Surveyor shall sign, seal, and certifiy the record drawings for the horizontal and vertical information. Certification to be in compliance with Standards of Practice for Land Surveying in North Carolina.
- The Professional Engineer shall sign, seal, and certify in accordance with detail C30.02.

Record Drawing Submittal Process

The submittal process for the review and approval of Record Drawings is as follows:

1. Submittal of Record Drawings

   a. Submit either a contractor's “red-lined” mark-ups of approved construction drawings or an electronic submission of approved construction drawing with changes to the above “clouded” based on a contractor's “red-lined” mark-ups to the Engineering Department's Land Development Division online at the City's Customer Self Service Portal.

      i) Only changes from the approved construction drawings need to be presented.

      ii) The “red-lined” information will have a single line placed through it with the revised information or measurement placed next to it.

      iii) If an electronic drawing is submitted in place of the contractor's red line drawings, then a single line will be drawn through the errant information. The correct information will be placed next to the errant information and a “cloud” will surround both.

      iv) A licensed professional engineer with the State of North Carolina (either the engineer of record or one hired by the developer) shall also be responsible for reviewing and certifying the contractor's red line mark-ups of approved construction drawings prior to submittal to the City of Greenville.

   b. Submit storm drainage calculations

      i) The engineer shall review the Record Drawings to determine and establish if any construction deviations will impact positive storm drainage flow throughout the system or place the system out of compliance with the City of Greenville requirements.

      ii) The engineer must submit revised storm drainage calculations based on the record drawings for review and evaluation by the Engineering Department, as well as discuss any issue(s) with the City Engineer or his designee to determine a viable solution(s).

   c. Submit concrete load tickets for curb & gutter, valley gutter, and sidewalks. Submit concrete test results for structural concrete.

d. Record Drawings shall be reviewed within ten (10) working days after date of receipt.

i) The benchmark(s) and datum used for measurements of the record drawings shall be conveyed and easily interpreted on the submitted drawings and shall be the same as used for the design of the original approved construction drawings and for construction.

(1) If the referenced benchmark(s) used for design and construction and shown on the approved construction drawings have been compromised, new benchmark(s) must be reestablished to an accuracy on the site from published NGS monuments in accordance with the Standard of Practice For Land Surveyors in North Carolina, N.C.A.C. Title 21, Chapter 56, Section .1600, and by either conventional survey methods or Global Positioning Systems survey methods (21 NCAC 56.1607).

* Revisions to the record drawing submittals or requests for additional information may be required by the City of Greenville staff and may delay approval.

ii) Any exceptions or deviations from the approved construction drawings determined as acceptable by the City Engineer shall be noted on and incorporated as part of the final Record Drawings.

2. Upon approval of all Record Drawings

e. An electronic copy of the Record Drawing shall be returned by the Engineering Department to the engineer with an approval stamp.

f. The engineer shall submit an electronic copy of the drawing in “pdf” format with the following certification:

“I, _____, as a duly registered Professional Engineer in the State of North Carolina, hereby certify that construction of the street(s) and storm drainage infrastructure as presented on these Record Drawings has been competed in substantial accordance with the approved plans and specifications and that the information pertaining to said infrastructure provided by _____ and prepared under the supervision of _____ is correct to the best of my knowledge and belief.”

g. The engineer shall also submit an electronic drawing in a version of AutoCad “DWG” format compatible with the City of Greenville's current system. The digital record drawings should be submitted in AutoCAD State Plane North Carolina 3200 drawing format. Each type of stormwater infrastructure should be on its own layer in the AutoCAD drawing (e.g. pipes on one layer, catch basins on one layer, drop inlets on one layer, and junction boxes on one layer).

h. The Engineer's & Owner's Certificate of Completion forms (Std. detail No. C31.01 & C31.02, respectively) shall be submitted to the Engineering Department.

3. A pre-final street acceptance inspection shall be scheduled following approval and completion of all submittal requirements stated above.

Street Acceptance Timeline

The following is a summary of the Street Acceptance Process. Details on the Record Drawing Submittal Process can be found within the document named “Record Drawing Submittal Process” (Std. detail No. C30.02). Details on the Final Inspection Process can be found within the document named “Final Inspections - Subdivision” (Std. detail No. C30.04).

1. Developer completes all construction infrastructure proposed for continuous maintenance by the City of Greenville*.
2. The Record Drawing Submittal Process is initialized with the submission of the developer's contractor's red-lined drawings or electronic drawings with “clouded” changes to the approved construction drawings.
3. A licensed professional engineer with the State of North Carolina (either the engineer of record or one hired by the developer) will verify that the street(s) and storm drainage infrastructure as presented on these Record of Drawings has been completed in substantial accordance with the approved plans and specifications. The engineer will review this information to confirm that the system meets the City of Greenville requirements. If the storm drainage system is not in compliance with the approved construction drawings or the City of Greenville's requirements, the engineer will submit revised storm drainage calculations based on the Record Drawings for review and evaluation by the Engineering Department, as well discuss the issue(s) with the City Engineer or his designee to determine a viable solution(s).
4. Red-lined drawings and stormwater calculations are reviewed within ten (10) working days, unless additional information is required.
5. A pre-final inspection may be scheduled by the contractor with the City Engineer or his designee upon: approval of the Record Drawings; the submittal of the electronic Record Drawings with the certification statement by the engineer; submittal and acceptance of all asphalt thickness and density test results, and the submittal of the Engineer's and Owner's Certificate of Completion forms (Std. detail No. C31.01 & C31.02, respectively).
6. After the pre-final inspection is performed and all punch-list items from the pre-final inspection are completed, the final inspection with the City Engineer may be scheduled - this will be coordinated through the City Engineer or his designee. Upon notification, the date of the final inspection will be scheduled within three (3) working days.
7. The Contractor has thirty (30) days to complete any additional items found deficient during the final inspection or a re-inspection will need to be performed.

(*) Developer is responsible for meeting all acceptance and inspection requirements for infrastructure proposed for continuous maintenance by the Greenville Utilities Commission.

Final Inspection - Subdivision

INTRODUCTION

As subdivision development nears completion, it becomes necessary for the City of Greenville to conduct a “final inspection” of work performed in anticipation of street acceptance for continuous maintenance by the City. This inspection will encompass review of all aspects of subdivision construction to ensure compliance with approved plans, applicable regulations and standards. So as to maintain consistency and thoroughness in conduction of the “final inspection”, the following guidelines are to be followed:

Single family, Industrial, Multi-family, and Innovative Subdivisions:

A. Once the subdivision has been completed, Record Drawings of the subdivision (as identified in the Street and Storm Drainage Record Drawing Submittal Requirements, Std. detail No. C30.01) shall be completed and sent to the City Engineer or his designee for acceptance. These drawings will be reviewed within ten (10) working days after date of receipt.

B. After the Record Drawings have been accepted by the City Engineer and the electronic Record Drawings with the certification statement by the Owner's engineer and the Engineer's and Owner's Certificate of Completion forms (Std. detail No. C31.01 & C31.02, respectively) have been submitted, the subdivision developer shall formally request a pre-final inspection through the Engineer Department's Subdivision Inspector, which may be presented in writing or by telephone. This will allow for the subdivision to be prepared for the final inspection to be conducted by the City Engineer. After all items identified in the pre-final process are addressed, the final inspection may be requested.

C. It will be the responsibility of the subdivision developer or representative to formally request a final inspection through the City Engineer's office. This shall be done in writing by the developer or representative thereof.

D. The Subdivision Inspector will verify status of the involved subdivision to the City Engineer. It will be the Subdivision Inspector's responsibility to ensure the subdivision is constructed according to the approved preliminary subdivision plan and Manual of Standard Designs and Details, unless approved through an official variance or plan revision.

E. Once the subdivision is determined ready for final inspection, the Subdivision Inspector will schedule the final inspection with the subdivision developer or his appointed designee at a time convenient for himself and the City Engineer. It will be the Subdivision Inspector's responsibility to notify the aforementioned persons of the confirmed inspection time within three (3) working days once it has been determined that the subdivision is ready for final inspection.

F. Should the subdivision not be ready for inspection, the Subdivision Inspector will work with the developer to bring the involved subdivision into conformance. This will include, but not be limited to:

1. Streets shall be swept clean up to the gutter line of the curb.
2. Check asphalt pavement, all concrete ramps, sidewalks, and curb and gutter for cracks, alignment, and settlement. The developer is responsible for testing and providing test results to verify the specified thickness and density.
3. Check storm drain manholes and catch basins for proper construction. Pipes within the manholes and catch basins shall be cut off flush with the wall of structure and the end of the pipe grouted and brushed smooth.
4. Look through the pipe to check alignment and to determine if pipe is free of debris.
5. Check headwalls, end walls, and flared end sections. Pipe to be cut flush with face of the wall and grouted and brushed smooth.
6. Right of way monuments shall be placed as required.
7. Right of way to be graded to the proper slope and seeded and mulched before a final inspection can be made.
8. Detention basins shall be completed and functioning.
9. All erosion control measures shall be removed in stabilized areas and maintained in non-stabilized areas.
10. Barricades shall be placed as required.
11. The area from the back of the curb to the right of way is to remain clear of all obstructions other than those permitted by existing policies.
12. Stormwater facility installed and inspected by Stormwater inspector.

G. The final inspection will be performed under the supervision of the City Engineer or his designee. It will be the Subdivision Inspector's responsibility to be familiar with the approved plan, revisions, variances, bond status, and all other administrative details related to the involved development.

H. It will be the responsibility of the Subdivision Inspector to ensure that all deficiencies are properly noted on the Project Inspection Report Form. The form will be completed and signed by the appropriate persons.

I. The Subdivision Inspector will present a copy of the completed Project Inspection Report Form to the Developer (or his representative) and the Contractor upon completion of the final inspection, but no later than the next working day.

J. After each inspection, the developer will have a thirty (30) day limit to correct the deficiencies noted on the Project Inspection Report Form. Otherwise a re-inspection will be scheduled the day after the time limit expires and an updated Project Report Form will be processed.

K. It will be the responsibility of the Subdivision developer to notify the Subdivision Inspector once the deficiencies noted on the aforementioned Project Inspection Report Form are corrected.

L. It will be the responsibility of the Subdivision Inspector to ensure the deficiencies are corrected and in conformance with the approved plan, the Manual of Standard Designs and Details, or as noted on the Project Inspection Report Form. Once the Subdivision Inspector is satisfied that the deficiencies have been corrected, he will so notify the City Engineer.

M. The Subdivision Inspector will distribute the Acceptance of Physical Improvements Form to the City Engineer and the designated representative for Greenville Utilities Commission. Upon return receipt of these forms, the City Engineer will begin proceedings for continuous maintenance, approval of involved record plats, and release of posted bonds. Permanent record will be maintained by the Engineering Department.

Stormwater Control Measures "Record Drawings" Checklists

1. General Requirements for ALL Stormwater SCM Record Drawings

a. The survey for the as-built plans must be completed by a land surveyor registered in the State of North Carolina.

b. Provide two sealed, signed and dated copies for review and approval along with a proposed list of plantings (if applicable) for review and approval before proceeding with planting of the SCM.

2) Wet Detention Pond

a. Outlet Structure Details
   - i. Inverts of all outlets
   - ii. Inverts of all draw down orifices
   - iii. Inverts and dimensions of all weirs

b. Flared End Sections

c. 1' Contours (As-built contours overlaid on approved design contours)

d. 50' cross section of entire SCM (top of bank to top of bank)

e. Spot Elevations
   - i. Bottom of clearing, grubbing, & stripping under dam footprint
   - ii. Bottom of pond
   - iii. Bottom of riser
   - iv. Top of riser
   - v. Water quality orifice
   - vi. Invert of inflow & outflow pipe(s)
   - vii. Permanent pool
   - viii. Top of berm between forebay and main pool
   - ix. Depth of deep pool

f. Top of dam (elevation & width)

g. Normal pool depth (measured from top of sediment storage)

h. Width of vegetated shelf

i. Width of maintenance bench

j. Type & Size of barrel seepage control

k. Size & material of riser/barrel

l. Emergency spillway (width & crest elevation)

3) **Stormwater Wetlands**

a. Outlet Structure Details
   i. Inverts of all outlets
   ii. Inverts of all draw down orifices
   iii. Inverts and dimensions of all weirs

b. Flared End Sections

c. 1' Contours (As-built contours overlaid on approved design contours)

d. 50' cross section of entire SCM (top of bank to top of bank)

e. Spot Elevations
   i. Bottom of clearing, grubbing, & stripping under dam footprint
   ii. Bottom of forebay & micropool
   iii. Bottom of riser
   iv. Top of riser
   v. Water quality orifice
   vi. Invert of inflow & outflow pipe(s)
   vii. Permanent pool
   viii. Top of berm between forebay and micropool
   ix. Depth of pools

f. Top of dam (elevation & width)

g. Width of vegetated shelf

h. Width of maintenance bench

i. Type & Size of barrel seepage control

j. Size & material of riser/barrel

k. Pool elevation at principal spillway

l. Emergency spillway (width & crest elevation)

4) Bioretention Area

a. Outlet Structure Details
   i. Inverts of all outlets
   ii. Inverts of all draw down orifices
   iii. Inverts and dimensions of all weirs
b. Flared End Sections
c. 1' Contours (As-built contours overlaid on approved design contours)
d. 50' cross section of entire SCM (top of bank to top of bank)
e. Bioretention surface area
f. Type and dimensions of pretreatment
g. Elevations
   i. Bottom of planting soil
   ii. Top of planting soil
   iii. Top of mulch layer
   iv. Inlet of overflow / bypass structure
h. Ponding depth
i. Underdrain system specifications
   i. Size & type of perforated pipe
   ii. Number of branch lines & spacing width of perforated pipe
   iii. Invert elevation of underdrain
   iv. Invert elevation of outflow pipe at outlet

5) Underground Detention System

a. Outlet Structure (See Item 4)
b. Flared End Sections (See Item 5)
c. 50' cross section of entire SCM (top of bank to top of bank)
d. Detention tank or pipe length, width, depth (or diameter)
e. Detention tank material
f. Elevations
   i. Bottom of excavation for detention systems
   ii. Depth of system bedding
   iii. Invert of detention tank/pipe(s)
   iv. Invert of inflow & outflow pipe(s)
   v. Invert of low flow orifice
   vi. Invert of overflow weir or orifice
   vii. Top of manhole covers
g. Temporary sediment max depth
h. Low flow orifice material of construction

6) **Restored Riparian Buffer**

a. 1' Contours (As-built contours overlaid on approved design contours)
b. 50' cross section of entire SCM (top of bank to top of bank)
c. Elevations
    i. Top of distribution device
    ii. Upper edge of Riparian Buffer
    iii. Lower edge of Riparian Buffer
d. Length of distribution device
e. Length of Riparian Buffer
f. Width of Riparian Buffer
    i. Width of grass zone
    ii. Width of forest vegetation zone

7) **Dry Detention Basin**

a. Outlet Structure
    i. Inverts of all outlets
    ii. Inverts of all draw down orifices
    iii. Inverts and dimensions of all weirs
    iv. Size and dimensions of structure
b. Flared End Sections (See Item 5)
c. 1' Contours (As-built contours overlaid on approved design contours)
d. 50' cross section of entire SCM (top of bank to top of bank)
e. Elevations
    i. Bottom of clearing, grubbing, & stripping under dam footprint
    ii. Bottom of basin
    iii. Bottom of riser
    iv. Top of riser
    v. Low flow orifice
    vi. Invert of inflow & outflow pipe(s)
f. Top of dam (elevation & width)
g. Sedimentation basin surface area
h. Width of maintenance bench
i. Barrel seepage control (type & size)
j. Size & material of riser/barrel
k. Emergency spillway (width & crest elevation)
l. Outfall pipe/swale elevations

8) **Sand Filter**

a. Outlet Structure Details
   i. Inverts of all outlets
   ii. Inverts of all draw down orifices
   iii. Inverts and dimensions of all weirs
b. Flared End Sections
c. 1' Contours (As-built contours overlaid on approved design contours)
d. 50' cross section of entire SCM (top of bank to top of bank)
e. Sand filter type
f. Sediment chamber specifications
   i. Bottom elevation
   ii. Depth
   iii. Surface area
g. Sand filter chamber specifications
   i. Elevation at top of filter media
   ii. Depth of filter media
   iii. Filter bed area
h. Underdrain system specifications
   i. Size & type of perforated pipe
   ii. Type & thickness of filters
   iii. Number of branch lines
   iv. Invert elevation of underdrain
   v. Invert elevation of outflow pipe at outlet
   vi. Invert elevation of receiving storm sewer / receiving stream water surface
   vii. Depth of gravel jacket
   viii. Invert elevation of overflow / bypass structure
   ix. Dissipater pad length & width

ENGINEER'S CERTIFICATE OF COMPLETION

To: City of Greenville, Engineering Division

From: _____

Date: _____

RE: Certificate of Completion
Name of Development: _____
Project No.:_____

I, the undersigned here certify:

1. That based upon my periodic inspection, the construction of the street(s) and storm drainage infrastructure for the referenced development has been completed in substantial accordance with the approved plans and specification on record with the City of Greenville dated _____. (Any exceptions must be approved by the City Engineer.)
2. That street(s) and storm drainage infrastructure for the referenced development have been installed as shown on the Record Drawings submitted to the City of Greenville Engineering Division.

_____ _____ _____

SIGNATURE OF PROFESSIONAL ENGINEER DATE

_____

COMPANY

_____

LICENSE NO. SEAL

OWNER'S CERTIFICATE OF COMPLETION

To: City of Greenville, Engineering Department

From: _____

Date: _____

RE: Certificate of Completion
Name of Development: _____
Project No.:_____

I, the undersigned here certify:

1. That I am the owner/or authorized representative of the referenced project.
2. That the street(s) and storm drainage infrastructure for the referenced development are in accordance with the approved construction drawings dated _____ and/or subsequent plan modifications as approved by the City of Greenville. That I hereby convey ownership, upon acceptance by the City of Greenville City Council, of all street(s), easements, and storm drainage infrastructure to the City of Greenville as called for on the Record Drawings prepared by_____.
   (Name of Consulting Engineer)
3. That I/we, as the developer(s), guarantee the materials and workmanship as directly associated with, but not necessarily limited to, the installation of the street(s), storm drainage infrastructure, and restoration of any disturbed areas located within the rights-of-way for a period of one (1) year that are proposed for acceptance and maintenance by the City of Greenville. For the one (1) year warranty period, I/we, as the developer(s), shall be responsible for performing all repairs and restoration, as deemed necessary or required by the City, on the street(s), storm drainage infrastructure, and disturbed areas. The one year period shall begin at the date the street(s) and storm drainage infrastructure is formally accepted by the City Council of Greenville. If, for any reason that I/we, as the developer(s), cannot make repairs within a time period accepted by the City of Greenville, we will reimburse the City of Greenville for the cost of any repairs that it deems necessary to make with its own forces including the cost of materials, labor, and equipment.
4. I further warrant to the City that all fees and liens have been paid by the owner such that there is not outstanding indebtedness remaining and holding the City harmless in each instance.
5. That I hereby convey all necessary easements for the street(s) and storm drainage system to the City of Greenville as recorded with the Pitt County Register of Deeds and as described in Plat Book

   _____ Page _____.

_____ _____ _____
NAME (PRINT) DATE SIGNATURE / TITLE

As a duly registered professional in the State of North Carolina, I hereby attest that all required stormwater control facilities for the above referenced project were thoroughly inspected under my responsible charge, and to the best of my knowledge the construction, safety, and function are in compliance with the intent of the approved plans and the City of Greenville and NCDEQ standards and regulations.

_____ _____ _____

SIGNATURE OF PROFESSIONAL ENGINEER DATE

_____

COMPANY

_____

LICENSE NO. SEAL

TABLE OF DETAILS

SEDIMENTATION AND EROSION CONTROL

EROSION CONTROL GUIDE

ANY EROSION CONTROL DEVICES OR METHODS SHALL BE IN ACCORDANCE WITH THE NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES - EROSION AND SEDIMENTATION CONTROL PLANNING AND DESIGN MANUAL AND ALL AMENDMENTS. THE EROSION CONTROL DEVICES AND METHODS THAT FOLLOW ARE SUPPLEMENTAL TO THE STATE MANUAL. OTHER DEVICES & METHODS NOT INCLUDED IN THE STATE MANUAL MAY BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL.

EROSION CONTROL NOTES:

1. Scheduling of a preconstruction conference with the Engineering Department is required prior to initiating land disturbing activities. For scheduling please call (252) 329-4467. A 24-hour notice is required. No person may initiate a land disturbing activity before notifying the City of the date of the land disturbing activity.

2. No land disturbing activity beyond that required to install appropriate erosion control may proceed until erosion control measures are inspected and approved by the City.

3. Seeding and mulching or otherwise providing ground cover devices or structures sufficient to restrain erosion for all exposed slopes is required within 21 working days of completing any phase of grading.

4. Contractor shall inspect and maintain all erosion control devices on a weekly basis and after each major storm event. Failure to maintain erosion control devices may result in an issuance of stop work order or civil penalties up to $5,000 per day of violation. Sites utilizing sediment traps must also specify a maximum depth of sediment prior to clean out.

5. The City Engineer reserves the right to require additional erosion control measures should the plan or its implementation prove to be inadequate.

6. Acceptance and approval of this plan is conditioned upon your compliance with Federal and State water quality laws, regulations and rules. In addition, local City and County ordinances or rules may also apply to this land disturbing activity. Approval by the City does not supersede any other permit or approval.

   A. Please be advised of the rules to protect and maintain existing buffers along watercourses in the Neuse and Tar River basins. These rules are enforced by the Division of Water Quality (DWQ). Direct any questions about the applicability of these rules to your project to the regional water quality supervisor, Washington Regional Office at (252) 946-6481.

SEEDING AND MULCHING:

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

All Roadway Areas

March 1 - August 31		**September 1 - February 28**	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (hulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Water and Borrow Locations

March 1 - August 31		**September 1 - February 28**	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (hulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

2nd Millennium	Chipper	Focus	Masterpiece	Quest	Titan Ltd.
Avenger	Coronado	Grande II	Matador	Rebel Exeda	Titanium
Barlexas	Coyote	Greenkeeper	Matador GT	Rebel Sentry	Tomohawk
Barlexas II	Davinci	Greystone	Millennium	Regiment II	Tacer
Barrera	Dynasty	Inferno	Montauk	Rembrandt	Trooper
Barrington	Dominion	Justice	Mustang 3	Rendition	Turbo
Biltmore	Duster	Jaguar 3	Olympic Gold	Scorpion	Ultimate
Bingo	Endeavor	Kalahari	Padre	Shelby	Watchdog
Bravo	Escalade	Kentucky 31	Paraiso	Signia	Wolfpack
Cayenne	Falcon II, III, IV & V	Kitty Hawk	Picasso	Silverstar	
Chapel Hill	Fidelity	Kitty Hawk 2000	Piedmont	Southern Choice II	
Chesapeake	Finesse II	Lexington	Pure Gold	Stetson	
Constitution	Firebird	Magellan	Prospect	Tarheel	

On cut and fill slopes 2:1 or steeper Centipede shall be applied at a rate of 5 pounds per acre and add 20# of Sericea Lespedeza.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

All areas seeded and mulched shall be tacked with asphalt or crimped in accordance with the following section.

CRIMPING STRAW MULCH:

Straw mulch shall be sufficient length and quality to withstand the crimping operation.

Crimping equipment including power source shall be subject to the approval of the Engineer providing that maximum spacing of crimper blades shall not exceed 8".

SINGLE FAMILY RESIDENTIAL CONSTRUCTION EROSION CONTROL:

Standard Erosion and Sedimentation Control Plan Sets for small residential lots can be found on the Erosion and Sediment Control Forms page of the North Carolina Environmental Quality - Energy, Mineral, & Land Resources web page.

TABLE OF DETAILS

SUMMARY OF STREET STANDARDS

STREET CLASSIFICATIONS	CROSS SECTION	EASEMENT / ROW	PAVEMENT WIDTH (B/B)	AVERAGE DAILY TRAFFIC
PRIVATE STREET	CURB	40' EASEMENT	28'	< 1,500
	DITCH	60' EASEMENT	22'	< 1,500
STANDARD RESIDENTIAL	CURB	50'	28'	< 1,500
	DITCH	60'	22'	< 1,500
COLLECTOR	CURB	60'	36'	1,500 - 4,999
	DITCH	70'	34'	1,500 - 4,999
PLANNED INDUSTRIAL	DITCH	80'	28'	N/A
MINOR THOROUGHFARE	CURB	80'	65'	5,000 - 10,000
MAJOR THOROUGHFARE	CURB	100'+	VARIABLE	10,000 +

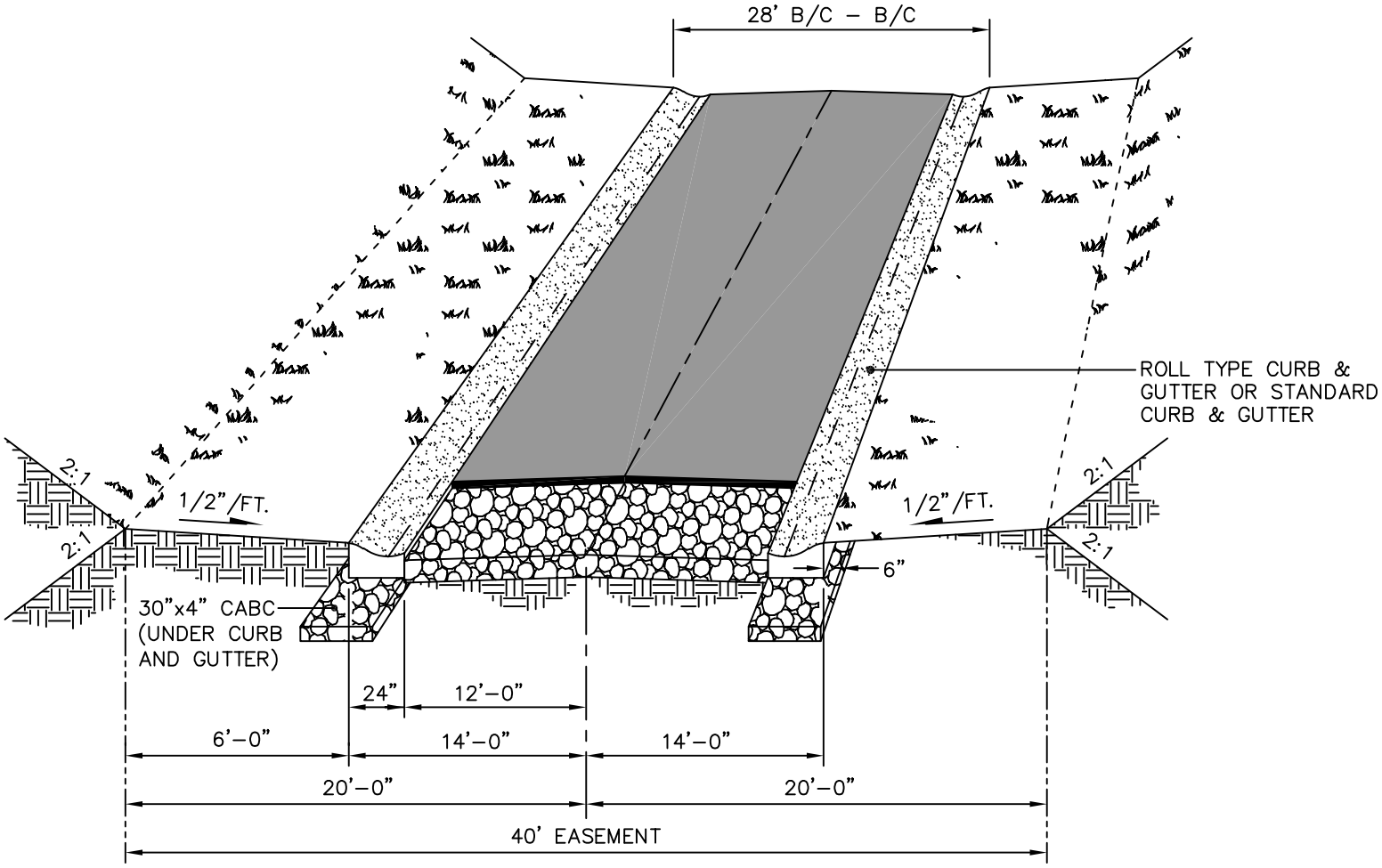
	STD. C&G	ROLL C&G	NON CURB & GUTTER (outside urban core, single family only)
MIN. LONGITUDINAL SLOPE	0.3%	0.5%	0.5% (channel flow line) 0.5% (street center line)
MAX. DEPTH OF FLOW			
THOROUGHFARE	0.3 ft	N/A	N/A
NON-THOROUGHFARE	0.5 ft	0.3 ft	2 ft
MIN. DRIVEWAY CULVERT SIZE	N/A	N/A	15"

NOTES:

1. The minimum longitudinal grade for channel sections may be reduced for cross drainage and at some isolated locations with the approval of the City Engineer. The City Engineer shall have the option of requiring piping for channels less than 0.8% slope.
2. Minimum driveway separation along non-curb and gutter streets shall be 100 feet center to center as measured along the edge of pavement. A shared culvert configuration may be utilized pursuant to standards 422.01 thru 422.07, if the required spacing cannot be obtained.
3. Driveways, along standard curb and gutter streets, shall conform to the Driveway Ordinance which requires removal of the complete section of the curb and gutter in lieu of breaking off the backs of curb.
4. Driveway culvert sizes for each single family lot shall be determined at time of construction plan approval and shall be recorded on the final plat for each lot.
5. The maximum 10-year storm headwater depth for driveway culverts shall not exceed 1.2D or the elevation of the driveway, whichever is less.
6. All required channel linings and velocity control devices shall be designed and installed in accordance with the Soil Erosion and Sedimentation Control Ordinance and the North Carolina Erosion and Sediment Control Planning and Design Manual.
7. Any street to be City-maintained shall have “Record Drawings” submitted and approved prior to scheduling of the pre-final street acceptance inspection. All “Record Drawings” for streets and storm drainage infrastructure shall include, but not necessarily limited to, the information as identified in the *Street and Storm Drainage “Record Drawings” Submittal Requirements.*

NOTES (CONTINUED):

8. All concrete shall be cured with white pigmented curing compound in accordance with NCDOT Standards and Specifications.
9. Concrete testing in accordance with NCDOT Specifications is only required for structural concrete installed within or beneath the roadway. This includes but is not limited to bridge decks, box culverts, top slabs, and concrete paving. Testing is not required for sidewalks, valley gutter, and/or curb & gutter; however a copy of the load tickets for all concrete that is not tested shall be submitted to the City. Load tickets must specify mix design strength of concrete. The City reserves the right to conduct additional testing.
10. Right of Way Encroachment Agreement is required for mail kiosks within the right of way.
11. Mail kiosks are prohibited on minor and major thoroughfares unless off street parking is provided. Mail kiosks installed on residential streets require installation of "No Parking" signs on opposite side of street from mail kiosk (not required for collector streets).
12. Street lights shall be installed in accordance with the Lighting Standards for the City of Greenville.
13. All pavement markings shall be thermoplastic in accordance with NCDOT Standard Specifications for Roads and Structures.
14. Curb ramps shall be installed in accordance with NCDOT Standard Specifications for Roads and Structures and NCDOT Roadway Standard Drawings (latest editions). All ramps shall comply with applicable portions of the Americans with Disabilities Act and the U.S. Access Board Public Rights-of-Way Accessibility Guidelines.
15. Street standards are applicable to both public and private streets.
16. Parking is prohibited on both sides of dead end streets which do not require the installation of a cul de sac or temporary turn around. "No Parking" signs shall be shown on construction plans and installed by the developer prior to street acceptance.
17. Maintenance of temporary turn arounds is the responsibility of the developer or Homeowner's Association and a note stating such shall be included on the final plat.



TYPICAL CROSS SECTION

"PRIVATE STREET"
(CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. May only be used in cases where projected traffic volumes will not exceed 1,500 ADT based on trip generation factors shown on Std. detail No. 491.01.
3. Certification of construction in compliance with approved design required from Professional Engineer upon completion, including test results on subgrade, stone base, concrete, and asphalt.

ENGINEERING DEPARTMENT
Greenville, North Carolina 27834

CITY OF GREENVILLE, N.C.

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Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

PRIVATE STREET (CURB & GUTTER)

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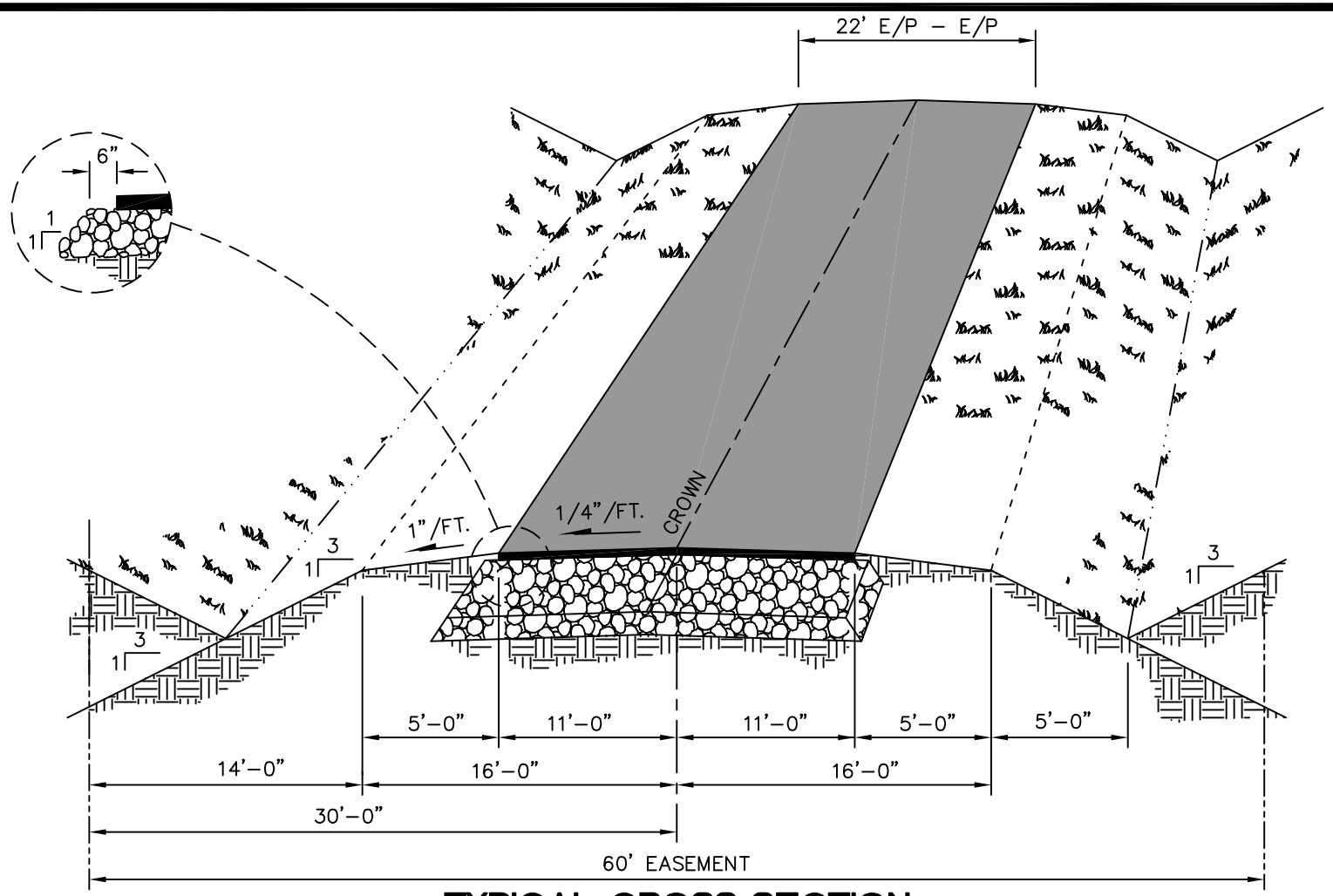

TYPICAL CROSS SECTION

"PRIVATE STREET"
(NON-CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. May only be used in cases where projected traffic volumes will not exceed 1,500 ADT based on trip generation factors shown on Std. detail No. 491.01.
3. Certification of construction in compliance with approved design required from Professional Engineer upon completion, including test results on subgrade, stone base, concrete, and asphalt..

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PRIVATE STREET (NON-CURB & GUTTER)

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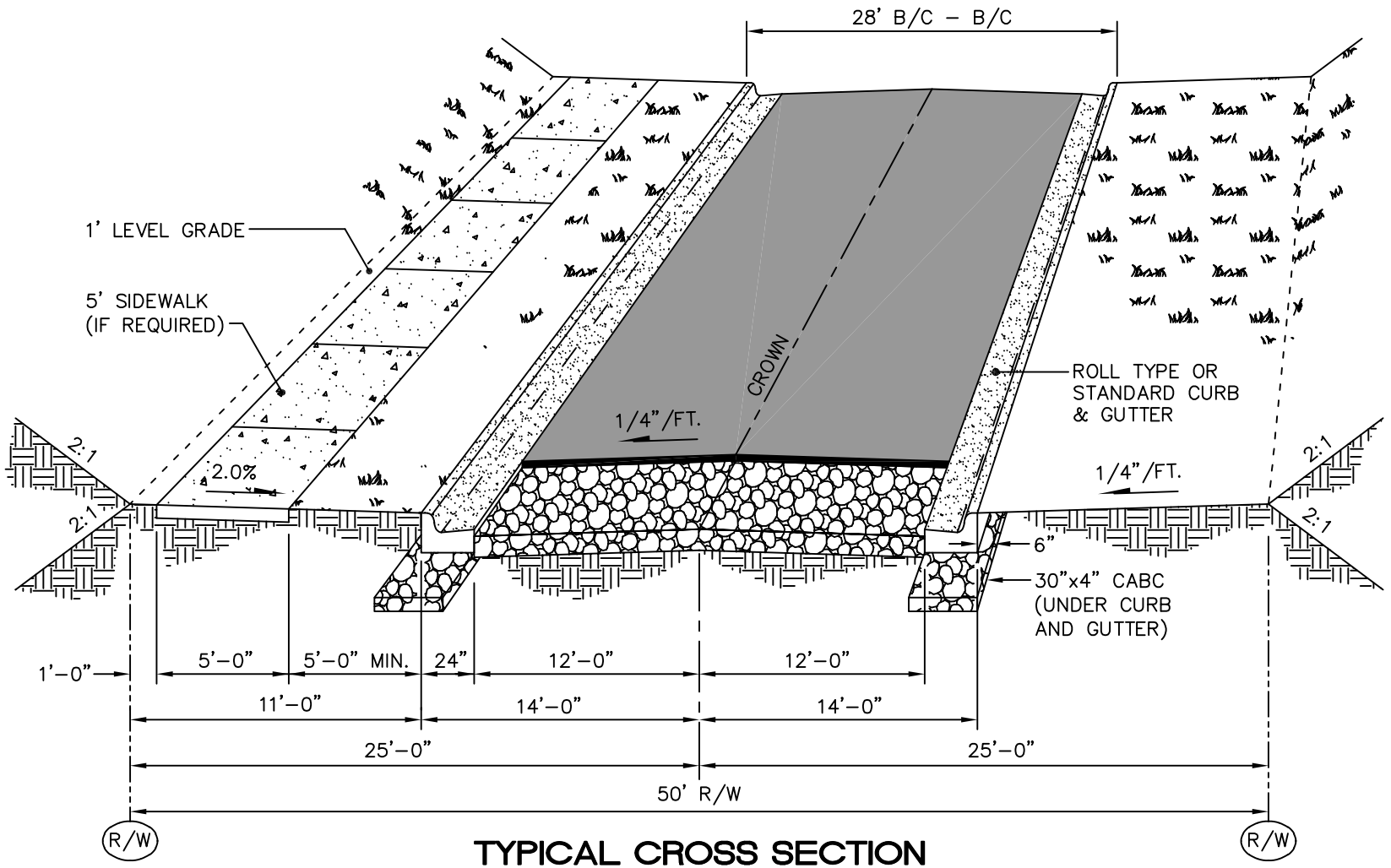

TYPICAL CROSS SECTION

"STANDARD RESIDENTIAL STREET"
(CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. May only be used in cases where projected traffic volumes will not exceed 1500 ADT based on trip generation factors shown on Std. detail No. 491.02.
3. Planting strip may be reduced to 2'-0" minimum if roll curb is utilized.

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STANDARD RESIDENTIAL STREET (CURB & GUTTER)

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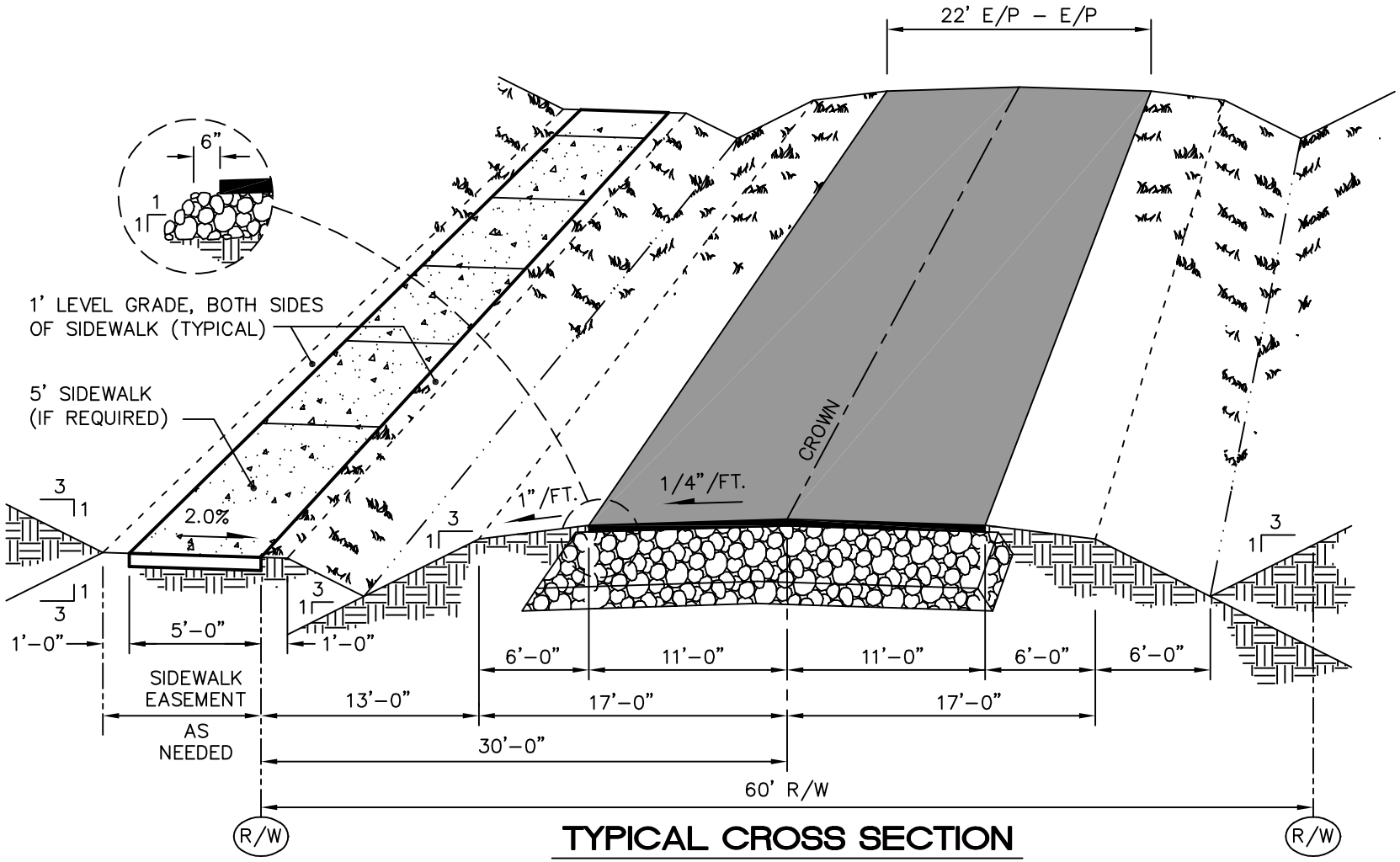

TYPICAL CROSS SECTION

"STANDARD RESIDENTIAL STREET"
(NON-CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. May only be used in cases where projected traffic volumes will not exceed 1500 ADT based on trip generation factors shown on Std. detail No 491.02.
3. Tie-in slopes may be shallower, however all drainage must be maintained within R/W..

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STANDARD RESIDENTIAL STREET (NON-CURB & GUTTER)

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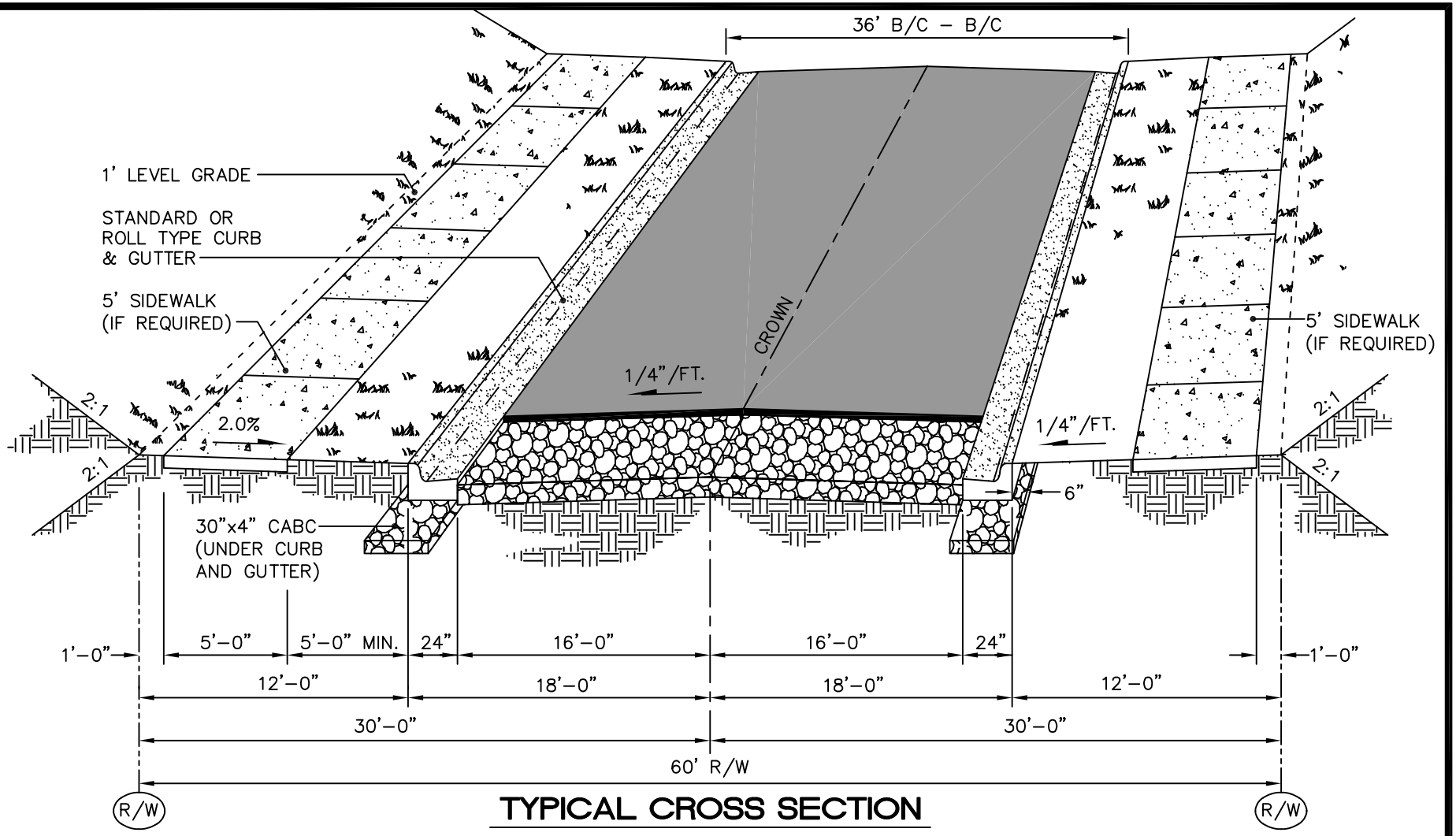

TYPICAL CROSS SECTION

"COLLECTOR STREET"
(CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. May only be used in cases where projected traffic volumes will not exceed 3500 ADT based on trip generation factors shown on Std. detail No. 491.02.
3. Planting strip may be reduced to 2'-0" minimum if roll curb is utilized.

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COLLECTOR STREET (CURB & GUTTER)

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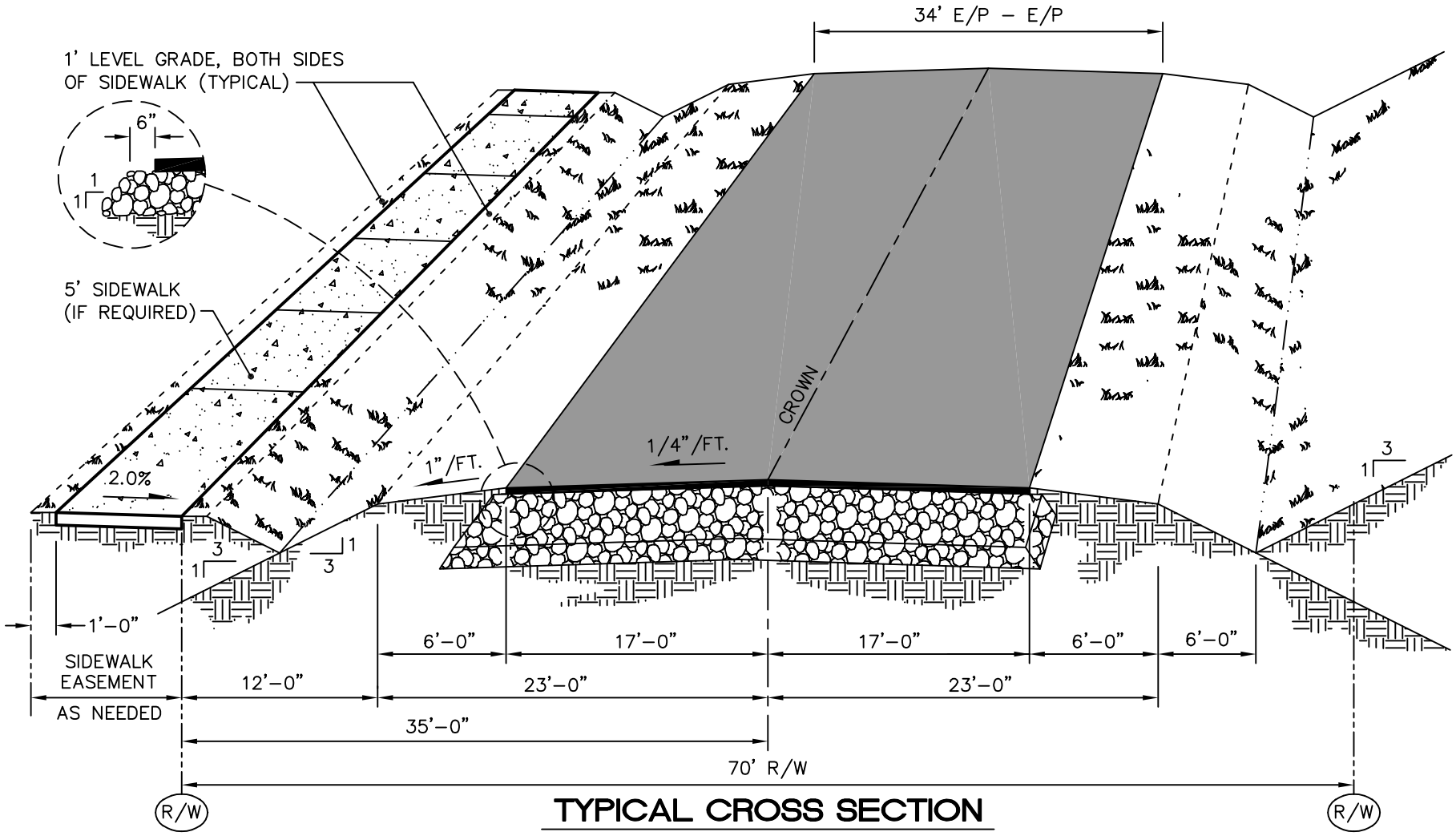

TYPICAL CROSS SECTION

"COLLECTOR STREET"
(NON-CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. May only be used in cases where projected traffic volumes will not exceed 3500 ADT based on trip generation factors shown on Std. detail No. 491.02.
3. Tie-in slopes may be shallower, however all drainage must be maintained within R/W.

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COLLECTOR STREET (NON-CURB & GUTTER)

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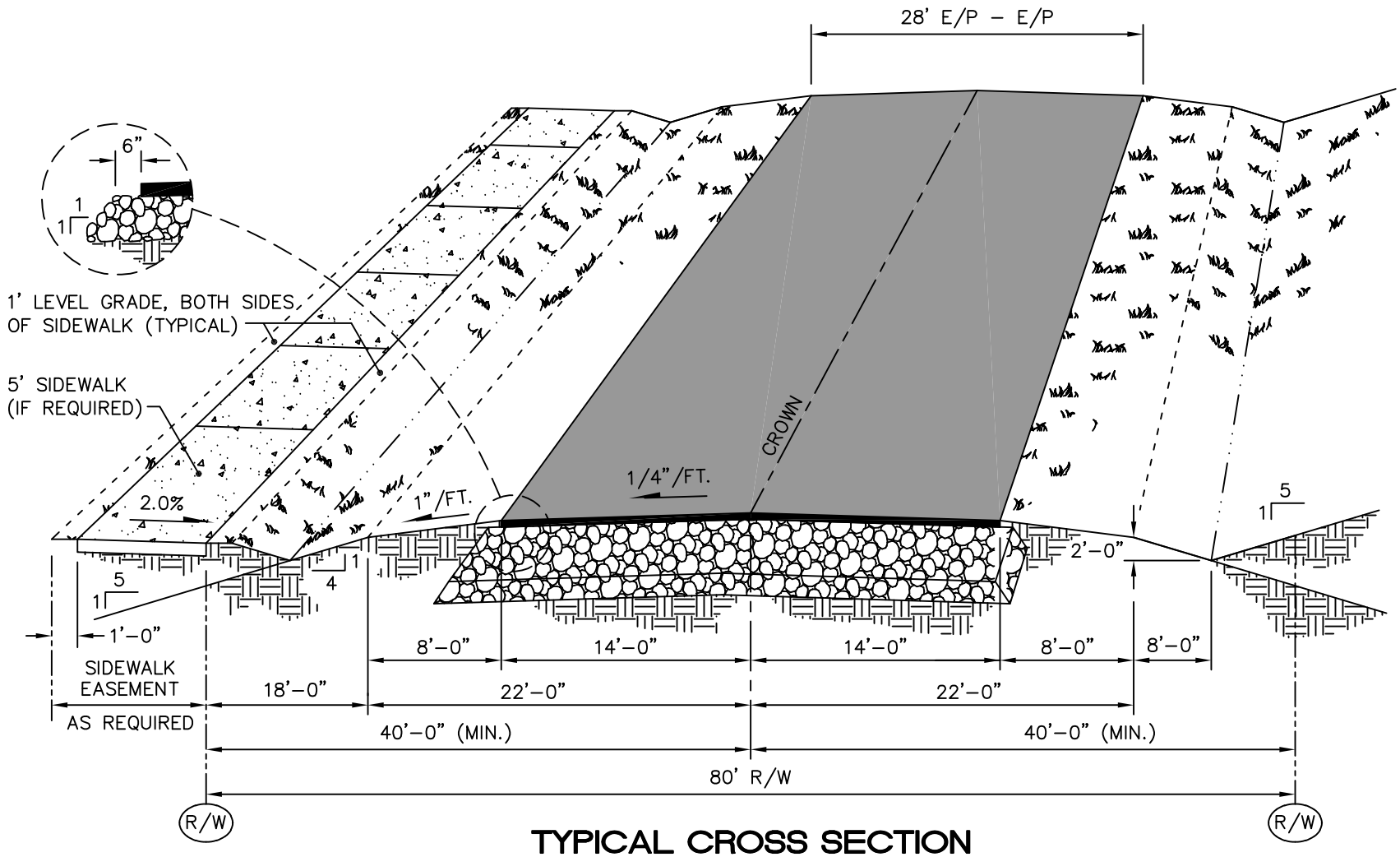

TYPICAL CROSS SECTION

"PLANNED INDUSTRIAL STREET"
(NON-CURB & GUTTER)

NOTES:

1. Pavement design to be according to procedure described in Std. detail no. 490.01.

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Greenville, North Carolina 27834

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PLANNED INDUSTRIAL STREET (NON-CURB & GUTTER)

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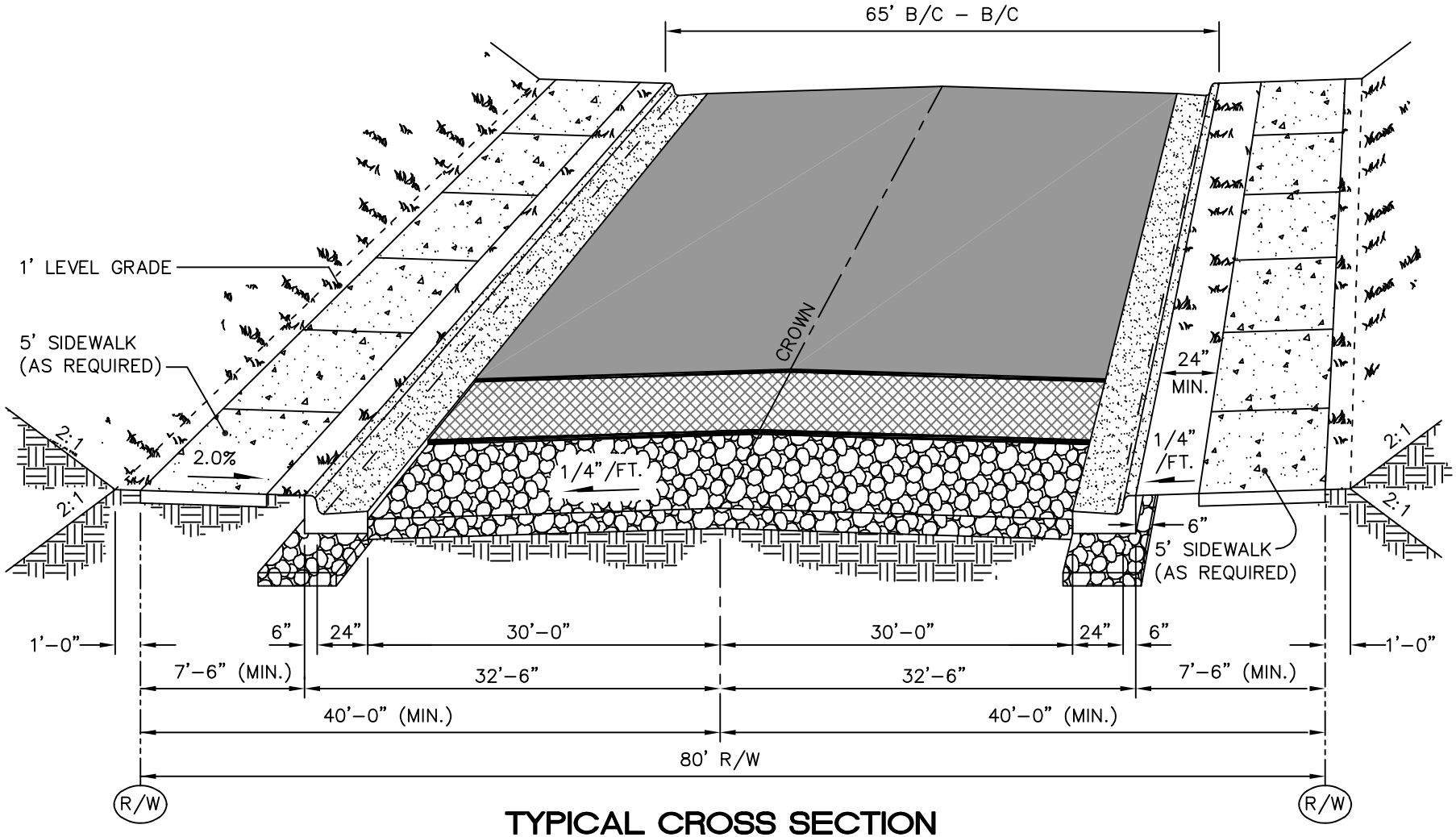

TYPICAL CROSS SECTION

"MINOR THOROUGHFARE"

NOTES:

1. Pavement design to be according to procedure described in Std. detail No. 490.01.
2. Pavement markings to be determined as part of the review process & must comply with MUTCD.

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STANDARD TYPICAL SECTION - MINOR THOROUGHFARE

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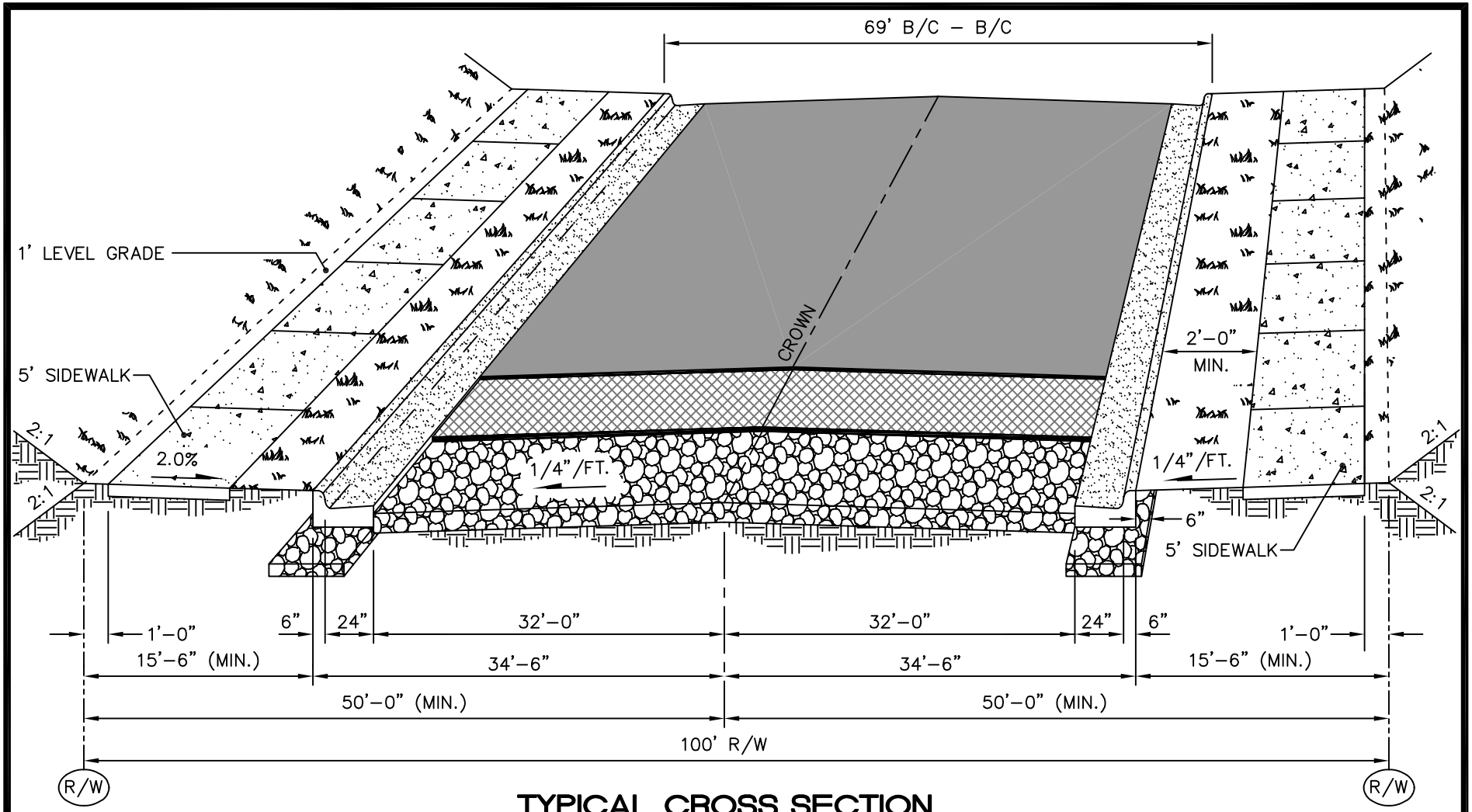

TYPICAL CROSS SECTION

"MAJOR THOROUGHFARE"

NOTES:

1. Pavement design to be according to procedure described in std. detail No. 490.01.
2. Pavement markings to be determined as part of the review process & must comply with MUTCD.

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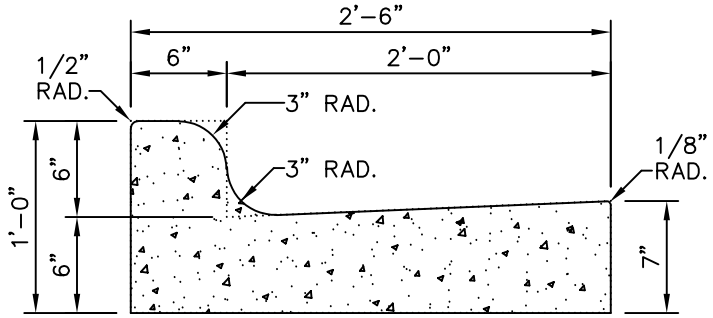
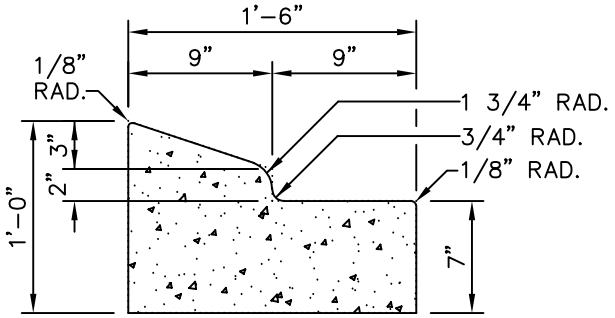
STANDARD TYPICAL SECTION - MAJOR THOROUGHFARE

Scale:	Sheet #:	Detail #
not to scale	1 of 1	410.07



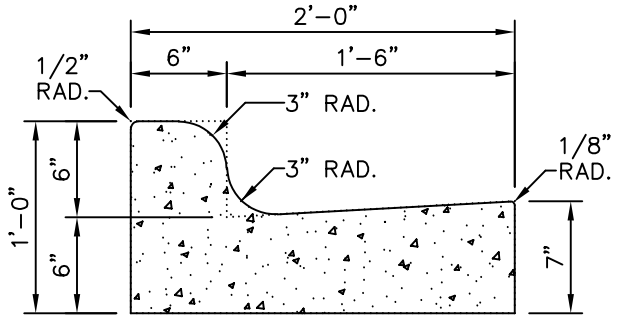
2'-6" CURB AND GUTTER

30" CURB AND GUTTER SHALL BE PLACED IN NCDOT R/W.



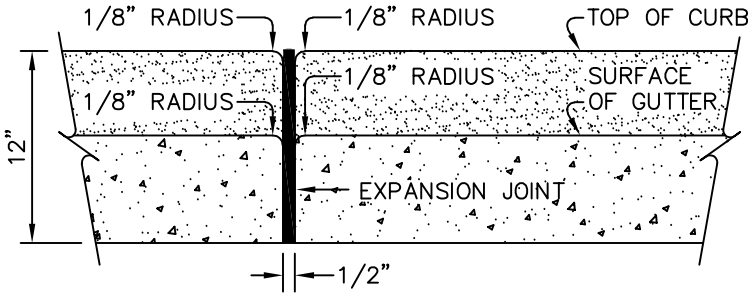
1'-6" CURB AND GUTTER

(TO BE USED IN MEDIANS ONLY)



2'-0" CURB AND GUTTER

24" CURB AND GUTTER SHALL BE PLACED IN RESIDENTIAL DEVELOPMENTS OR AS PROVIDED IN THE MSDD.



TRANSVERSE EXPANSION JOINT IN CURB AND GUTTER

NOTES:

1. Contraction joints shall be placed at 10' intervals, except that 15' spacing may be used when a machine is used or when satisfactory support for the face form can be obtained without the use of templates at 10' intervals. Joint spacing may be altered by the engineer to prevent uncontrolled cracking.
2. Contraction joints may be installed by the use of templates or formed by other approved methods. Where such joints are not formed by templates, a minimum depth of 1 1/2" shall be obtained.
3. Minimum section length of curb & gutter shall be 5 feet.
4. Expansion joints shall be spaced at 90' intervals, and adjacent to all rigid objects.
5. Flexible forms are to be used when radius is less than 200'.
6. Installation shall be in accordance with NCDOT Standards and Specifications. Joint sealer not required.

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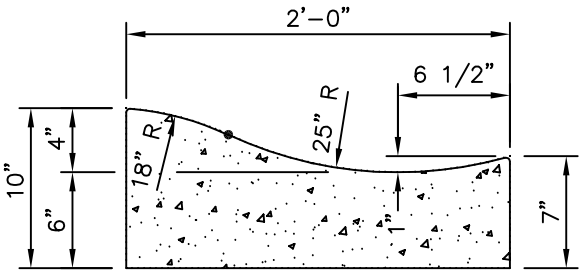
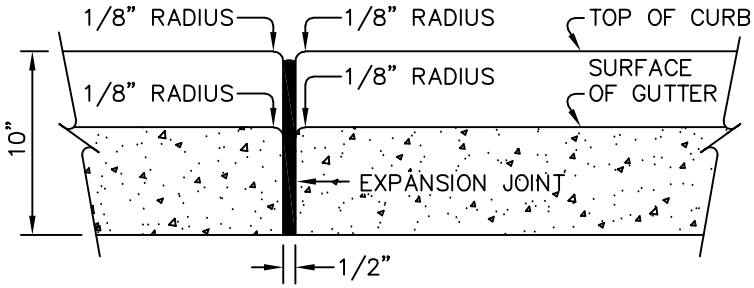
STANDARD CURB & GUTTER

Scale:	Sheet #:	Detail #
not to scale	1 of 1	411.01



ROLL TYPE CURB AND GUTTER



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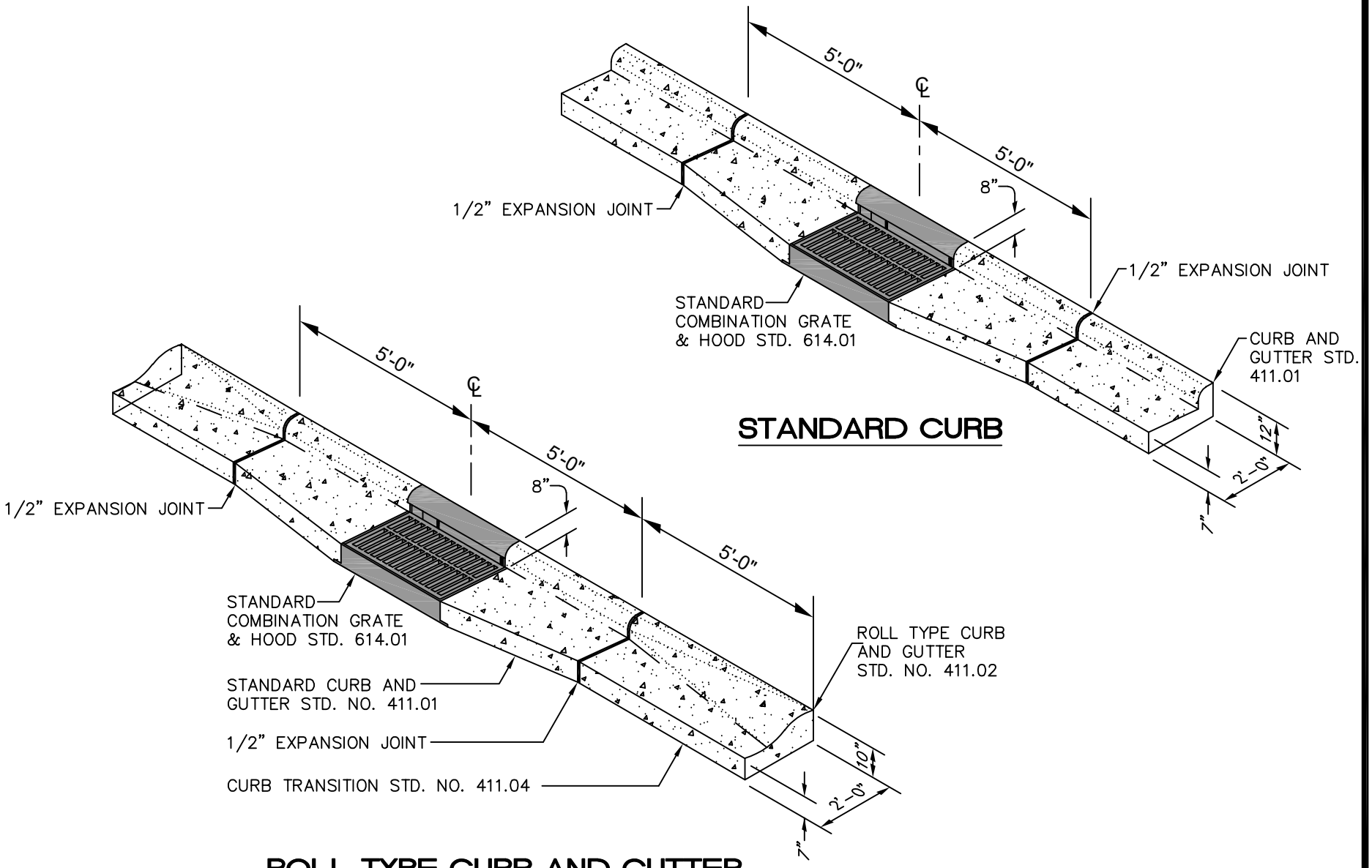
STANDARD ROLL-TYPE CURB AND GUTTER

Scale: not to scale

Sheet #: 1 of 1

Detail # **411.02**



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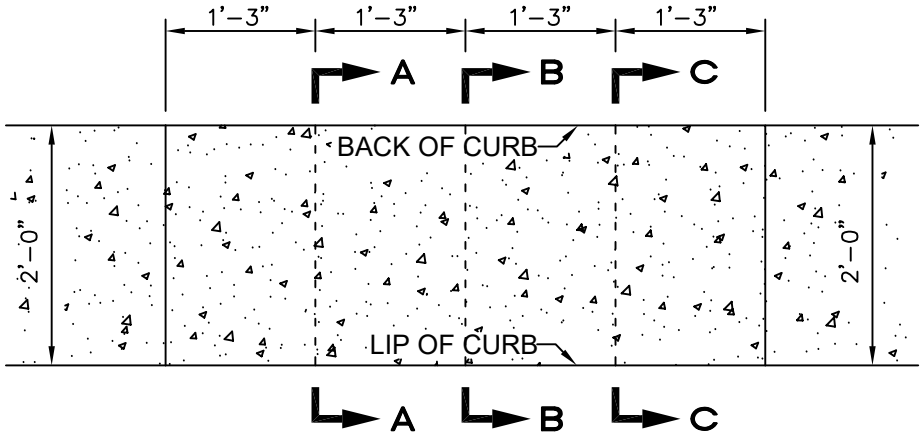
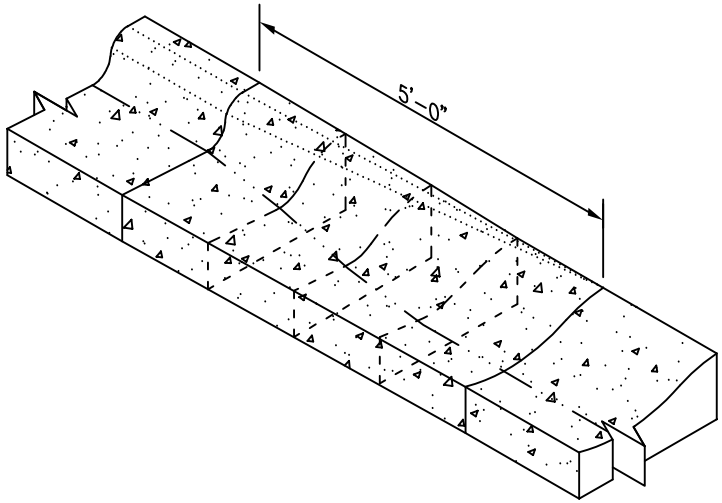
STANDARD CATCH BASIN FRAME 2'-0" IN CURB AND GUTTER

Scale:	Sheet #:	Detail #
not to scale	1 of 1	411.03

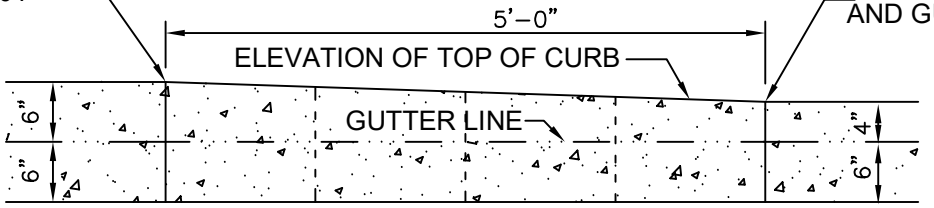


PLAN VIEW

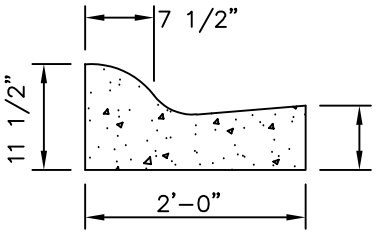


STANDARD CURB AND GUTTER STD. NO. 411.01

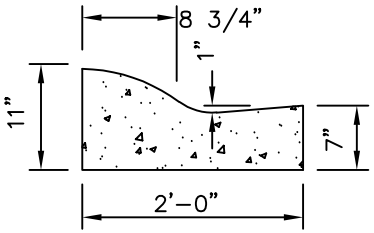
BEGIN 2'-0" ROLL - TYPE CURB AND GUTTER STD. NO. 411.02



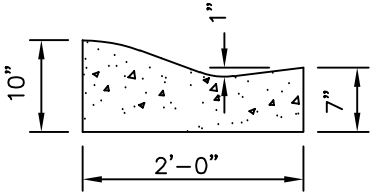
FRONT ELEVATION



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. Transition is NOT to be located within the curb radius.

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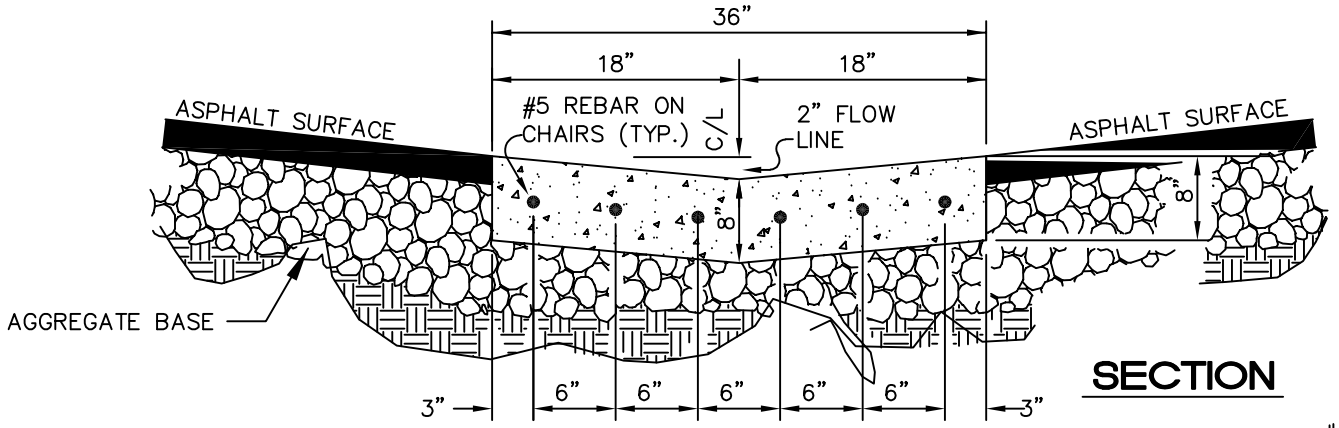
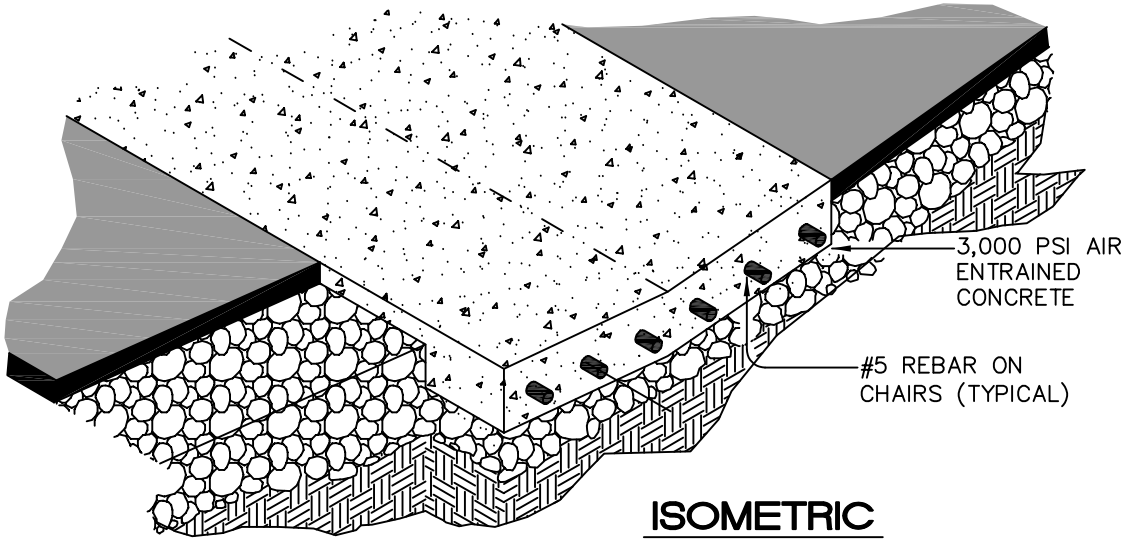
CURB TRANSITION - 2'-0" C&G TO 2'-0" ROLL TYPE C&G

Scale:	Sheet #:	Detail #
not to scale	1 of 1	411.04



SECTION



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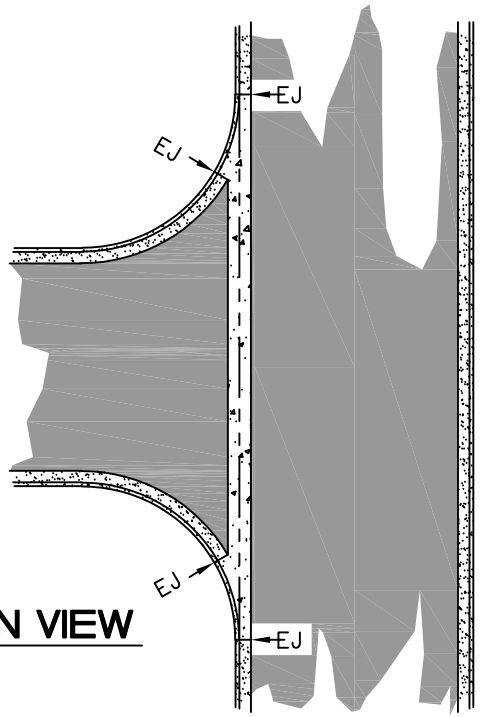

PLAN VIEW

NOTES:

1. For use with 24" standard curb and gutter.
2. Installation shall be in accordance with NCDOT Standards and Specifications. Joint sealer not required.
3. Lap rebar a minimum of 12" at joints.
4. Contact the Engineering Department Land Development Division a minimum of 24 hours in advance for a pre-pour inspection.

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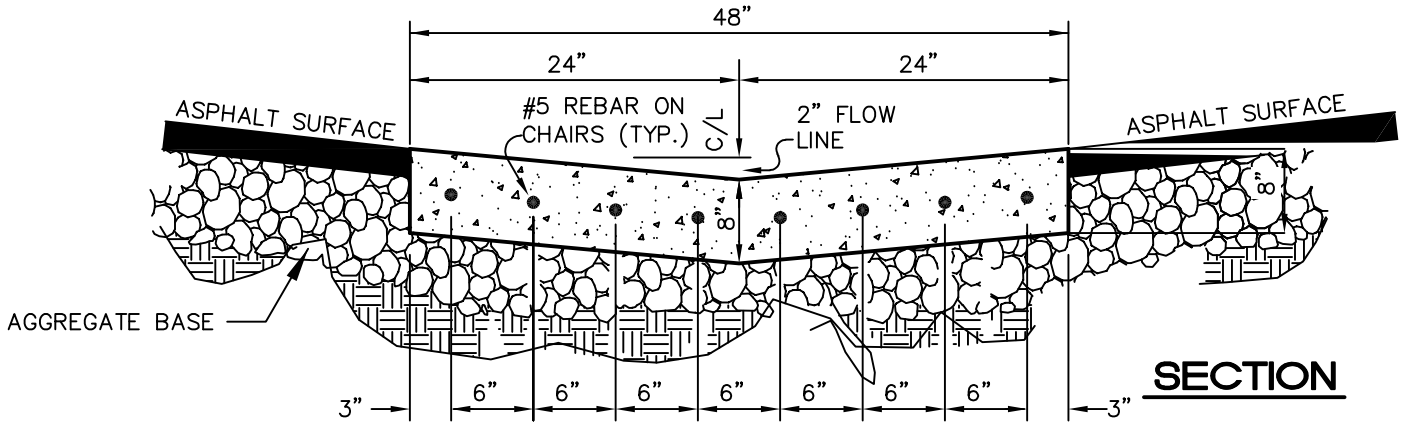
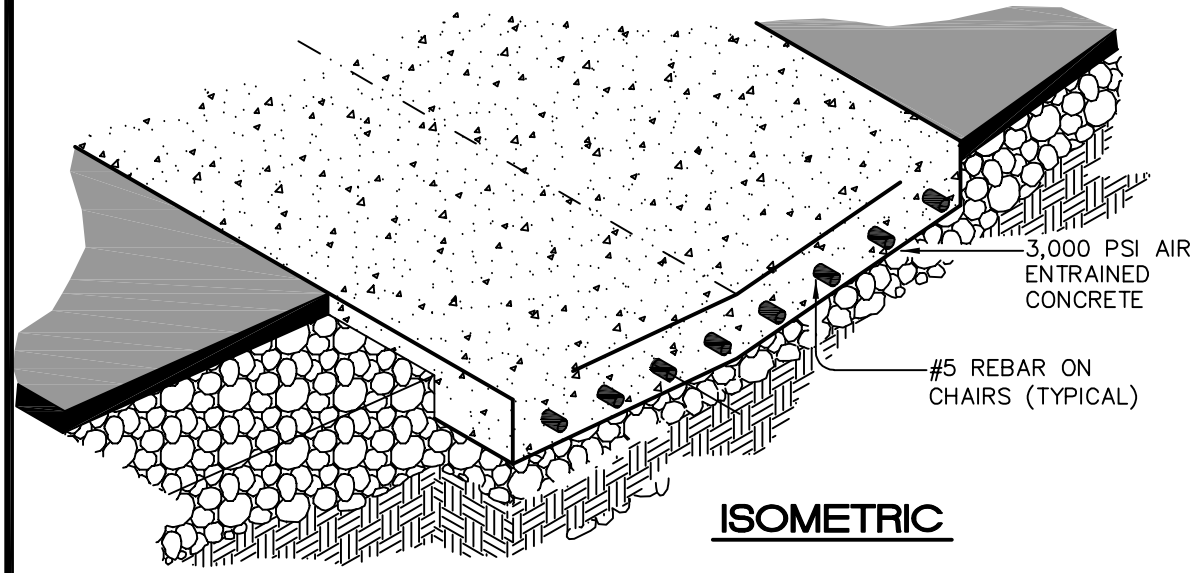
36" CONCRETE VALLEY GUTTER

Scale:	Sheet #:	Detail #
not to scale	1 of 2	411.05



SECTION



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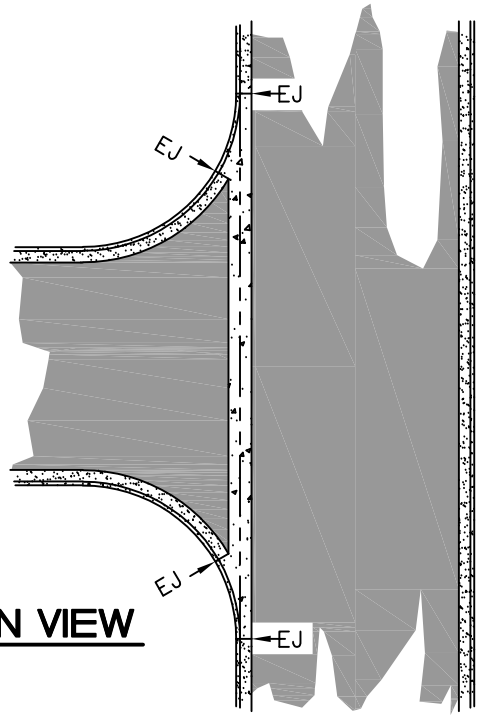

PLAN VIEW

NOTES:

1. For use with 30" standard curb and gutter.
2. Installation shall be in accordance with NCDOT Standards and Specifications. Joint sealer not required.
3. Lap rebar a minimum of 12" at joints.
4. Contact the Engineering Department Land Development Division a minimum of 24 hours in advance for a pre-pour inspection.

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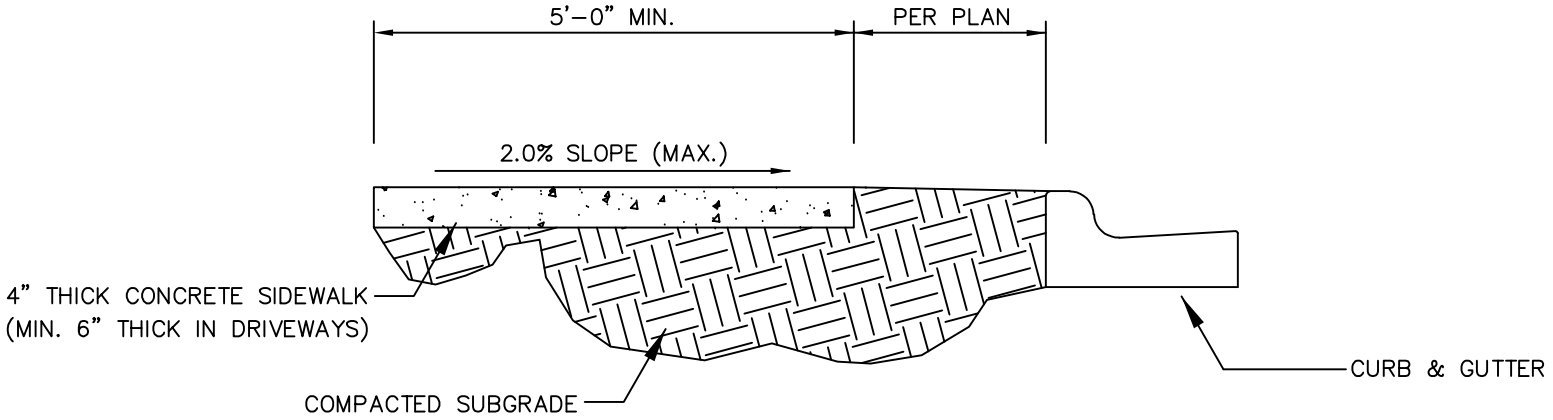
48" CONCRETE VALLEY GUTTER

Scale:	Sheet #:	Detail #
not to scale	2 of 2	411.05



NOTES:

1. Concrete shall be minimum Class "B" (2,500 PSI).
2. All sidewalks shall be installed in accordance with ADA regulations.
3. Contraction joints shall be placed at 5' intervals.
4. Minimum section length of sidewalk shall be 5 feet.
5. Expansion joints shall be spaced at 90' intervals, and adjacent to all rigid objects.
6. Installation shall be in accordance with NCDOT Standards and Specifications. Joint sealer not required.
7. Within the right of way the maximum running slope shall not exceed the general grade established for the adjacent street. Outside right of way the maximum running slope shall be 5.0%.

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CONCRETE SIDEWALK

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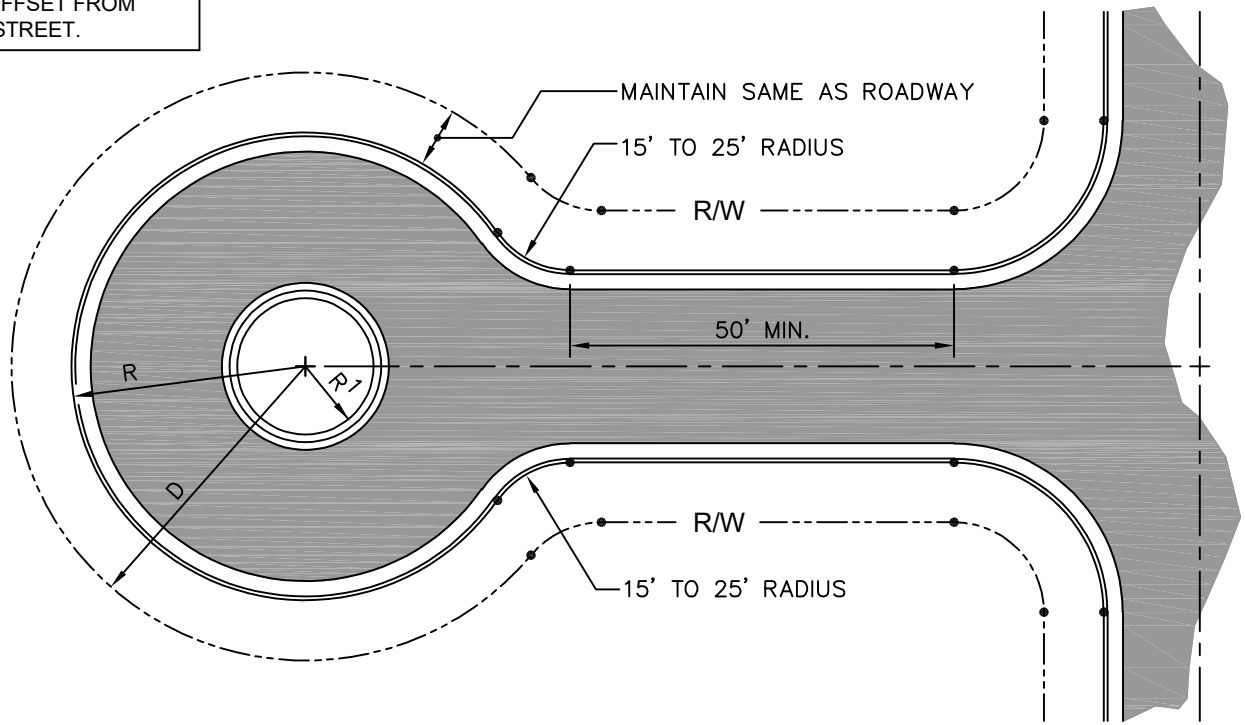
Detail # **411.06**

R	48.5' TO BACK OF CURB (MIN.)
R [1]	0' TO 15' TO BACK OF CURB (MAX.)
D	VARIES
CUL-DE-SAC MAY BE OFFSET FROM CENTERLINE OF STREET.	



NOTES:

1. Interior island is NOT required.
2. If installed, center island to be R/W maintained by HOA.
3. Center islands larger than specified in table allowed with CIty Engineer approval. Outer radius (R) shall increase proportional to increase of center island radius (R1).
4. No parking in cul-de-sac.
5. Mountable (median) curb on island.
6. Maximum height of vegetation (at maturity) to be installed in center island is 30 inches. Larger vegetation within island to be reviewed & approved by City Engineer. Encroachment agreement required for all non-vegetative improvements. No vegetation or other improvements shall be installed within 5' of back of curb in center island.
7. All dead end access roads in excess of 150 feet shall be provided with a proper fire apparatus turnaround as approved in Appendix D of the latest edition of the North Carolina Fire Code.

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STANDARD CUL-DE-SAC

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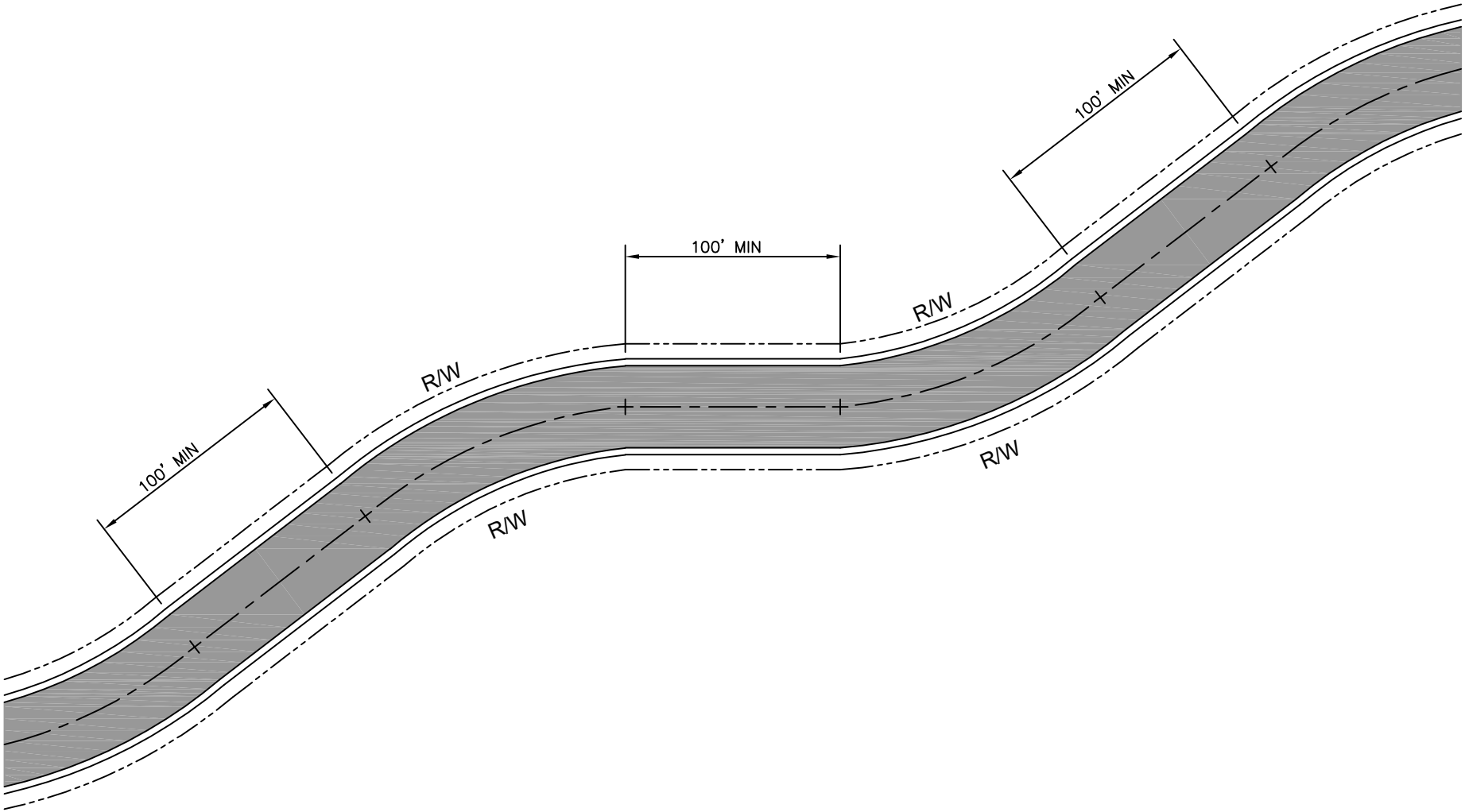

NOTES:

1. A minimum of 100 ft. tangent distance is required between reverse curves on residential streets, collector streets, and all thoroughfares.

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TANGENT DISTANCES AT REVERSE CURVES

Scale:	Sheet #:	Detail #
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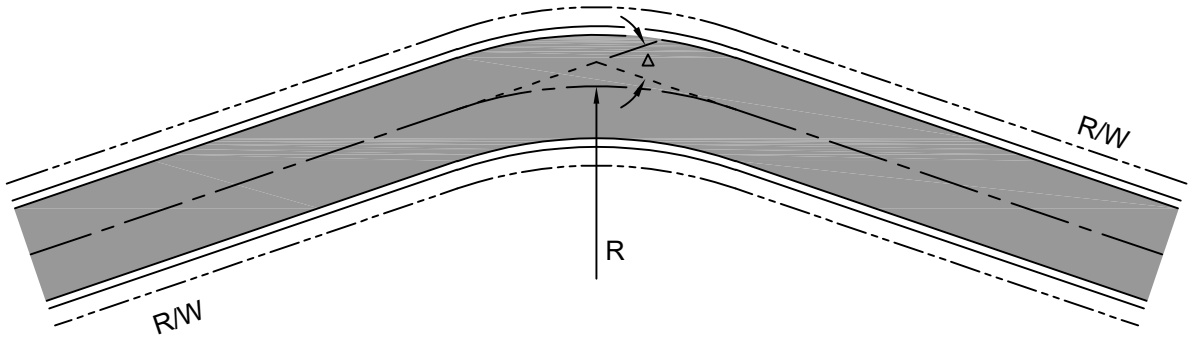

NOTES:

1. When connecting street centerlines deflect from each other at any one point by more than five degrees, (Δ>5°), they shall be connected by a curve with a radius of not less than 100 feet (R≥100') for residential streets. For collector streets and thoroughfares, the radius should be sufficient to ensure a sight distance adequate for visibility and safety, considering the character of the street and the types and speed of traffic anticipated, but in no case shall such radius be less than 200 feet (R≥200').

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CURVE RADIUS AT DEFLECTING STREET LINES

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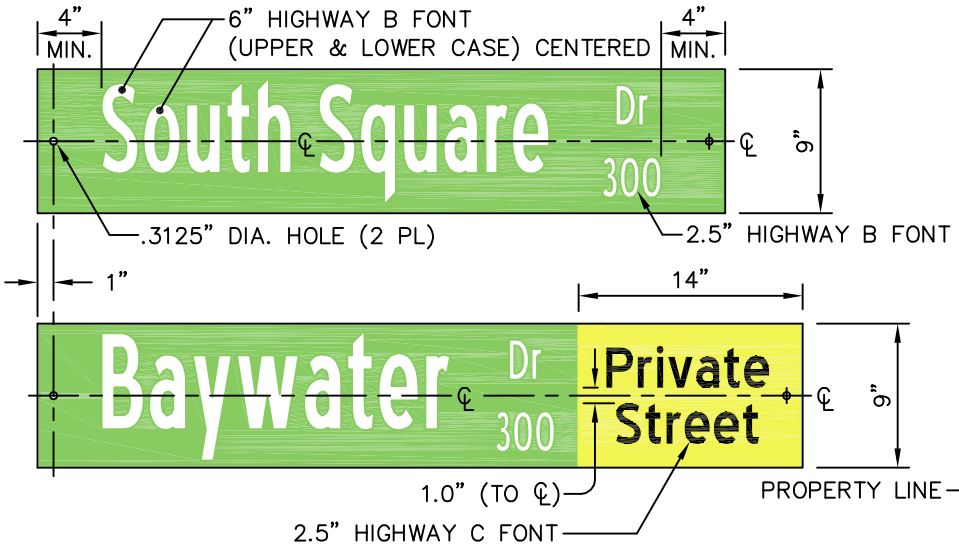
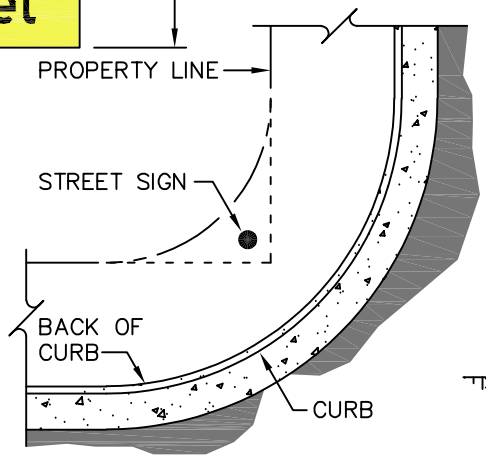
K = L/A
L = length of vertical curve
A = algebraic difference in grade

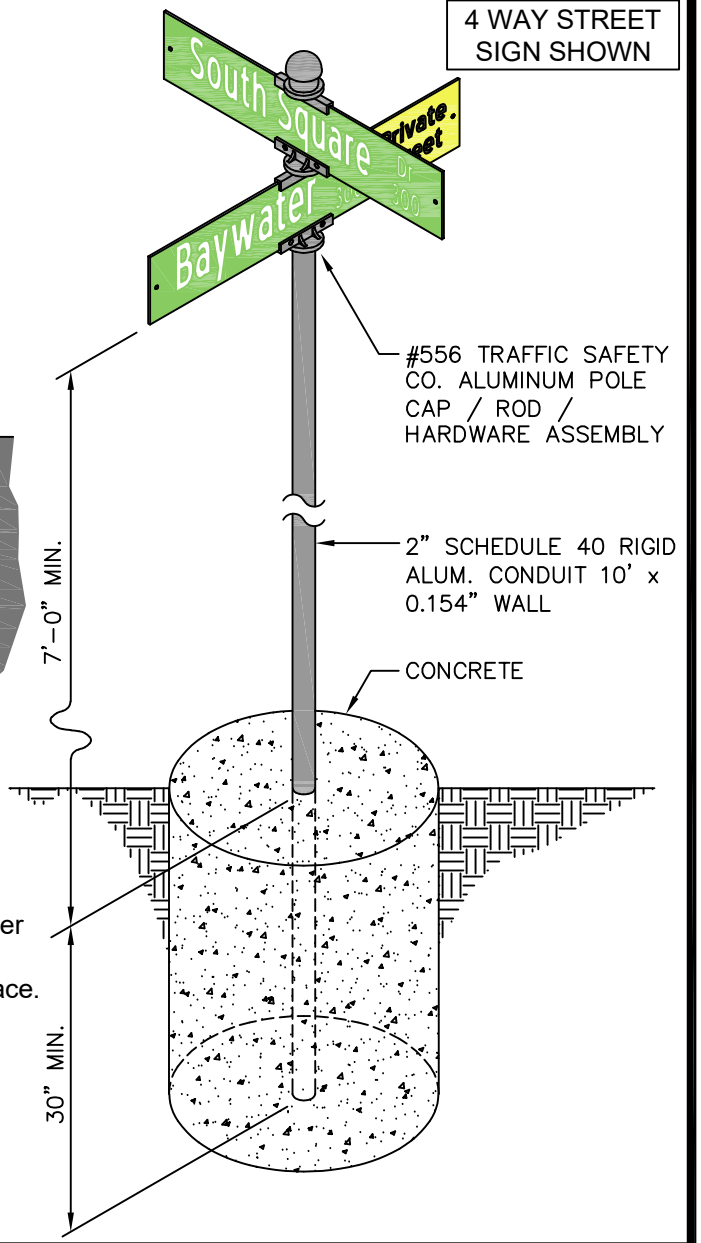
VERTICAL CURVE TABLE				
DESIGN SPEED (mph)	MIN. STOPPING SIGHT DISTANCE (ft)	K (crest) (deg)	K (sag) (deg)	K (stop) (deg)
25	155	26	26	12
30	200	37	37	19
35	250	49	49	29
40	305	64	64	44
45	360	79	79	61
50	425	96	96	84
55	495	115	115	114

NOTES:

1. Design speed is equal to the posted speed limit plus 10 MPH.
2. K(stop) values may be used within 50' of centerline of intersection on stop controlled approaches.







NOTES:

1. 6" letters to be series "B" (FHWA)
2. 2 1/2" letters to be series "B" (FHWA)
   All letters and background materials to be "Scotchlite" or an approved equal and meet I.T.E. Specifications on reflectivity.
3. Sign appearance shall be green background with white letters and white border.
4. Fabricate sign as follows: Base sheeting shall be Hi-Intensity Prismatic (or equal). Overlay letter mask using translucent EC green film. Allow a 0.50" border to show.
5. Aluminum sign blank materials to be 0.080" thick with 1.5" radius corners, 2-blanks per sign face.

RECOMMENDED INSTALLATION

1. Street name sign to be one-foot from property line if said lines were extended.
2. Sign blades not to extend past back of curb into road.
3. Sign location to be placed on low side of block numbering.
4. Any exceptions shall be approved by the City Engineer.
5. Developer responsible for payment of fees to City for cost of all street signs.

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STREET NAME SIGNS - 9" SIGN HEIGHT

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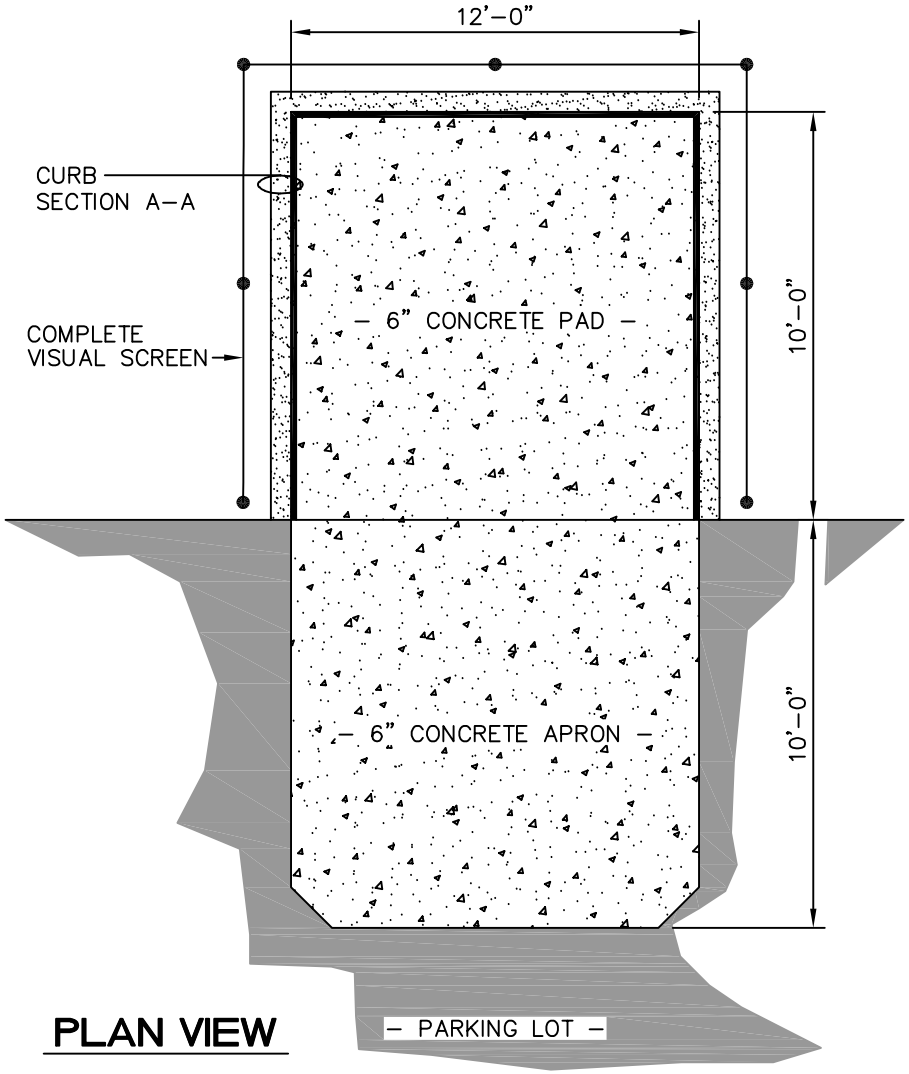
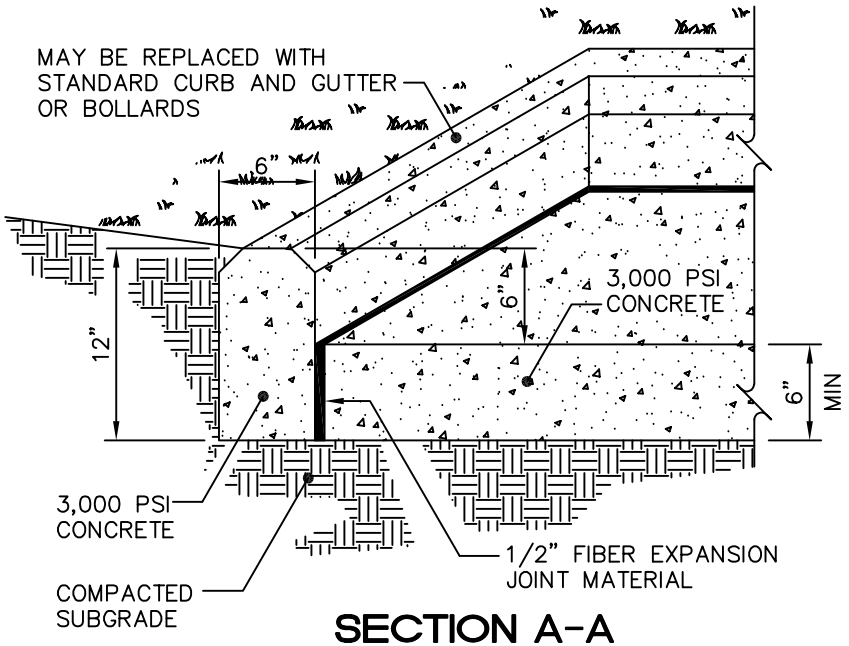


PLAN VIEW



SECTION A-A

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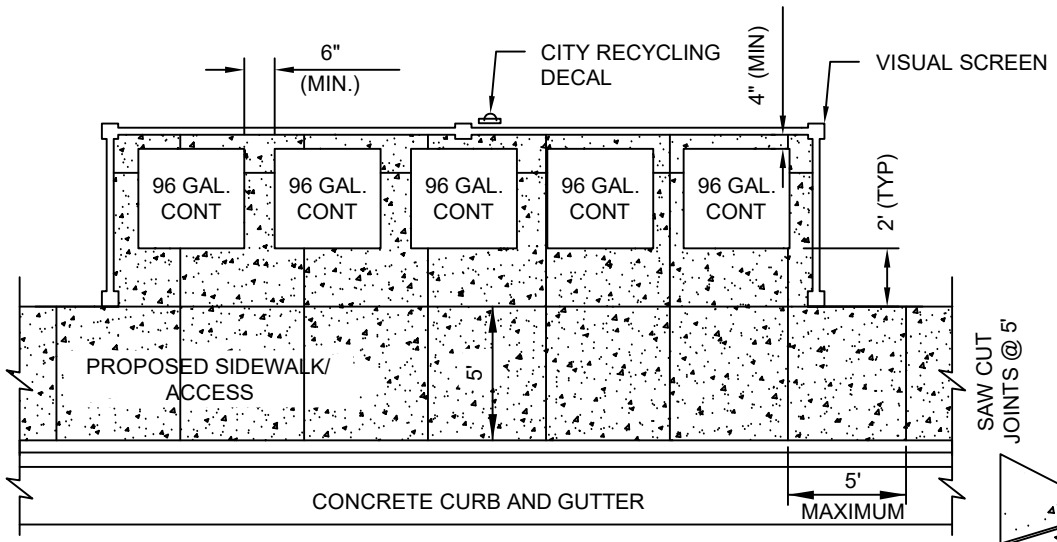
DUMPSTER PAD DETAIL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	415.01

CONTAINER REQUIREMENTS:
REQUIRED : 1 - 96 CONTAINER FOR 20 UNITS OR FRACTION THEREOF.
RECOMMENDED : 2 - 96 CONTAINERS MINUMUM

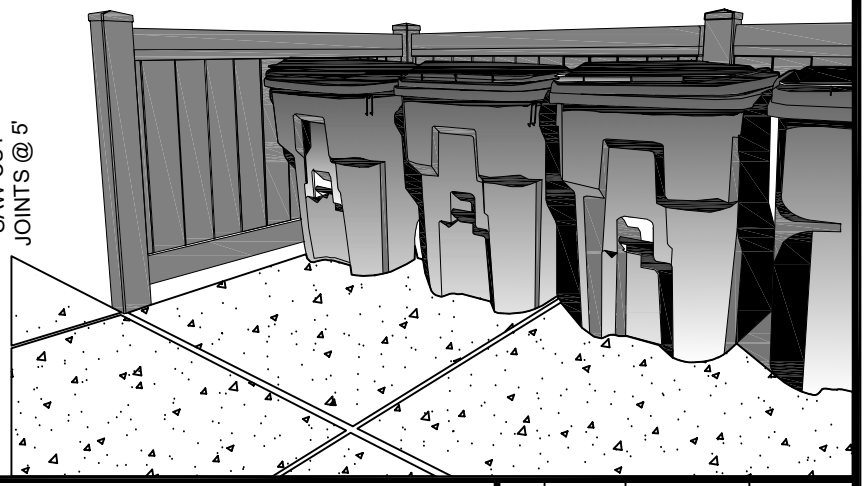
NOTES:

1. ALL SLOPES MUST MEET FEDERAL ADA AND NC STATE STANDARDS, WHENEVER CONFLICTS EXIST, THE MORE RESTRICTIVE PROVISION SHALL APPLY.
2. ACCESS FOR CITY REFUSE COLLECTION SHALL BE UNOBSTRUCTED BY PARKING OR ANY OTHER FORM OF TEMPORARY OF PERMANENT OBSTRUCTIONS.



PLAN VIEW

ISOMETRIC VIEW



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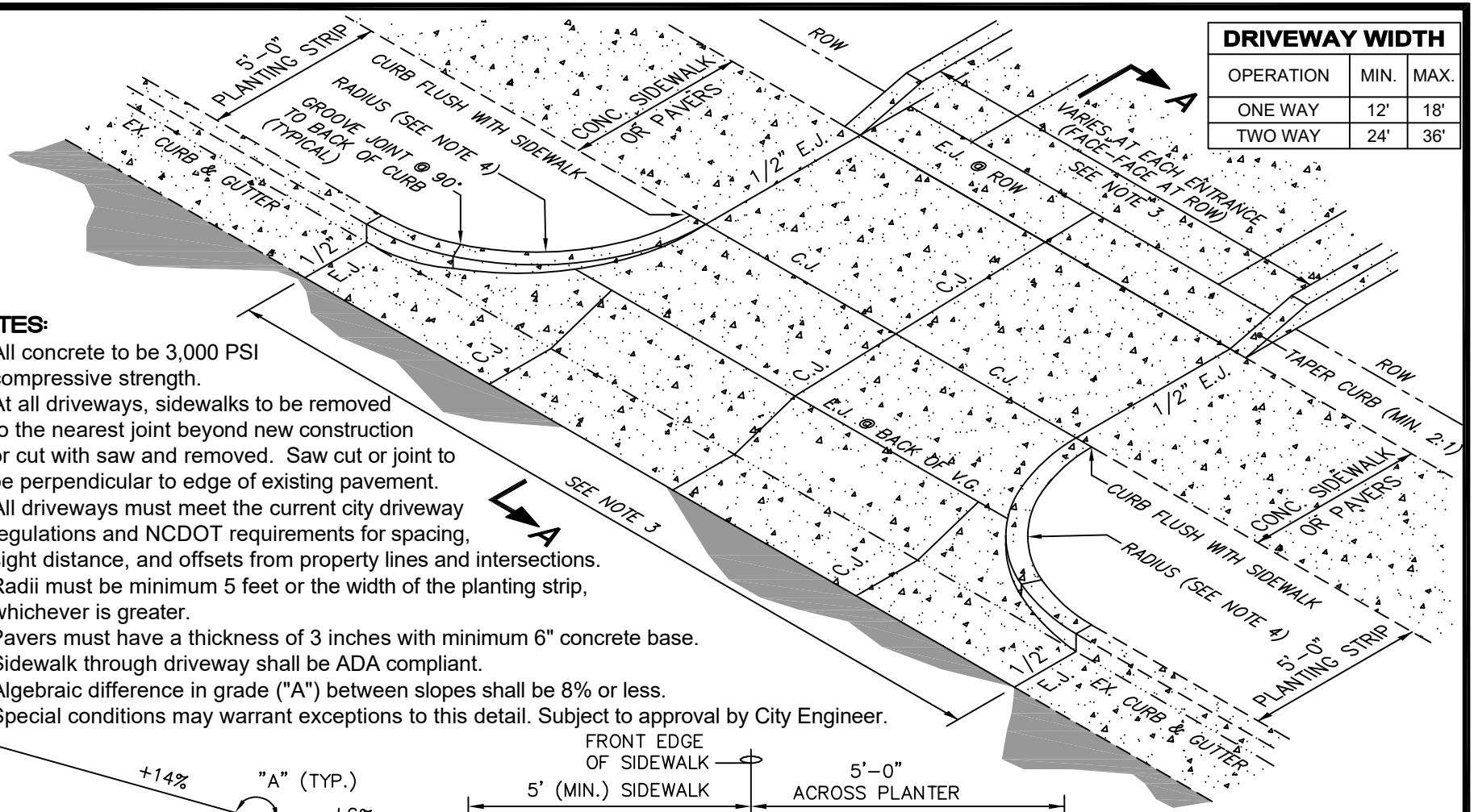
RECYCLING CENTER

Scale: not to scale | Sheet #: 1 of 1 | Detail # **415.02**

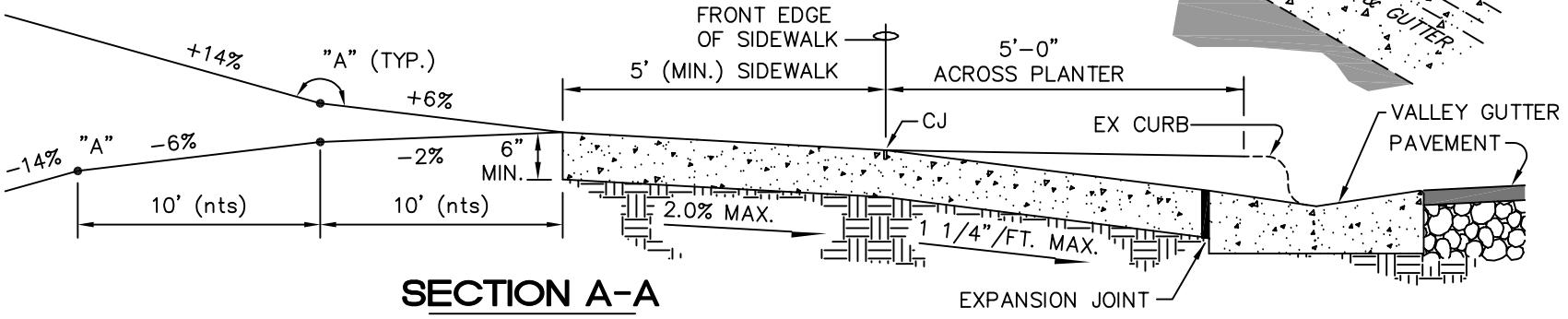
TABLE OF DETAILS



DRIVEWAY WIDTH		
OPERATION	MIN.	MAX.
ONE WAY	12'	18'
TWO WAY	24'	36'

NOTES:

1. All concrete to be 3,000 PSI compressive strength.
2. At all driveways, sidewalks to be removed to the nearest joint beyond new construction or cut with saw and removed. Saw cut or joint to be perpendicular to edge of existing pavement.
3. All driveways must meet the current city driveway regulations and NCDOT requirements for spacing, sight distance, and offsets from property lines and intersections.
4. Radii must be minimum 5 feet or the width of the planting strip, whichever is greater.
5. Pavers must have a thickness of 3 inches with minimum 6" concrete base.
6. Sidewalk through driveway shall be ADA compliant.
7. Algebraic difference in grade ("A") between slopes shall be 8% or less.
8. Special conditions may warrant exceptions to this detail. Subject to approval by City Engineer.



SECTION A-A

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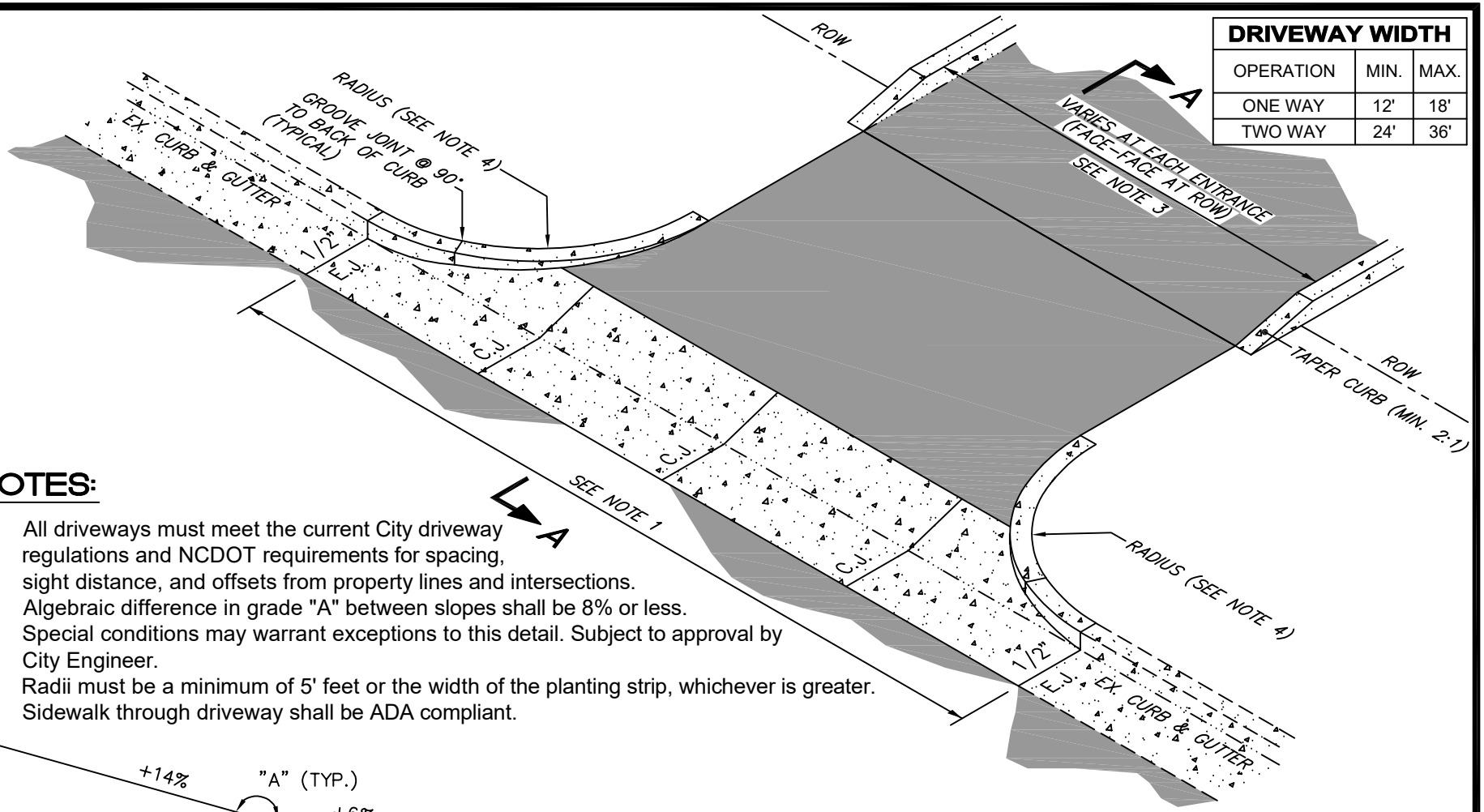
TYP. CONC. DRIVEWAY (COMMERCIAL, INDUSTRIAL, INSTITUTIONAL, MULTIFAMILY)

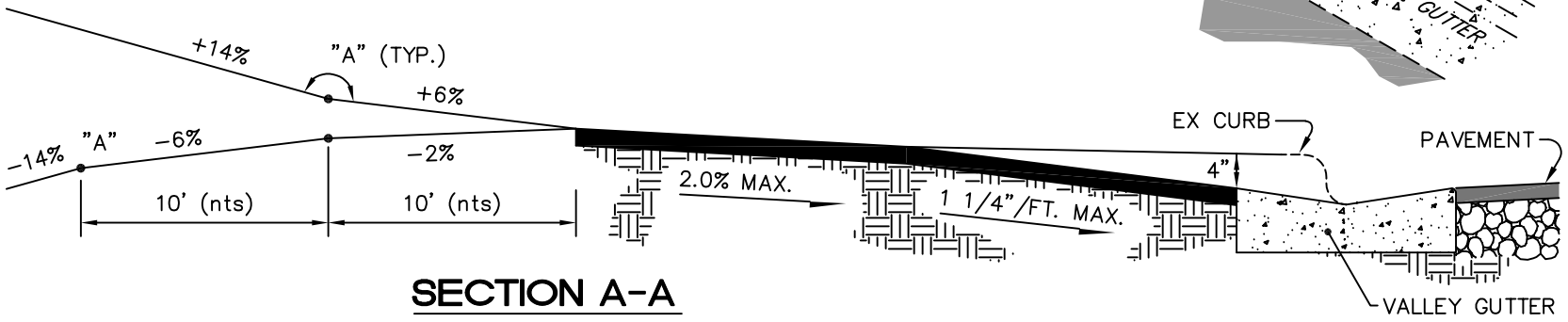
Scale: not to scale | Sheet #: 1 of 1 | Detail # 420.01

DRIVEWAY WIDTH		
OPERATION	MIN.	MAX.
ONE WAY	12'	18'
TWO WAY	24'	36'



NOTES:

1. All driveways must meet the current City driveway regulations and NCDOT requirements for spacing, sight distance, and offsets from property lines and intersections.
2. Algebraic difference in grade "A" between slopes shall be 8% or less.
3. Special conditions may warrant exceptions to this detail. Subject to approval by City Engineer.
4. Radii must be a minimum of 5' feet or the width of the planting strip, whichever is greater.
5. Sidewalk through driveway shall be ADA compliant.



SECTION A-A

ENGINEERING DEPARTMENT
Greenville, North Carolina 27834

CITY OF GREENVILLE, N.C.

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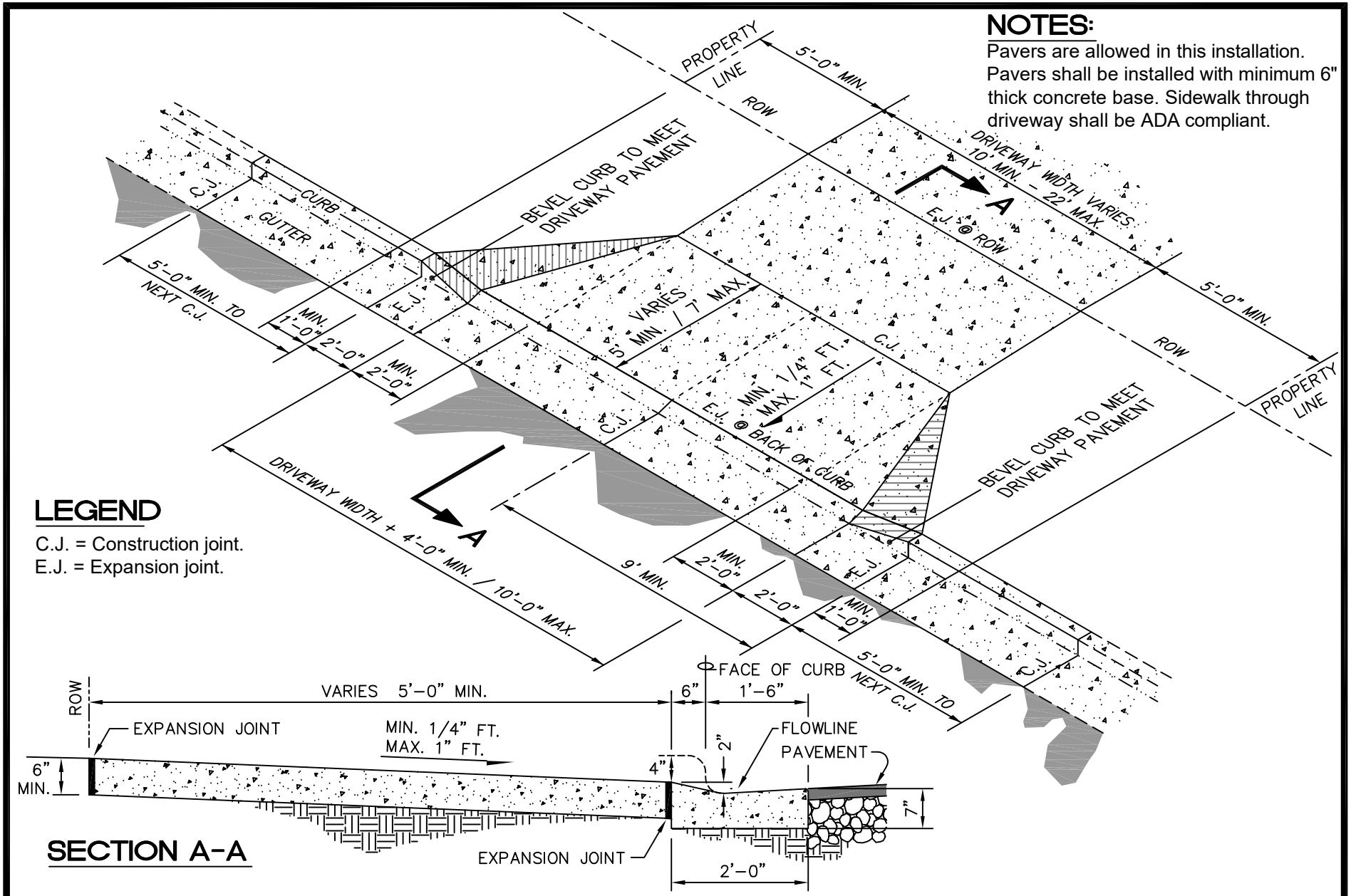
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

TYP. ASPHALT DRIVEWAY (COMMERCIAL, INDUSTRIAL, INSTITUTIONAL, MULTIFAMILY)

Scale: not to scale | Sheet #: 1 of 1 | Detail # 420.02

NOTES:

Pavers are allowed in this installation. Pavers shall be installed with minimum 6" thick concrete base. Sidewalk through driveway shall be ADA compliant.



LEGEND

C.J. = Construction joint.
E.J. = Expansion joint.

SECTION A-A

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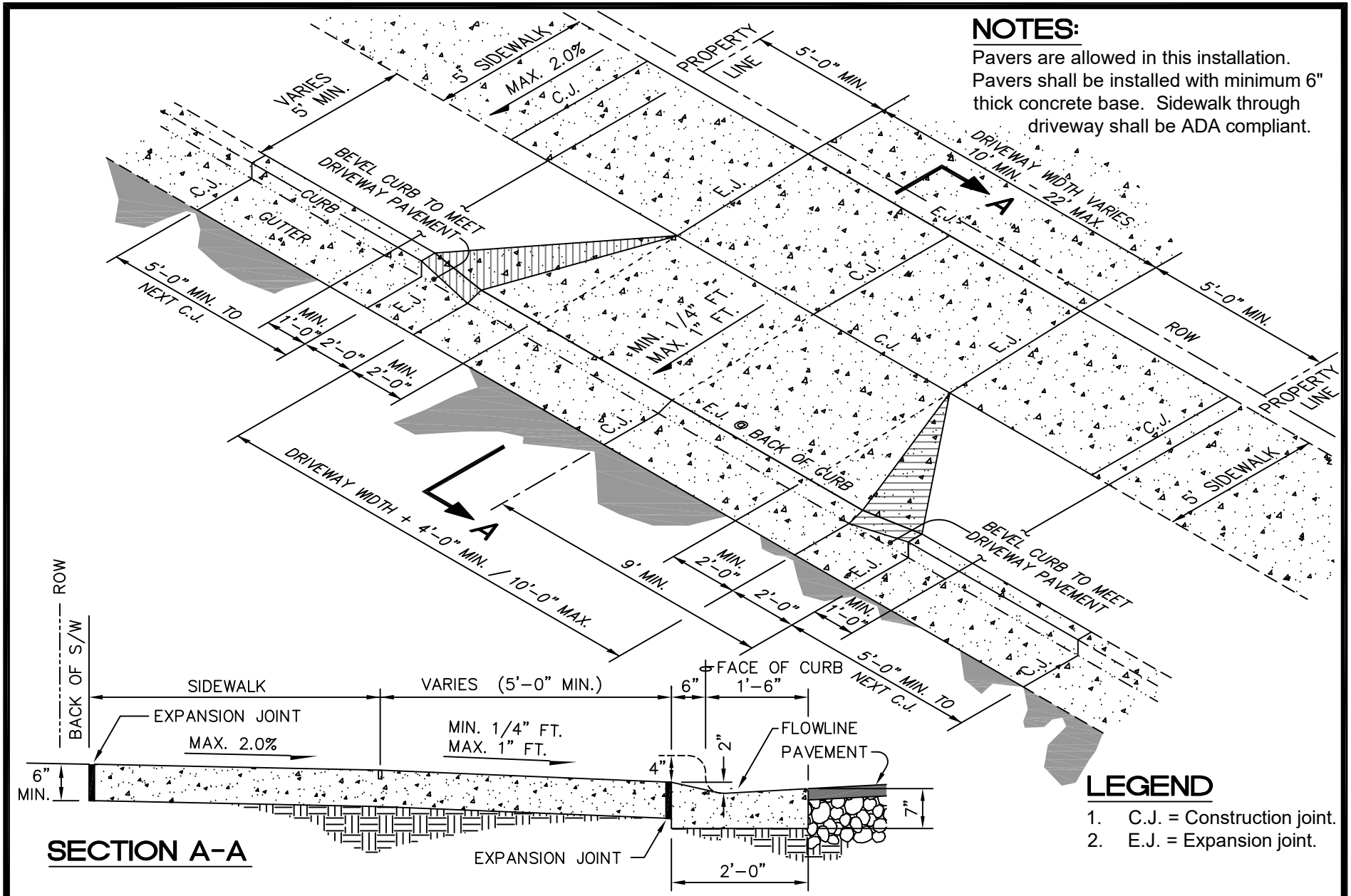
1	9/1/23	APPROVAL	L. KIRBY

RESIDENTIAL DRIVEWAY - NO SIDEWALK

Scale:	Sheet #:	Detail #
not to scale	1 of 1	421.01

NOTES:

Pavers are allowed in this installation. Pavers shall be installed with minimum 6" thick concrete base. Sidewalk through driveway shall be ADA compliant.



SECTION A-A

LEGEND

1. C.J. = Construction joint.
2. E.J. = Expansion joint.

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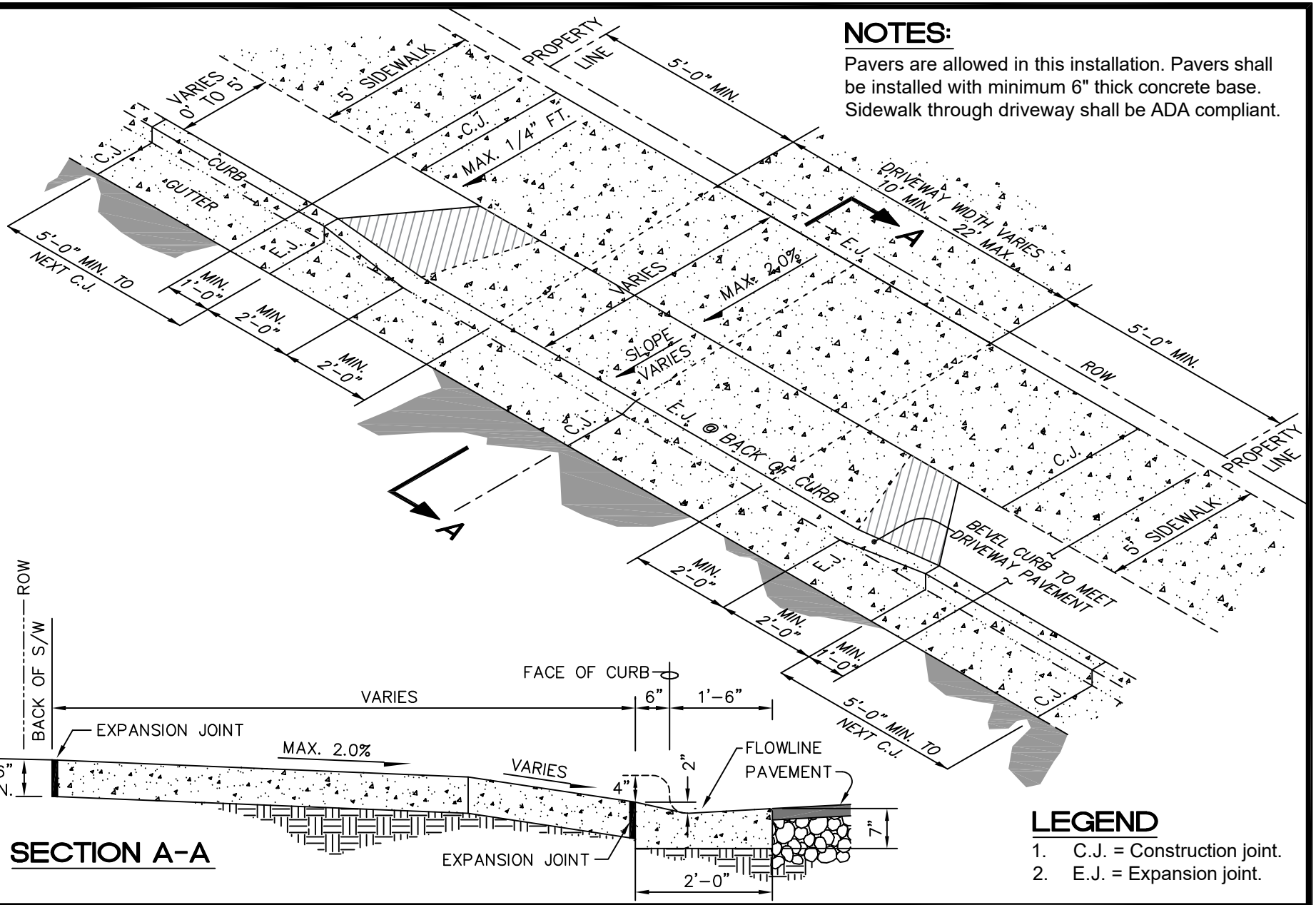
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

RESIDENTIAL DRIVEWAY - SIDEWALK GREATER THAN 5' FROM CURB

Scale:	Sheet #:	Detail #
not to scale	1 of 1	421.02

NOTES:

Pavers are allowed in this installation. Pavers shall be installed with minimum 6" thick concrete base. Sidewalk through driveway shall be ADA compliant.



SECTION A-A

LEGEND

1. C.J. = Construction joint.
2. E.J. = Expansion joint.

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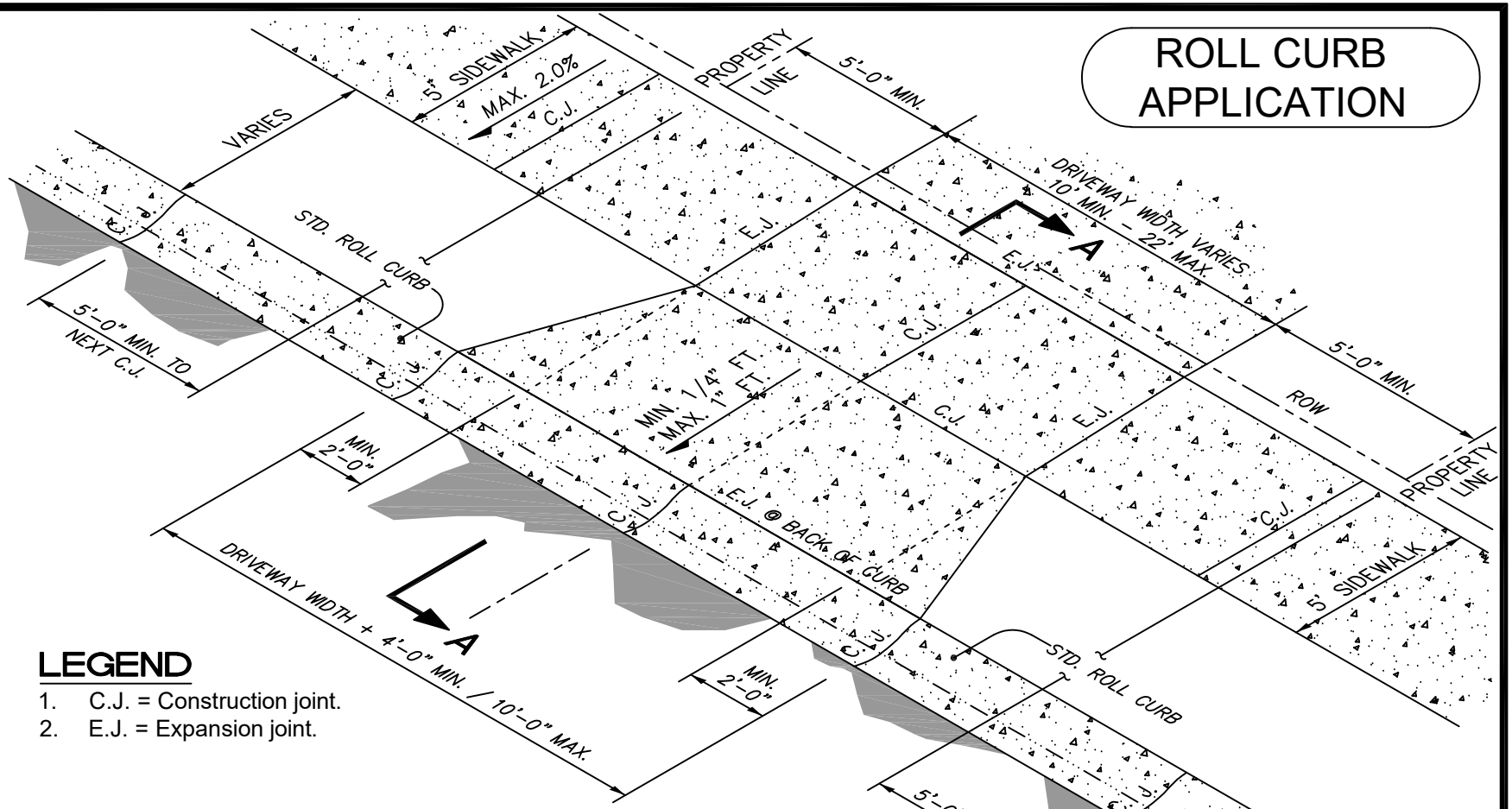
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

RESIDENTIAL DRIVEWAY - SIDEWALK WITHIN 5' OF CURB

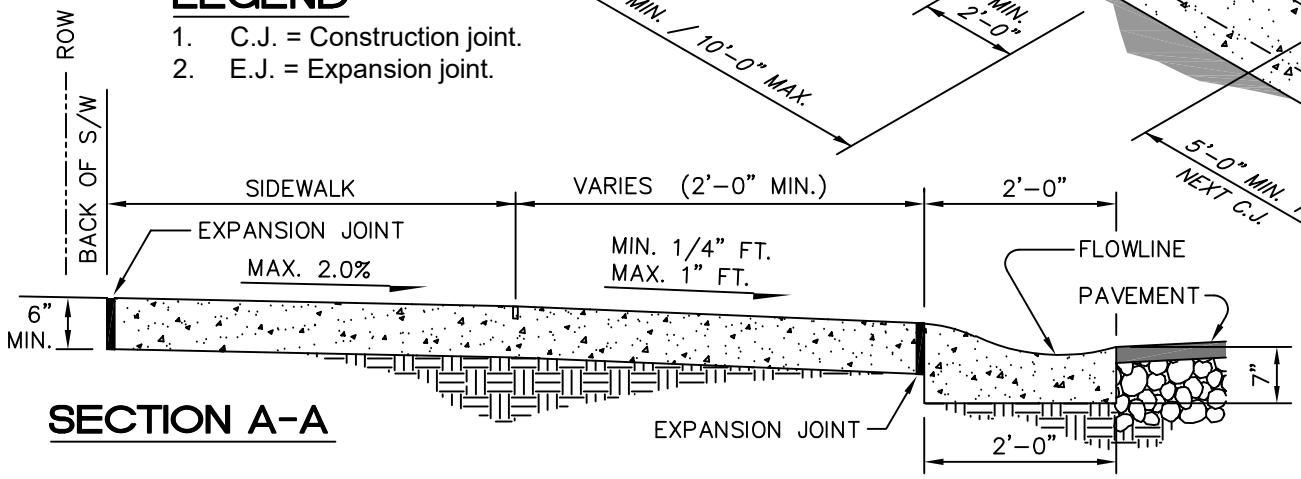
Scale: not to scale | Sheet #: 1 of 1 | Detail # 421.03

ROLL CURB APPLICATION



LEGEND

1. C.J. = Construction joint.
2. E.J. = Expansion joint.



SECTION A-A

NOTES:

Pavers are allowed in this installation. Pavers shall be installed with minimum 6" thick concrete base. Sidewalk through driveway shall be ADA compliant.

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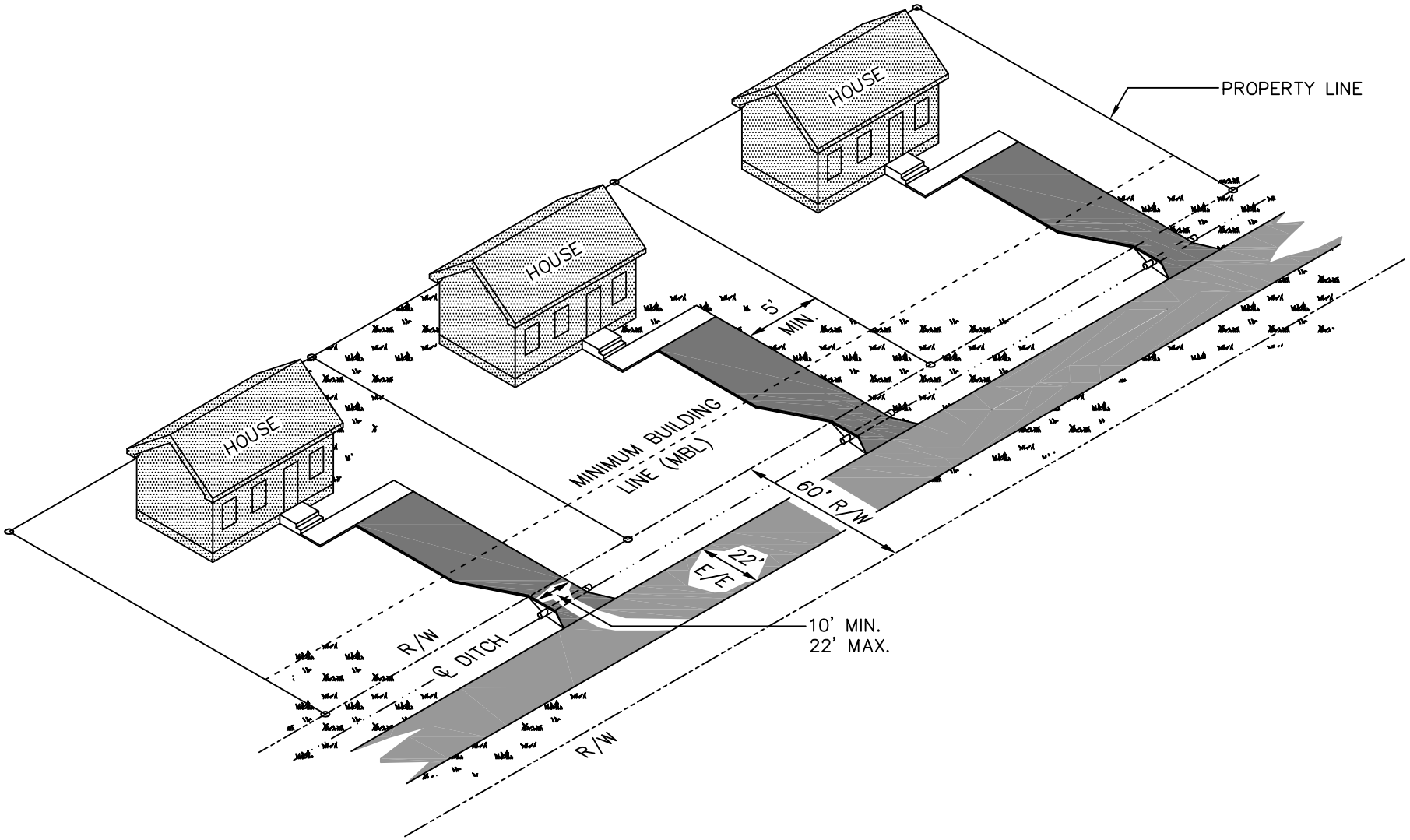
RESIDENTIAL DRIVEWAY - ROLL CURB WITH SIDEWALK

Scale:	Sheet #:	Detail #
not to scale	1 of 1	421.04



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Rev.	Date	Description	Approved
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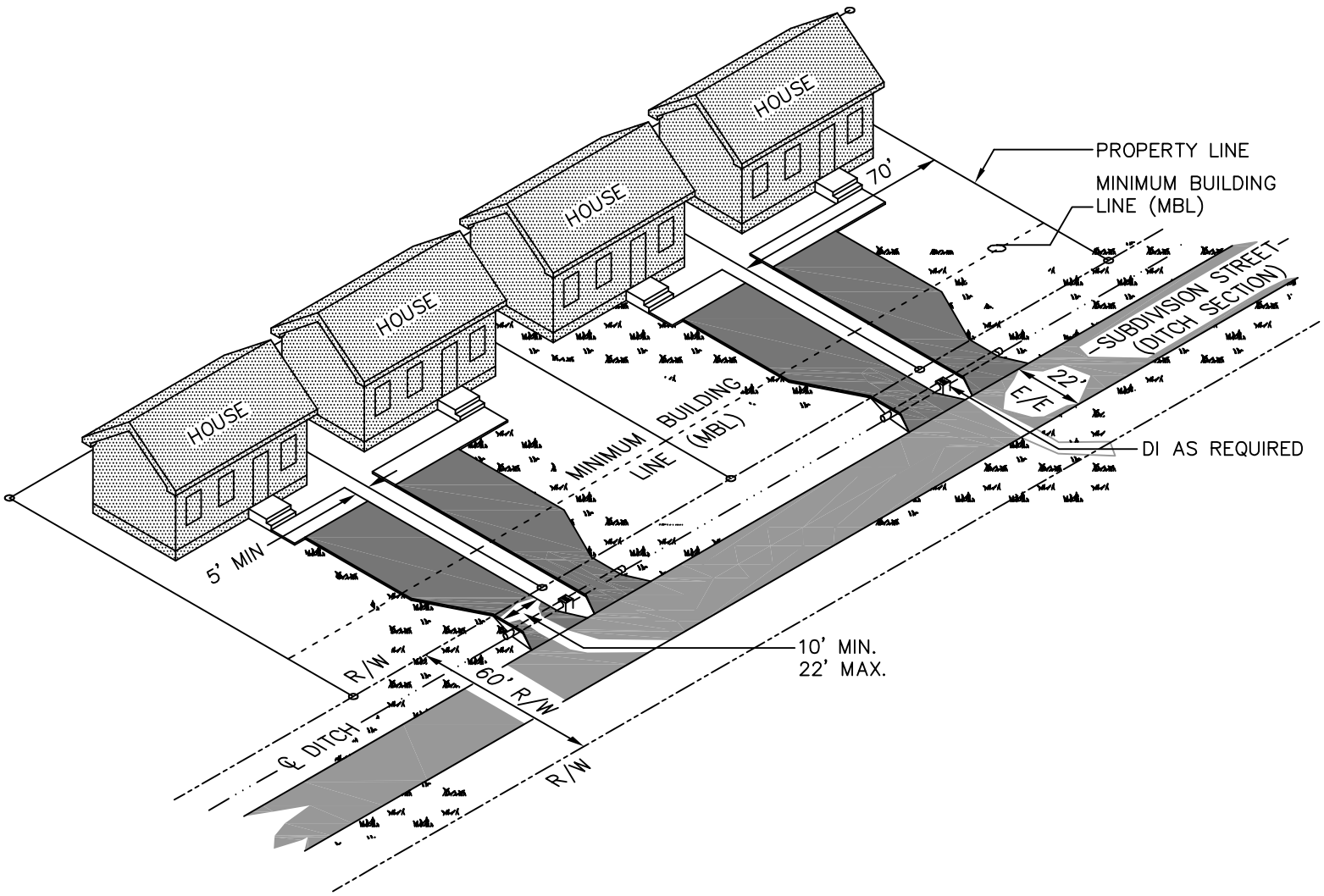
DRIVEWAY SPACING (NON C&G STREET)

Scale: not to scale

Sheet #: 1 of 1

Detail # **422.01**



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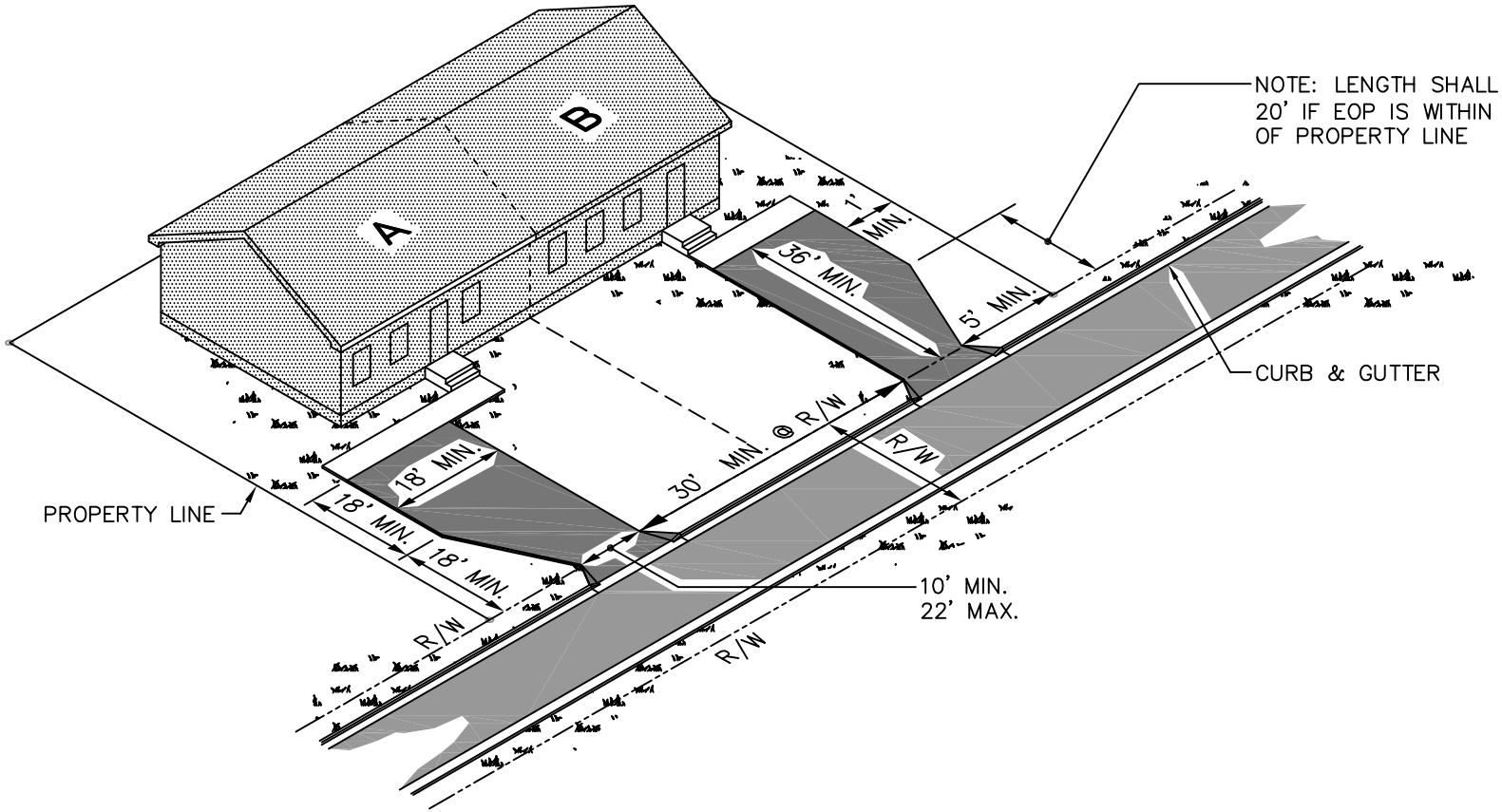
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

DRIVEWAY SPACING (NON C&G STREET) SHARED CULVERT

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.02



NOTE:

1. Special conditions may warrant exceptions to this detail. Subject to approval by City Engineer.

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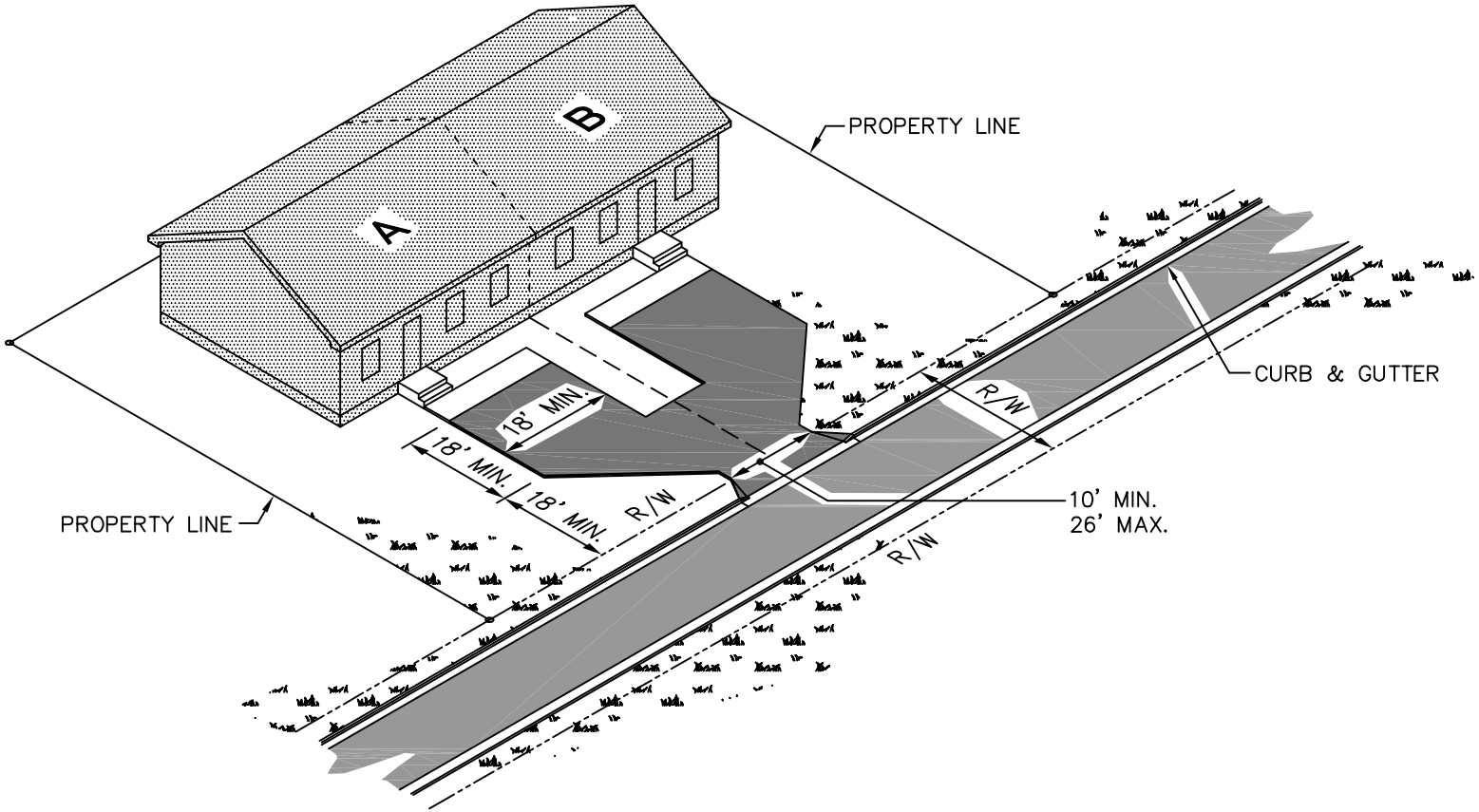
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

DUPLEX DRIVEWAY SPACING (C&G STREET)

Scale: not to scale

Sheet #: 1 of 1

Detail # **422.03**



NOTE:

1. Special conditions may warrant exceptions to this detail. Subject to approval by City Engineer.

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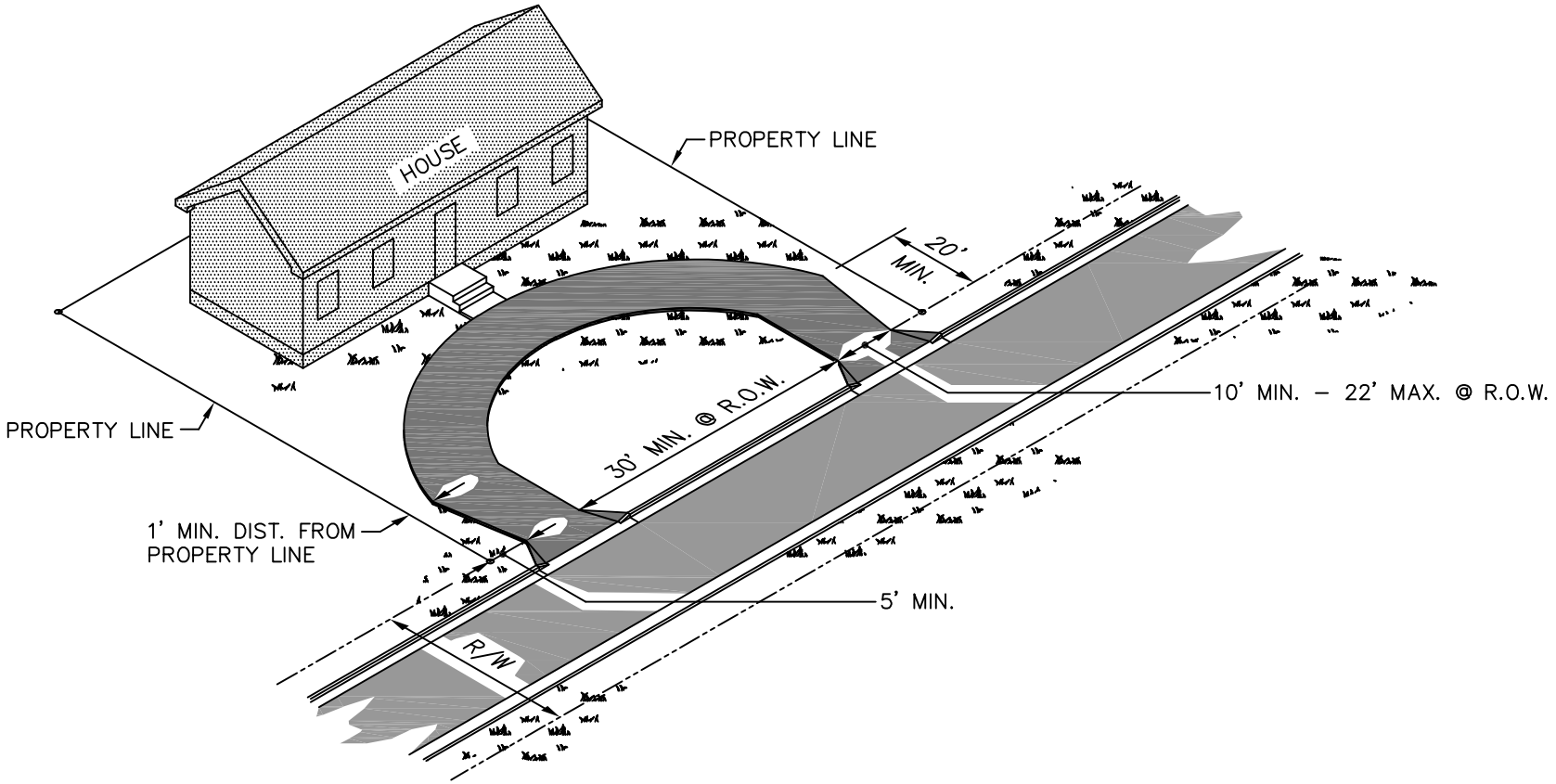
SHARED DUPLEX DRIVEWAY (C&G STREET)

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.04



NOTES:

1. Lot must have 400' of frontage to be considered for a 3rd driveway.
2. For curb & gutter only except along thoroughfare.

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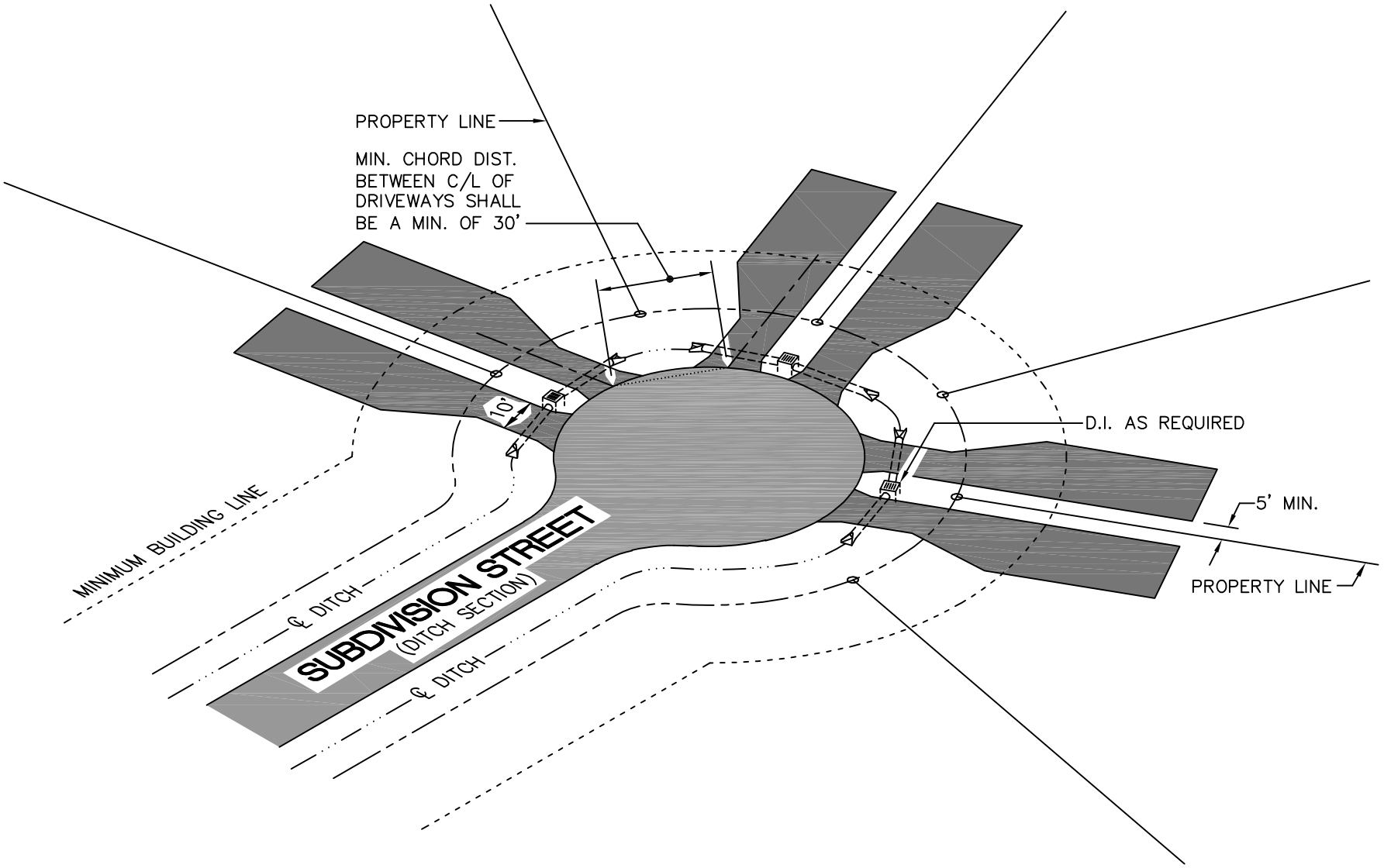
CIRCULAR OR DUAL DRIVEWAYS FOR SINGLE FAMILY (C&G STREET)

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.05



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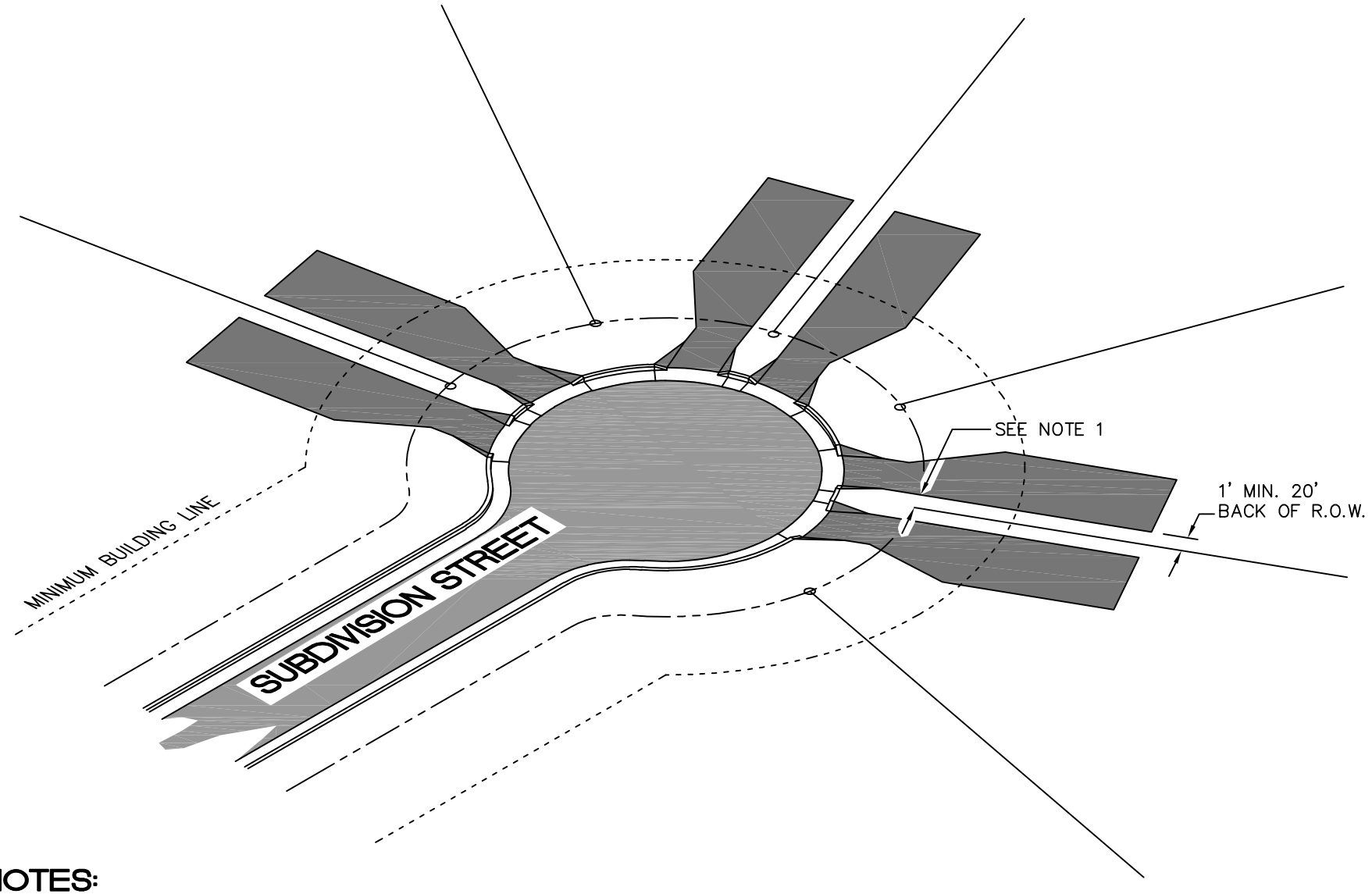
DRIVEWAY SPACING DETAIL (NON C&G STREET) CUL-DE-SAC

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.06



NOTES:

1. Minimum 3' for roll curb & gutter. Minimum 5' for standard curb & gutter.
2. Special conditions may warrant exceptions to this detail. Subject to approval by City Engineer.

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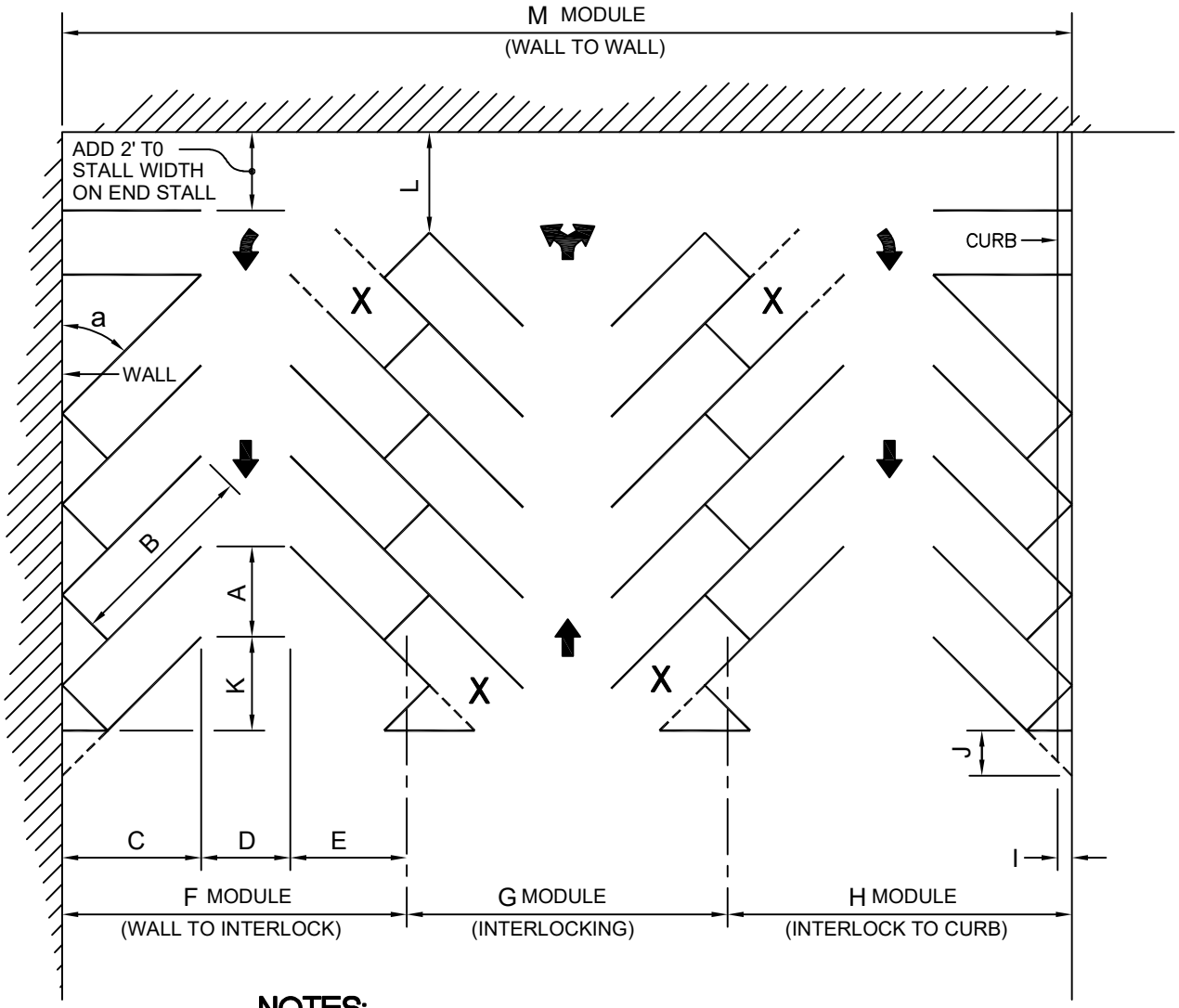
DRIVEWAY SPACING DETAIL (C&G STREET) CUL-DE-SAC

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.07

TABLE OF DETAILS



NOTES:

X = STALL NOT ACCESSIBLE IN CERTAIN LAYOUTS

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MINIMUM PARKING STANDARDS

Scale: not to scale

Sheet #: 1 of 1

Detail # 430.01

ANGLE

		45°				60°				75°				90°			
Stall width, parallel to aisle	A	10.6	12.0	12.7	13.4	8.7	9.8	10.4	10.9	7.8	8.8	9.3	9.8	7.5	8.5	9.0	9.5
Stall length of line	B	24.0	25.0	25.0	25.0	20.4	22.0	22.0	22.0	17.9	20.0	20.0	20.0	16.0	18.5	18.5	18.5
Stall depth of line	C	17.0	17.7	17.7	17.7	17.7	19.0	19.0	19.0	17.2	19.3	19.3	19.3	16.0	18.5	18.5	18.5
Aisle width between stall lines	D	11.0	13.0	12.0	11.0	14.0	18.0	16.0	15.0	17.4	25.0	23.0	22.0	20.0	28.0	26.0	25.0
Stall depth, interlock	E	14.3	14.7	14.5	14.3	15.8	16.9	16.8	16.6	16.2	18.2	18.1	18.1	16.0	18.5	18.5	18.5
Module, wall to interlock	F	42.3	45.4	44.2	43.0	47.5	53.9	51.8	50.6	50.8	60.9	60.4	59.4	52.0	65.0	63.0	62.0
Module, interlocking	G	39.6	42.4	41.0	39.6	45.6	51.8	49.6	48.2	49.2	61.4	59.2	58.2	52.0	65.0	63.0	62.0
Module, interlock to curb face	H	40.3	43.4	42.2	41.0	45.2	51.6	49.5	48.3	48.3	58.4	57.9	56.9	49.5	62.5	60.5	59.5
Bumper overhang (typical)	I	2.0	2.0	2.0	2.0	2.3	2.3	2.3	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Offset	J	5.3	6.0	6.4	6.7	1.9	2.1	2.3	2.4	0.5	0.6	0.6	0.6	0.0	0.0	0.0	0.0
Setback	K	11.7	11.7	11.3	11.0	8.2	9.0	8.8	8.7	4.5	4.6	4.6	4.6	0.0	0.0	0.0	0.0
Cross aisle, one-way	L_1	13	14	14	14	13	14	14	14	13	14	14	14	13	14	14	14
Cross aisle, two-way	L_2	22	24	24	24	22	24	24	2.4	22	24	24	24	22	24	24	24
Module, wall to wall	M	45.0	48.4	47.4	46.4	49.4	56.0	54.0	53..0	51.8	63.6	61.6	60.6	52.0	65.0	63.0	62.0
STALL WIDTH		7.5' Compacts Only	8.5'	9.0'	9.5'	7.5' Compacts Only	8.5'	9.0'	9.5'	7.5' Compacts Only	8.5'	9.0'	9.5'	7.5' Compacts Only	8.5'	9.0'	9.5'

NOTES:

1. All site lighting shall comply with the Lighting Standards for the City of Greenville.

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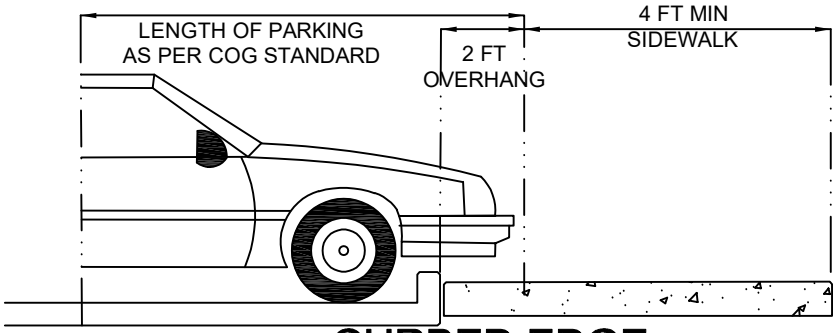
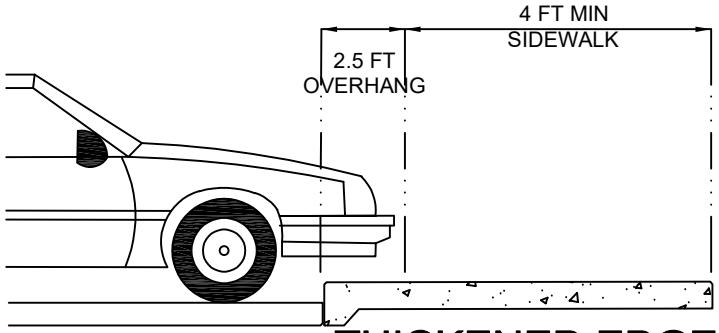
MINIMUM PARKING STANDARDS

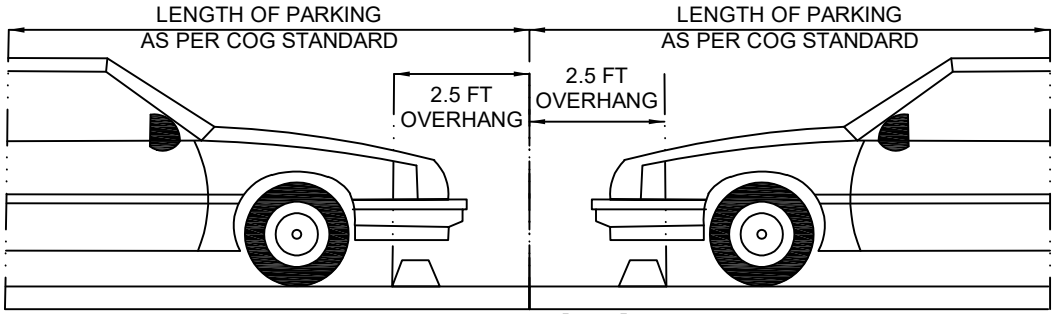
Scale: not to scale | Sheet #: 1 of 1 | Detail # **430.02**



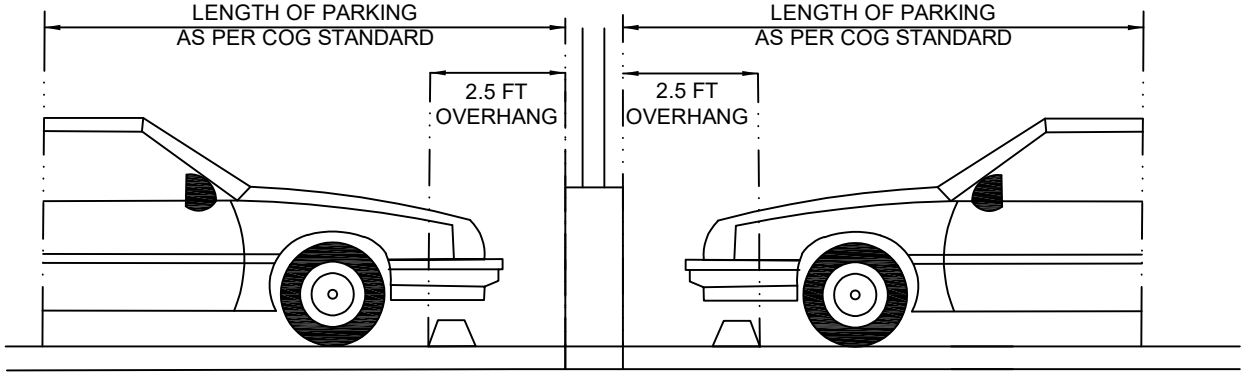
CURBED EDGE
SIDEWALK DETAIL



THICKENED EDGE
SIDEWALK DETAIL



WHEEL STOP
PLACEMENT IN INTERLOCKING PARKING



PARKING LOT WITH CONFLICT

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MINIMUM PARKING STANDARDS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	430.03

TABLE OF DETAILS

PAVEMENT DESIGN

The following tables, graphs, and procedures have been developed by the City Engineering Department to assist developers and engineers with the design of streets within subdivisions. The following procedures are based on information provided by the North Carolina Department of Transportation, North Carolina State University Civil Engineering Department, and the Soil Conservation Service.

DESIGN PROCEDURES

STEP I. Determining the Soil Support Value (SSV)

Either of the following two alternatives may be used to determine the soil support value (SSV). SSV = 5.32(log CBR) - 1.52

The lowest obtained CBR value (regardless of penetration depth) shall be used for the design.

METHOD A - Measure CBR of Soils and Calculate SSV

This is the best method to determine the actual characteristic of the subgrade base material and will require a certified laboratory CBR (California Bearing Ratio) test by an approved soil laboratory. The CBR test should be performed in accordance with AASHTO designation T193 (latest edition) with the exception that if the required soil compaction density to be used during construction is known, only one specimen needs to be tested at the required density for each soil type.

A sufficient number of CBR tests shall be made to ensure coverage in the range of soil conditions encountered in the area to be paved.

The following minimum testing is required:

(1) Soil Borings - Perform soil borings with a maximum spacing of 250 linear feet and with at least four borings in each separate street area and with at least one boring in each soil type area identified in the soil survey map of Pitt County. Each boring shall extend at least two feet below the finished subgrade elevation.

(2) CBR Tests - A CBR test shall be performed on each soil type which will be within two feet of the finished subgrade elevation. If off-site soils are used as fill, CBR tests shall also be performed on each soil type which will occur in the upper two feet below pavement subgrade.

METHOD B: Measure CBR of Soils to be Used to Fill and Calculate SSV

If the SSV of the soil types at the pavement subgrade level, as determined by Method A, result in an uneconomical pavement section, the developer has the option of undercutting the existing soils to a depth of at least 18 inches below finished pavement subgrade elevations and backfilling with better soils. The SSV is then determined by performing a CBR test on each soil type used for backfilling and by calculating the SSV from the measured CBR values. The subgrade soils must be prepared as outlined in the “Construction Considerations” section of this manual.

STEP II. **Derive the Design AVERAGE DAILY TRAFFIC (ADT)**

An average daily traffic (ADT) shall be determined according to Std. detail No. 491.02 for residential streets. A design average daily traffic ($\overline{ADT}$) shall be calculated according to the following formula:

$$\overline{ADT} = \frac{ADT + (G \times ADT)}{2}$$

$$G = (1 + i)^{n}$$

i = fractional rate of yearly increase

n = design life of pavement
(See Std. detail No. 491.03)

STEP III. **Determine N (See Std. detail No. 491.04)**

STEP IV. **Determine the STRUCTURAL NUMBER (SN)**

Go to Std detail No. 492.01 (20-year design life). From these figures, derive a structural number (SN) for the pavement section. For collector streets, add 0.75 to the structural number; for minor thoroughfares, add 1.5 to the structural number; and for major thoroughfares, add 2.0 to the structural number.

STEP V. **Determine Pavement Section**

Design the pavement according to Std. detail No. 491.05 such that the structural number obtained using Std. detail No. 491.05 will be equal to or greater than the structural number derived in Step IV. To use Std. detail No. 491.05, multiply the thickness (in inches) of the various components of the pavement section (Base Course, Binder Course, and Surface Course) by the corresponding structural coefficient and total the results. The total must be equal to or greater than the structural number derived in Step IV. This will be the minimum pavement design allowable for the particular street in question. Pavement section of turn lanes shall match pavement section of through lanes for all streets.

CONSTRUCTION CONSIDERATION

Subgrade Preparation

1. The soils below the pavement subgrade must be compacted during construction to a density equal to or greater than the density at which the CBR test was performed. If Method A was used, the upper 12 inches of soil below the pavement section must be compacted. If Method B was used, the upper 18 inches of soil below the pavement section must be compacted and at least one in-place density test must be performed per 200 linear feet of street in accordance with AASHTO designation T191, T204, T205, or T238 (latest edition) by an approved soils laboratory. The test results shall be submitted to and approved by the Engineering Department before the street is paved. Required densities shall be in accordance with the appropriate NCDOT Standards.

2. No stone base, curb and gutter, or asphalt pavement shall be placed without prior inspection by the Engineering Department. The inspection shall include, but not be limited to proof rolling the prepared subgrade and/or stone base with a rubber-tired proof roller (loaded dump truck) with a minimum gross weight of at least 50,000 pounds under the observation of a representative of the Engineering Department. Proof rolling must be done within ten days prior to placement of the stone, curb, or asphalt. Proof rolls shall become invalid if rainfall over 0.5" occurs on exposed soil or stone subgrade. If rainfall over 0.25" occurs on exposed soil subgrade, the subgrade shall be evaluated by the Engineering Department for determination of the requirement for an additional proofroll. Rainfall data shall be determined from an on site rain gauge or the Multi-sensor Precipitation estimates available on the North Carolina State University website at https://legacy.climate.ncsu.edu/dot. The proof roller and operator shall be furnished by the developer. All areas of the subgrade and/or stone base shall be covered by the wheels of the proof roller operating at walking speed (two to three miles per hour). Any areas which rut or pump excessively under the wheels of the proof roller shall be repaired by the developer and reinspected before the street is paved. If the developer disagrees with the Engineering Department about the need for repairs to the subgrade, the developer may hire a registered professional engineer to perform CBR tests on the prepared subgrade. If the registered professional engineer certifies that the subgrade will provide adequate support for design pavement section and the anticipated traffic loading for the 20-year design life of the street, the street may be paved without making repairs to the subgrade.

3. Stone subgrade testing shall be performed by an approved independent testing laboratory in accordance with appropriate NCDOT standards, to include but not limited to the NCDOT Standard Specifications for Roads & Structures (latest edition) and/or NCDOT Materials and Tests Unit Manuals. Minimum testing shall include stone thickness verification, stone densities, and crown verification. Minimum stone densities shall be in accordance with Table 2 in Section 4 of the NCDOT Nuclear Density Testing Manual.

Pavement Structures

1. All materials should be placed in accordance with the appropriate NCDOT standards, to include but not limited to the NCDOT Standard Specifications for Roads & Structures (latest edition) and the NCDOT Asphalt Quality Management System (latest edition). As an exception, the maximum lift thickness of S9.5B asphalt shall be 2.0".

2. All required pavement structure testing shall be performed by an approved independent testing laboratory, in accordance with the appropriate NCDOT standards, to include but not limited to the NCDOT Standard Specifications for Roads & Structures (latest edition), the NCDOT Asphalt Quality Management System (latest edition), and/or NCDOT Materials and Tests Unit Manuals.

3. Asphalt density testing shall be in accordance with the NCDOT Asphalt Quality Management System (latest edition). All density tests/samples shall meet or exceed the minimum density requirements as listed in Table 610-7. No consideration shall be given for acceptance of asphalt with a compaction percentage less than that listed in the table.

4. Cores for asphalt thickness verification shall be required. A minimum of one core shall be required on each street. Streets in excess of 500 linear feet shall have a minimum of one core taken for every 500' in length or portion thereof. For example, a street that is 900 linear feet in length would require a minimum of two cores, and a street that is 1,100 linear feet in length would require a minimum of three cores. Random core locations for each street shall be determined as specified in Section 10.3.6 of the NCDOT Asphalt Quality Management System - "Determining Random Sample Locations." Core samples on streets that require multiple samples shall alternate travel lanes. The average thickness of all core samples of a given design thickness shall meet or exceed the design pavement thickness. No individual core shall have a thickness less than $\frac{1}{4}$" below the design pavement thickness.

5. Existing asphalt shall be saw cut at all tie in points. Joint shall be crack sealed upon completion of paving operations.

MAINTENANCE

The developer is responsible for maintenance and repairs of streets until such time as the City accepts responsibility for permanent maintenance. Upon completion of all improvements, the developer may submit a letter to the city engineer, accompanied by a metes and bounds survey map of the streets to be accepted, requesting that the City accept said streets. The City Council may at that time accept responsibility of said streets.

EXAMPLE PAVEMENT DESIGN

EXAMPLE: DEVELOPMENT CONSISTING OF 100 LOTS IN R-9 ZONING CLASSIFICATION. CBR TEST RESULTS INDICATE A CBR VALUE 10. ASSUME NORMAL TRUCK LOADING. DESIGN FOR FULL DEVELOPMENT AND 20-YEAR DESIGN LIFE.

SOLUTION:

STEP 1 - Determine the Soil Support Value (SSV) using the formula SSV = 5.32 (log CBR) -1.52.

SSV = 5.32(log10) - 1.52 = 3.8

STEP 2 - Derive the Design Average Daily Traffic ($\overline{ADT}$).

Std. detail No. 491.01 implies a trip/day/dwelling factor of 8.2 for an R-9 zone classification, therefore:

8.2 x 100 lots = 820 trips/day = ADT

Using the equation $\overline{ADT} = \frac{ADT + (G \times ADT)}{2}$ in conjunction with Std. detail No. 491.02 assuming fully developed subdivision which implies 0.5% annual increase in traffic.

$$\overline{ADT} = \frac{820 + (1.11 \times 820)}{2} = 865 \text{ trip/day}$$

STEP 3 - Determine $\overline{N}$

Use Std. Detail No. 491.03 or the equation on Std. detail No. 491.03 to get a $\overline{N}$ of approximately 14.

STEP 4 - Determine the Structural No. (SN)

Go to Std. detail No. 492.01 with a SSV of 3.8 and a $\overline{N}$ of 14 SN = 2.18

STEP 5 - Determine Pavement Section

Go to Std. detail No. 491.04 and try different sections

(a)	Trial 1 -	6" CABC	6 x 0.14 =	0.84
		2.5" S9.5B	2.5 x 0.44 =	1.10
				1.94
		1.94 < 2.18	DESIGN INSUFFICIENT	
(b)	Trial 2 -	7" CABC	7 x 0.14 =	0.98
		3" S9.5B	3 x 0.44 =	1.32
				2.30
		2.30 > 2.18	DESIGN OK	
(c)	Trial 3 -	4" CABC	4 x 0.14 =	0.56
		2.5" Binder I.19.0B	2.5 x 0.44 =	1.10
		1.5" S9.5B	1.5 x 0.44 =	0.66
				2.32
		2.32 > 2.18	DESIGN OK	

TRIP GENERATION

THE FOLLOWING SHALL BE USED TO DETERMINE THE "AVERAGE DAILY TRAFFIC" (ADT) WITHIN NEW RESIDENTIAL DEVELOPMENTS. THE FOLLOWING FACTOR SHALL BE USED ON A PER LOT BASIS, PER DWELLING UNIT BASIS, PER USE BASIS, OR CALCULATED ON THE MAXIMUM DENSITY, WHICHEVER WILL GENERATE THE GREATEST NUMBER OF TRIPS. FACTORS FOR AREAS ZONED OTHER THAN RESIDENTIAL SHALL BE ASSIGNED ON AN INDIVIDUAL BASIS BY THE CITY ENGINEERING DEPARTMENT, USING THE TRIP GENERATION INTENSITY FACTORS AND SUPPLEMENTS THEREOF PUBLISHED BY THE ITE TRIP GENERATION MANUAL AS A REFERENCE MANUAL.

ONCE THE ADT HAS BEEN CALCULATED, THE "DESIGN AVERAGE DAILY TRAFFIC" ($\overline{ADT}$) CAN BE CALCULATED BY USING FORMULA ② BELOW IN CONJUNCTION WITH TABLE 10-4. THE DESIGN LIFE FOR ALL PAVEMENTS SHALL BE A MINIMUM OF 20-YEARS.

CLASSIFICATION	TRIPS/DAY/DWELLING
MULTIFAMILY	6.7
HIGH DENSITY SINGLE FAMILY	8.2
MEDIUM DENSITY SINGLE FAMILY	10.0
LOW DENSITY SINGLE FAMILY	9.5

② $\overline{ADT} = \frac{ADT + (G \times ADT)}{2}$

Where: $\overline{ADT}$ = THE "DESIGN AVERAGE DAILY TRAFFIC" OR THE AVERAGE DAILY TRAFFIC OVER THE DESIGN LIFE OF THE PAVEMENT.

ADT = THE AVERAGE DAILY TRAFFIC AT FULL DEVELOPMENT = (TOTAL NUMBER OF DWELLINGS USING THE STREET AT FULL DEVELOPMENT) x (THE TRIPS/DAY/DWELLING FOR THE ZONE CLASSIFICATION OF THE DWELLING)

G = GROWTH FACTOR (SEE STD. DETAIL NO. 491.03)

TRAFFIC GROWTH					
FACILITY DESCRIPTION	ESTIMATED YEARLY INCREASE	GROWTH FACTOR, G			
		20 YRS.	15 YRS.	10 YRS.	5 YRS.
DEAD END STREET	1%	1.22	1.16	1.10	1.05
COLLECTOR STREET	2%	1.49	1.35	1.22	1.11
SUBDIVISION STREET					
(a) FULLY DEVELOPED	0.5%	1.11	1.08	1.05	1.03
(b) 50% DEVELOPED	4%	2.19	1.80	1.48	1.22
PRINCIPAL COUNTY ROAD	3%	1.81	1.56	1.34	1.16
OTHER COUNTY ROADS	2%	1.49	1.35	1.22	1.11
INDUSTRIAL SERVICE ROAD					
(a) UNDEVELOPED	6%	3.21	2.40	1.79	1.34
(b) 50% DEVELOPED	4%	2.19	1.80	1.48	1.22

THE ABOVE ARE TYPICAL VALUES. THE ACTUAL TRAFFIC GROWTH RATE FOR A PARTICULAR FACILITY MAY VARY SUBSTANTIALLY FROM THOSE ABOVE. IF THE DESIGNER HAS BETTER INFORMATION AVAILABLE, HE MAY CALCULATE AN APPROPRIATE GROWTH FACTOR USING THE FOLLOWING EQUATION (1)

(1) $G = (I + i)^n$

where i = FRACTIONAL RATE OF YEARLY INCREASE
n = DESIGN LIFE OF PAVEMENT

(2) $\overline{ADT} = \frac{ADT + (G \times ADT)}{2}$

TABULATED VALUES ASSUMES 1% OF TRAFFIC IS COMPOSED OF TRUCK-TRACTOR SEMI-TRAILER (TTST) AND 4% SINGLE-AXLE DUAL-TIRE VEHICLES. FOR THESE VALUES USE THE FOLLOWING FORMULA

$\overline{N} = \overline{ADT}\ (0.016)$

WHEN THE DESIGNER HAS A BETTER ESTIMATE OF THE ACTUAL TRAFFIC HE SHOULD USE THE FORMULA

$\overline{N} = \overline{ADT}\ (0.25\frac{X}{100} + 0.60\frac{Y}{100})$

WHERE X = PERCENT DUALS AND Y = PERCENT TTST USING THE PAVEMENT.

$\overline{N}$ IS A FUNCTION OF THE NUMBER OF TRUCKS.

EQUIVALENT $\overline{N}$ AND $\overline{ADT}$

$\overline{N}$	$\overline{ADT}$
200	12,500
100	6,250
80	5,000
40	2,500
30	1,875
25	1,562
20	1,250
15	937
10	625
5	312
4	250
3	187
2	125
1	63

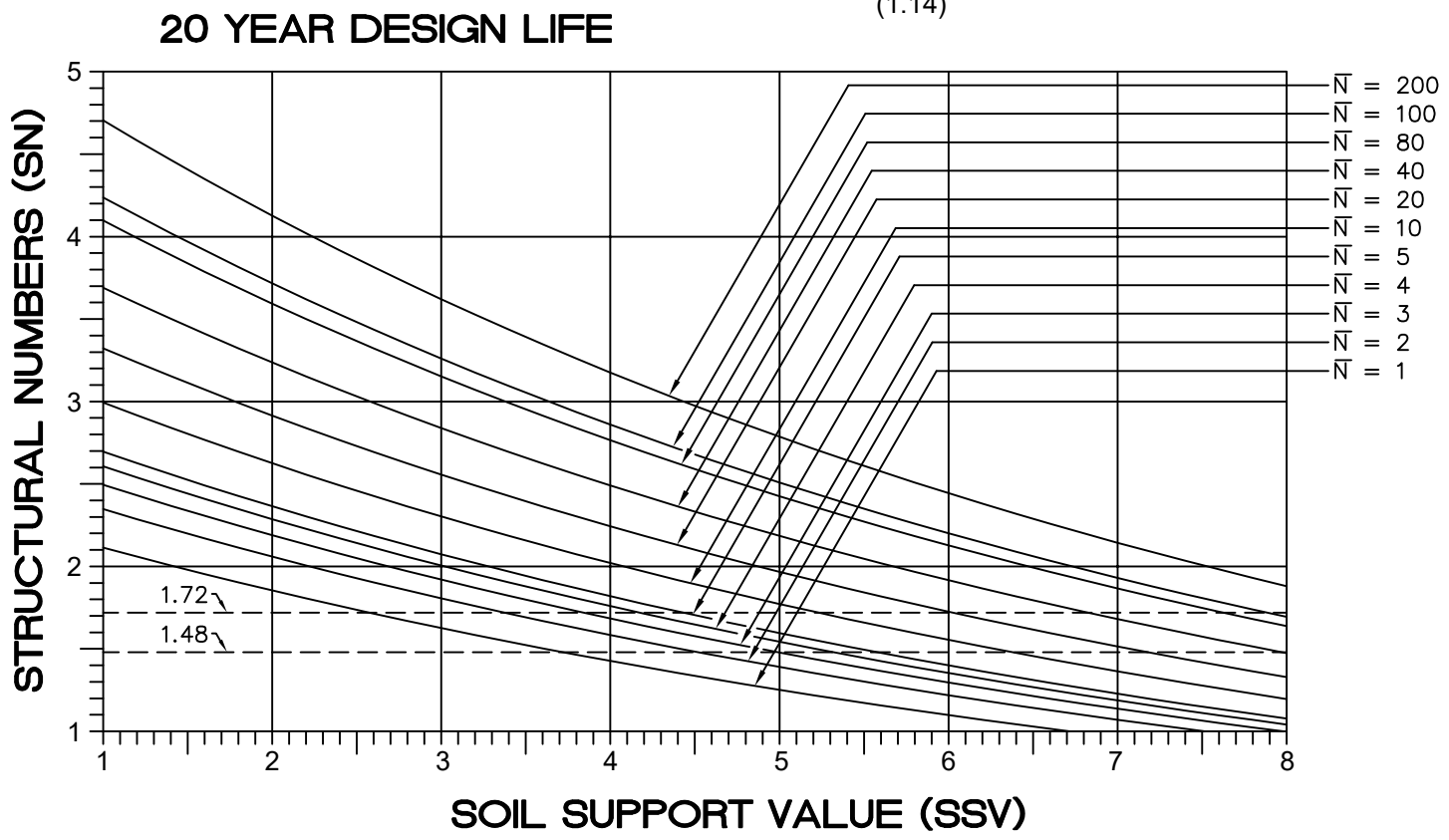
STRUCTURAL COEFFICIENTS

PAVEMENT LAYER	TYPE OF MATERIAL	STRUCTURAL COEFFICIENT PER INCH OF THICKNESS
SURFACE COURSES	SAND ASPHALT	0.40
	BITUMINOUS CONCRETE S9.5X	0.44
	BITUMINOUS SURFACE TREATMENT	0.20 *
BINDER COURSE	BITUMINOUS CONCRETE I19.0X	0.44
BASE COURSES	SOIL TYPE BASE COURSE	0.10
	COURSE AGGREGATE BASE COURSE	0.14
	BITUMINOUS CONCRETE B25.0X	0.30
	SAND ASPHALT	0.30

* USE AS SHOWN. DO NOT MULTIPLY BY THICKNESS.

*NO SN BELOW 2.0 SHOULD BE USED.

$$SN = \frac{2.41\,(\overline{N})^{0.151}}{(1.14)^{SSV}}$$



ENGINEERING DEPARTMENT
Greenville, North Carolina 27834

CITY OF GREENVILLE, N.C.

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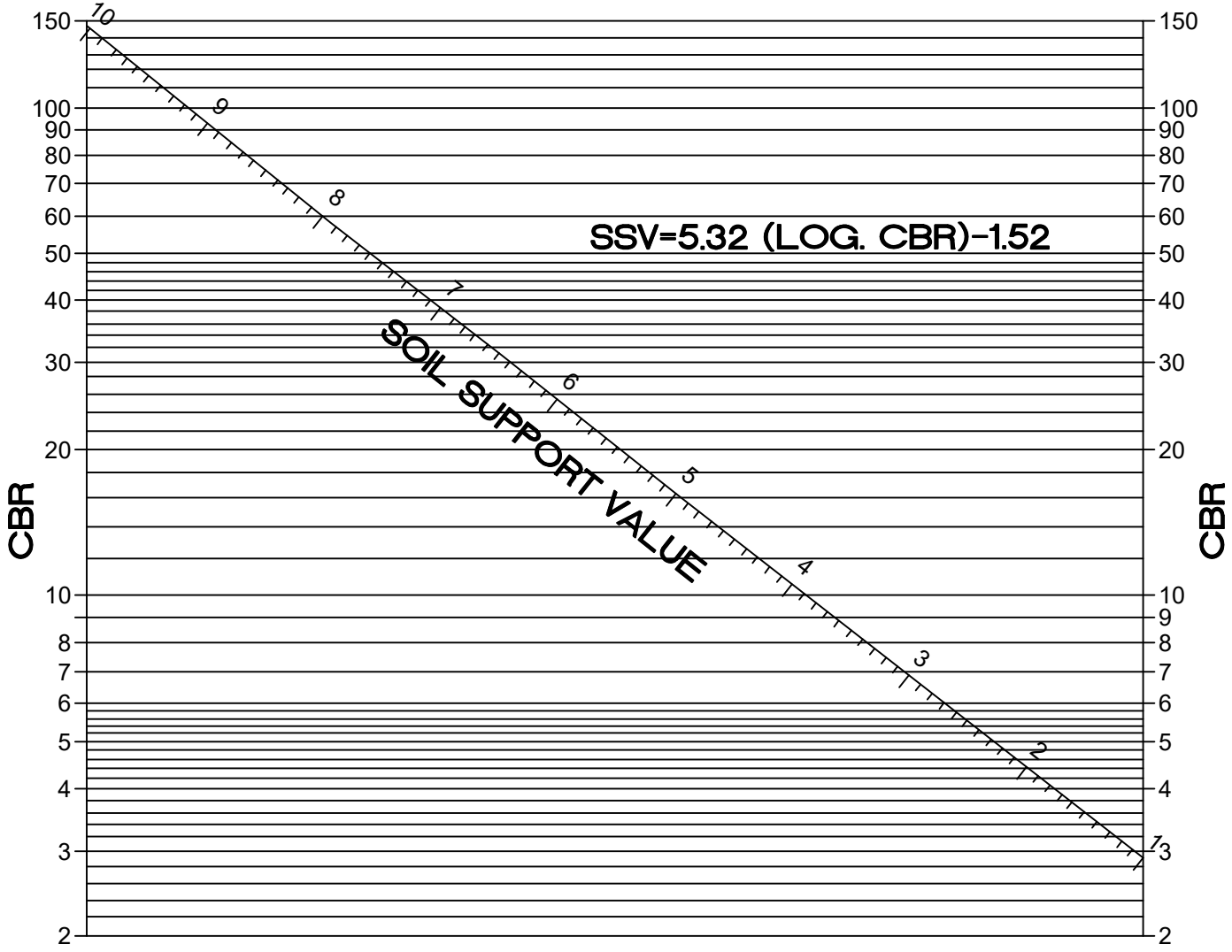
Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

STREET SECTION DESIGN

Scale:	Sheet #:	Detail #
not to scale	1 of 1	**492.01**



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STREET SECTION DESIGN

Scale: not to scale

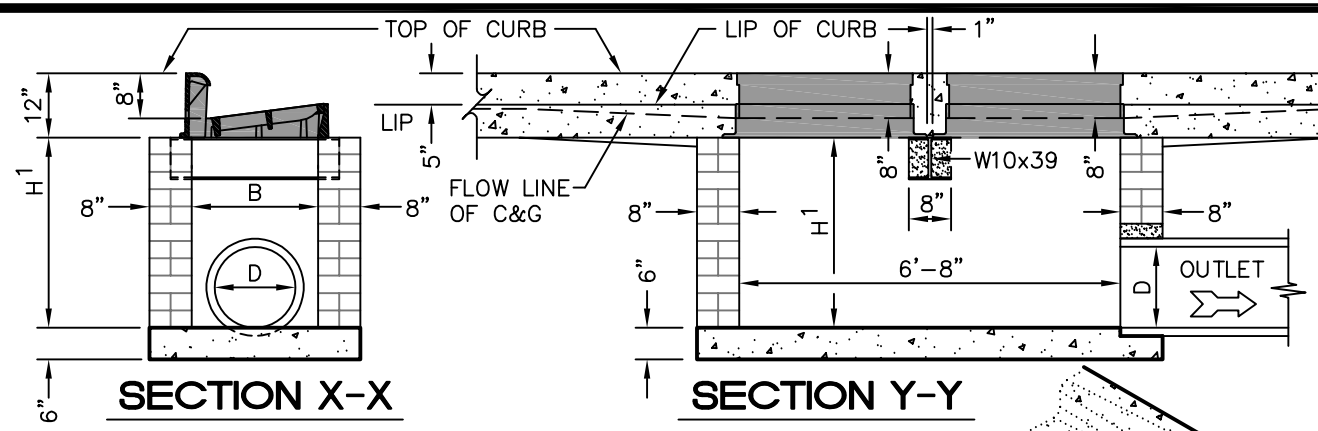
Sheet #: 1 of 1

Detail # **492.02**

TABLE OF DETAILS

CATCH BASIN, DROP INLET, MANHOLE, & JUNCTION BOX STANDARD NOTES

1. All structures shall be constructed in accordance with the City of Greenville MSDD and all appropriate NCDOT Standards, including but not limited to the NCDOT Standard Roadway Drawings (latest edition) and the NCDOT Standard Specifications for Roads and Structures (latest edition). Concrete testing in accordance with NCDOT Specifications is required for all structural concrete installed within the right of way. This includes but is not limited to cast in place box culverts and top slabs for catch basins and junction boxes. Testing for top slabs on catch basins that do not extend beneath the roadway are exempt from the testing requirement.
2. All precast drainage structures to be located within the public right of way shall be stamped with the NCDOT approval stamp as specified in Section 1077 of the NCDOT Standard Specifications for Roads and Structures.
3. Oversized structures not depicted in NCDOT Standard Roadway Drawings shall be designed by Professional Engineer.
4. All castings shall be manufactured in the USA and indicated as such on the casting. Catch basin hoods shall be stamped "FLOWS TO RIVER".
5. Roll type catch basins will not be allowed.
6. Pipe penetrations into precast drainage structures shall be sealed on both the inside and outside of the structure. The annular opening shall be grouted the full 360 degrees of the pipe diameter using a combination of concrete or masonry block and Type M mortar. Mortar shall be struck flush with wall face and have a broomed finish. The pipe penetration shall be inspected prior to backfilling.

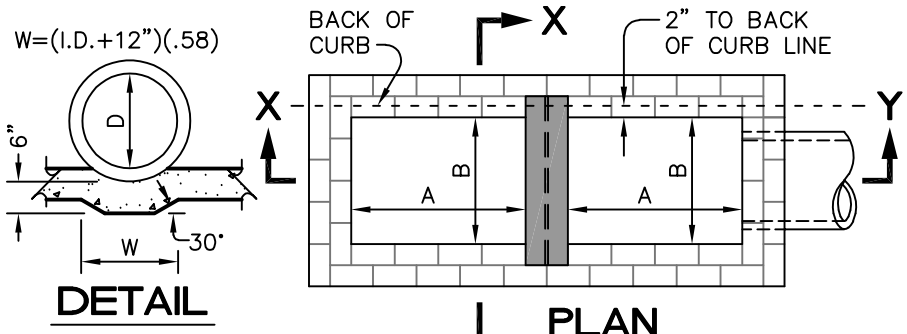


SECTION X-X

SECTION Y-Y

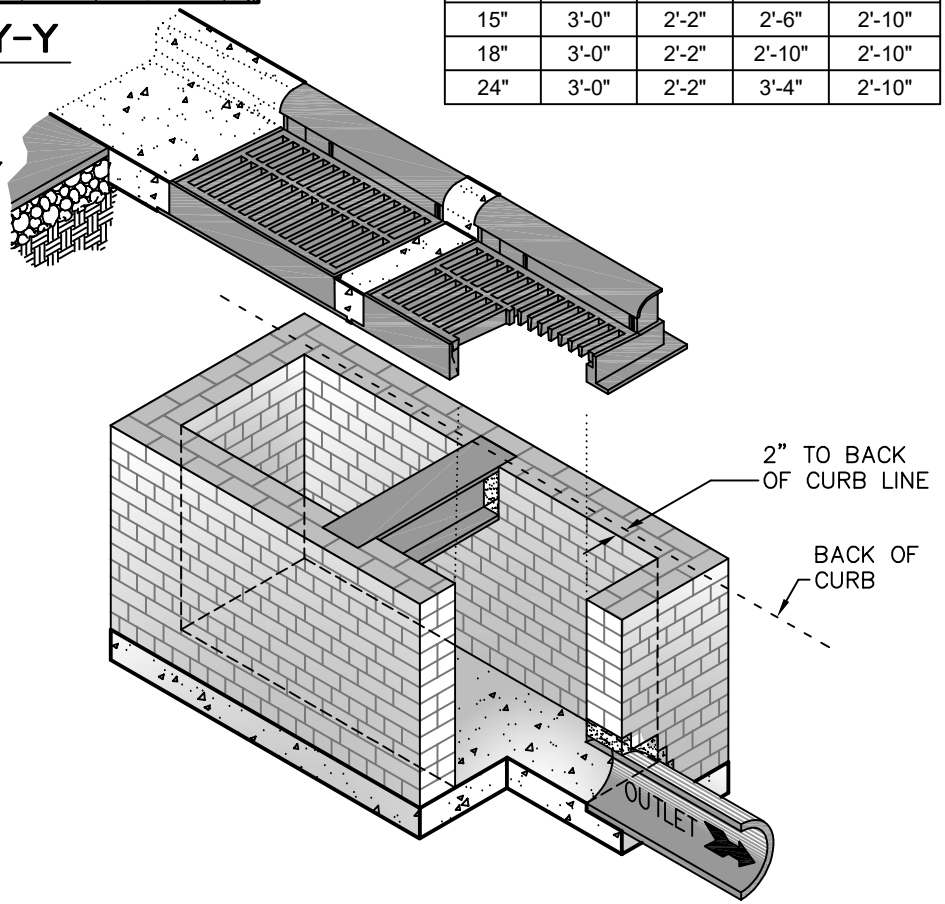
DIMENSIONS OF BOX AND PIPE

PIPE	SPAN	WIDTH	HEIGHT	W 10
D	A	B	MIN. H [1]	LENGTH
15"	3'-0"	2'-2"	2'-6"	2'-10"
18"	3'-0"	2'-2"	2'-10"	2'-10"
24"	3'-0"	2'-2"	3'-4"	2'-10"



DETAIL

PLAN



NOTES:

1. See Std. detail No. 610.01 for standard notes.

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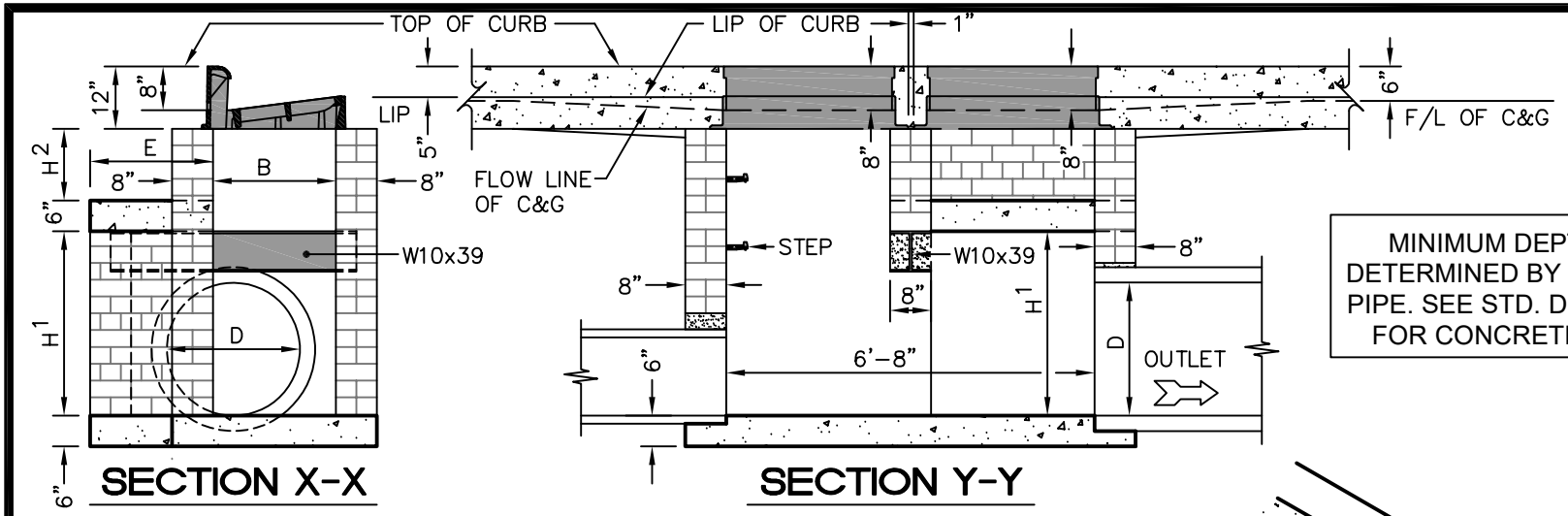
STANDARD BRICK DOUBLE CATCH BASIN (15" THRU 24" PIPE)

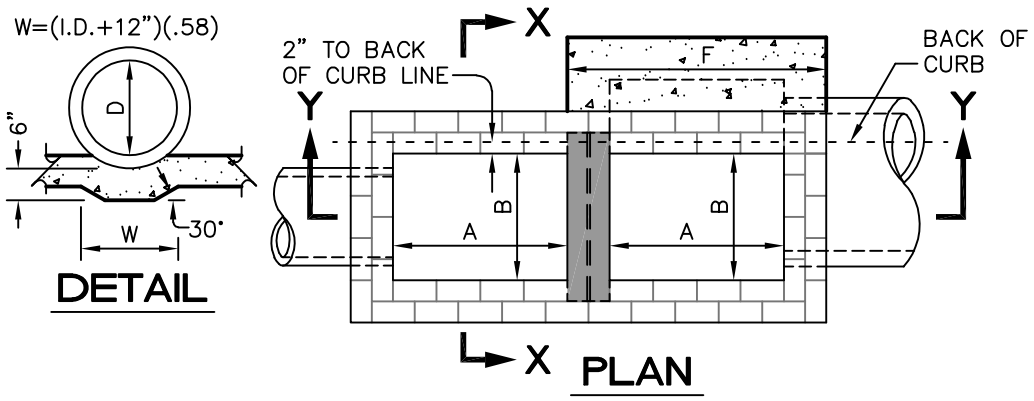
Scale: not to scale

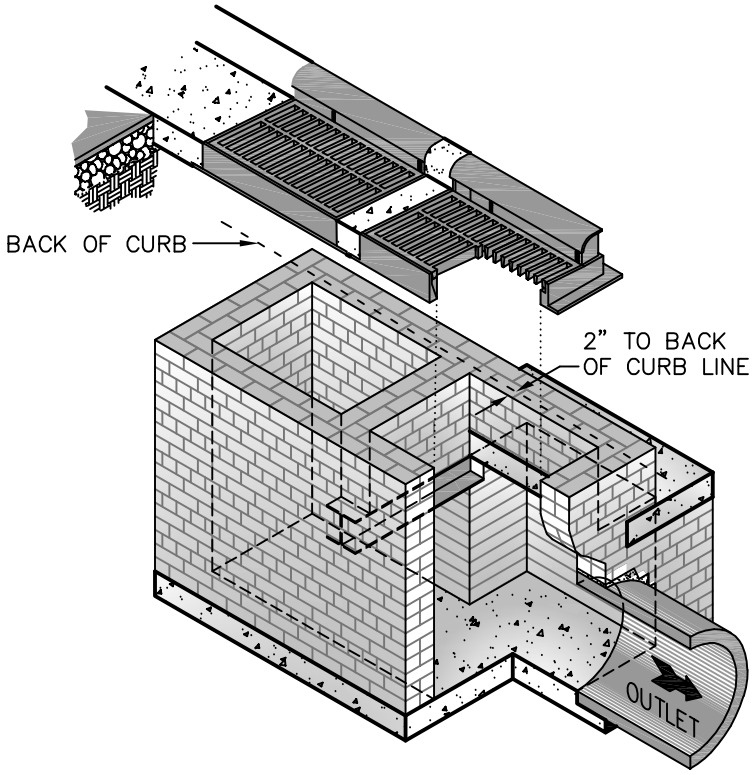
Sheet #: 1 of 1

Detail # **610.02**



MINIMUM DEPTH (H^1) TO BE DETERMINED BY SIZE OF OUTLET PIPE. SEE STD. DETAIL NO. 610.02 FOR CONCRETE SLAB DETAIL





NOTES:

1. See sheet 2 of 2 for dimensions.
2. See Std. detail No. 610.01 for standard notes.

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Rev.	Date	Description	Approved
1	9/1/23	APPROVAL	L. KIRBY

STANDARD BRICK DOUBLE CATCH BASIN (30" THRU 36" PIPE)

Scale:	Sheet #:	Detail #
not to scale	1 of 2	610.03

DIMENSIONS OF BOX AND PIPE

15" THRU 24" PIPE				
PIPE	SPAN	WIDTH	HEIGHT	W 10
D	A	B	MIN. H [1]	LENGTH
15"	3'-0"	2'-2"	2'-6"	2'-10"
18"	3'-0"	2'-2"	2'-10"	2'-10"
24"	3'-0"	2'-2"	3'-4"	2'-10"

DIMENSIONS OF BOX AND PIPE

30" THRU 36" PIPE

DIMENSIONS OF BOX & PIPE							COVER DIMENSIONS		REINFORCEMENT						
									BARS-U		BARS-V		BARS-W		TOTAL
PIPE	SPAN	WIDTH	WIDTH	HEIGHT	HEIGHT	W 10									
D	A	B	C	MIN. H [1]	H [2]	LENGTH	E	F	Qty.	LENGTH	Qty.	LENGTH	Qty.	LENGTH	LBS.
30"	3'-0"	2'-2"	3'-4"	3'-2"	VAR.	4'-0"	1'-10"	4'-4"	4	1'-6"	3	4'-1"	3	4'-1"	45
36"	3'-0"	2'-2"	3'-10"	3'-8"	VAR.	4'-6"	2'-4"	4'-4"	4	2'-0"	4	4'-1"	3	4'-1"	49

TABLE OF DETAILS

STORM DRAINAGE DESIGN REQUIREMENTS

In order that the Engineering Department may adequately review preliminary plats, construction plans, and stormwater management plans, the following items should be indicated or accounted for on all plans submitted for approval:

D-1 All storm drainage facilities shall comply with the requirements as stated in the Stormwater Management Program for the City of Greenville and the North Carolina Division of Water Quality Stormwater Best Management Practices Manual.

D-2 Storm drainage pipes to be designed for a 10-year storm (post development), catch basins to be designed for a 2-year storm (post development). Use NOAA ATLAS 14 Precipitation Data and assume time of concentration equals duration.

D-3 Minimum storm drainage pipe size is 15 inches.

D-4 Double Basins are permitted.

D-5 Minimum allowable velocity is 2.5 feet per second. Maximum velocity is 10 feet per second within a system. Exiting velocities shall be in conformance with the Sedimentation and Erosion Control Ordinance of the City of Greenville or the latest version thereof.

D-6 Drainage pipes which are located parallel or near parallel to public streets shall be contained within street rights-of-way. If this is not possible, dedicated storm drainage easements shall be required as defined on Std. detail 681.01.

D-7 In cases where two ditches intersect at perpendicular or obtuse angles, erosion control measures must be indicated.

D-8 Headwalls or flared end sections will be required at the influent and effluent of all pipe systems. Headwalls shall be constructed in accordance with the NCDOT Standard Roadway Drawings (latest edition).

D-9 Indicate all ditch sections with centerline elevations at least every 50' and cross sections if there is a significant change in the profile.

D-10 Indicate topography, ditches, pipes, swales, and drainage easements which are adjacent to the proposed project.

D-11 Catch basins shall be placed such that the maximum depth of flow in the curb and gutter for all streets shall not exceed 6" for standard curb and gutter and 4" for roll type curb and gutter.

D-12 With all storm drainage designs, the following design data must be submitted for each run of pipe.

a. Area drained (incremental and total)
b. Design storm intensity adjusted for duration
c. Design flow
d. Coefficient of runoff
e. Grade of pipe
f. Type of pipe and N value
g. Size of pipe
h. Velocity of flow
i. Maximum capacity
j. Hydraulic grade line

D-13 Not more than one acre may drain in the street at a single concentrated point unless calculations are submitted and approved by the City Engineer which verify that the maximum depth of flow in the curb and gutter is not exceeded.

D-14 The minimum grade for any storm drainage pipe shall be 0.3%. In the event that this requirement cannot be met, the City Engineer may approve an alternate provided the minimum velocity of 2.5 ft/sec is met.

D-15 Any storm drainage system to be city-maintained shall be CCTV inspected per the "Process for Camera Inspection before paving."

D-16 Any storm drainage system to be city-maintained shall have “Record Drawings” submitted and approved prior to scheduling a pre-final street acceptance inspection. All “Record Drawings' for storm drainage infrastructure shall include, but is not necessarily limited to, the information as identified in the *Street and Storm Drainage “Record Drawings” Submittal Requirements.*

D-17 Maximum distance between manholes/boxes shall be 300'.

D-18 If the tailwater elevation is unknown use the pipe invert elevation plus 80% of the pipe diameter. If routing of stormwater management facilities shows that the tailwater elevation is less than the invert plus 80% of the pipe diameter for the ten year storm then use elevation of the ten year storm from routing calculations.

REQUIREMENTS FOR INSTALLATION OF REINFORCED CONCRETE PIPE

1. Reinforced Concrete pipe shall meet the requirements of AASHTO M 170 (latest revision). All pipe installed within the street right-of-way shall be Class III or higher. Minimum and maximum fill heights for pipes within the right of way shall be in accordance with the NCDOT Roadway Standard Drawings (Sheet 300.01). Minimum cover for pipes outside the right of way shall be 0.5 feet or as recommended by the manufacturer, whichever is more restrictive.
2. A flexible plastic joint material shall be applied on the spigot end of the pipe. Joints shall be pushed together until the pipe is completely homed. Joints shall be wrapped with a non-woven geotextile fabric (silt fence is acceptable), extending a minimum of 12” beyond either side of the connection.
3. A manning's roughness coefficient of 0.013 (“n” factor) shall be used in the design of reinforced concrete drainage systems.
4. Backfill shall be a NCDOT Class II or better.
5. In areas where high groundwater exists, joints shall meet ASTM C443.
6. All pipes shall be designed to meet a minimum H-20 load condition.
7. Minimum of 4" of stone bedding (#57) required for pipes larger than 48" diameter.

REQUIREMENTS FOR INSTALLATION OF CORRUGATED ALUMINUM PIPE

1. Corrugated Aluminum pipe shall meet the requirements of AASHTO M196 (latest revision) Coupling bands shall be used at all joints and shall be of a size specified by the manufacturer in accordance with the pipe design. Bands shall conform to AASHTO Designation M196. Bands to be of Hugger-Type or approved equal.
2. Pipe installation shall be per NCDOT recommended practices.
3. A manning's roughness coefficient of 0.024 (“n” factor) shall be used in the design of corrugated metal pipe drainage systems.
4. In areas where high groundwater exists, joints shall meet performance expectations found in ASTM C443.
5. All pipes shall be designed to meet a minimum H-20 load condition.
6. Corrugated aluminum pipe shall only be approved for use on a case by case basis by the City Engineer.

REQUIREMENTS FOR INSTALLATION OF CORRUGATED HIGH DENSITY POLYETHYLENE PIPE

1. Corrugated High Density Polyethylene pipe shall meet the requirements of AASHTO M294.
2. Joints shall be bell and spigot with a rubber gasket meeting ASTM F477.
3. A manning's roughness coefficient of 0.012 (“n” factor) shall be used in the design of corrugated High Density Polyethylene pipe.
4. Pipe installation shall be per NCDOT recommended practices. Minimum and maximum fill heights for pipes within the right of way shall be in accordance with the NCDOT Roadway Standard Drawings (Sheet 300.01). Minimum cover for pipes outside the right of way shall be 12" or as recommended by the manufacturer, whichever is more restrictive.
5. Pipe backfill shall be NCDOT Class II or better.
6. In areas where high groundwater exists, joints shall meet or exceed leakage rate found in ASTM C443.
7. All pipes shall be designed to meet a minimum H-20 load condition.
8. Maximum allowable pipe deflection is 5%. Contractor shall verify deflection is within tolerance by pulling a mandrel as requested by City Engineer.
9. High Density Polyethylene pipe is not allowed within the right of way.

REQUIREMENTS FOR INSTALLATION OF POLYPROPYLENE PIPE

1. Polypropylene pipe shall meet the requirements of ASTM F2736 OR ASTM F2764.
2. Joints shall be bell and spigot with a gasket meeting the requirements of ASTM F477.
3. A manning's roughness coefficient of 0.012 (“n”) shall be used in the design of Polypropylene pipe.
4. Pipe installation shall be per NCDOT recommended practices. Minimum and maximum fill heights for pipes within the right of way shall be in accordance with the NCDOT Roadway Standard Drawings (Sheet 300.01). Minimum cover for pipes outside the right of way shall be 12" or as recommended by the manufacturer, whichever is more restrictive.
5. Pipe backfill shall be NCDOT Class II or better.
6. In areas where high ground water exists, joints shall meet or exceed leakage rate found in ASTM C443.
7. All pipes shall be designed to meet a minimum H-20 load condition.
8. Maximum allowable pipe deflection is 5%. Contractor shall verify deflection is within tolerance by pulling a mandrel as requested by City Engineer.

COMPACTION AND BACKFILL

Backfill type and compaction for reinforced concrete, corrugated high density polyethylene, and corrugated high density polypropylene pipe shall be in accordance with NCDOT Standard Specifications for Roads and Structures and manufacturers recommendations.

STORM WATER DESIGN CALCULATIONS

RUNOFF DETERMINATION

There are two acceptable methods: (1) Rational Method (good for areas less than 20 acres and minor design systems) and (2) Soil Conservation Service Method using Curve Numbers.

CULVERT DESIGN

DESIGN PROCEDURE:

Culvert design shall be in accordance with the NCDOT Guidelines for Drainage Studies and Hydraulic Design, latest edition. All streets shall be designed to accommodate the design storm in the table below with a minimum freeboard of 12" to the lowest portion of the street or a maximum headwater depth of 1.2 times the open height of the culvert, whichever is lower.

DESIGN STORM	
STREET CLASSIFICATION	**DESIGN STORM FREQUENCY**
RESIDENTIAL	10 YEARS
COLLECTOR	10 YEARS
PLANNED INDUSTRIAL	25 YEARS
MINOR THOROUGHFARE	25 YEARS
MAJOR THOROUGHFARE	50 YEARS

CATCH BASIN DESIGN DATA

With all catch basin layout designs, the following design data must be submitted for each basin at a minimum. Computer software for catch basin spacing design is acceptable.

a. Inlet #

b. Drainage area

c. Surface Q (Sub area and total including bypass flow)

d. Longitudinal and transverse street grade

e. K value

f. Inlet capacity

g. Flow depth

h. Bypass flow

PIPE SYSTEM DESIGN

Pipes within the system shall be designed to carry a 10-year storm (post development). The sizing of these pipes shall be based on the Manning Equation. It should be noted that the velocities for the pipes shall be maintained between 2.5 feet per second and 10 feet per second. In addition, points of discharge should be treated in such a manner to conform with the State and local ordinances on velocity controls. This design is based on the sum of the individual areas served by the catch basins and not the sum of the capacities of each basin. A Storm Drainage Design Data Sheet with the information listed on Note D-12 in the Storm Drainage Design Requirements should be completed and submitted with each plan.

Hydraulic grade line calculations shall also be completed for all proposed public pipe systems. The hydraulic grade line shall not exceed the top of grate elevation on any catch basin (6" below top of curb) or other inlet including yard inlets on residential lots.

GENERAL NOTES:

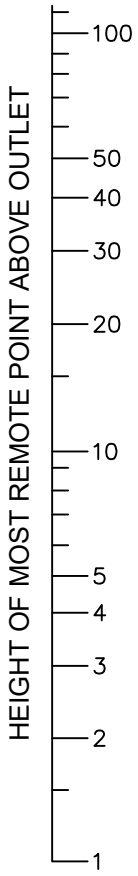
1. FOR OPEN CHANNELS THE MINIMUM EASEMENT MUST CONTAIN THE WIDTH OF THE CHANNEL FROM TOP OF BANK TO TOP BANK PLUS (+) 15' ON EACH SIDE OF CHANNEL.
2. WIDER EASEMENT WIDTHS REQUIRED FOR PIPE DEPTHS GREATER THAN SIX FEET. SEE TABLE BELOW. DEPTH MEASURED TO INVERT OF PIPE.
3. PIPE SYSTEMS AND OPEN CHANNELS ON PRIVATE PROPERTY CONVEYING STORMWATER FROM MULTIPLE PROPERTIES SHALL BE PLACED IN A STORM DRAINAGE EASEMENT.

Minimum Easement Requirements for Storm Drain Pipe

Pipe Size	Easement Requirement
15"	20'
18"	20'
24"	20'
30"	20'
36"	20'
42"	25'
48"	25'
54"+	30' MIN. (VARIES)

Additional Easement Width Requirements by Depth of Pipe

Depth	Add'l Easement Required
0'-6'	0'
6'-8'	5'
8'-10'	10'
Over 10'	15'



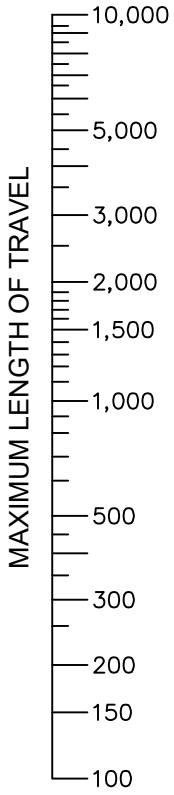
Use nomograph T_C for natural basins with well defined channels for overland flow on bare earth, and for mowed grass roadside channels.

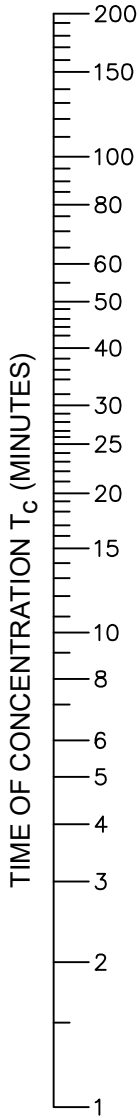
For overland flow, grassed surfaces, multiply T_C by 2.

For overland flow, concrete or asphalt surfaces, multiply T_C by 0.4

For concrete channels, multiply T_C by 0.2

$$T_C = \frac{\left(\frac{L^3}{H}\right)^{0.385}}{128}$$





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CITY OF GREENVILLE, N.C.

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TIME OF CONCENTRATION

Scale: not to scale

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Detail # **682.01**

RUNOFF COEFFICIENTS

LAWNS:	(1) SANDY SOILS	FLAT	<2%	0.10
		AVERAGE	2% - 7%	0.15
		STEEP	>7%	0.20
	(2) HEAVY SOILS	FLAT	<2%	0.15
		AVERAGE	2% - 7%	0.20
		STEEP	>7%	0.30
WOODS, CEMETERIES, PARKS:				0.20
UNIMPROVED AREAS (PASTURE, CROP, ETC.):				0.25
PLAYGROUNDS:				0.30
RESIDENTIAL:	(1) APARTMENTS AND TOWNHOUSES			0.70
	(2) LOT SIZE <1/4 ACRE (R-6, R-9)			0.60
	(3) LOT SIZE <1/3 ACRE (R-15)			0.55
	(4) LOT SIZE <1/2 ACRE (R-20)			0.50
	(5) LOT SIZE <1.0 ACRE			0.40
	(6) LOT SIZE >1.0 ACRE			0.35
INDUSTRIAL:	(1) LIGHT			0.70
	(2) HEAVY			0.80
COMMERCIAL:	(1) DOWNTOWN, STRIP, MALL, PAVEMENT AREAS			0.95
	(2) CENTER			0.90
	(3) NEIGHBORHOOD			0.85
ROOF:				0.95
PAVEMENT:	(1) ASPHALT OR CONCRETE			0.90
	(2) BRICK			0.80
GRAVEL:				0.40

CAPACITY OF BASIN =

$$Q = K D^{5/3}$$

WHERE:

Q= C.F.S.

D= DEPTH OF GUTTER FLOW IN FEET

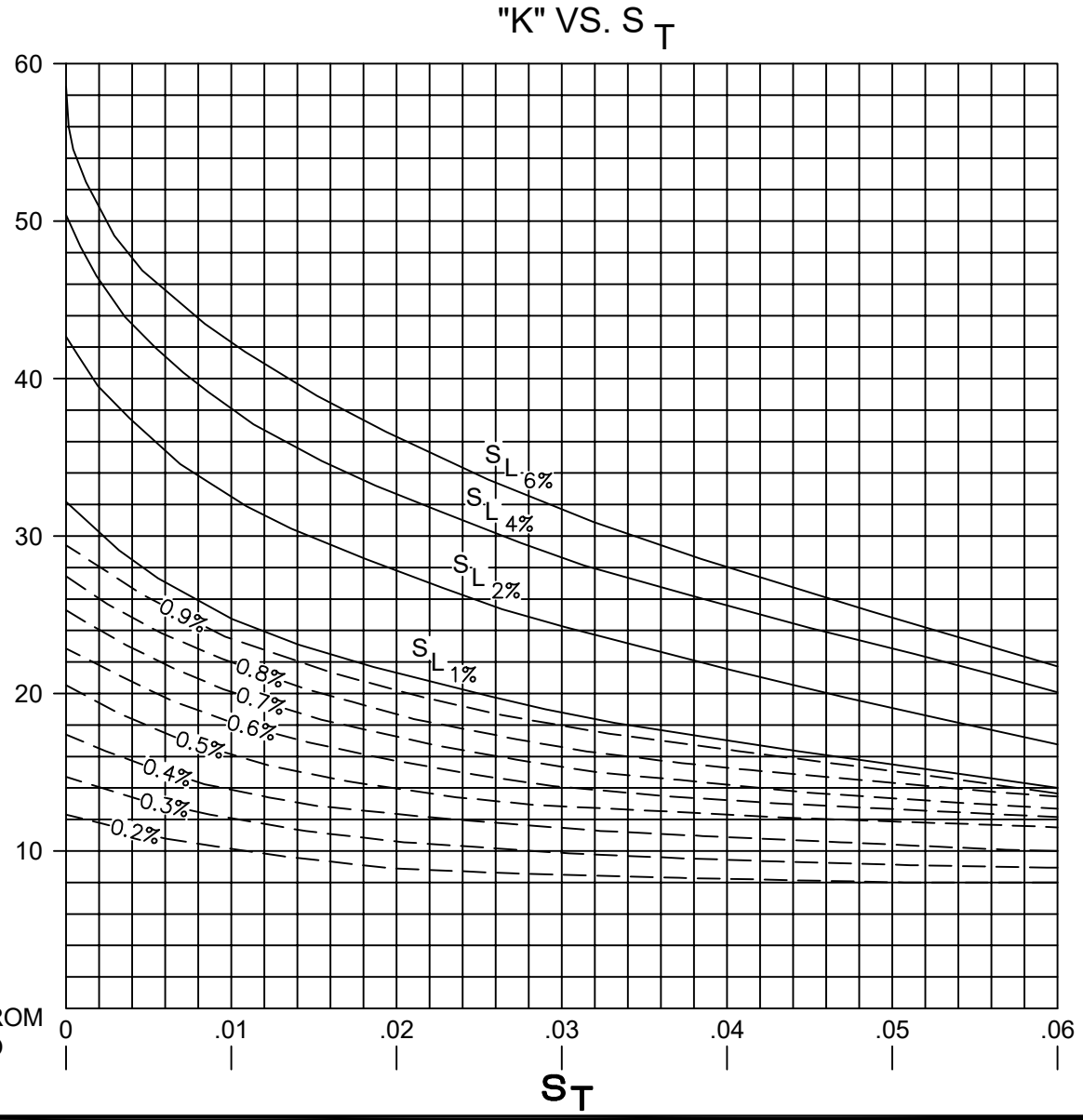
S_L = LONGITUDINAL GUTTER SLOPE

S_T = TRANSVERSE STREET SLOPE

K = GRATE INLET COEFFICIENT

— — — INDICATES INTERPOLATED VALUES

S_T = VERTICAL DISTANCE FROM CROWN TO GUTTER LINE DIVIDED BY DISTANCE FROM CREST OF ROADWAY (USUALLY C/L) TO GUTTER LINE.



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STANDARD CATCH BASIN INLET CAPACITY

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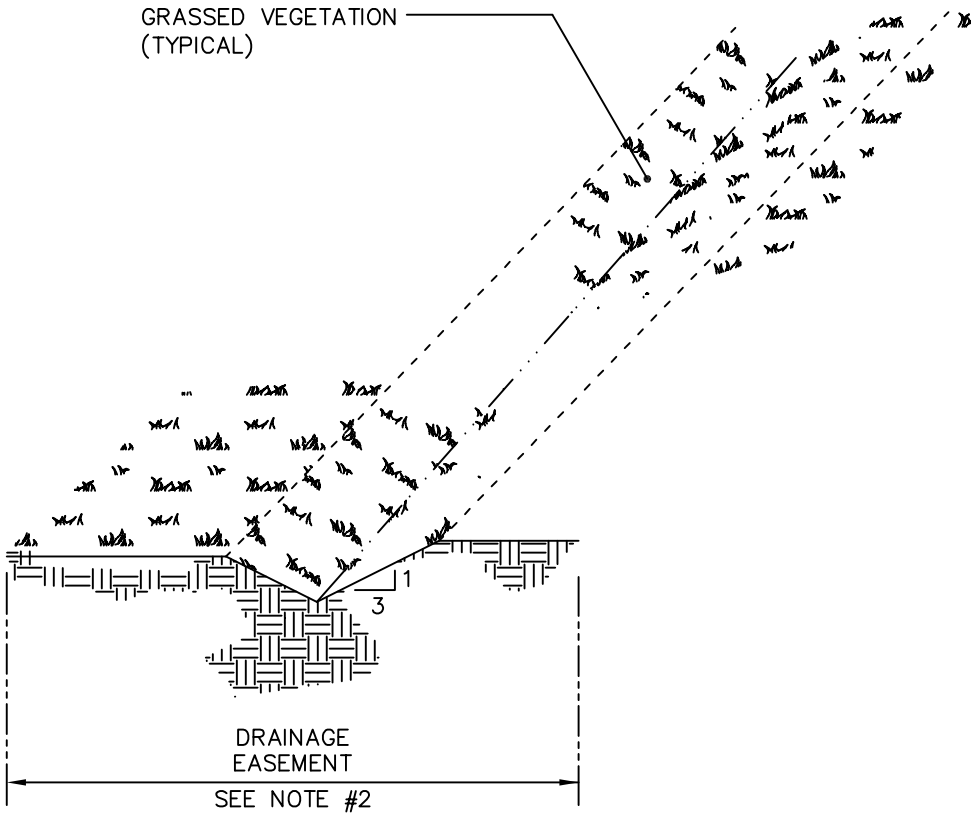
Sheet #: 1 of 1

Detail # **682.03**

COEFFICIENT OF ENTRANCE LOSS, "ke"

TYPE OF STRUCTURE AND DESIGN OF ENTRANCE	COEFFICIENT Ke:
PIPE, CONCRETE	
Projecting from fill	0.5
Headwall or headwall and wingwalls	0.5
Mitered to conform to fillslope	0.7
PIPE OR PIPE-ARCH, CORRUGATED METAL	
Projecting (no headwall)	0.9
Headwall or headwall and wingwalls	0.5
Mitered to conform to fillslope	0.7
BOX REINFORCED CONCRETE	
Headwall	0.5
Wingwall at 30 degrees to 75 degrees to barrel	0.4
Wingwalls at 10 degrees to 25 degrees to barrel	0.5



TYPICAL CROSS SECTION

NOTES:

1. Drainage swales shall be grassed.
2. Drainage easement shall be minimum 5' from top of bank on each side of swale.
3. Maximum depth of swale is 36".
4. Side slopes shall be no steeper than 3:1 (horizontal to vertical). The conveyance shall be designed so that it does not erode during the peak flow from the 10-year storm as demonstrated by engineering calculations.
5. Swales shall not be utilized to convey public runoff.

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SWALE (CONVEYANCE)

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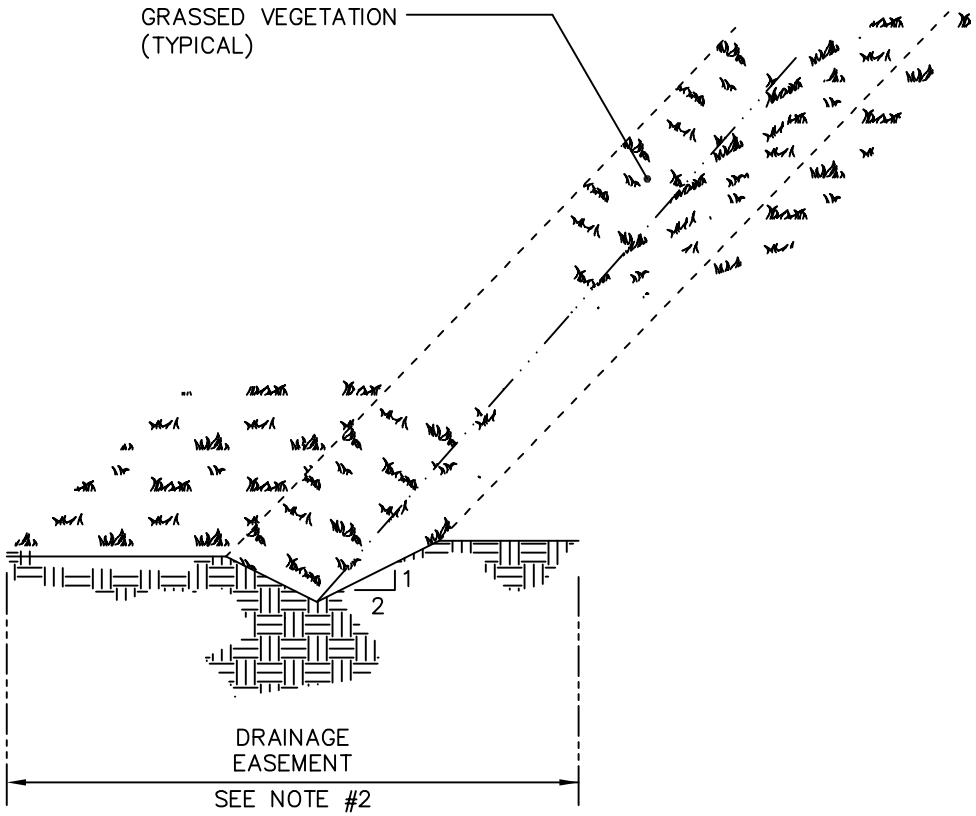

TYPICAL CROSS SECTION

NOTES:

1. Ditches shall be appropriately stabilized.
2. Drainage easement shall be minimum 15' from top of bank on each side of ditch.
3. Side slopes shall be no steeper than 2:1 (horizontal to vertical). Existing ditches with steeper side slopes may remain if it is demonstrated that the soils and vegetation will remain stable in perpetuity based on field investigation by City staff. Existing ditches to remain shall be required to provide positive flow.
4. The conveyance shall be designed so that it does not erode during the peak flow from the 10-year storm as demonstrated by engineering calculations.

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DITCH

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TABLE OF DETAILS

STORMWATER MANAGEMENT

DESIGN AND CONSTRUCTION CRITERIA

The following criteria will be used for the design and construction of all stormwater facilities within extraterritorial boundaries of the City of Greenville.

GENERAL:

- Design and installation of all stormwater impoundment facilities must comply with applicable Federal, State, and local laws. Attention should be given to the City of Greenville Soil Erosion and Sediment Ordinance and the North Carolina Dam Safety Law.
- In no case shall a habitable structure be located within the impoundment area of any stormwater storage facility. Impoundment areas for parking lot detention shall not encroach into any required parking stalls or ADA accessible routes, and the maximum allowable depth of storage for parking lot detention shall be 9".
- No utilities (sewer lines, power lines, water lines, etc.) shall be located within or immediately around any impoundment facility.
- All impoundment facilities will be considered permanent.
- All facilities shall be protected by a “Drainage Easement” or as a common lot recorded at Pitt County Register of Deeds office.

STORMWATER PLAN:

A stormwater plan acceptable by the City Engineer's standards will include the following:

I. Stormwater Management Plan

a. General

i. Vicinity Map

ii. Legend, North arrow and Scale

iii. Title Block with development name, owner, engineering firm, engineer's seal, and signature.

iv. Existing and proposed contours at not more than 2' intervals (including residential lots)

v. All published flood hazard boundaries identified

vi. Existing and proposed improvements (built upon area)

vii. Existing and proposed ground cover

b. Drainage

i. Existing and proposed drainage patterns and structures (SCM's, pipe systems, ditches/streams, lot grading, contours, etc.)

ii. Size, length, and grade of pipes and swales

iii. Drainage area map

iv. Soil types

c. Calculations

i. First Flush

ii. Attenuation in accordance with City of Greenville Stormwater Management and Control Ordinance

iii. Underdrain calculations (if necessary)

iv. Sizing of treatment area

v. Pipe/swale sizing calculations

d. Maintenance

i. SCM maintenance agreement

ii. Check to record agreement (Pitt County Register of Deeds)

iii. Maintenance Plan

iv. Adequate access to perform required maintenance

v. Easement (if required)

e. Erosion Control

i. Construction sequence

ii. Location of SCM erosion control measures (if necessary)

II. Stormwater Management Narrative

a. Description of project

b. Calculations of runoff (Utilizing NOAA ATLAS 14 Precipitation Data - latest edition)

c. Calculations for design of stormwater impoundment & facility.

d. Staging of project

e. Soil conditions

f. Soil type

g. Susceptibility to erosion and preventive measures

h. Seeding formula

NUTRIENT REDUCTIONS:

- All facilities constructed to achieve nutrient reductions shall meet all requirements specified in the North Carolina Department of Environmental Quality Stormwater Design Manual.

ATTENUATION:

- Various methods of which impoundment storage volume is approximated may be utilized; however, the result must at least equal that volume approximated using the method described within this manual.
- All required storage volume approximations must be included with the submitted design.

PRIMARY OUTLET DEVICE:

- All outlet devices must be constructed adhering to current construction standards as described in the City of Greenville's "Manual of Standard Designs and Details."
- Alternate outlet devices not referred to in this publication may be approved at the discretion of the City Engineer. Such approval must be specifically requested upon submittal of the drainage plan.
- The water velocity generated by any outlet device must meet the requirements set forth by the City of Greenville Soil Erosion and Sediment Control Ordinance.

SECONDARY OUTLET DEVICE (EMERGENCY SPILLWAY)

- It is recommended that all vegetated spillways be constructed in nonfilled or cut areas. However, emergency spillways may be constructed in fill areas provided they are asphalt or concrete lined and have sufficient approach and exit areas.
- Any emergency spillways as a minimum must pass the peak 25-year flood, as approved by the City Engineer, after the storage facility has reached its capacity.

FACILITY LIFE:

- All stormwater impoundments are to be permanent facilities.
- All materials used in the construction of a stormwater impoundment facility must have a life expectancy to that of the total facility or a regularly scheduled replacement program must be provided.

Determination of Impoundment Storage Volume

On-site detention involves the storage of stormwater runoff and the controlled release of that runoff and is applicable for all proposed sites required to meet the City of Greenville's Stormwater Management Program. See this program and any amendments for requirements. The excess runoff from the developed site must be less than or equal to the rate of stormwater runoff prior to the installation of the impervious cover for storms as noted in the City of Greenville's Stormwater Management and Control Ordinance. All impoundments will have an emergency device or "spillway" that will safely pass the 25-year storm, as approved by the City Engineer. The weir will be sized to carry the 25-year storm safely with an additional one foot of freeboard.

Flood routing is an algebraic method for determining the time and magnitude of a particular flood situation with regard to the rate of inflow storage versus the rate of outflow discharge. For the purpose of this manual, the routing procedure is based on the procedure described in the "Design Approaches of Stormwater Management in Urban Areas" by Dr. H. Rooney Malcolm, Jr. of N.C. State University.

Maximum Permissible Release Rate

The maximum release rate must be limited to that rate of runoff discharged from the site immediately prior to the proposed development during the applicable storms as listed in the City of Greenville's Stormwater Management and Control Ordinance. This rate can be calculated according to the Rational Method described in this manual, or another approved method. Pre and Post development runoff rates for a proposed development shall be calculated using the same methodology.

A group of hydrographs can be developed where the intensity is varied by using storms with different durations. The volume of runoff associated with each hydrograph is calculated by multiplying the maximum runoff rate with the respective storm duration (Note that runoff is measured in cubic feet per second and the duration is in minutes).

Once the hydrographs have been developed it is necessary to convert the maximum runoff rates for each rainfall to storm runoff volumes. These volumes should be computed in cubic feet.

This is only an approximation which is applicable to small basins. Many different methods may be used in the design of impoundment facilities and innovative designs will be considered by the City Engineer provided the maximum permissible release rate and storage facility requirements are met with a safety factor. In all cases, the design will be routed for confirmation.