Manual of Standard Designs and Details

The City of Greenville, NC
Public Works Department
1500 Beatty Street
Greenville, North Carolina 27834
www.greenvillenc.gov

Prepared by:

Appian Consulting Engineers, PA
Post Office Box 7966
154 Roundabout Court
Rocky Mount, NC 27804
Phone: 252.972.7703
www.appianengineers.com

Project Team:

City of Greenville

Wesley B. Anderson, Director of Public Works
Scott P.M. Godefroy, PE, City Engineer
Lisa Ann Kirby, PE, Senior Engineer
Tim Corley, PE, Civil Engineer II
James Lynn Raynor, PE, Civil Engineer II
Kinsey Holton, PE, Civil Engineer II
Amanda Braddy, Administrative Assistant

Appian Consulting Engineers, PA

Bobby L. Joyner, PE, Project/Team Leader and Author
Mike Gallina, CAD Supervisor
Tonya E. Nelms, Marketing and Business Development

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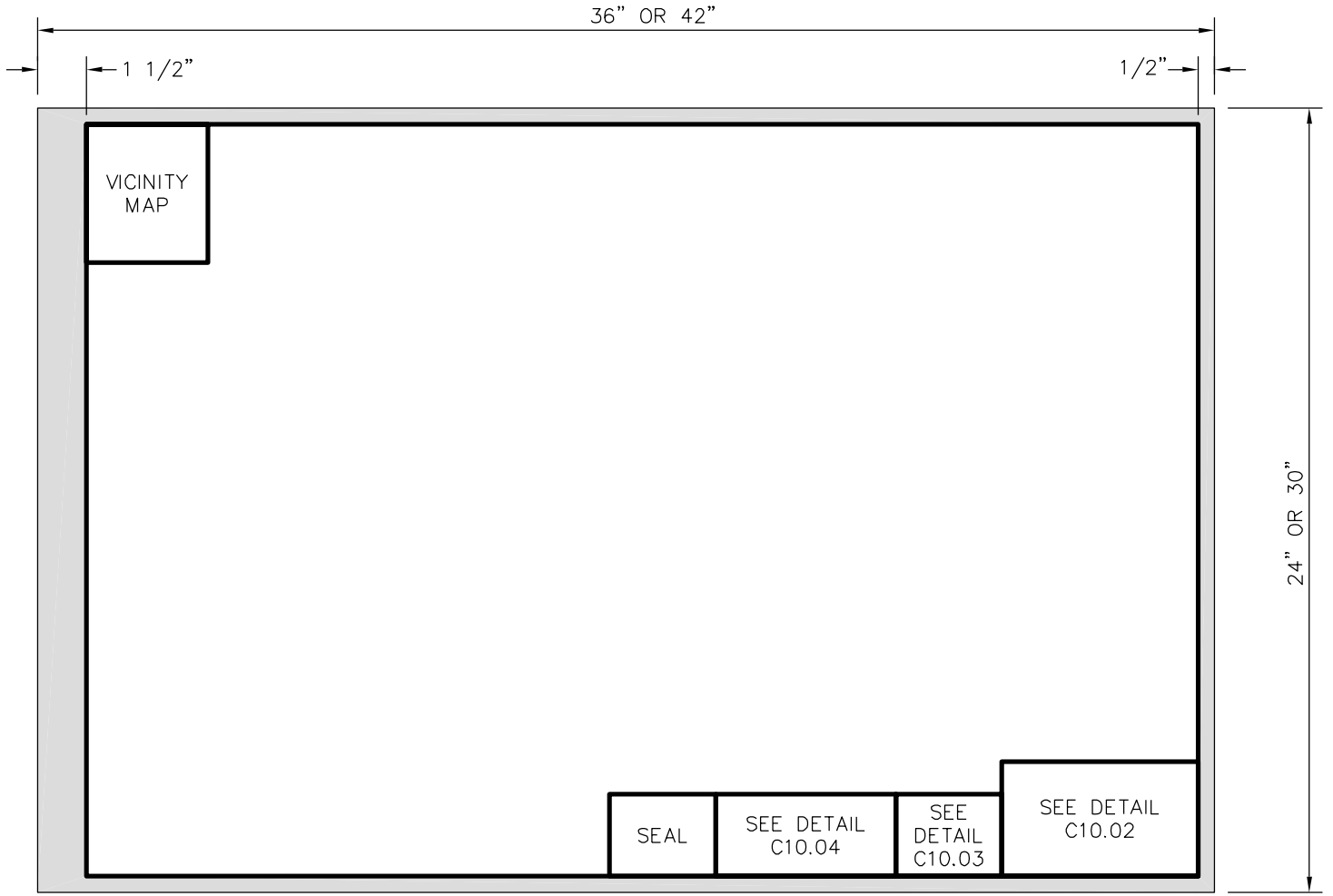

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CITY OF GREENVILLE, N.C.

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No.	Date	Description
1	9/16/11	APPROVAL

STANDARD PRELIMINARY PLAT LAYOUT

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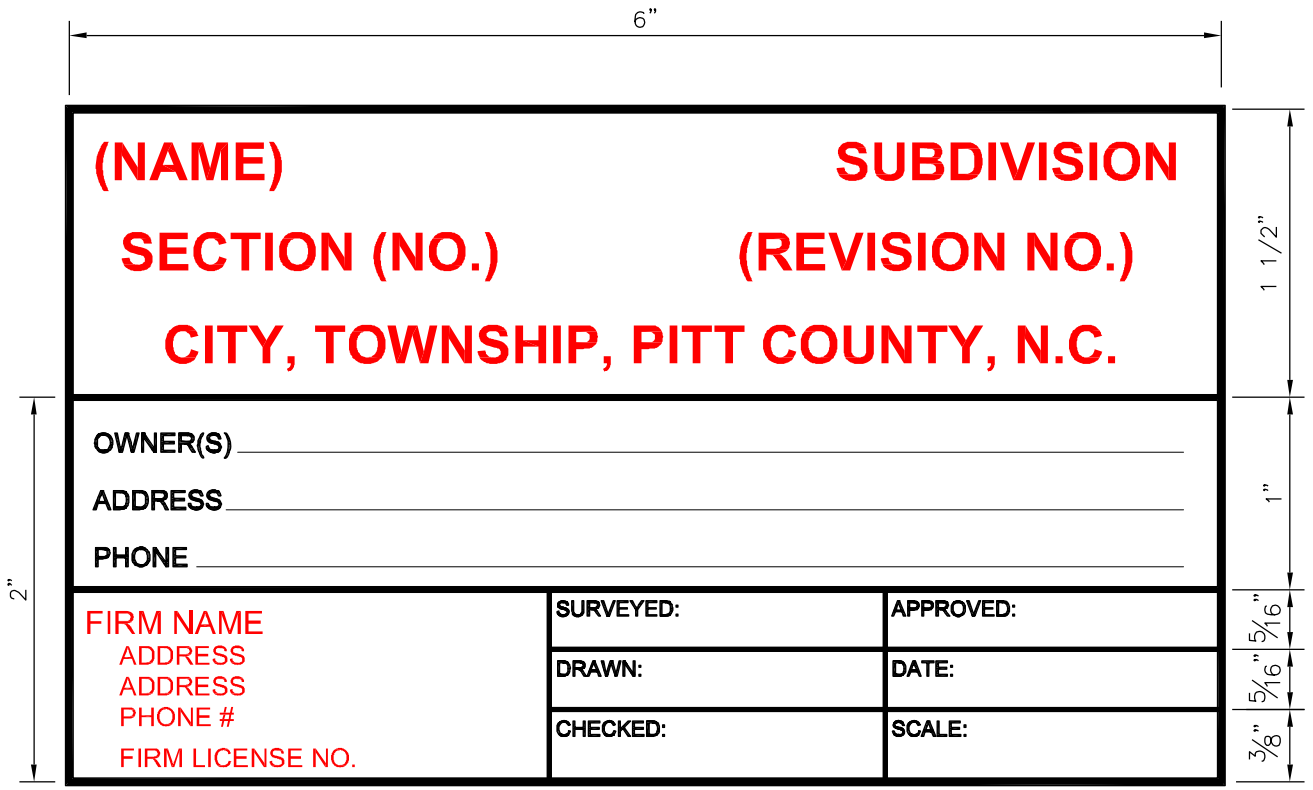

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STANDARD TITLE BLOCK FOR PRELIMINARY PLAT

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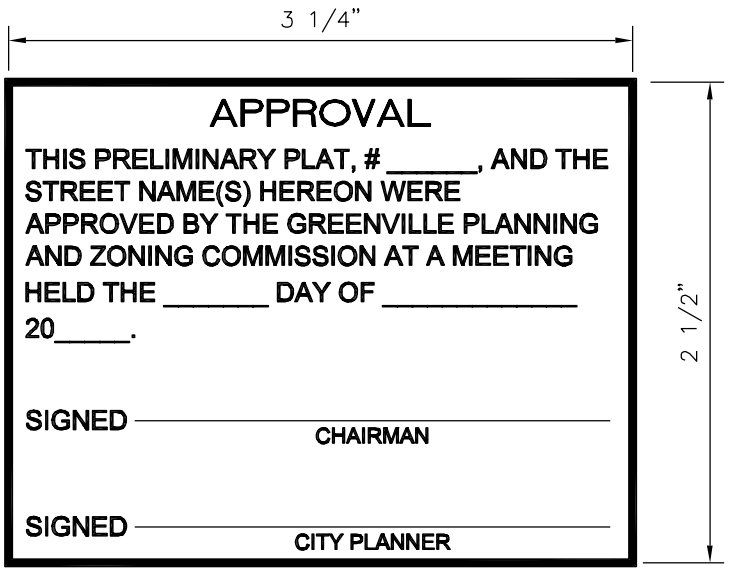

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STANDARD "APPROVALS" INFORMATION BLOCK

Scale: not to scale | Sheet #: 1 of 1 | Detail # C10.03

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"

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No.	Date	Description
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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 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+), 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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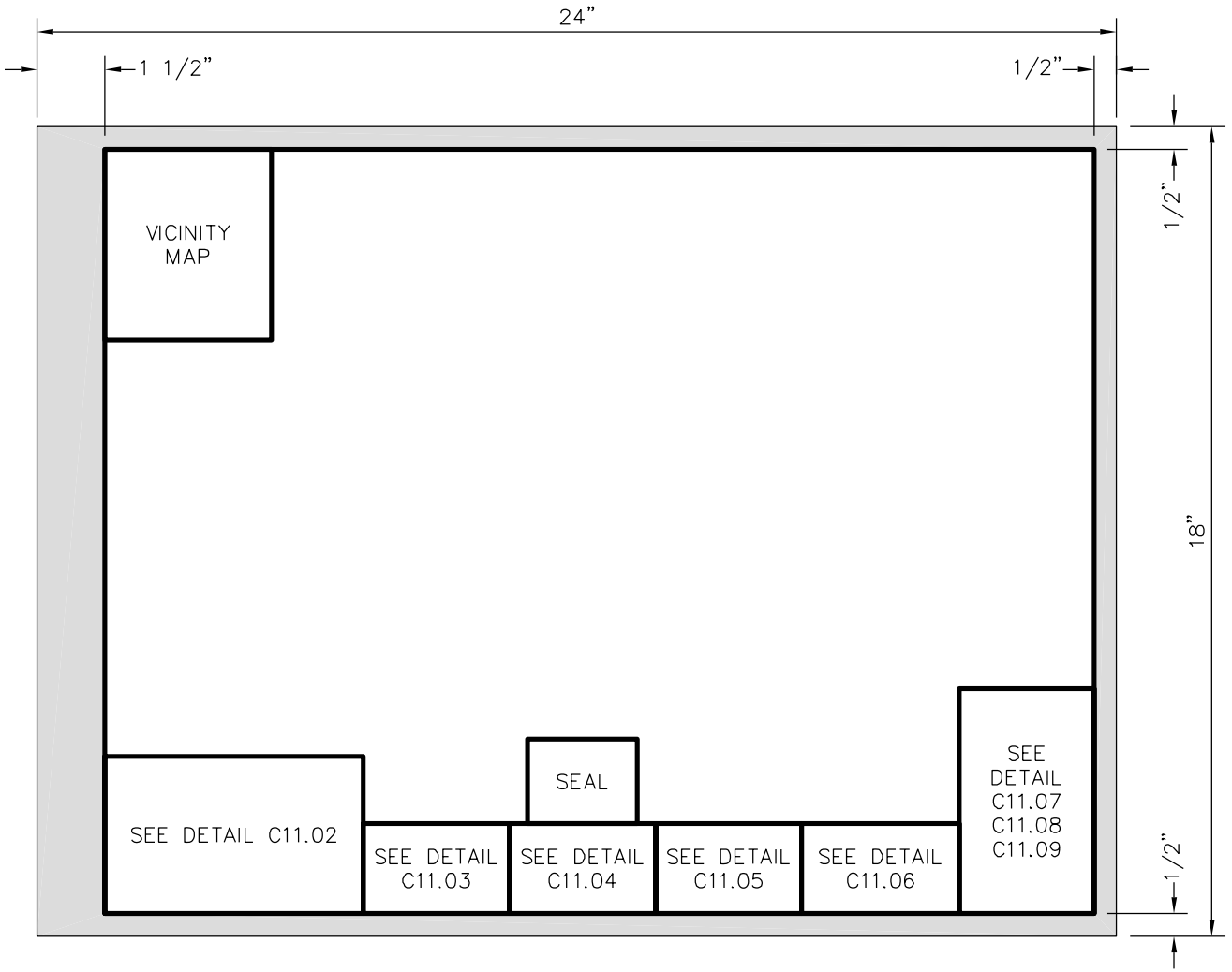

NOTES:

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

Scale:	Sheet #:	Detail #
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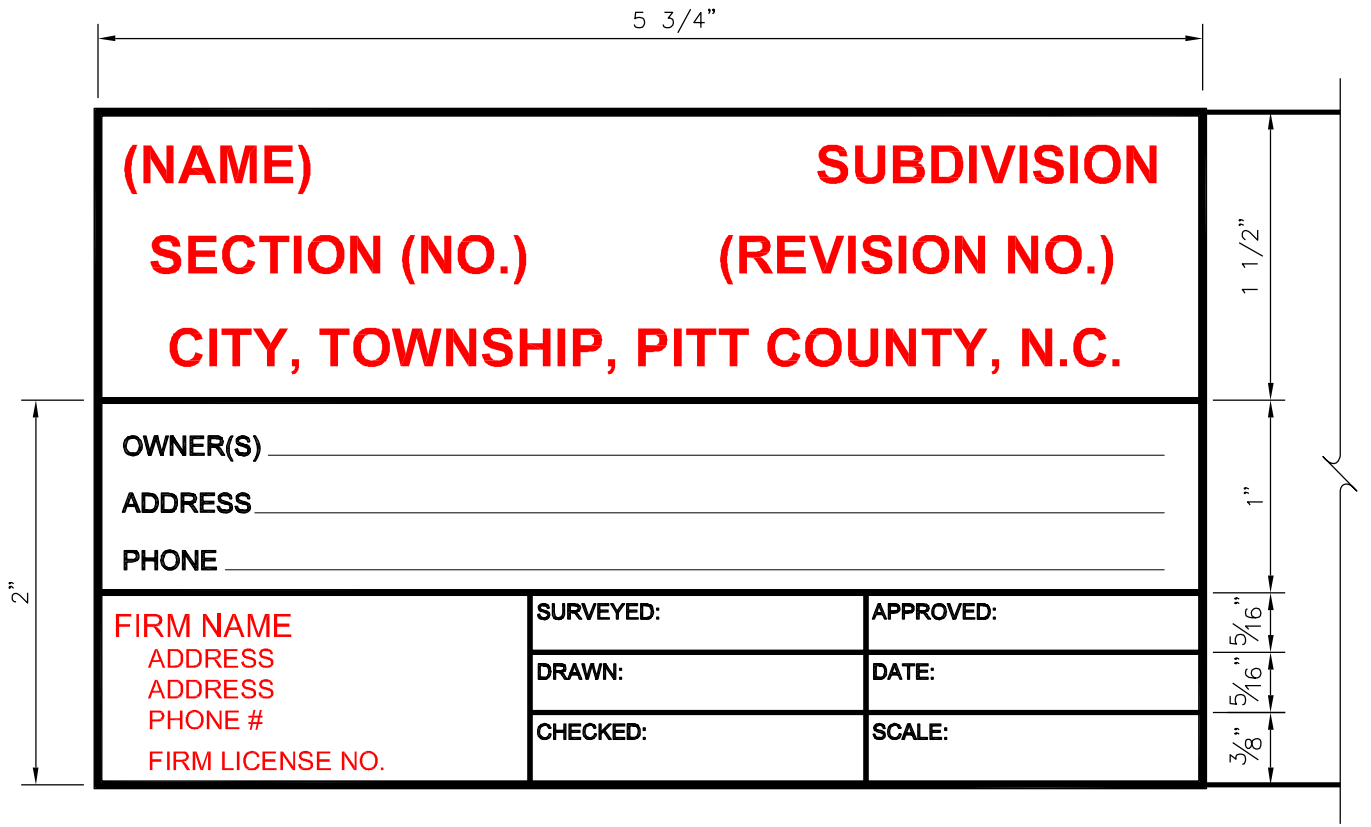

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STANDARD TITLE BLOCK FOR FINAL PLATS

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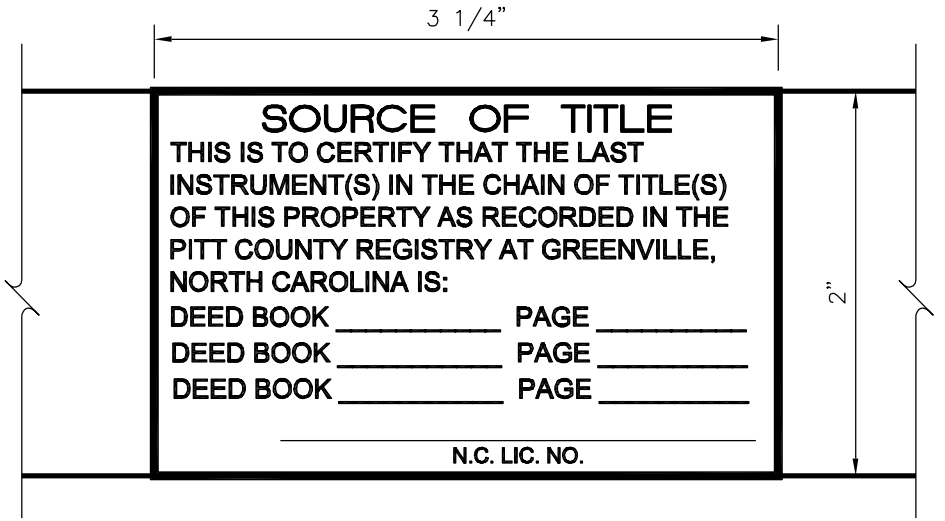

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STANDARD "SOURCE OF TITLE" INFORMATION BLOCK

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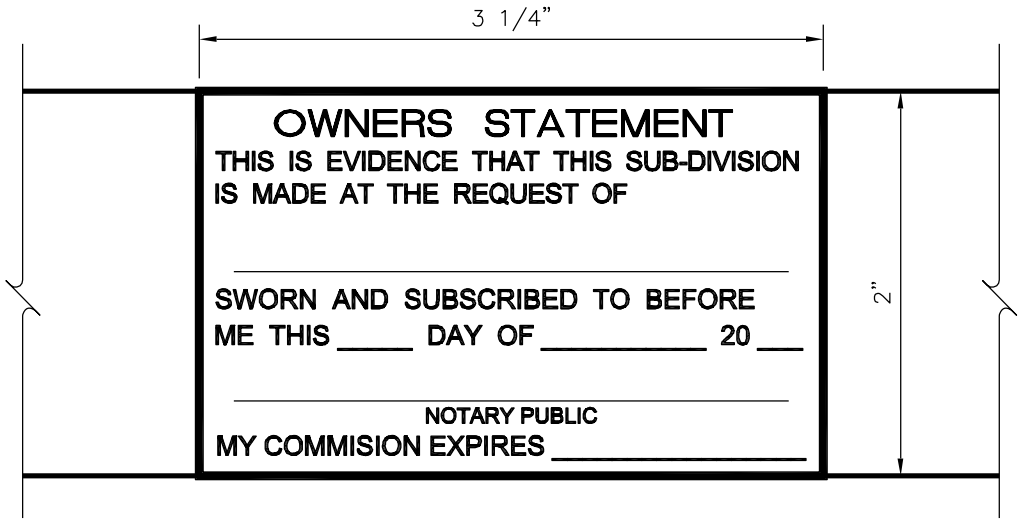

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STANDARD OWNERS STATEMENT BLOCK

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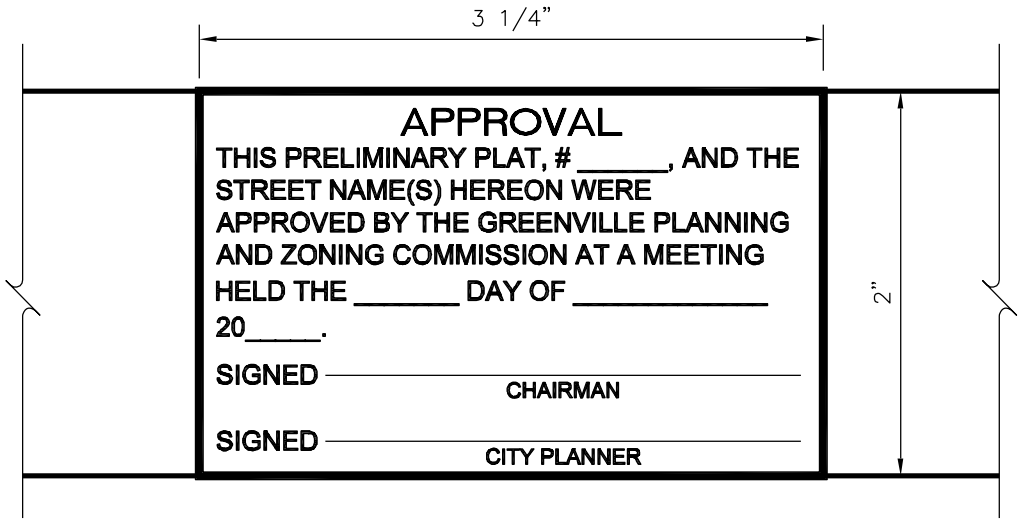

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STANDARD "APPROVALS" INFORMATION BLOCK

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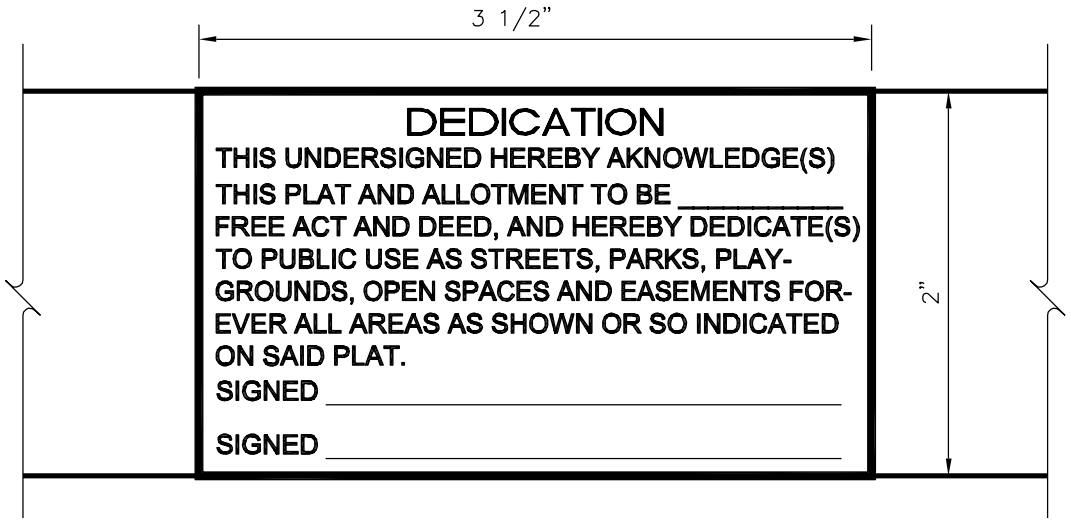

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STANDARD DEDICATION INFORMATION BLOCK

Scale:	Sheet #:	Detail #
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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).

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 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) (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- ####

3"

3"

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FINAL PLAT SURVEYOR'S CERTIFICATION - TRADITIONAL ONLY SURVEY METHODS

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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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No.	Date	Description
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FINAL PLAT REVIEW OFFICER'S CERTIFICATION

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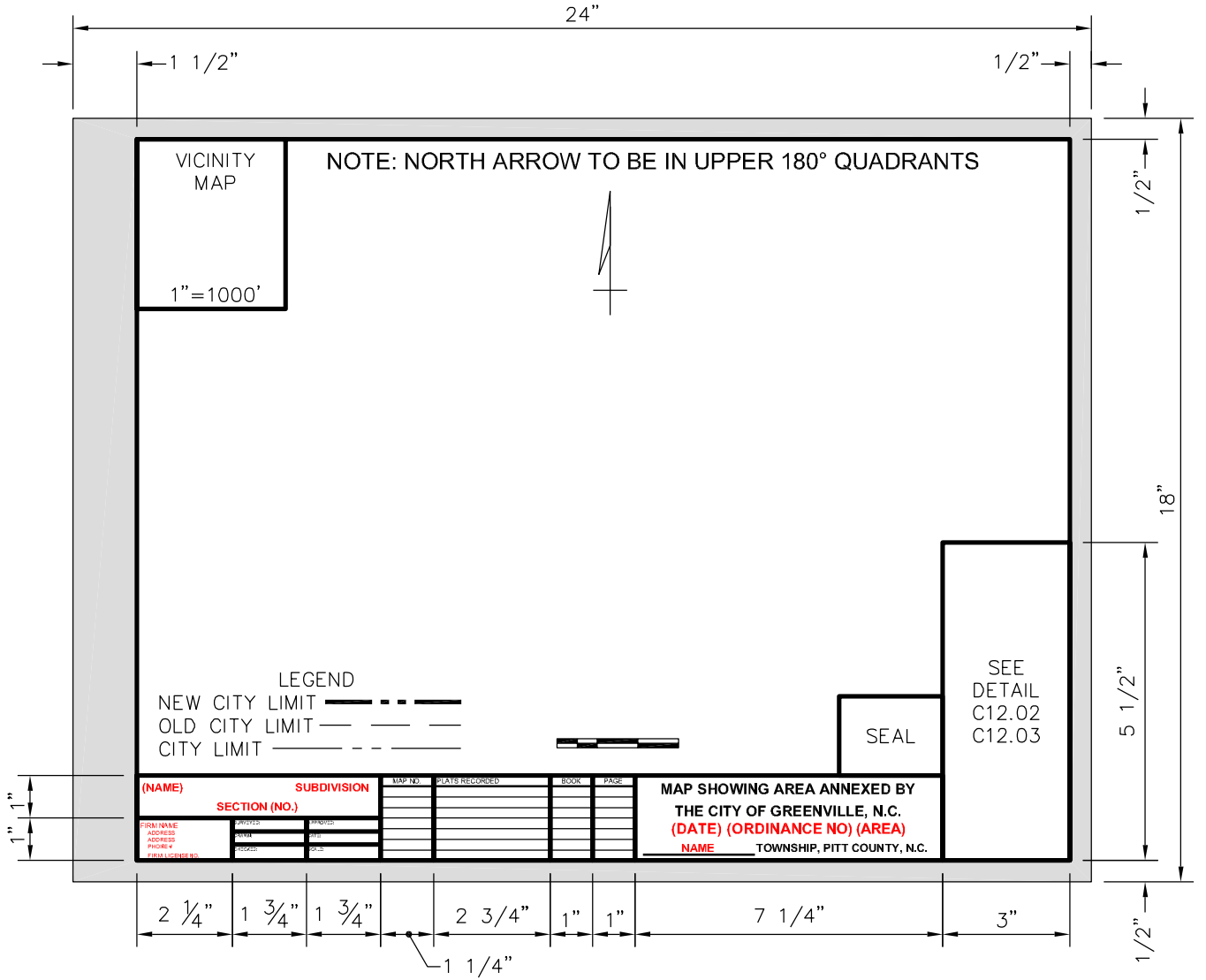

NOTES:

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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No.	Date	Description
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STANDARD FORMAT ANNEXATION MAP

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COMMENTS:

THE SURVEYORS 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 C12.03. 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).

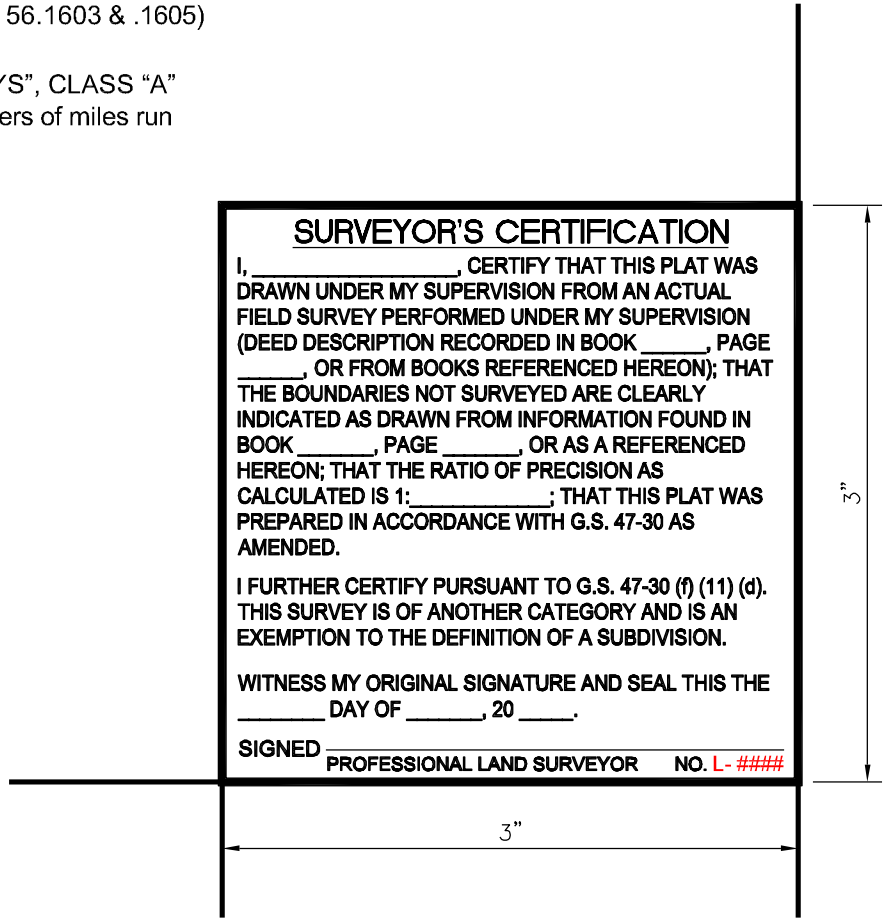
SURVEYOR'S CERTIFICATION

I, _____, CERTIFY THAT THIS 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

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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

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) (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"

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No.	Date	Description
1	9/16/11	APPROVAL

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

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

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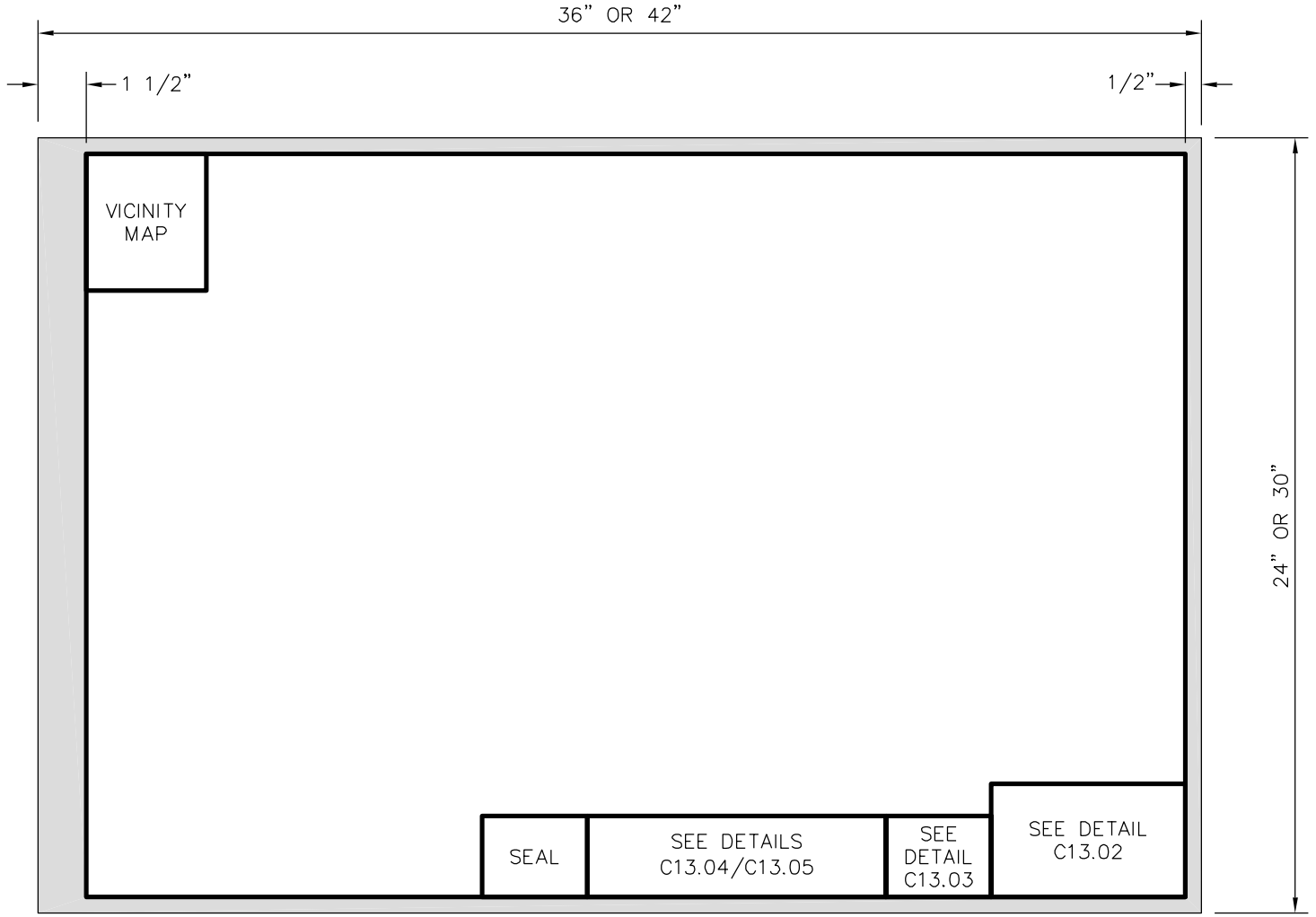
No.	Date	Description
1	9/16/11	APPROVAL

ANNEXATION MAP REVIEW OFFICER'S CERTIFICATION

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



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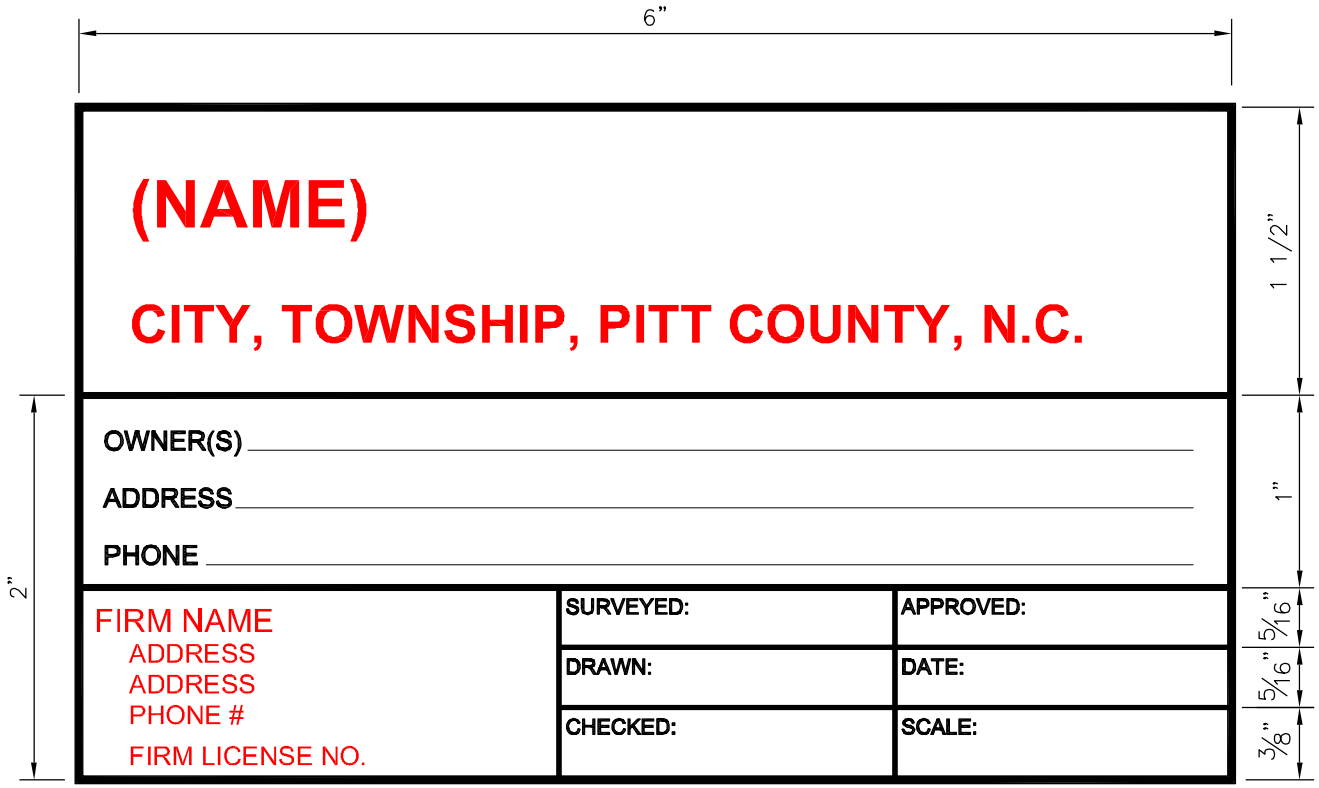
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD P.U.D. LAND USE PLAN LAYOUT

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C13.01



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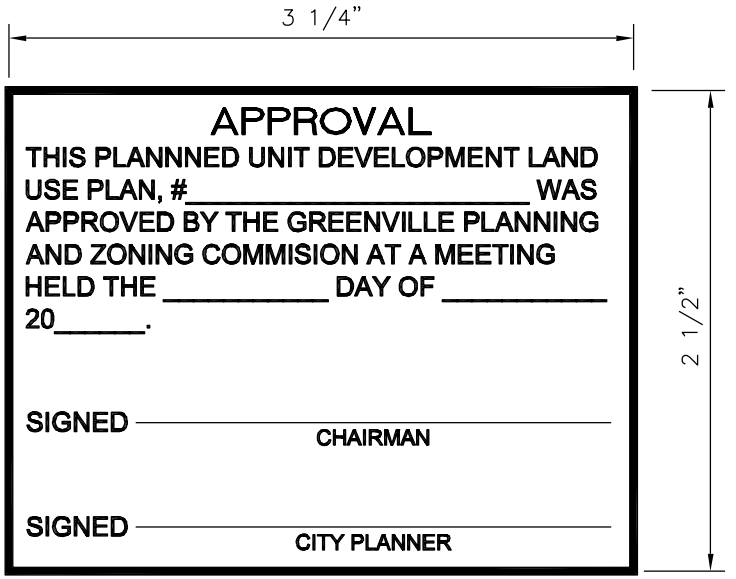
No.	Date	Description
1	9/16/11	APPROVAL

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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No.	Date	Description
1	9/16/11	APPROVAL

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"

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

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C13.04

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 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"

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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.
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 bearing 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. (a) Two (2) paper copies at the time of original submission for development review.
   (b) Two (2) copies shall be submitted following a request for revisions.
   (c) One (1) copy of the approved plan.
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. Floodplain boundaries, flood hazard area designation, and floodway boundaries and designation, including base flood elevations and FIRM panel reference.
7. 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.
8. The profile of each proposed street shall show clearly and accurately of the established new street grades and their relation to the existing street grades with which they connect.
9. The profiles shall show the finished elevation of the top of curb or street centerline for non-curb and gutter street sections.
10. The profiles of each street shall contain at least one (1) typical section, indicating the particular section to which the established 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.
11. 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 Division of the Public Works Department for review and approval. Record Drawings shall be submitted for any street and city 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. Horizontal alignment of the centerline (changes to be noted)
   b. Centerline final surface elevation :
      i. intersections - crossing of street centerlines
      ii. points of vertical inflection (pvi) - street centerline at point of inflection
      iii. radius points of cul-de-sacs
      iv. radius points for "hammerheads"
      v. end of pavement construction (street centerline)
   c. Width (verification with approved plans)

2. Sidewalks (verification with approved plans)
   a. Width
   b. Length
   c. Thickness
   d. Material
   e. Location

3. Stormwater Pipes
   a. Size
   b. Shape
   c. Material
   d. Length
   e. Slope

4. Structures (Junction Box, Drop Inlets, Catch Basins, Interference Boxes, Outlet Structures)
   a. Rim/hood elevation
   b. All pipe invert elevations
   c. Material
   d. Construction type (pre-cast, masonry block, or cast-in-place)
   e. Interior bottom elevation of structure
   f. Cover (lid/grate) dimensions
   g. Weirs
      i. Type
      ii. Invert elevation
      iii. Top of weir elevation
      iv. Length

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

6. Flared End Sections
   a. Material
   b. Invert
   c. Size
   d. Outlet / Inlet Protection
      i. Dimensions
      ii. Tonnage

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 two (2) copies of 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 Division's Capital Projects Section.

      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 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) If there is not positive drainage throughout the storm drainage system or if the system is not in compliance with the approved construction drawings or the City of Greenville requirements, the engineer must submit revised storm drainage calculations based on the record drawings for review and evaluation by the Engineering Division, as well as discuss the issue(s) with the City Engineer or his designee to determine a viable solution(s).

c. 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

a. One (1) copy shall be returned by the Engineering Division to the engineer with an approval stamp.

b. 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."

c. The engineer shall also submit an electronic drawing in a version of AutoCad "DWG" format compatible with the City of Greenville's current system.

d. The Engineer's & Owner's Certification of Completion forms (Std. detail No. C31.01 & C31.02, respectively) shall be submitted to Engineering Division.

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 "Street and Storm Drainage Record Drawing Submittal Requirements" (Std. detail No. C30.01). 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 Division, 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; and the submittal of the Engineer's and Owner's Certification 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.

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No.	Date	Description
1	9/16/11	APPROVAL

STREET ACCEPTANCE TIMELINE

Scale:	Sheet #:	Detail #
not to scale	1 of 1	C30.03

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 Certification 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 Division'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 City Engineer. After all items are 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.
3. Check storm drain manholes and catch basins for proper construction. Pipes within the manholes and catch basins shall be broken 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 broken 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 Public Works Director, 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 Division.

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 approval 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 Division

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.
3. 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 Engineering)
4. 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.
5. 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.
6. 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

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 PANNING 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 Division 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 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 from January 1 - December 21.

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. Crimping of straw in lieu of asphalt tack shall not be allowed on projects.

CRIMPING STRAW MULCH:

Crimping shall be required on projects adjacent to any section of roadway where traffic is to be maintained or allowed during construction. In areas within six feet of the edge of pavement, straw is to be applied and then crimped. After the crimping operation is complete, an additional application of straw shall be applied and immediately tacked with a sufficient amount of undiluted emulsified asphalt.

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".

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	24'	< 400
	DITCH	60' EASEMENT	20'	< 400
STANDARD RESIDENTIAL	CURB	50'	28'	< 1,500
	DITCH	60'	22'	< 1,500
COLLECTOR	CURB	60'	36'	1,500 - 3,500
	DITCH	70'	34'	1,500 - 3,500
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 channel's 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.*

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No.	Date	Description
1	9/16/11	APPROVAL

SUMMARY OF STREET STANDARDS

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No.	Date	Description
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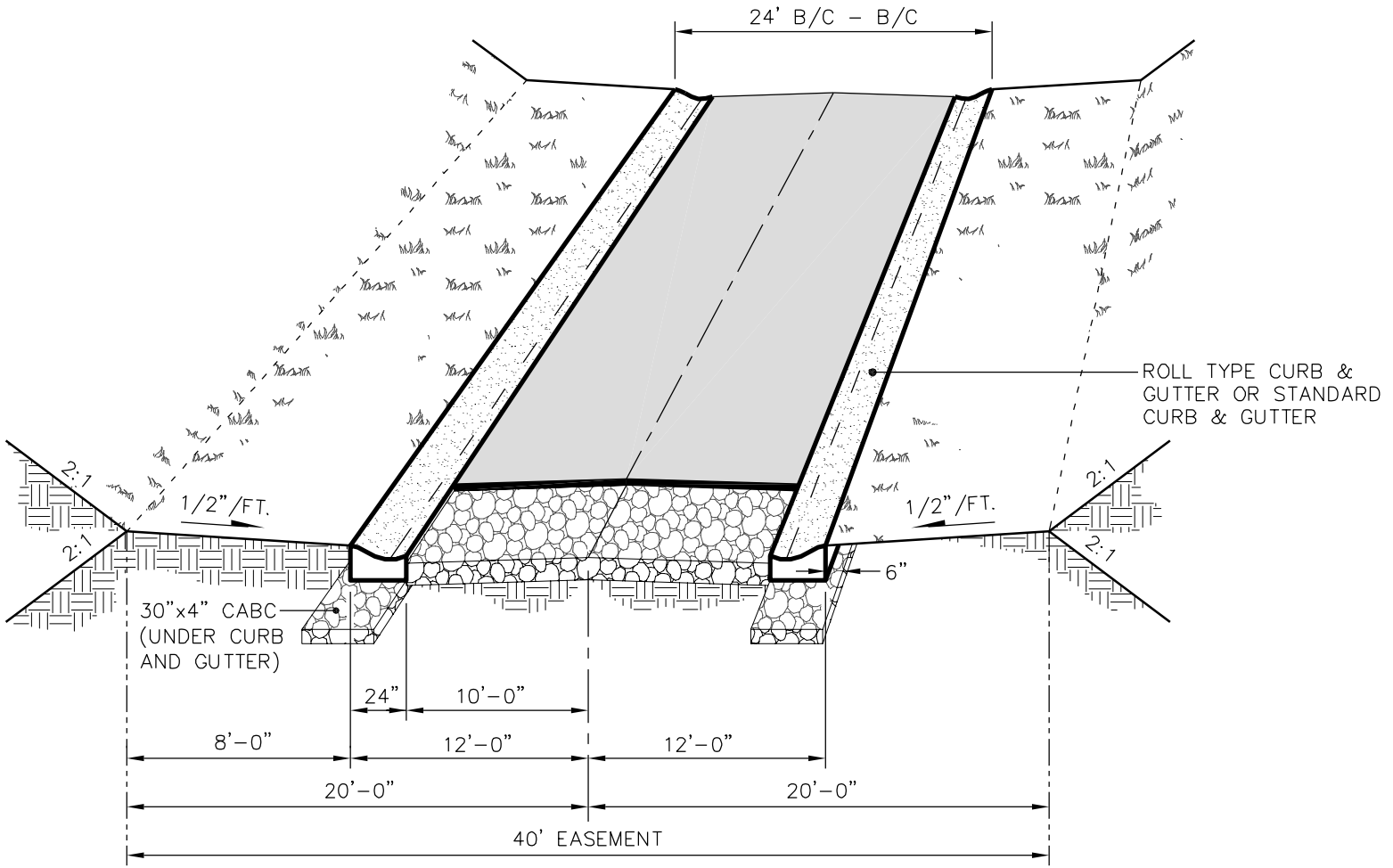

TYPICAL CROSS SECTION

"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 400 ADT based on trip generation factors shown on Std. detail No. 491.02.

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No.	Date	Description
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PRIVATE STREET (CURB & GUTTER)

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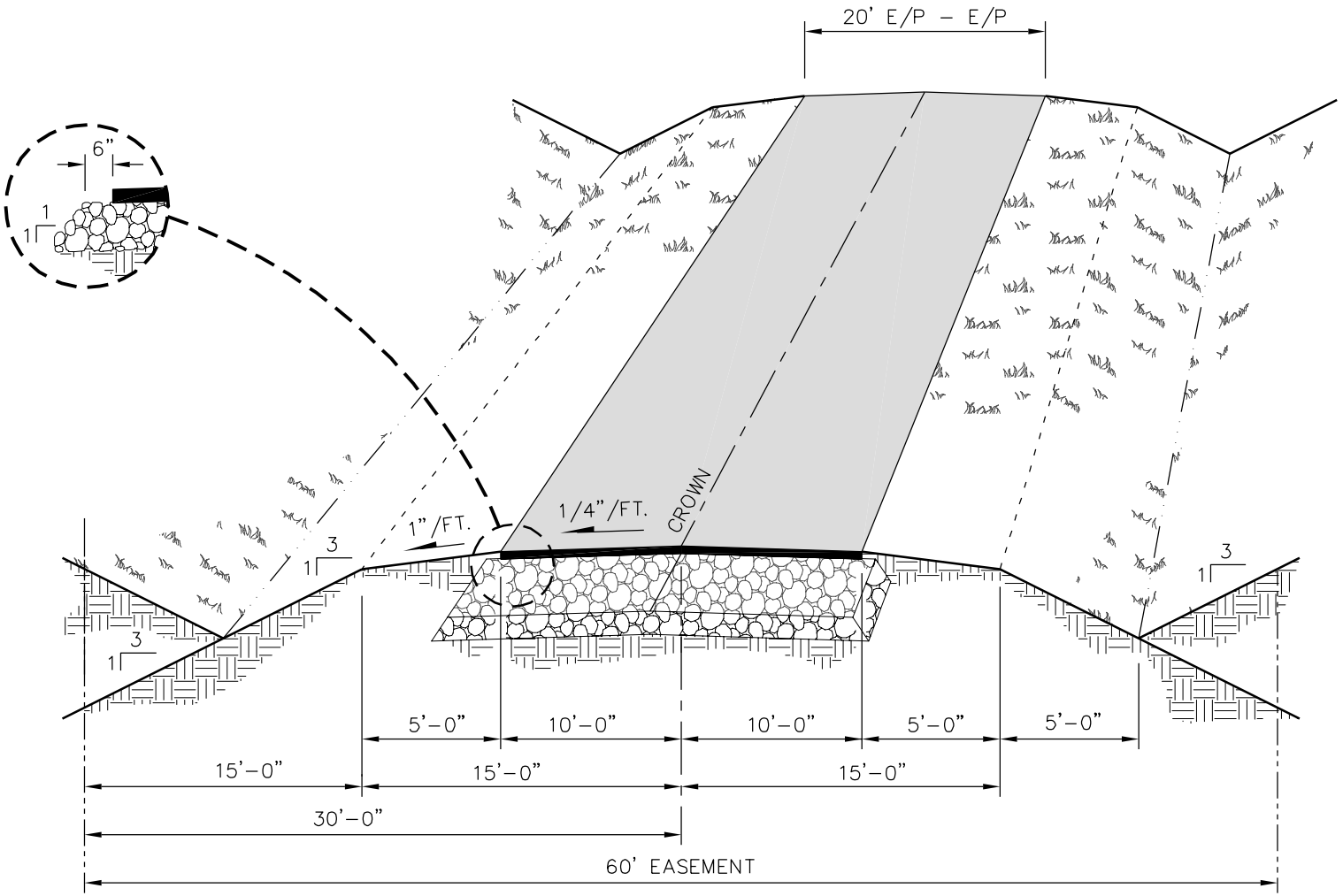

TYPICAL CROSS SECTION

"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 400 ADT based on trip generation factors shown on Std. detail No. 491.02.

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No.	Date	Description
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PRIVATE STREET (NON-CURB & GUTTER)

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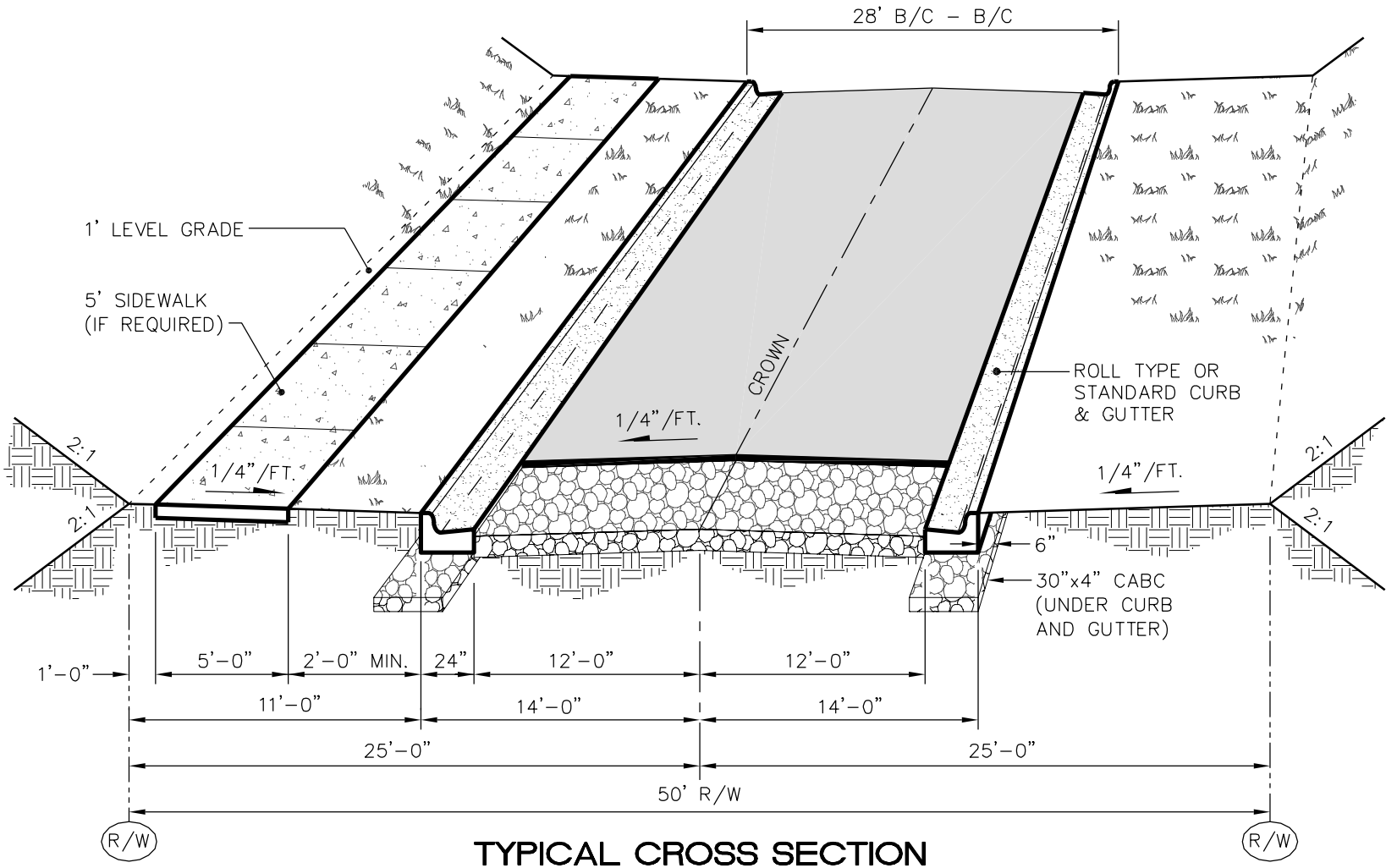

TYPICAL CROSS SECTION

"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.

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STANDARD RESIDENTIAL STREET (CURB & GUTTER)

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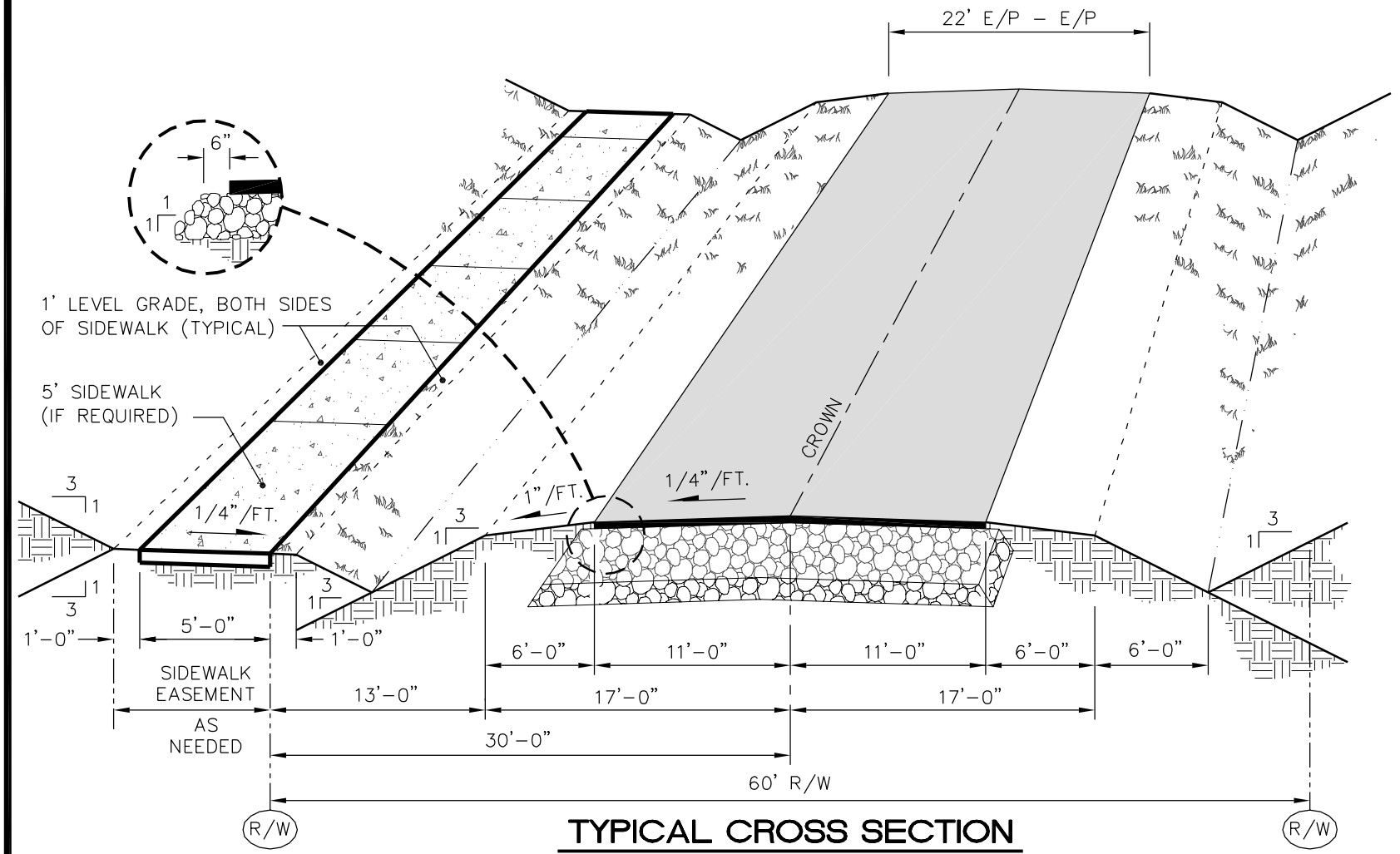

TYPICAL CROSS SECTION

"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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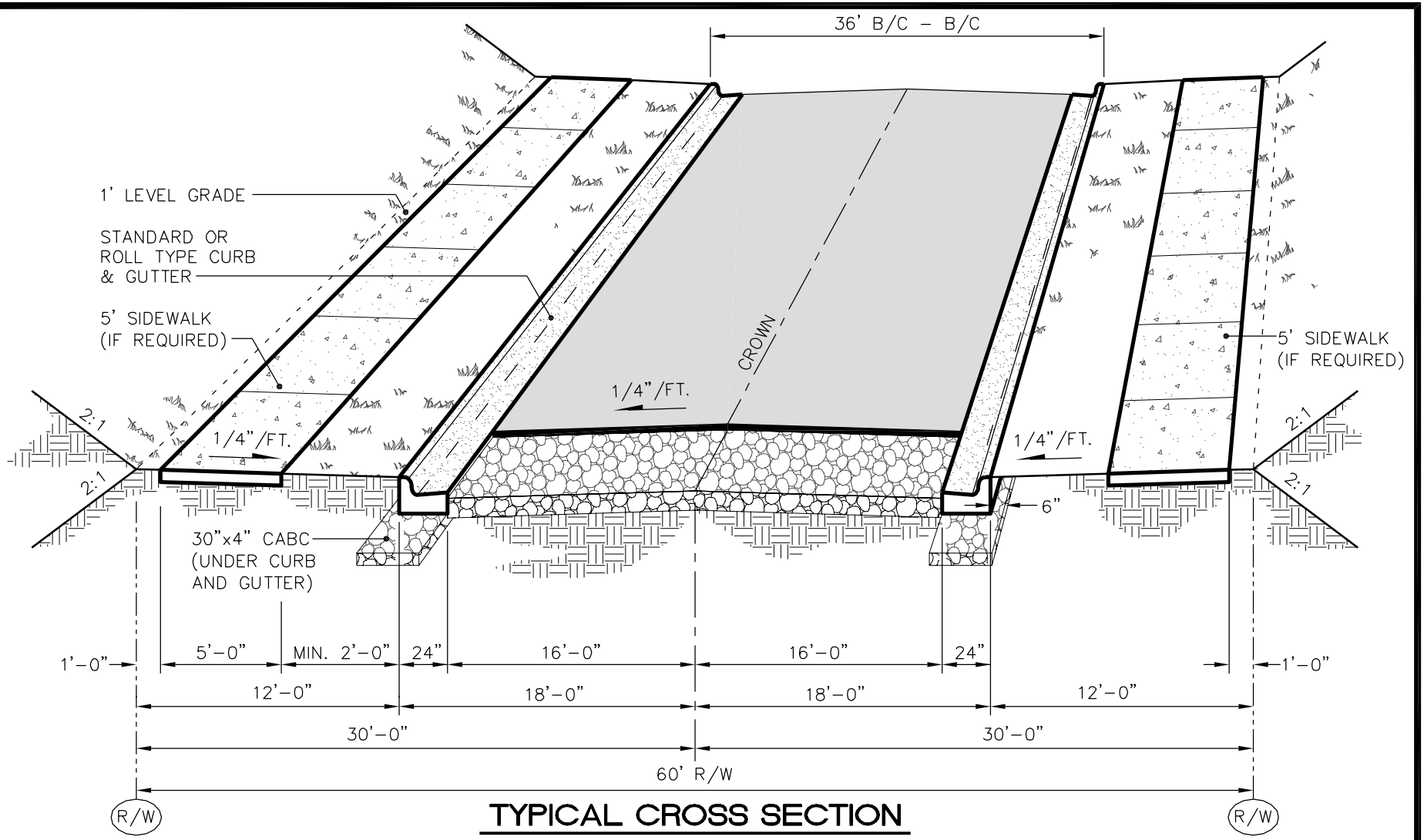

TYPICAL CROSS SECTION

"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 1500 - 3500 ADT based on trip generation factors shown on Std. detail No. 491.02.

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COLLECTOR STREET (CURB & GUTTER)

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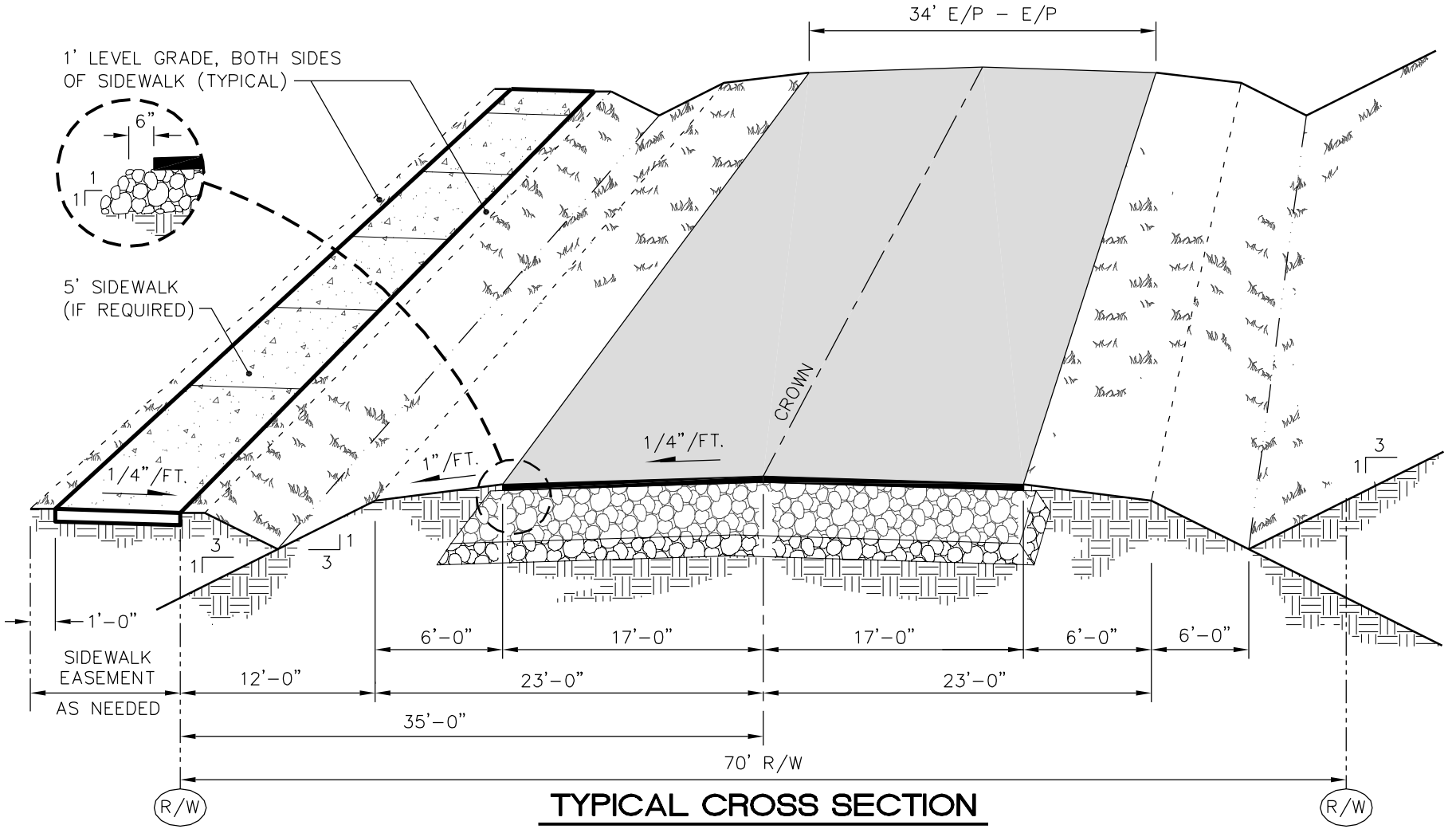

TYPICAL CROSS SECTION

"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 1500 - 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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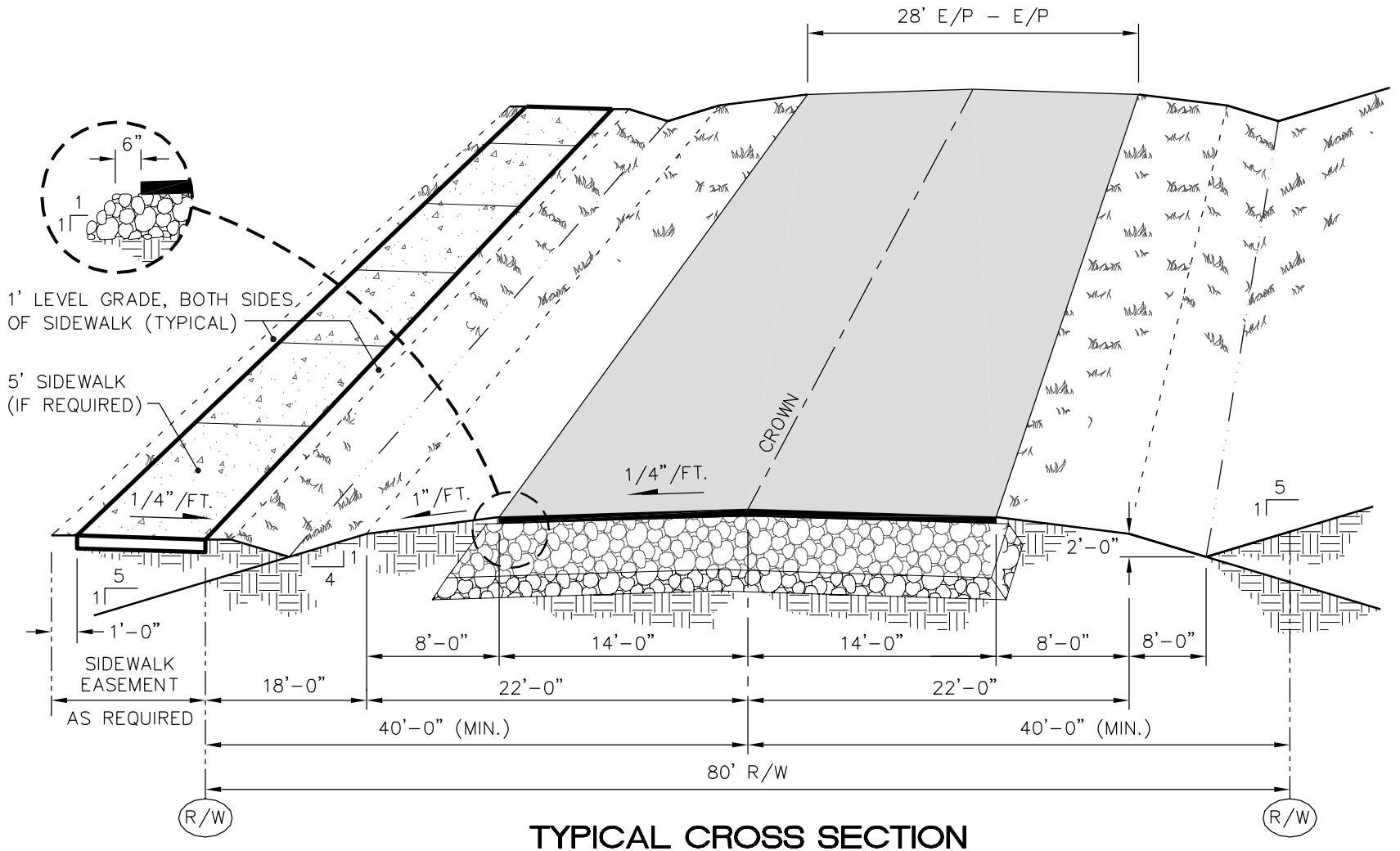

TYPICAL CROSS SECTION

"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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No.	Date	Description
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PLANNED INDUSTRIAL STREET (NON-CURB & GUTTER)

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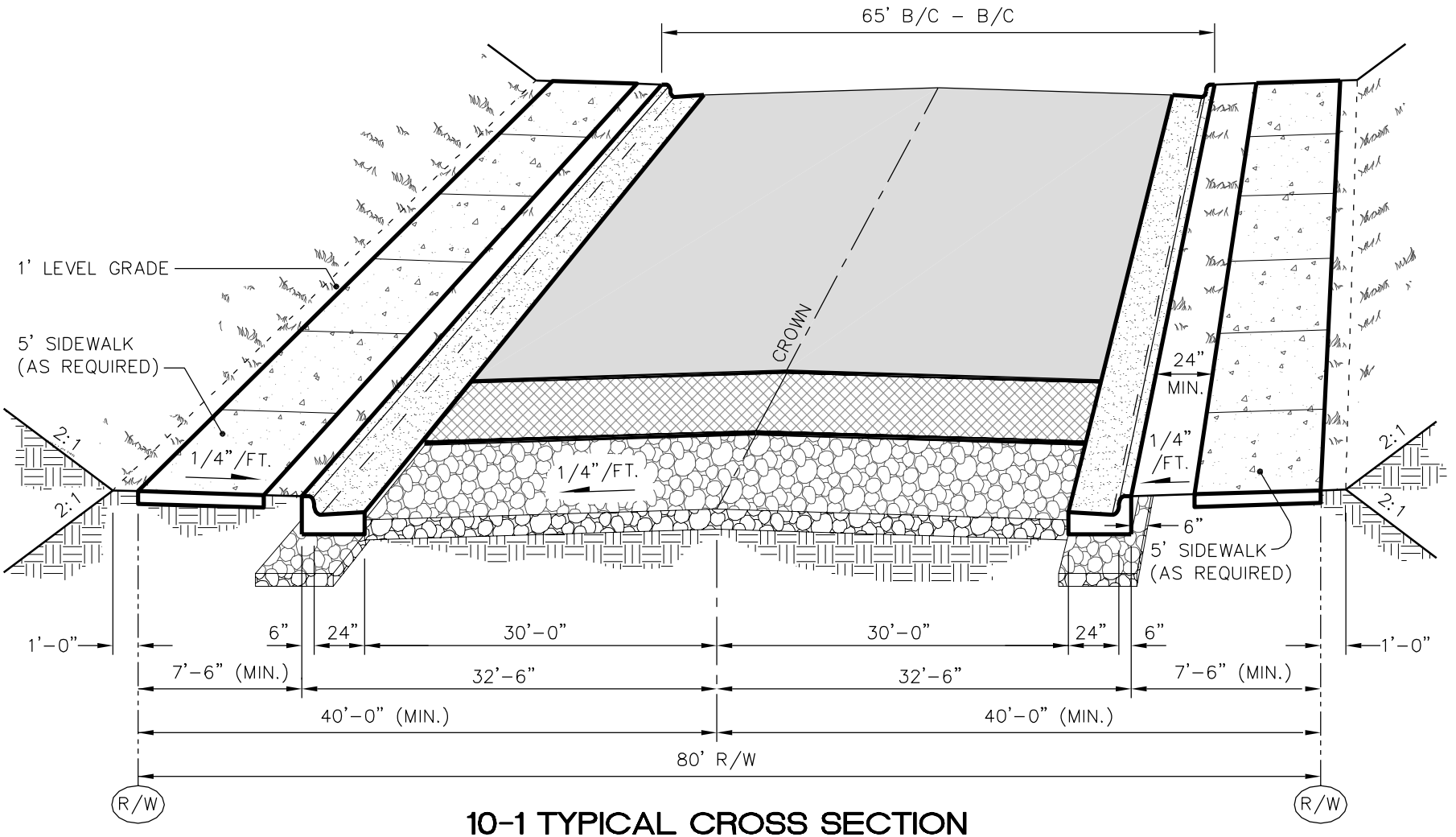

10-1 TYPICAL CROSS SECTION

"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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No.	Date	Description
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STANDARD TYPICAL SECTION - MINOR THOROUGHFARE

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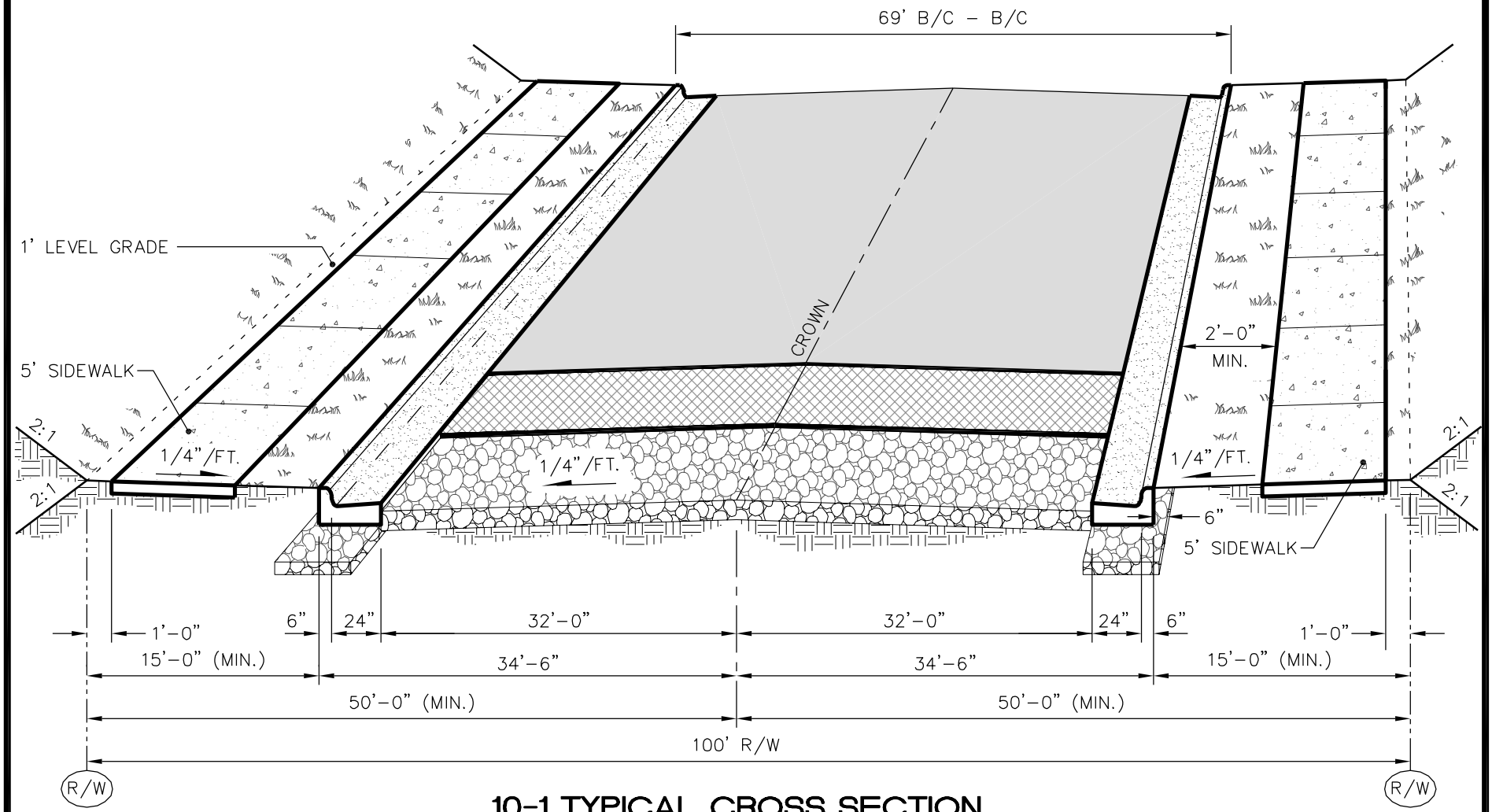

10-1 TYPICAL CROSS SECTION

"MAJOR THOROUGHFARE"

NOTES:

1. Pavement schedule to be determined by the City Engineering Department.

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STANDARD TYPICAL SECTION - MAJOR THOROUGHFARE

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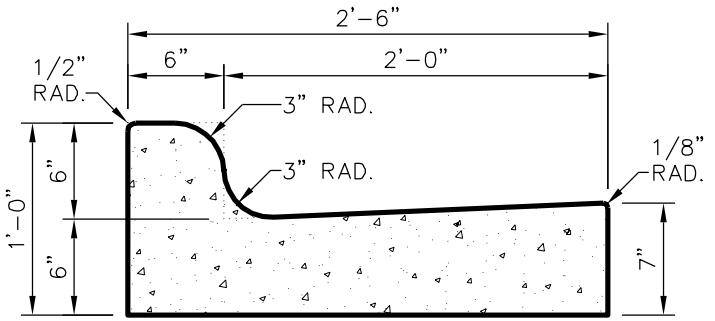
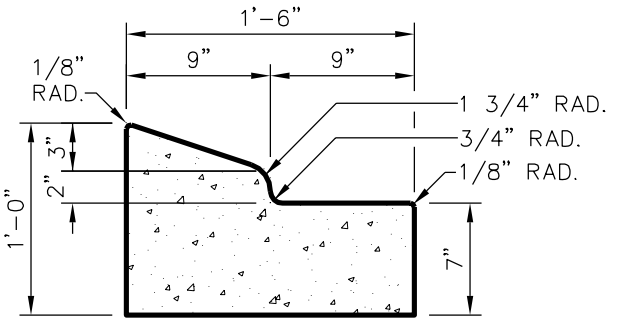


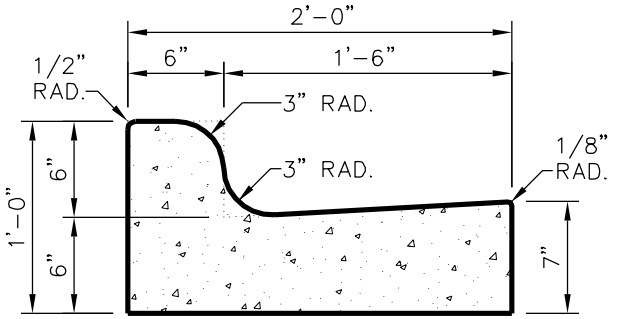
2'-6" CURB AND GUTTER

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



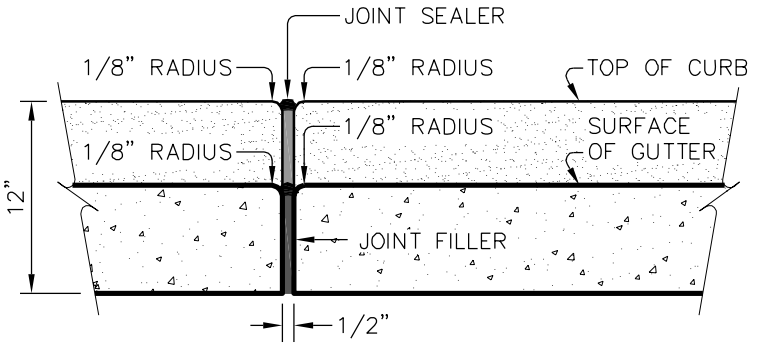
1'-6" CURB AND GUTTER

(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 SEC. 490 OF THIS MANUAL.



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. All contraction joints shall be filled with joint filler.
4. Expansion joints shall be spaced at 90' intervals, and adjacent to all rigid objects.
5. All curb and gutters are to be poured with class "A" concrete (3,000 PSI).
6. Flexible forms are to be used when radius is less than 200'.

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No.	Date	Description
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STANDARD CURB & GUTTER

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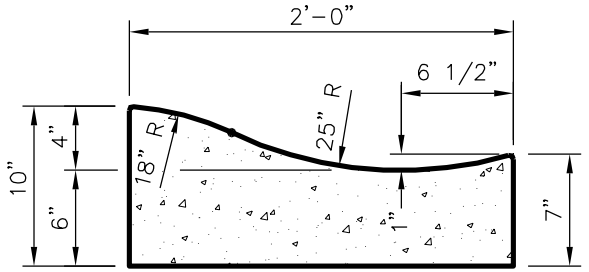
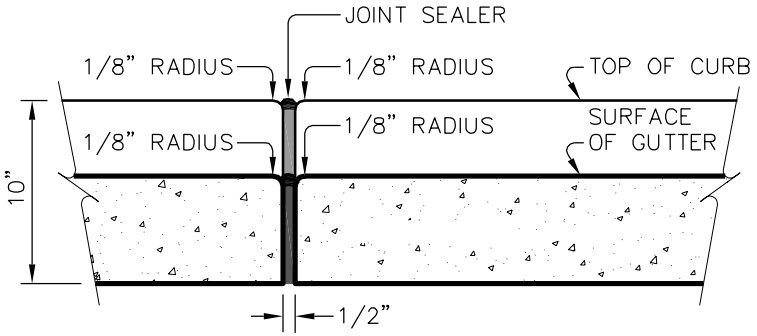


ROLL TYPE CURB AND GUTTER



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. All contraction joints shall be filled with joint filler.
4. Expansion joints shall be spaced at 90' intervals, and adjacent to all rigid objects.
5. All curb and gutters are to be poured with class "A" concrete (3,000 PSI).
6. Flexible forms are to be used when radius is less than 200'.

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CITY OF GREENVILLE, N.C.

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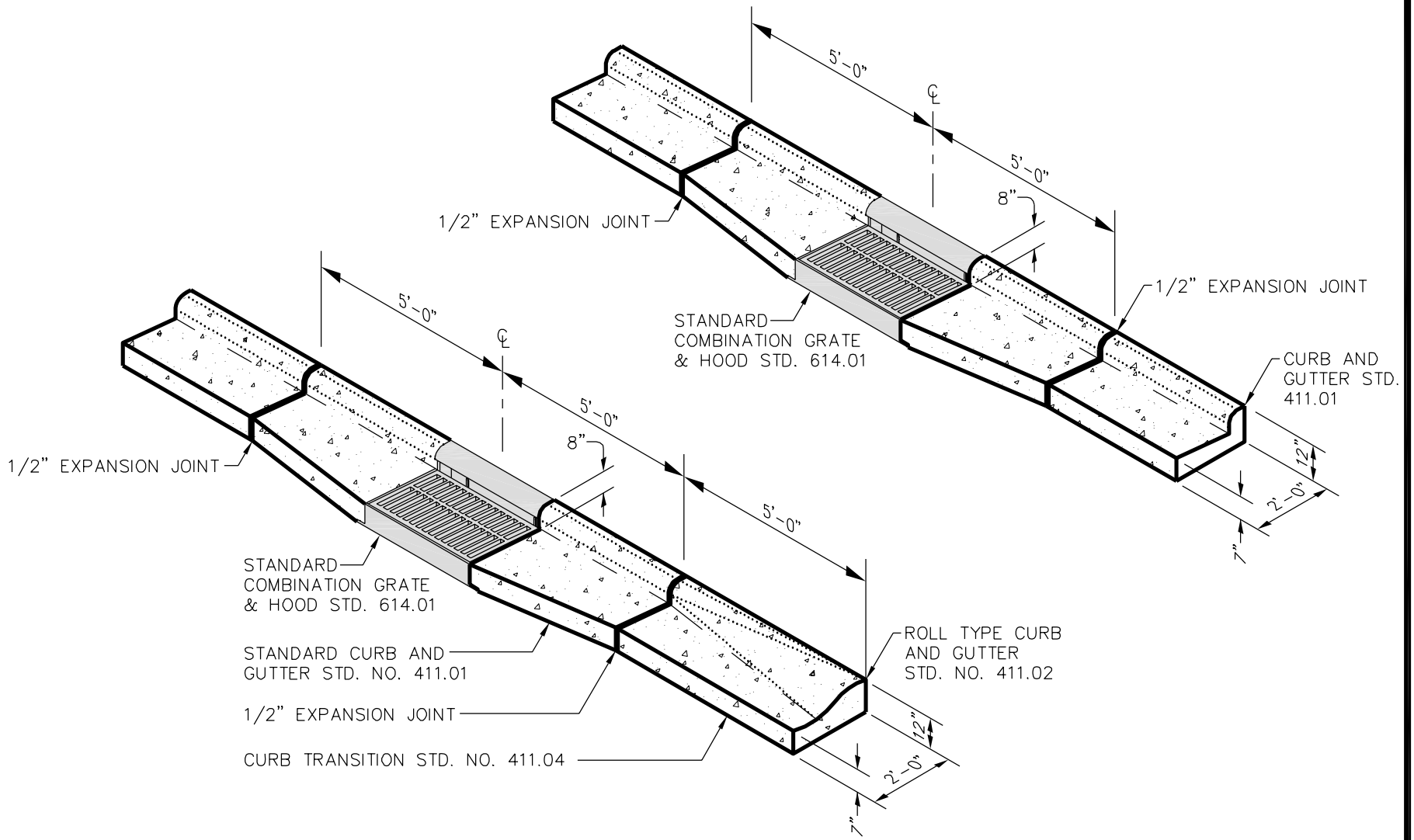
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD ROLL-TYPE CURB AND GUTTER

Scale:	Sheet #:	Detail #
not to scale	1 of 1	411.02



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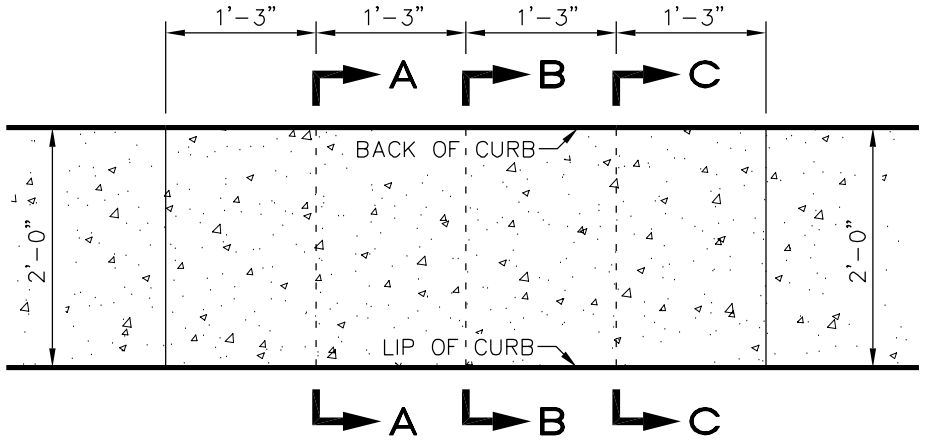
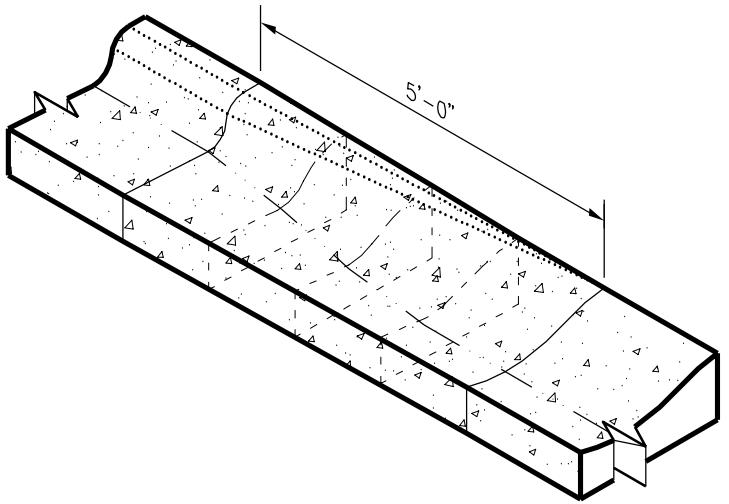
No.	Date	Description
1	9/16/11	APPROVAL

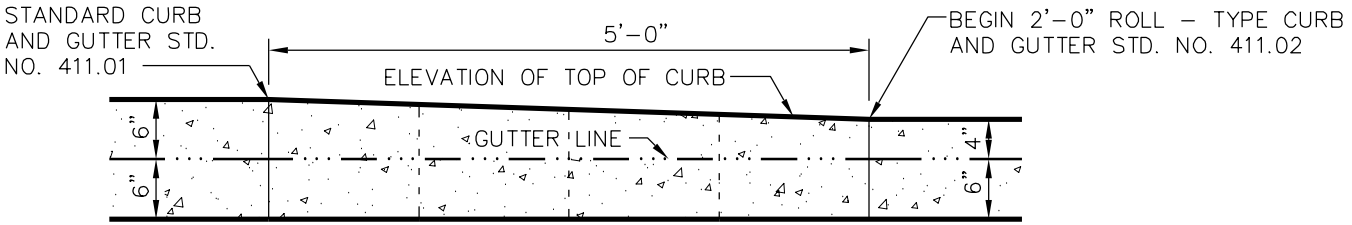
STANDARD CATCH BASIN FRAME 2'-0" IN CURB AND GUTTER

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

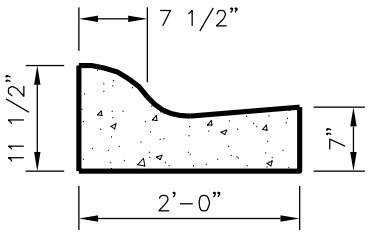


PLAN VIEW

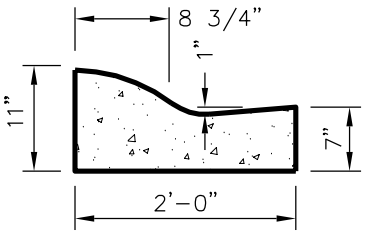




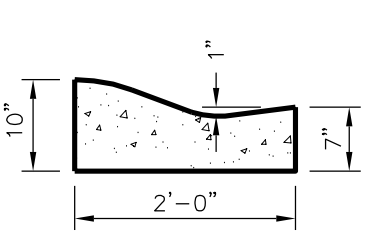
FRONT ELEVATION



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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No.	Date	Description
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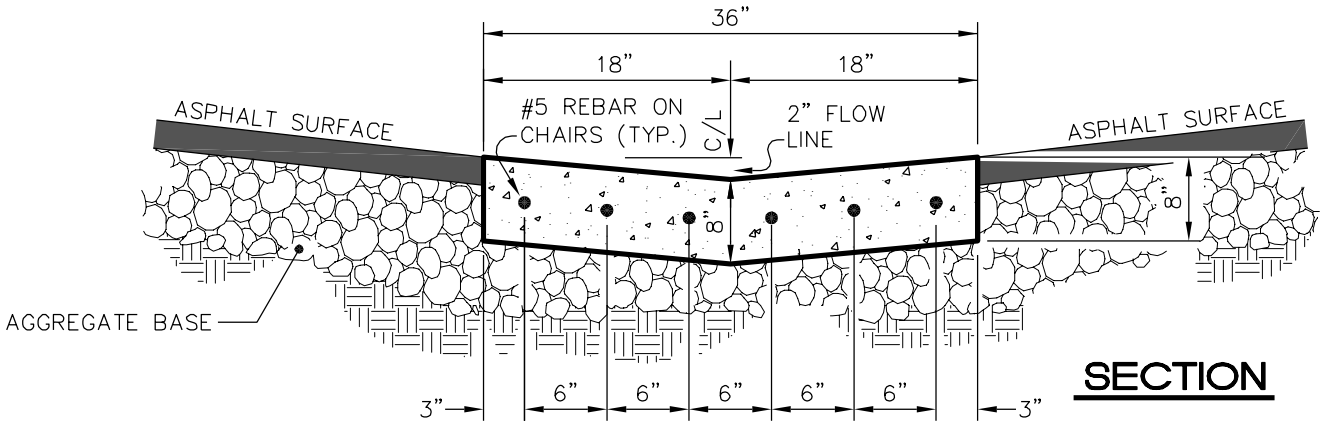
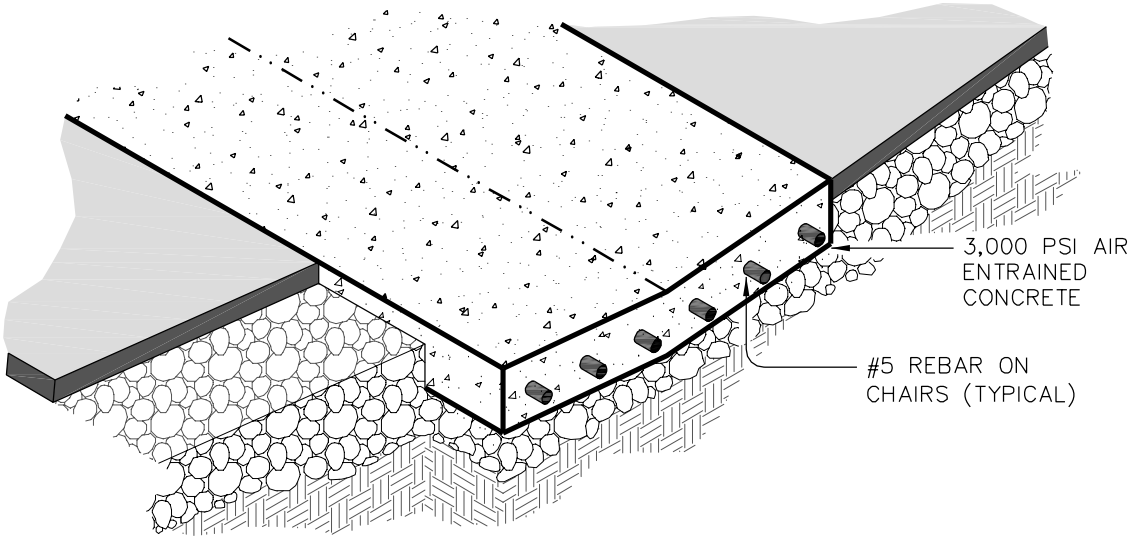
CURB TRANSITION - 2'-0" C&G TO 2'-0" ROLL TYPE C&G

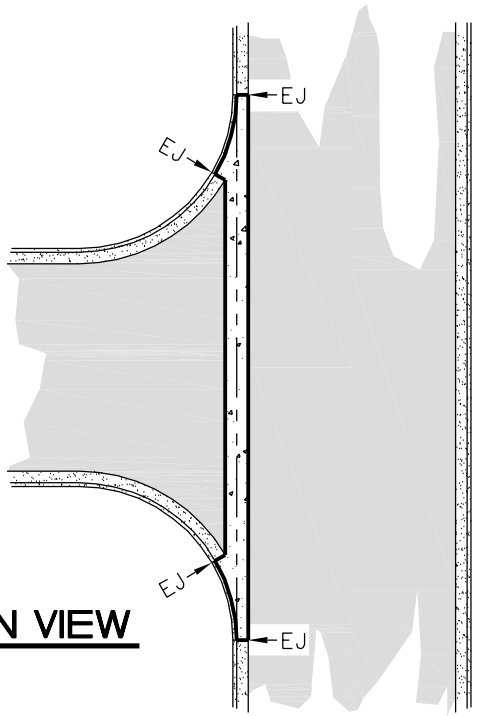
Scale:	Sheet #:	Detail #
not to scale	1 of 1	411.04



SECTION



ISOMETRIC



PLAN VIEW

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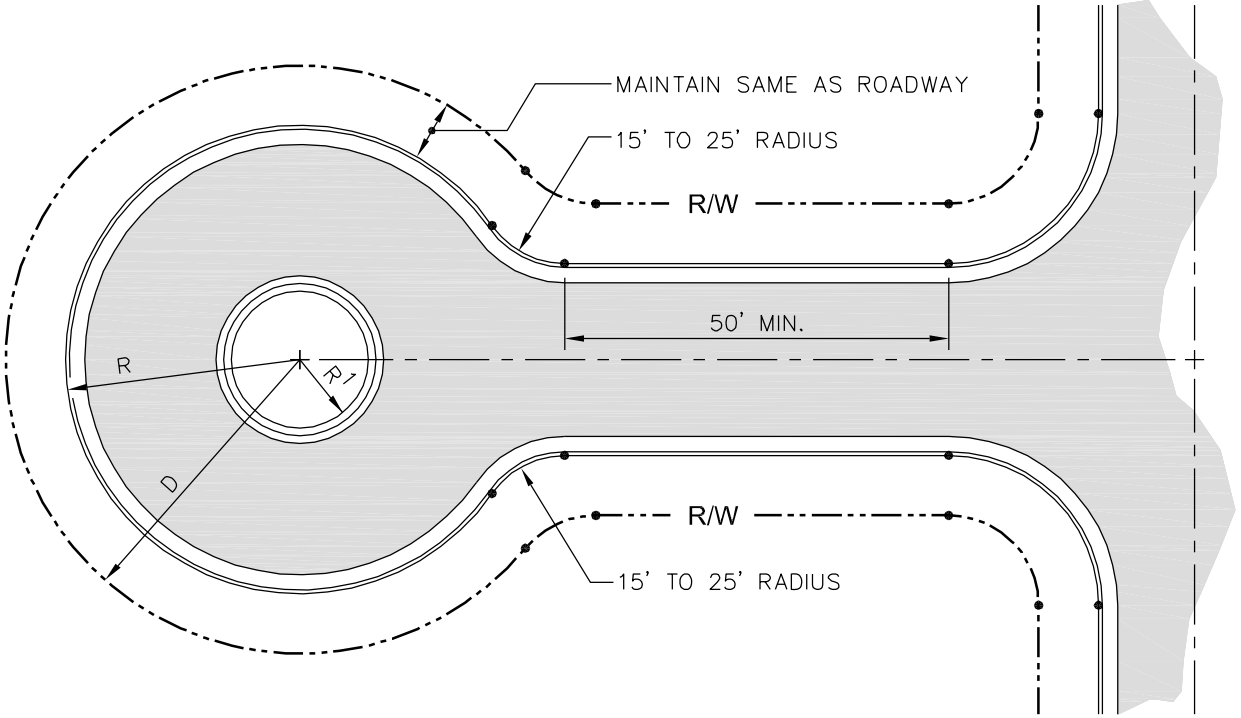
No.	Date	Description
1	9/16/11	APPROVAL

CONCRETE VALLEY GUTTER

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



NOTES:

1. Interior island is NOT required.
2. Island is NOT part of R/W (Common Space).
3. Island to be maintained by HOA.
4. No parking in cul-de-sac.
5. Mountable curb on island.
6. Vegetation within island to be reviewed & approved by City Engineer.
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.

R	48.5' TO BACK OF CURB
R^1	0' TO 15' TO BACK OF CURB
D	VARIES
CUL-DE-SAC MAY BE OFFSET FROM CENTERLINE OF STREET.	

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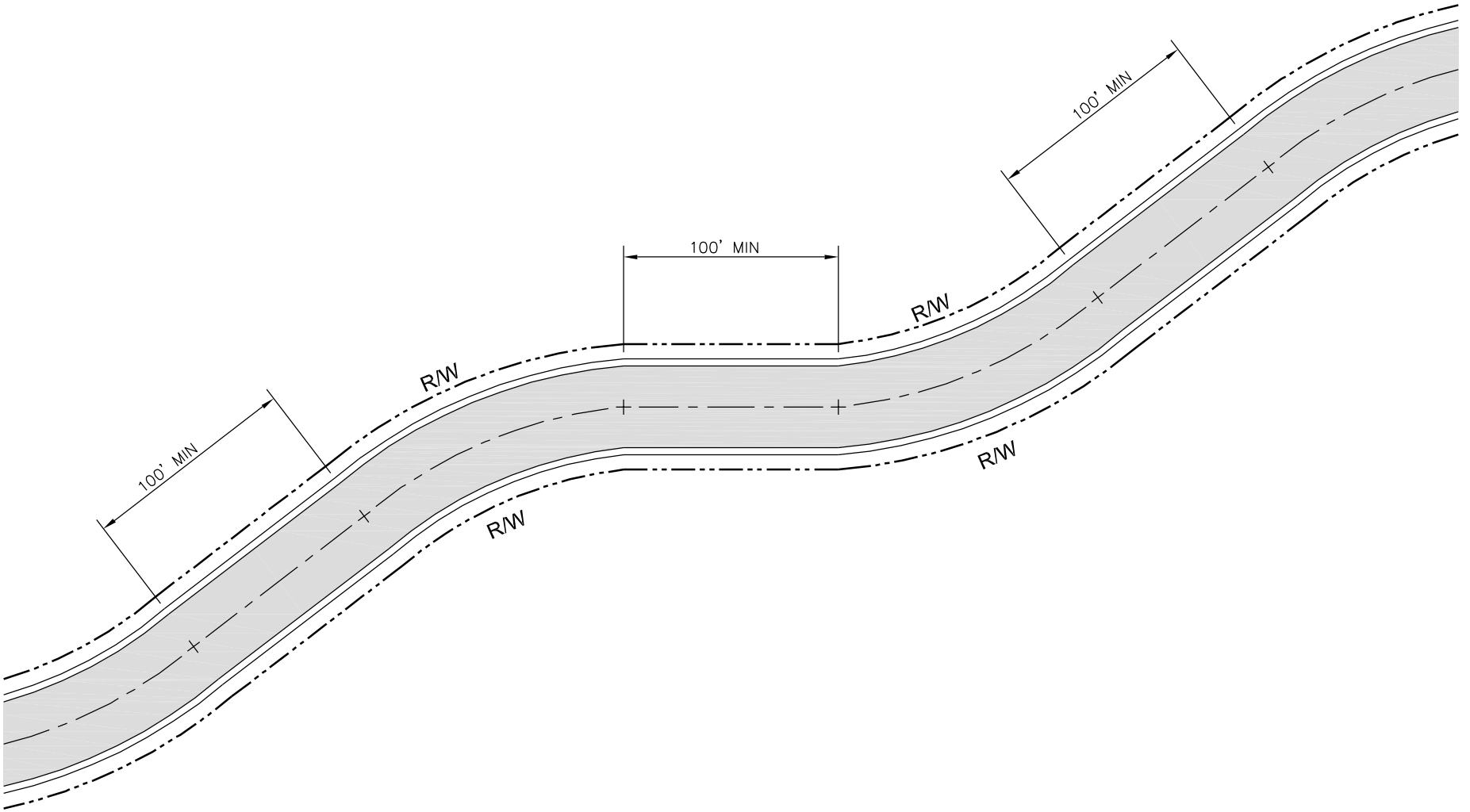
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD CUL-DE-SAC

Scale: not to scale | Sheet #: 1 of 1 | Detail # 412.01



NOTES:

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

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No.	Date	Description
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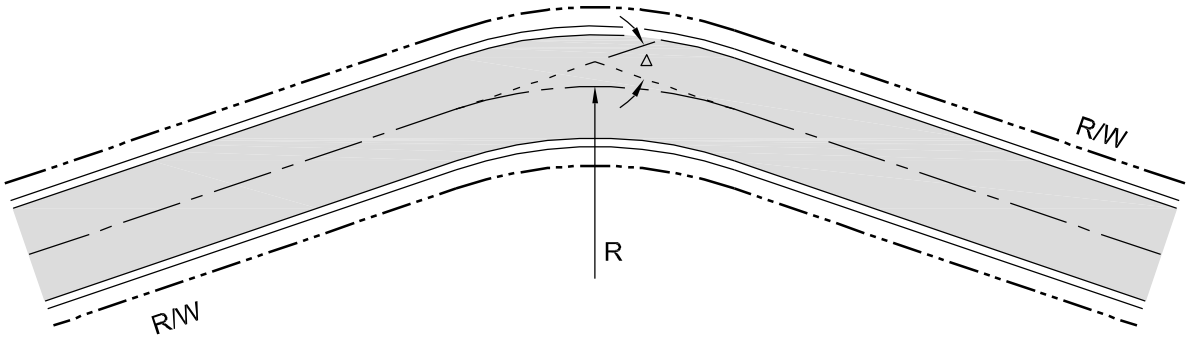
TANGENT DISTANCES AT REVERSE CURVES

Scale:	Sheet #:	Detail #
not to scale	1 of 1	412.02



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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No.	Date	Description
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CURVE RADIUS AT DEFLECTING STREET LINES

Scale:	Sheet #:	Detail #
not to scale	1 of 1	412.03

VERTICAL CURVE TABLE

DESIGN SPEED (mph)	MIN. STOPPING SIGHT DISTANCE (ft)	MIN. C/L RADIUS (ft)	K (crest) (deg)	K (sag) (deg)	K (stop) (deg)
25	155	150	26	26	12
30	200	230	37	37	19
35	250	340	49	49	29
40	305	475	64	64	44
45	360	640	79	79	61
50	425	825	96	96	84
55	495	1050	115	115	114

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No.	Date	Description
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VERTICAL CURVE DESIGN TABLE

Scale: not to scale

Sheet #: 1 of 1

Detail # 412.04

NOTES:

1. Construct the walking surface of the detectable domes with slip resistance and a 70% contrasting color to the sidewalk.
2. Crosswalk widths and configuration vary but must conform to traffic design standards.
3. Provide curb ramps at locations as shown on the plans or as directed by the engineer. Locate curb ramps as directed by the engineer where existing light poles, fire hydrants, drop inlets, etc. affect placement. Where two ramps are installed place not less than 2 feet of full height curb between the ramps. Place dual ramps as near perpendicular to the travel lane being crossed as possible.
4. Do not exceed 0.08 ft./ft. (12:1) slope on the curb ramp in relationship to the grade of the street.
5. Construct curb ramps a minimum of 48" wide (4'-0"); Greater for dual ramps.
6. Use class “B” concrete with a sidewalk finish in order to obtain a rough non-skid type surface.
7. Place a 1/2” expansion joint where the concrete curb ramp joins the curb.
8. Place the inside pedestrian crosswalk lines no closer in the intersection then would be established by bisecting the intersection radii, with an allowance of a 4'x4' maneuvering space (2003 ICC/ANSI a117 Commentary. Fig. C406.6 & 406.10) in the vehicular travel way when one ramp is installed.
9. Coordinate the curb cut and the pedestrian crosswalk lines so the floor of the curb ramp will fall within the pedestrian crosswalk lines. Place diagonal ramps with flared sides so 24” of the full height curb falls within the crosswalk markings on each side of the flares.
10. Construct the pedestrian crosswalk a minimum width of 6 feet. A crosswalk width of 10 feet or greater is required for all thoroughfares.
11. Use stop lines, normally perpendicular to the lane lines, where it is important to indicate the point behind which vehicles are required to stop in compliance with a traffic signal, stop sign or other legal requirement. An unusual approach skew may require the placement of the stop line to be parallel to the intersecting roadway.
12. Place all pavement markings in accordance with the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration and the North Carolina Supplement to the MUTCD.
13. Other detectable warning materials may be considered from that shown, but require City Engineer's written approval prior to installation.

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No.	Date	Description
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STANDARD CROSSWALK & CURB RAMP NOTES

Scale:	Sheet #:	Detail #
not to scale	1 of 2	413.01

NOTES:

14. For all roads with radius 25' or less. Only one curb ramp is required. Curb ramps to be placed as per traffic design standards to ensure pedestrians enter & exit without entering travel lanes.
15. Terminate parking a minimum of 20 feet back of pedestrian walk.
16. A 4'x4' maneuvering space is required at the bottom of the curb ramp and must be within the crosswalk.
17. Drop curb width (4'-0" min.) x 4' long landing required at top of curb ramp
18. North Carolina General Statute 136-44.14 requires that all street curbs being constructed or reconstructed for maintenance procedures, traffic operations, repairs, correction of utilities or altered for any reason after September 1, 1973 shall provide curb ramps for the physically disabled at all intersections where both curb and gutter and sidewalks are provided and at other points of pedestrian flow.
    In addition, section 228 of the 1973 Federal Aid Highway Safety Act requires provision of curb ramps on any curb construction after July 1, 1976 whether a sidewalk is proposed initially or is planned for a future date.
    The Americans with Disability Act (ADA) of 1990 extends to individuals with disabilities. Comprehensive civil rights protections similar to those provided to persons on the basis of race, sex, national origin and religion under the Civil Rights Act of 1964. These curb ramps have been designed to comply with the current ADA standards.
19. Construct all ramp surfaces to comply with sections R301 and R303.3.3 of the revised ADA guidelines.
20. Construct all ramps and sidewalks with a 2% cross slope.

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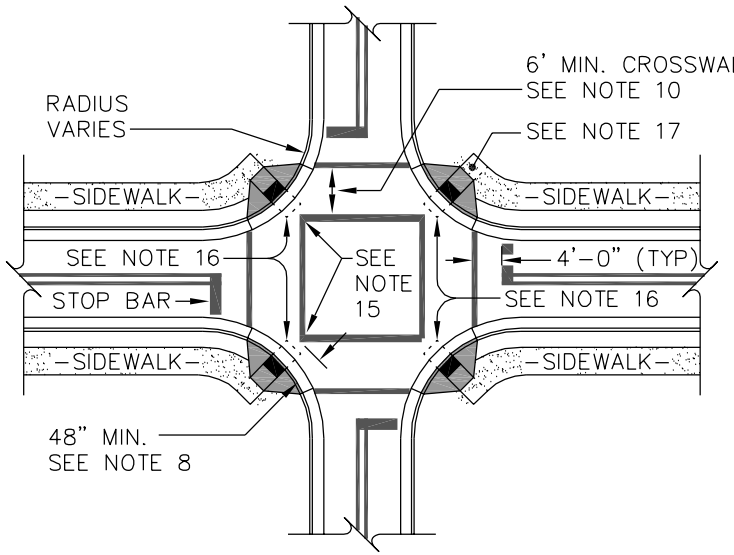
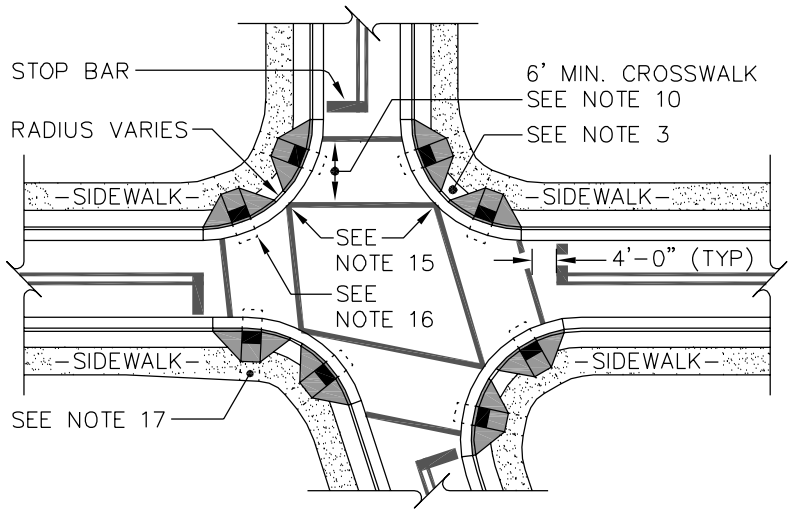
STANDARD CROSSWALK & CURB RAMP NOTES

Scale:	Sheet #:	Detail #
not to scale	2 of 2	413.01



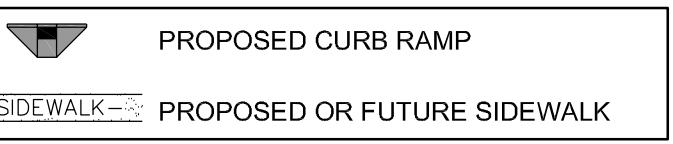
DETAIL SHOWING TYPICAL LOCATION OF SINGLE CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES FOR TEE INTERSECTIONS

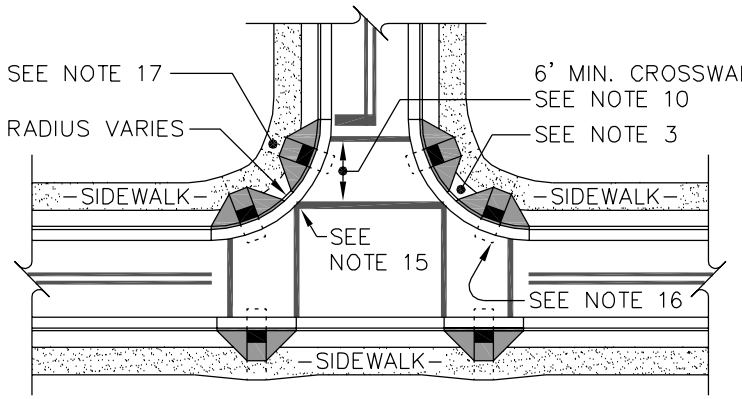
FOR CROSSING INTERSECTIONS



DETAIL SHOWING TYPICAL LOCATION OF DUAL CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES FOR TEE INTERSECTIONS

FOR CROSSING INTERSECTIONS





DETAIL SHOWING TYPICAL LOCATION OF CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES FOR TEE INTERSECTIONS

FOR TEE INTERSECTIONS

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No.	Date	Description
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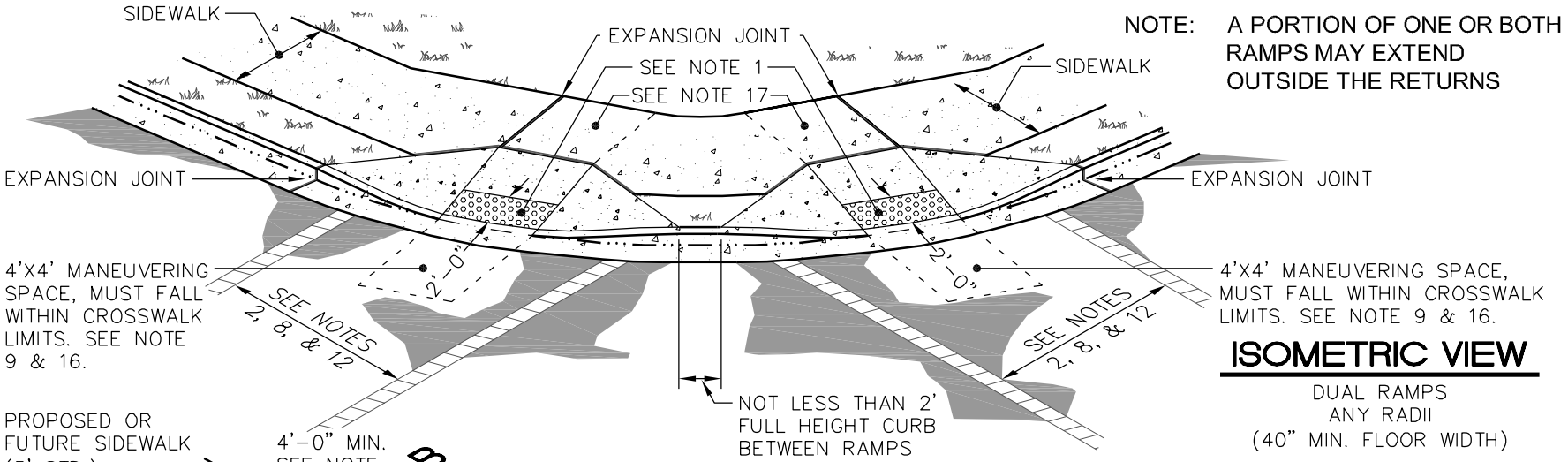
STANDARD DETAIL CURB RAMP PLACEMENT

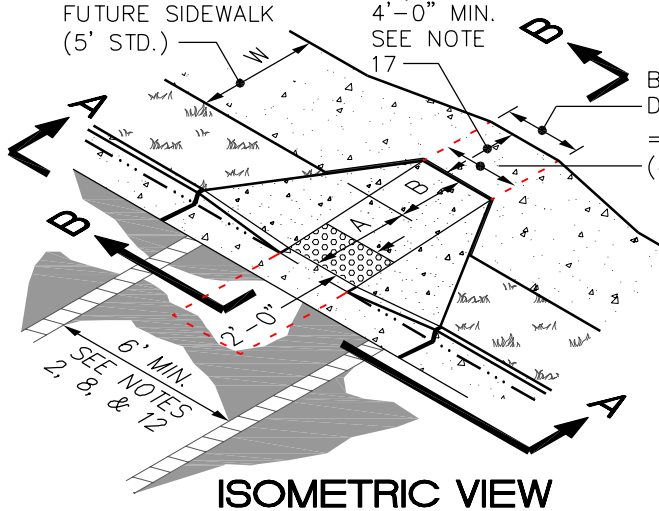
Scale:	Sheet #:	Detail #
not to scale	1 of 1	413.02



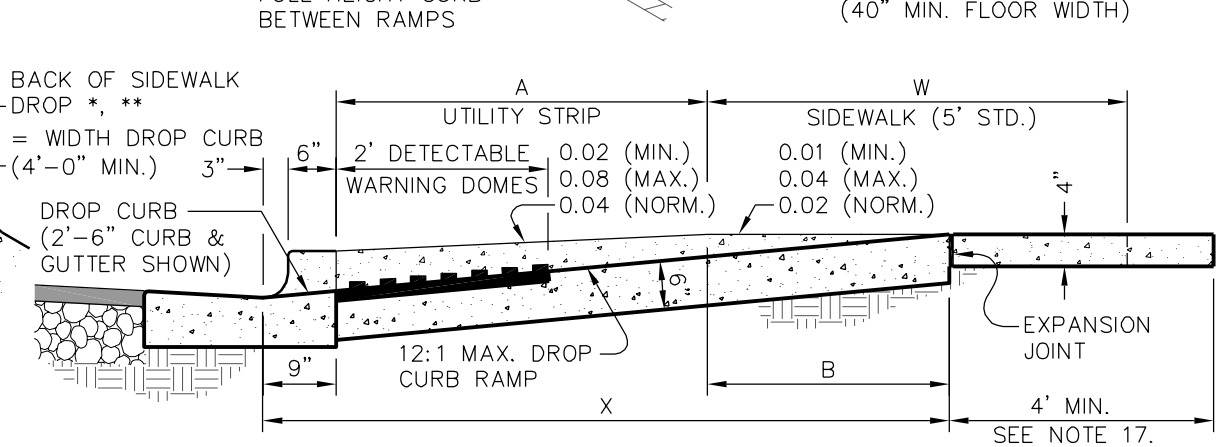
NOTE: A PORTION OF ONE OR BOTH RAMPS MAY EXTEND OUTSIDE THE RETURNS

ISOMETRIC VIEW

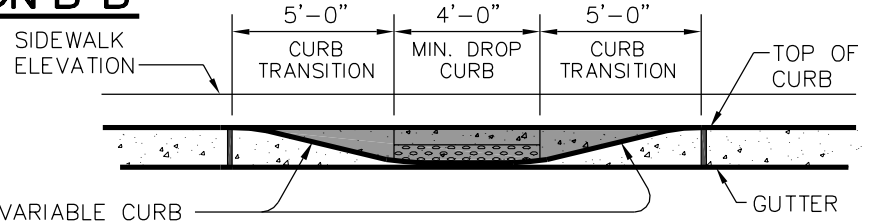
DUAL RAMPS
ANY RADII
(40" MIN. FLOOR WIDTH)



ISOMETRIC VIEW



SECTION B-B



SECTION A-A

SEE SHEET 2 OF 2 FOR DETECTABLE WARNING DOMES, DIMENSIONAL CHART AND NOTES

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No.	Date	Description
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STANDARD DETAIL CURB RAMP

Scale:	Sheet #:	Detail #
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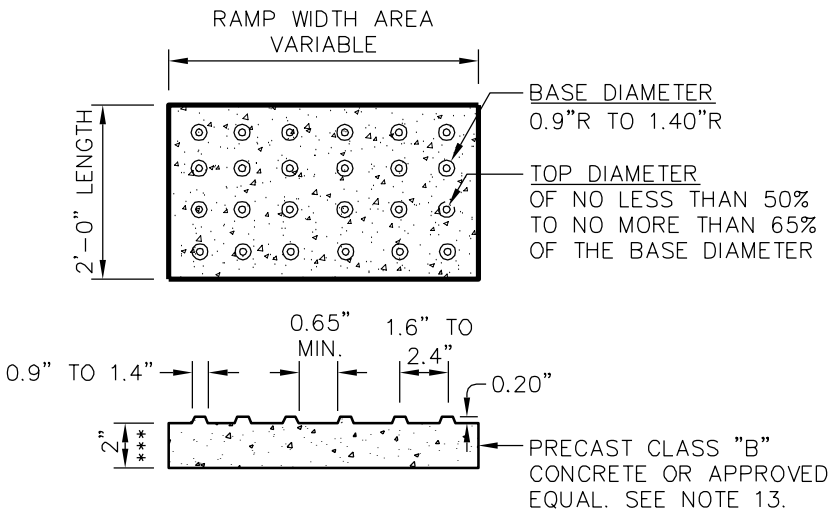

W	A	W + A + 9"	X	B
5'	0.0'	5.8'	5.8'	5.0' *
6'	0.0'	6.8'	6.8'	6.0' **
7'	0.0'	7.8'	7.3'	6.5' **
8'	0.0'	8.8'	7.3'	6.5' **
5'	1.5'	7.3'	7.5'	5.2'
5'	2.0'	7.8'	7.8'	5.0'
5'	2.5'	8.3'	8.1'	4.8'
5'	3.0'	8.8'	8.3'	4.4'
5'	3.5'	9.3'	8.3'	4.1'
5'	4.0'	9.8'	8.6'	3.8'
5'	4.5'	10.3'	8.7'	3.4'
5'	5.0'	10.8'	8.9'	3.1'

DETECTABLE WARNING DOMES

B = X-(A+9")

B = DISTANCE FROM FRONT EDGE OF SIDEWALK TO BACK POINT OF 12:1 (8.33%) SLOPE.

* BACK OF SIDEWALK DROP REQUIRED FOR ALL SIDEWALK SLOPES.

** BACK OF SIDEWALK DROP REQUIRED FOR SIDEWALK SLOPES 0.04.

*** THICKNESS MAY VARY FOR APPROVED EQUAL PRECAST MATERIAL

ROADWAY PLAN SYMBOL
CCFR
CURB CUT FOR FUTURE RAMP

ROADWAY PLAN SYMBOL
WCR
FOR PROPOSED CURB RAMP

NOTES:

1. Detectable warning domes shall cover 2'-0" length and full width of the ramp floor as shown on the details.
2. The entire ramp shall be Black in color or any color with a 70% contrast ratio and approved by City Engineer.

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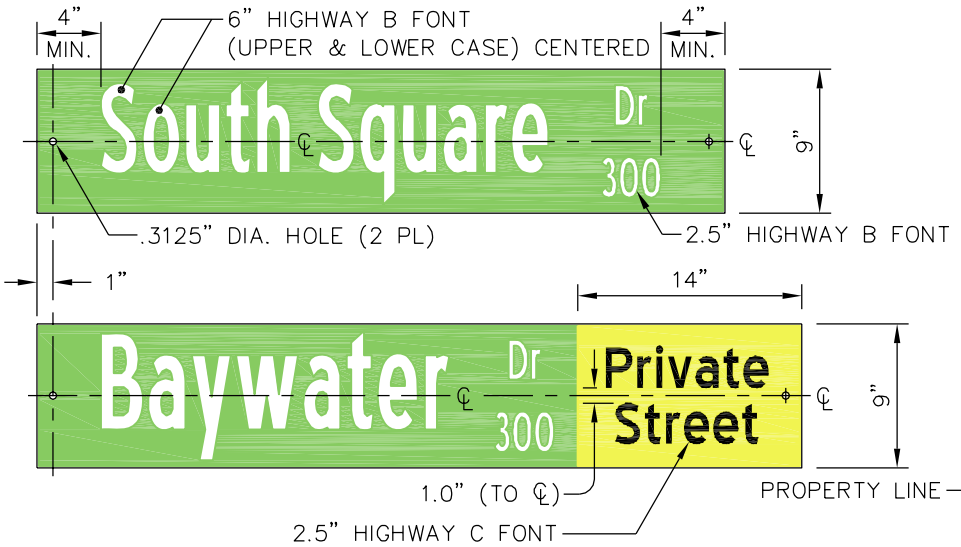
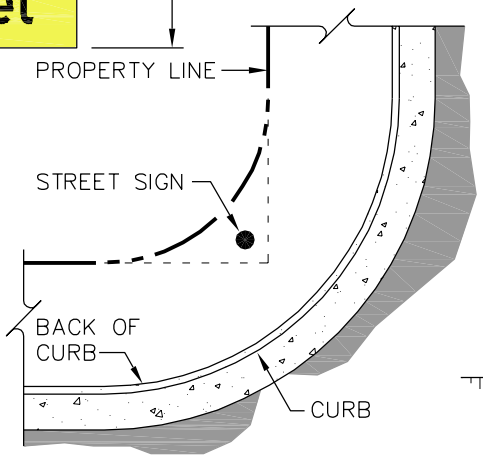
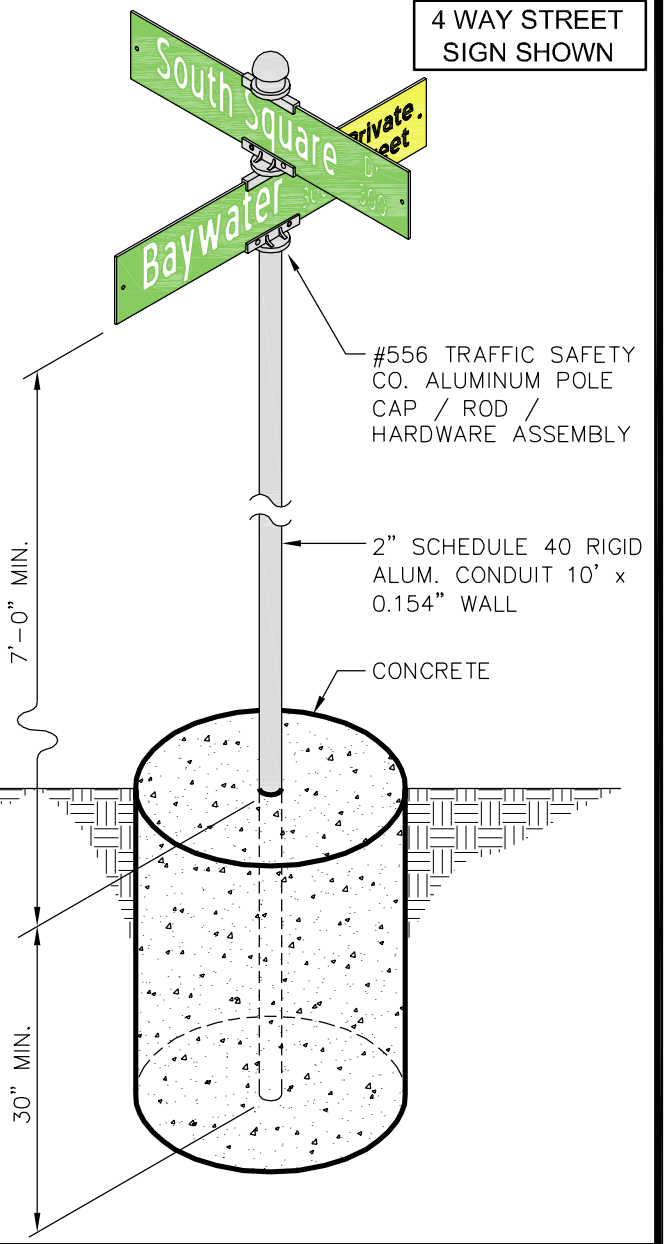
STANDARD CURB RAMP

Scale: not to scale | Sheet #: 2 of 2 | Detail # 413.03





4 WAY STREET SIGN SHOWN



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 installation of all street signs.

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No.	Date	Description
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STREET NAME SIGNS - 9" SIGN HEIGHT

Scale:	Sheet #:	Detail #
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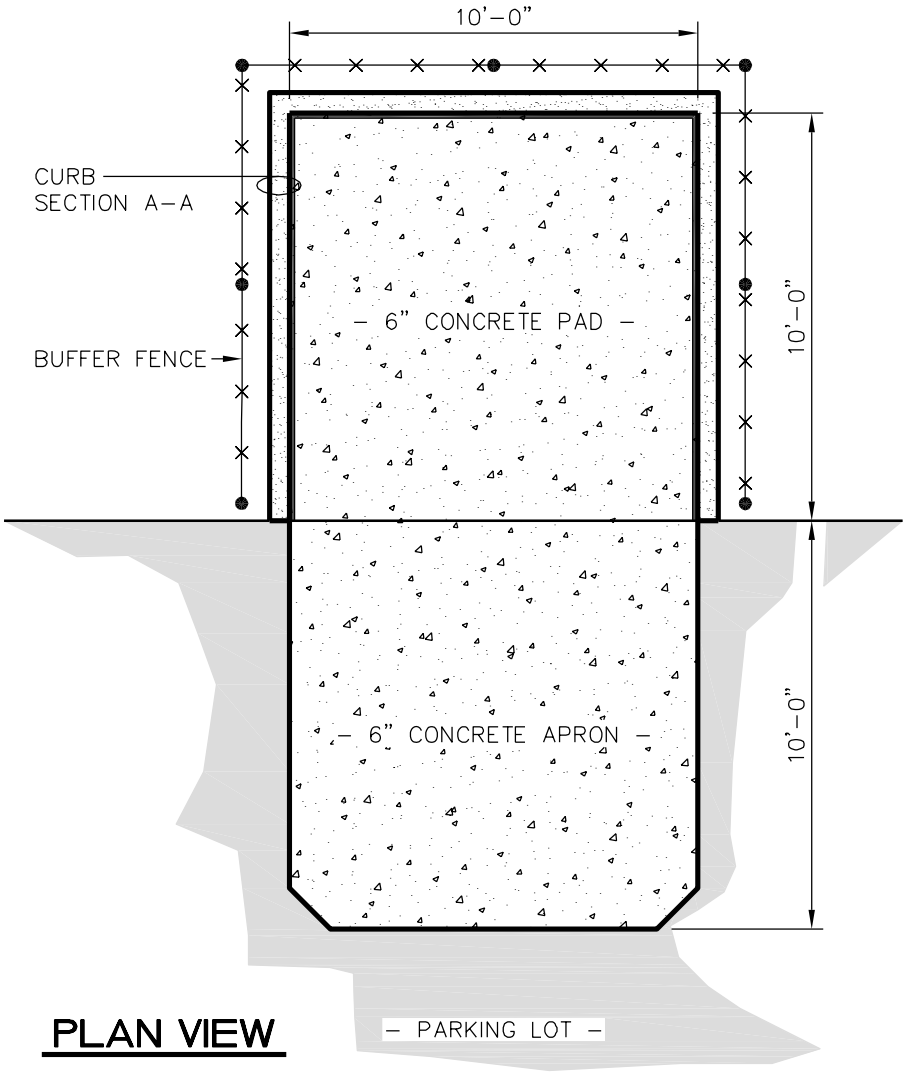
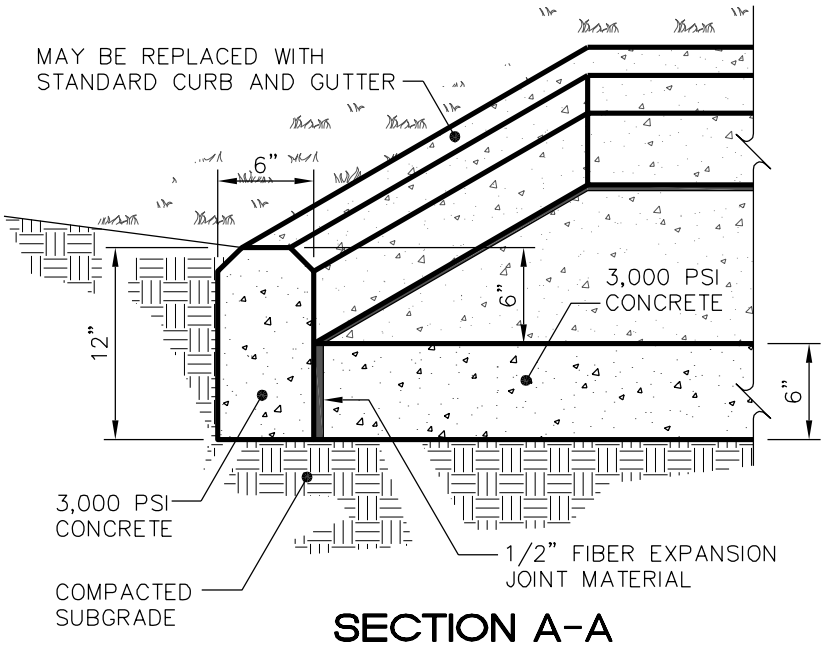


PLAN VIEW



SECTION A-A

NOTES:

1. Container pad must be flush with parking lot pavement.

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No.	Date	Description
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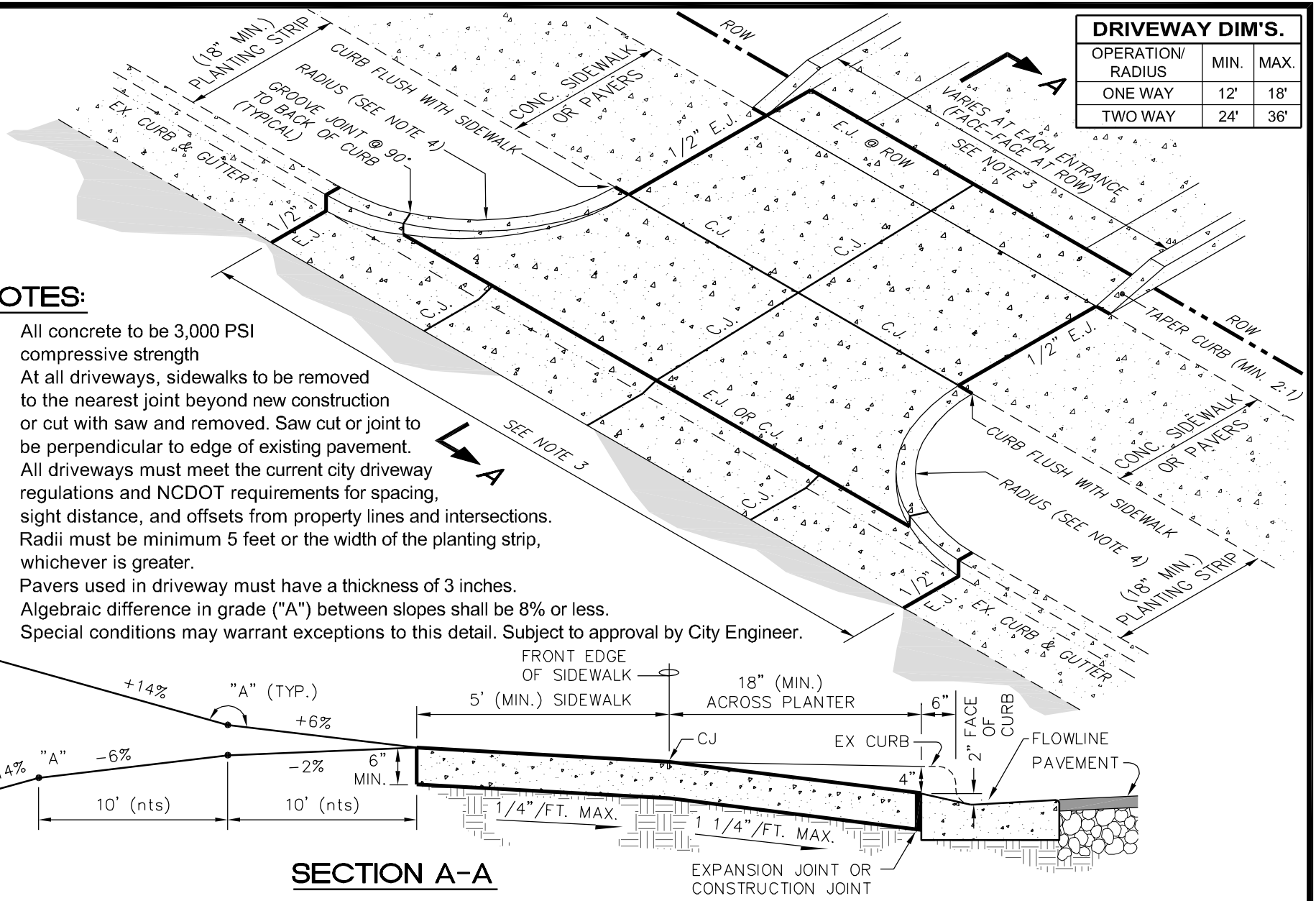
DUMPSTER PAD DETAIL

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

TABLE OF DETAILS

DRIVEWAY DIM'S.		
OPERATION/ RADIUS	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 used in driveway must have a thickness of 3 inches.
6. Algebraic difference in grade ("A") between slopes shall be 8% or less.
7. Special conditions may warrant exceptions to this detail. Subject to approval by City Engineer.

SECTION A-A

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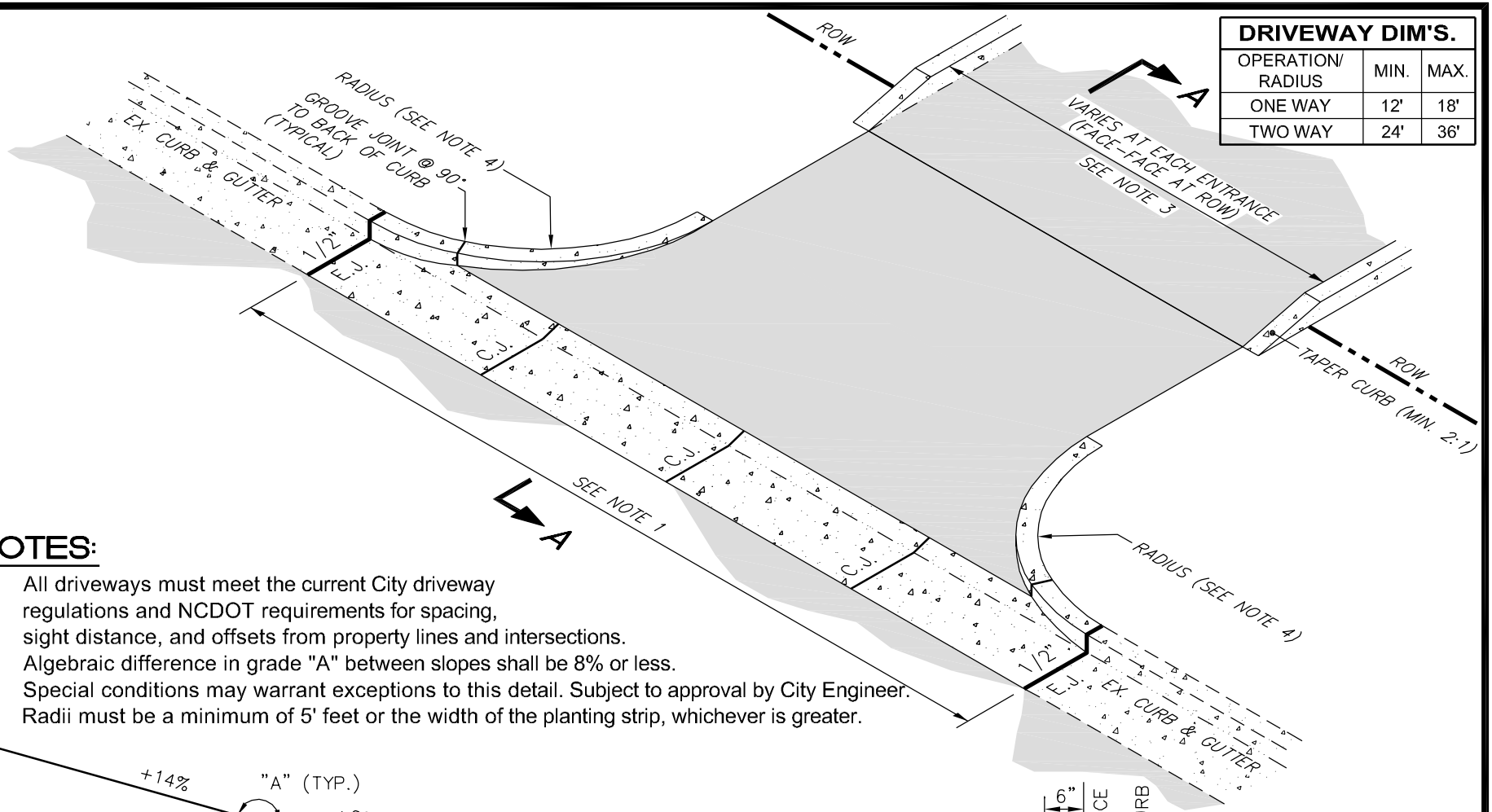
No.	Date	Description
1	9/16/11	APPROVAL

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

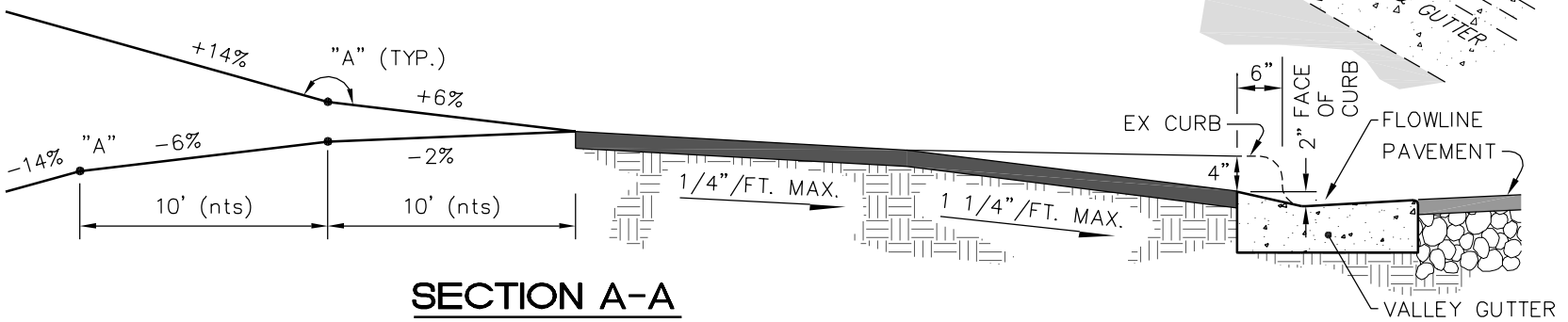
Scale: not to scale | Sheet #: 1 of 1 | Detail # 420.01

DRIVEWAY DIM'S.		
OPERATION/ RADIUS	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.



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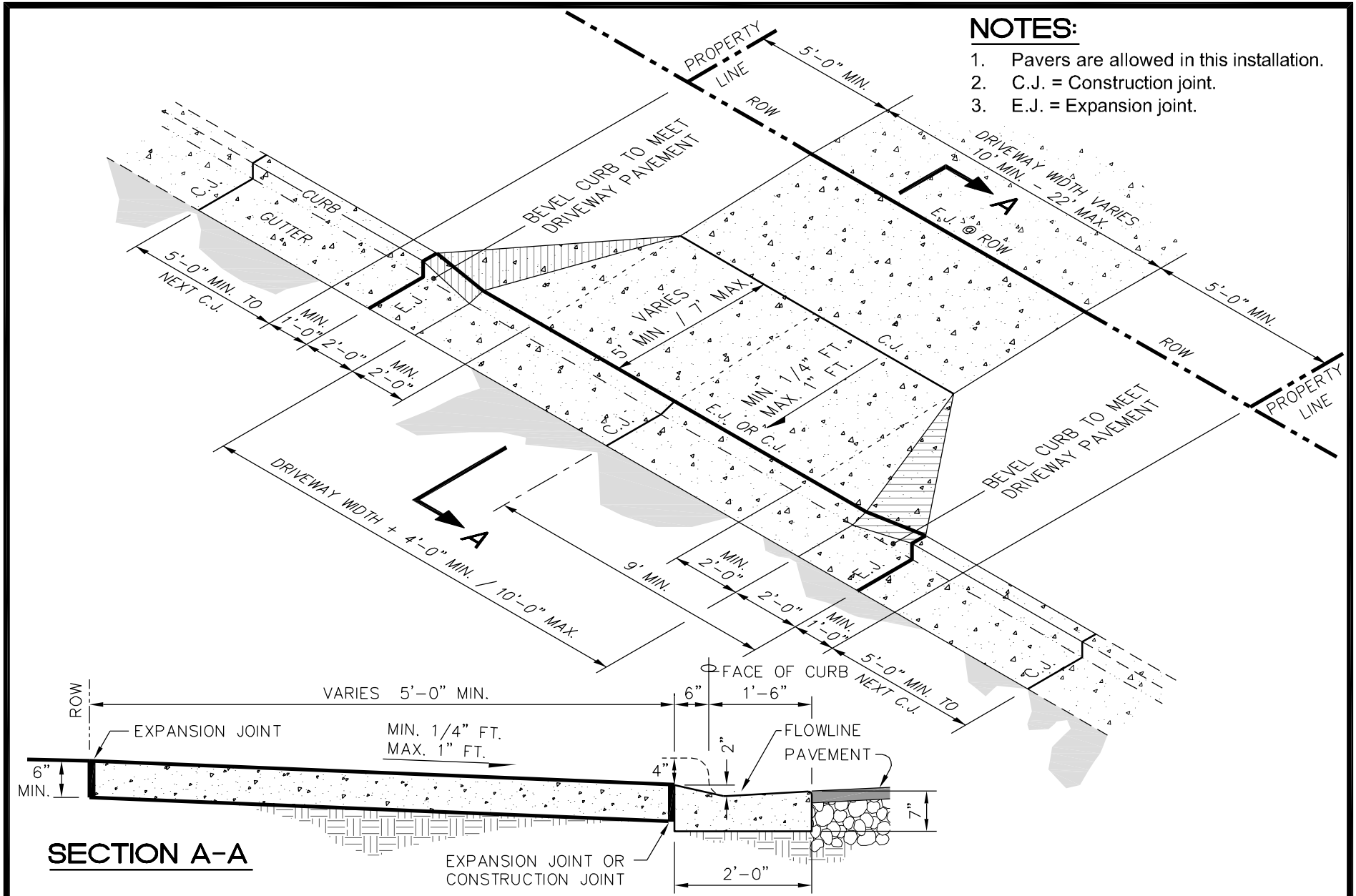
No.	Date	Description
1	9/16/11	APPROVAL

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

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

NOTES:

1. Pavers are allowed in this installation.
2. C.J. = Construction joint.
3. E.J. = Expansion joint.



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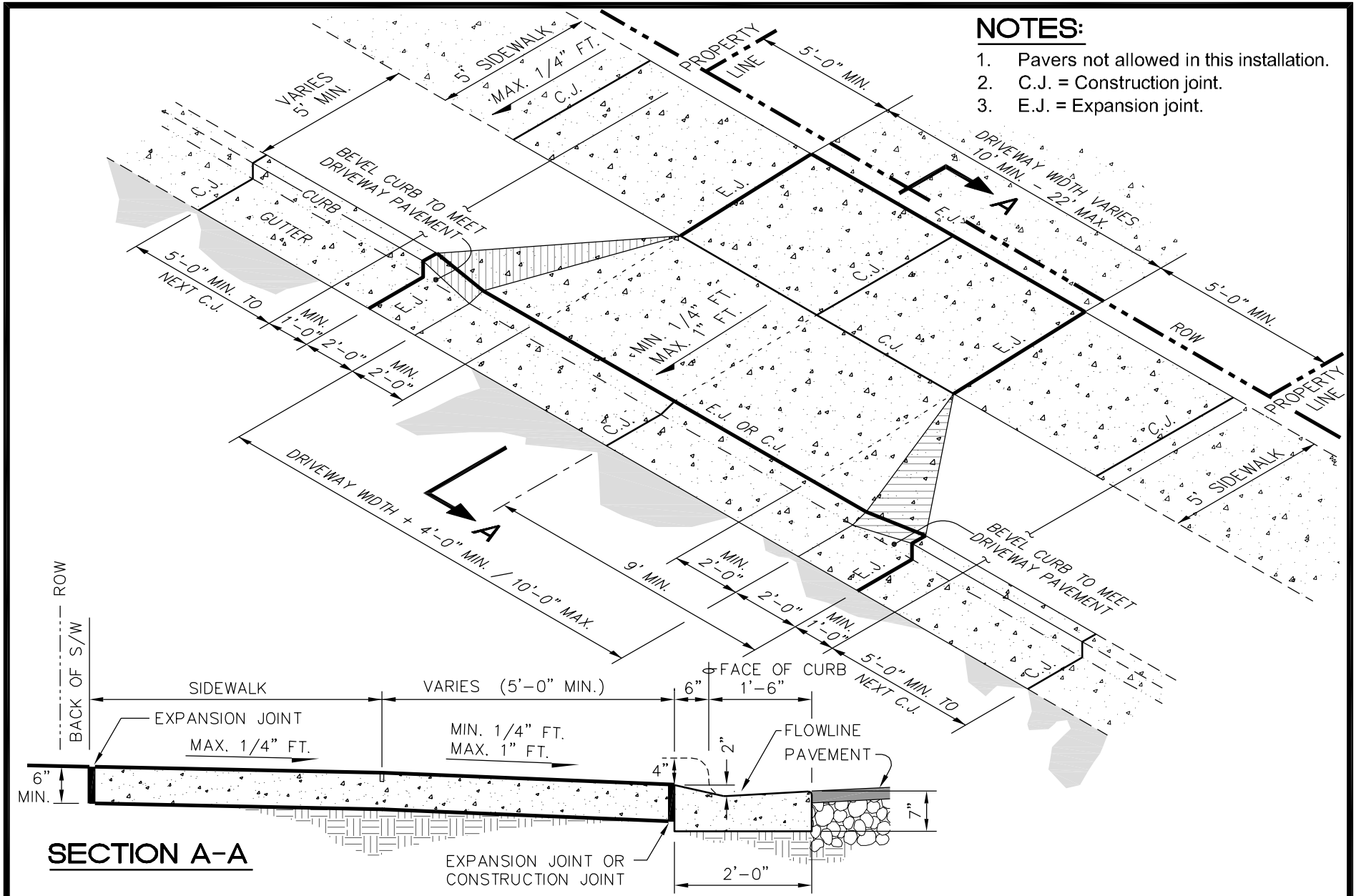
No.	Date	Description
1	9/16/11	APPROVAL

RESIDENTIAL DRIVEWAY - NO SIDEWALK

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

NOTES:

1. Pavers not allowed in this installation.
2. C.J. = Construction joint.
3. E.J. = Expansion joint.



SECTION A-A

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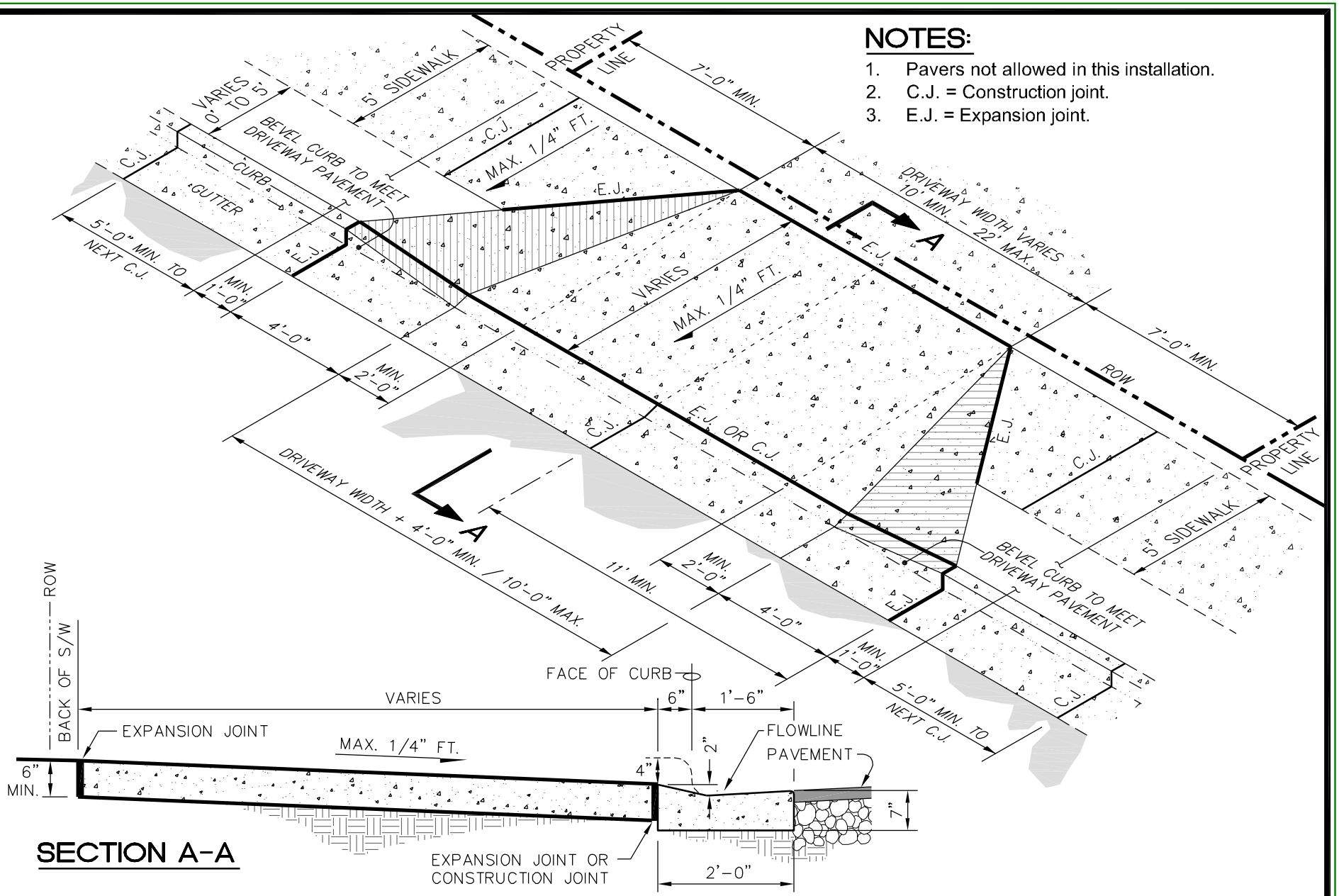
No.	Date	Description
1	9/16/11	APPROVAL

RESIDENTIAL DRIVEWAY - SIDEWALK GREATER THAN 5' FROM CURB

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

NOTES:

1. Pavers not allowed in this installation.
2. C.J. = Construction joint.
3. E.J. = Expansion joint.



SECTION A-A

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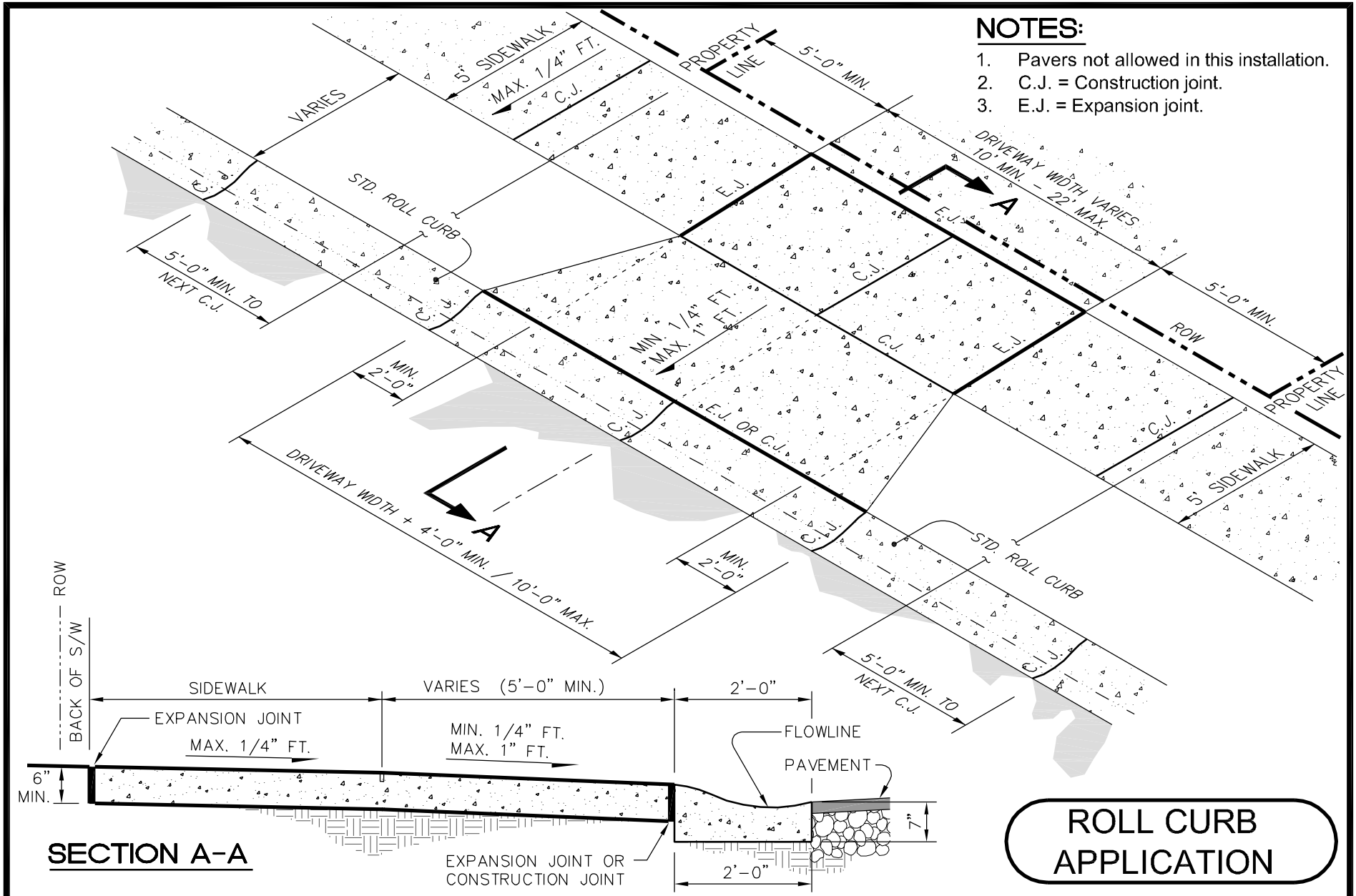
No.	Date	Description
1	9/16/11	APPROVAL

RESIDENTIAL DRIVEWAY - SIDEWALK WITHIN 5' OF CURB

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

NOTES:

1. Pavers not allowed in this installation.
2. C.J. = Construction joint.
3. E.J. = Expansion joint.



SECTION A-A

ROLL CURB APPLICATION

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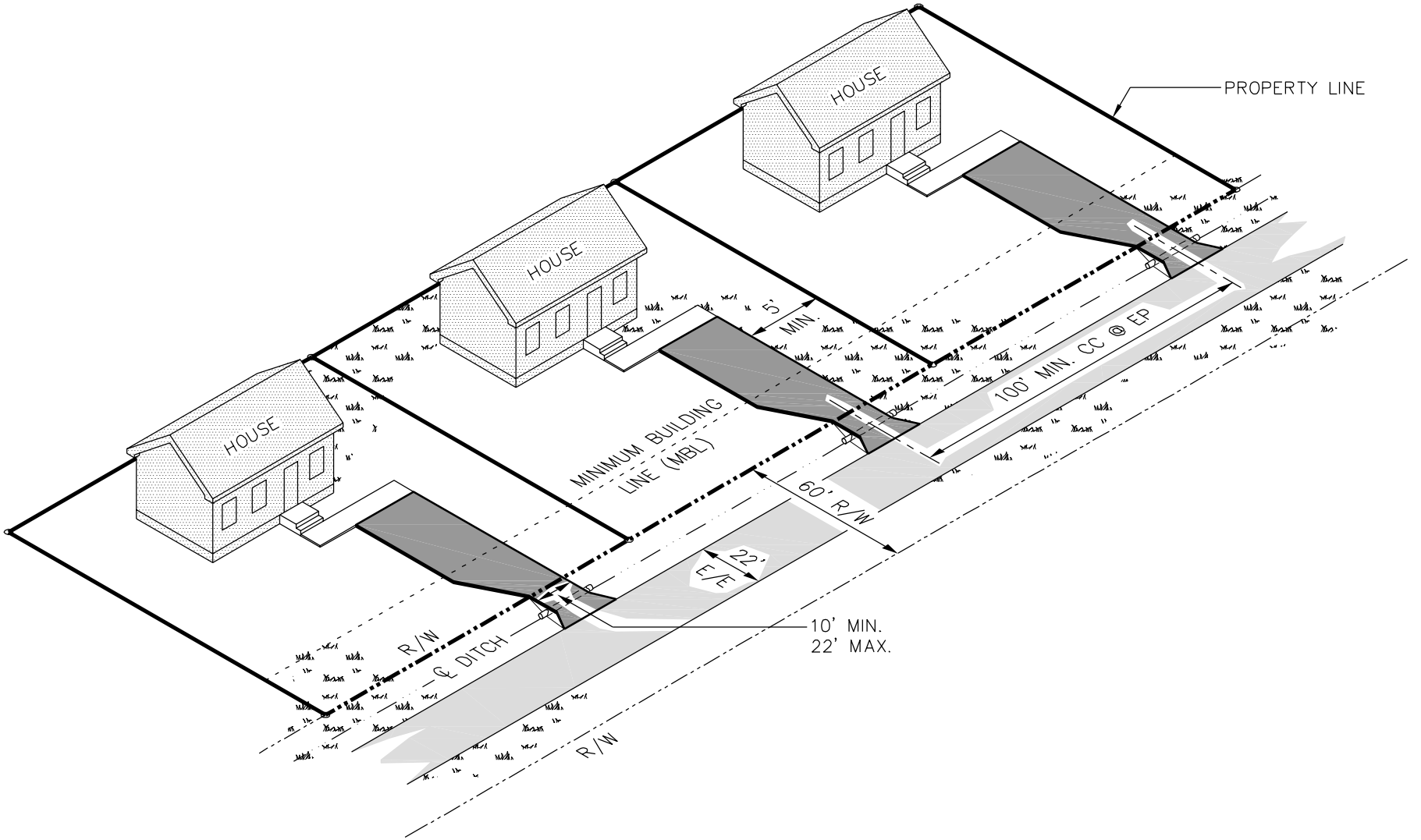
No.	Date	Description
1	9/16/11	APPROVAL

RESIDENTIAL DRIVEWAY - ROLL CURB WITH SIDEWALK

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



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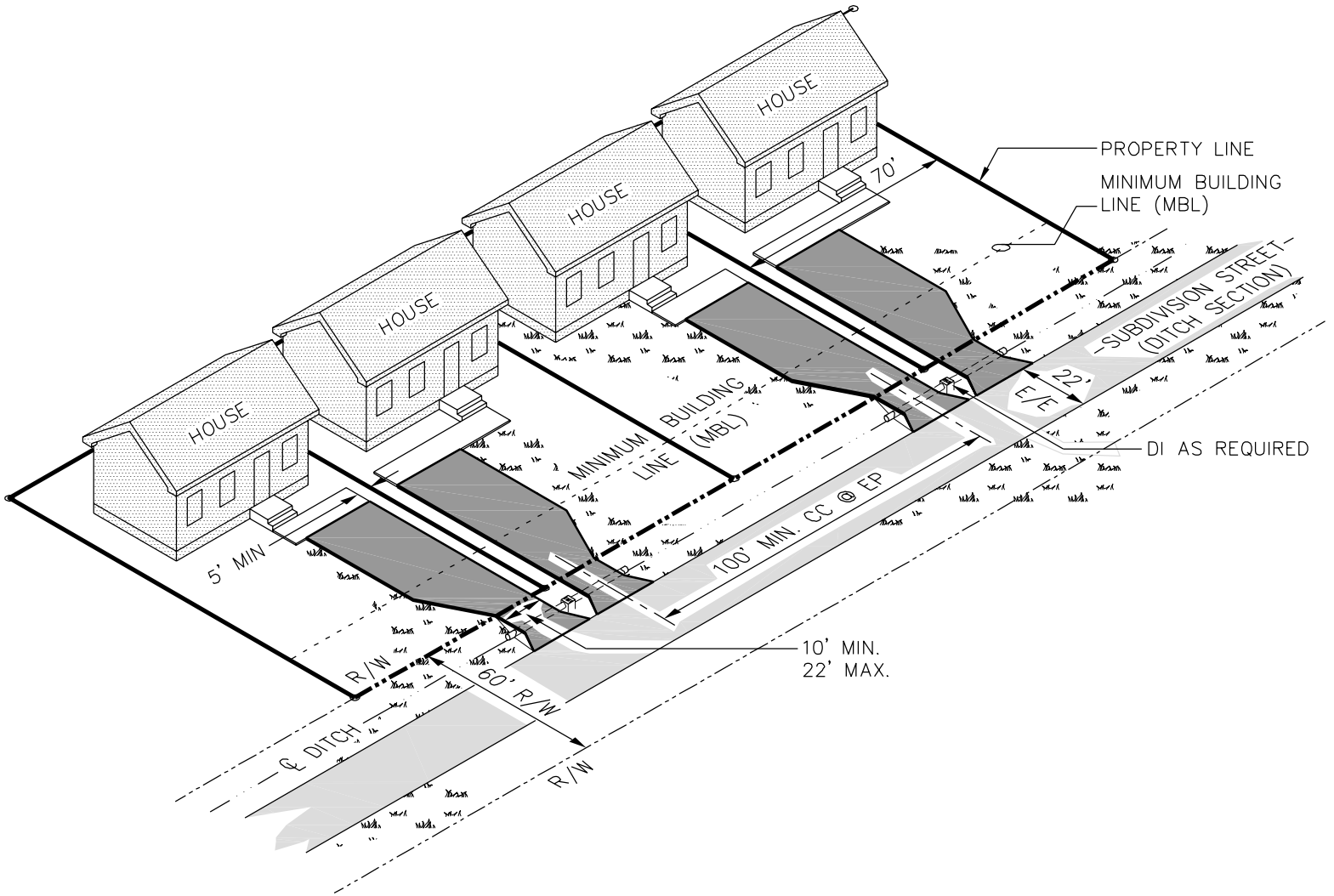
No.	Date	Description
1	9/16/11	APPROVAL

DRIVEWAY SPACING (NON C&G STREET)

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.01



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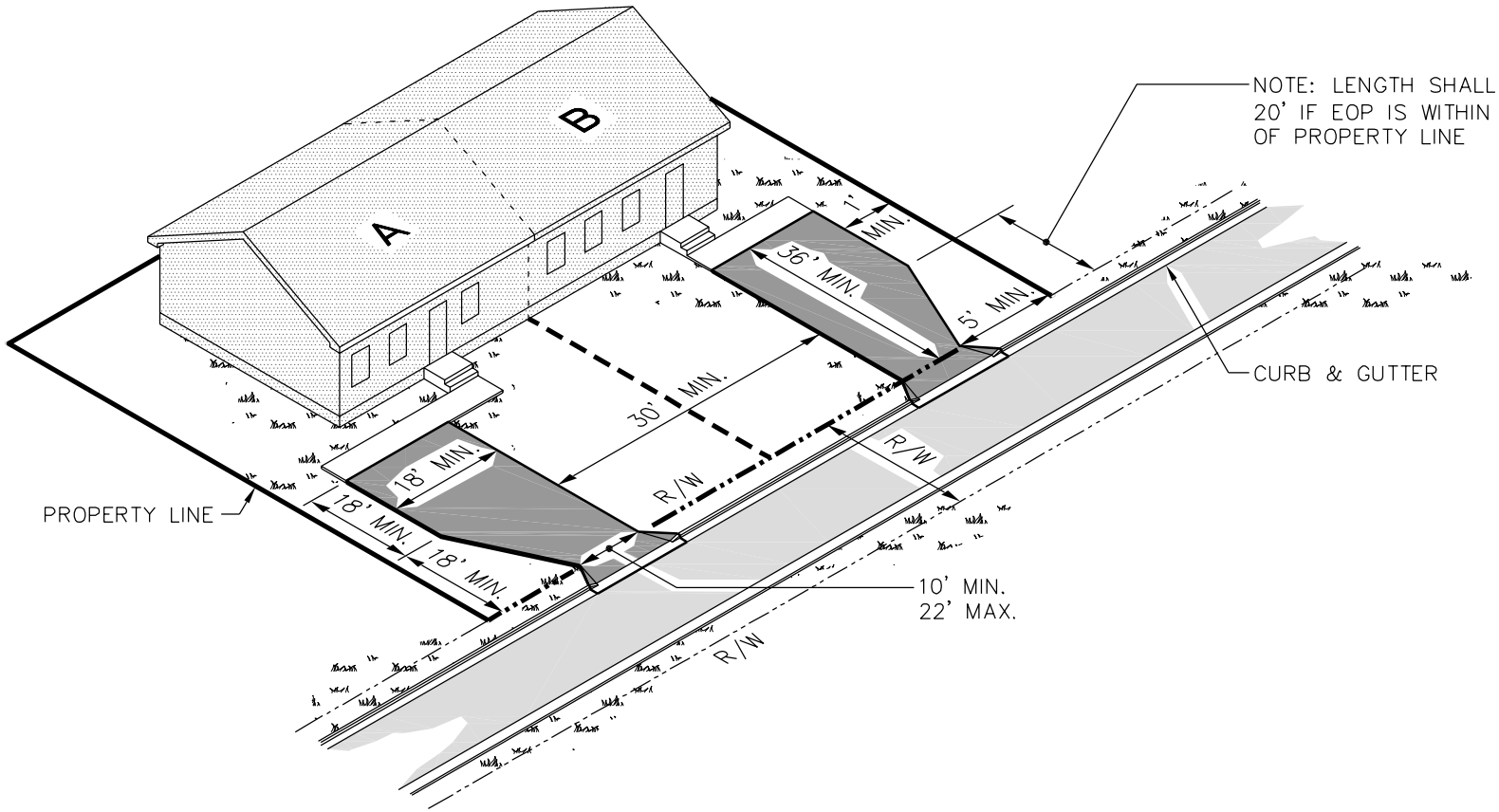
No.	Date	Description
1	9/16/11	APPROVAL

DRIVEWAY SPACING (NON C&G STREET) SHARED CULVERT

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



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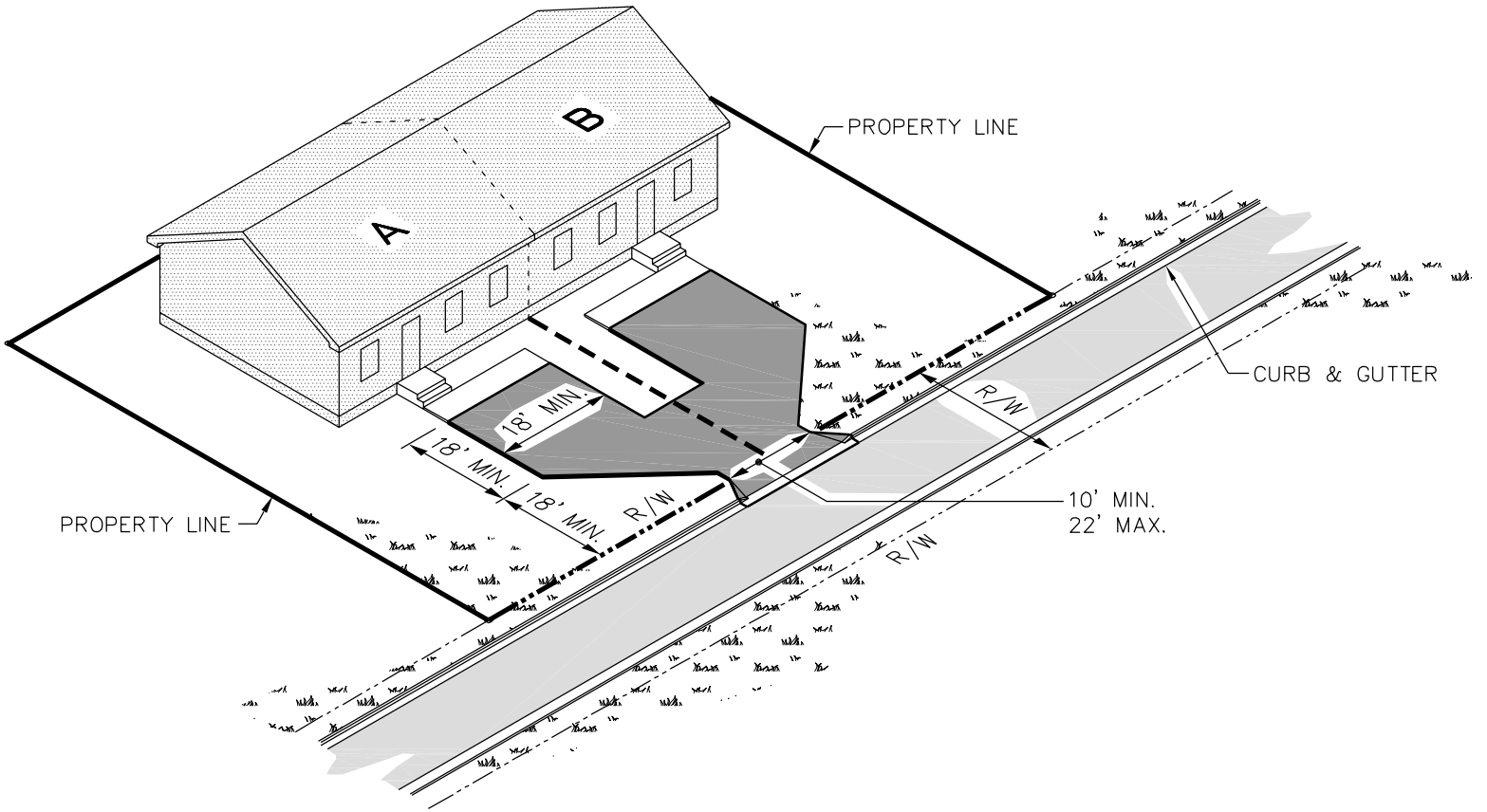
No.	Date	Description
1	9/16/11	APPROVAL

DUPLEX DRIVEWAY SPACING (C&G STREET)

Scale:	Sheet #:	Detail #
not to scale	1 of 1	422.03



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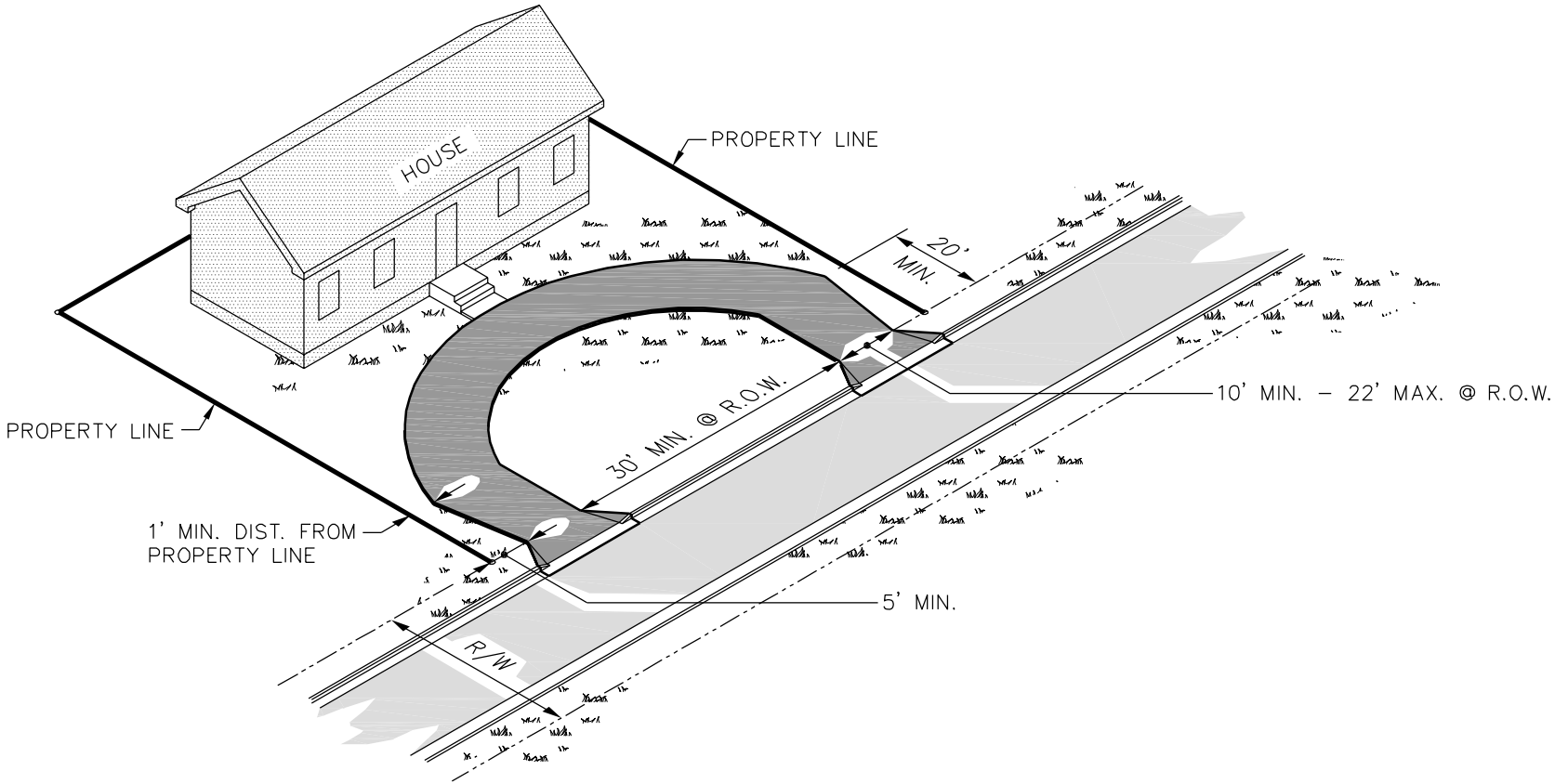
No.	Date	Description
1	9/16/11	APPROVAL

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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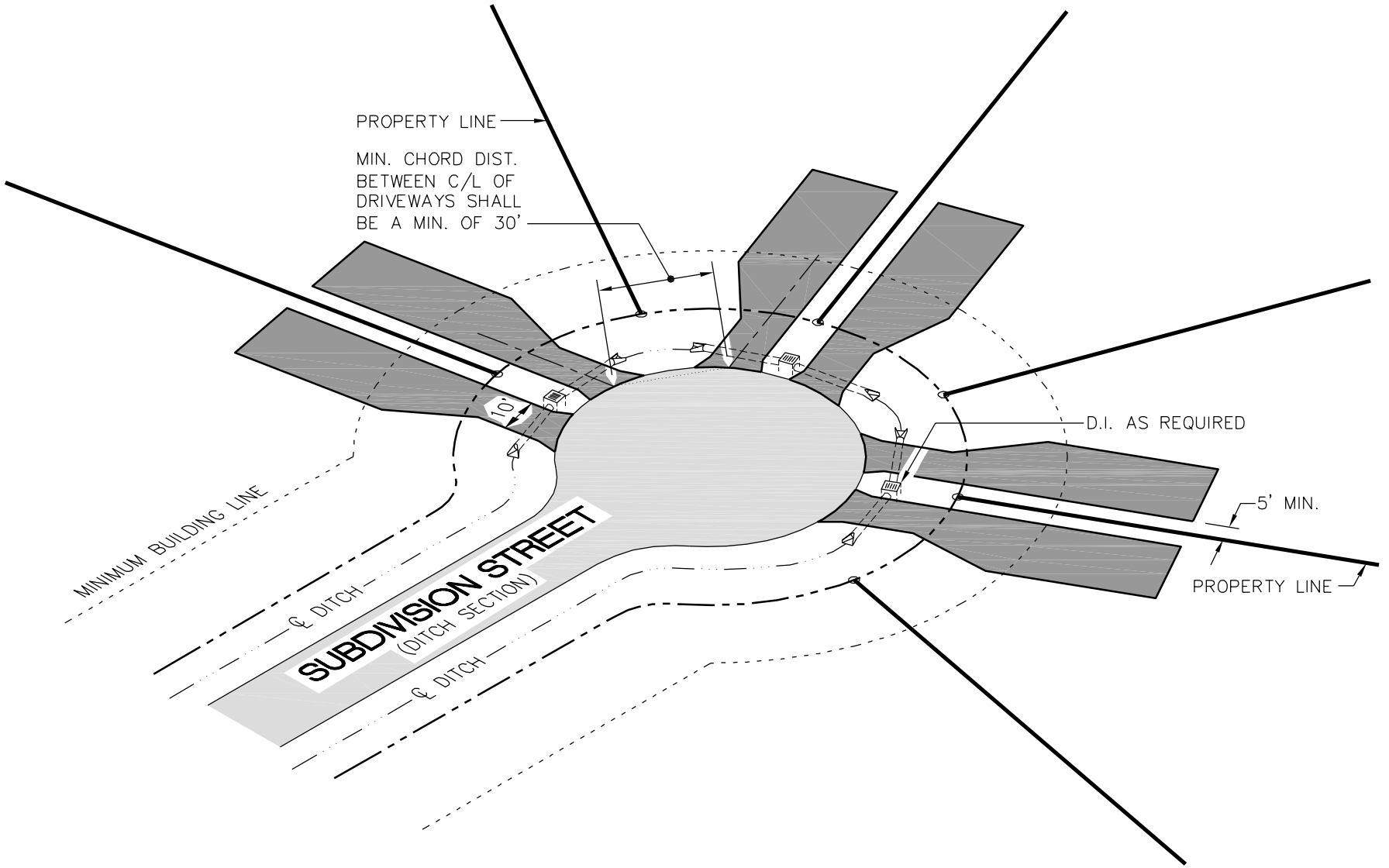
No.	Date	Description
1	9/16/11	APPROVAL

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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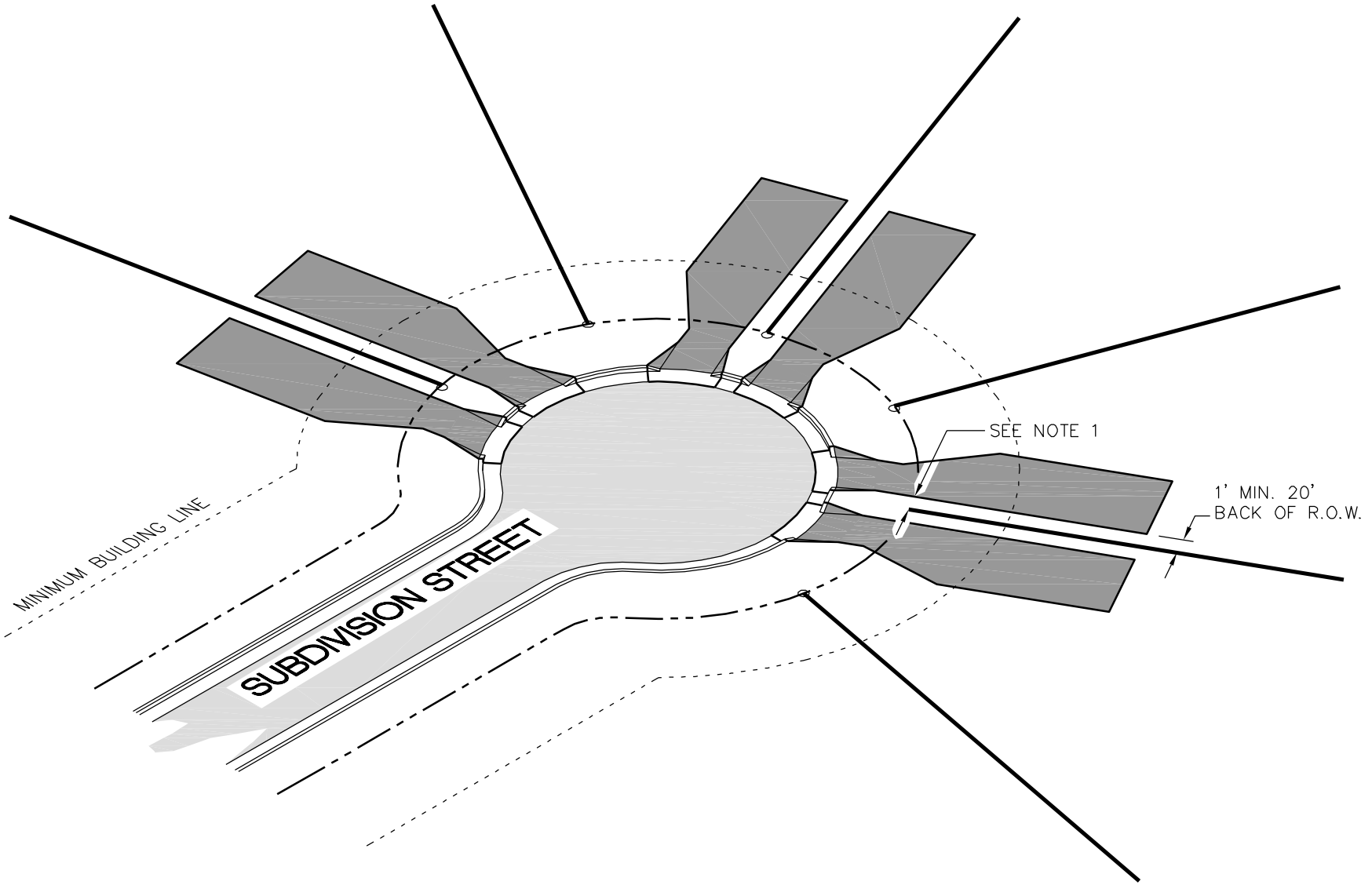
No.	Date	Description
1	9/16/11	APPROVAL

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

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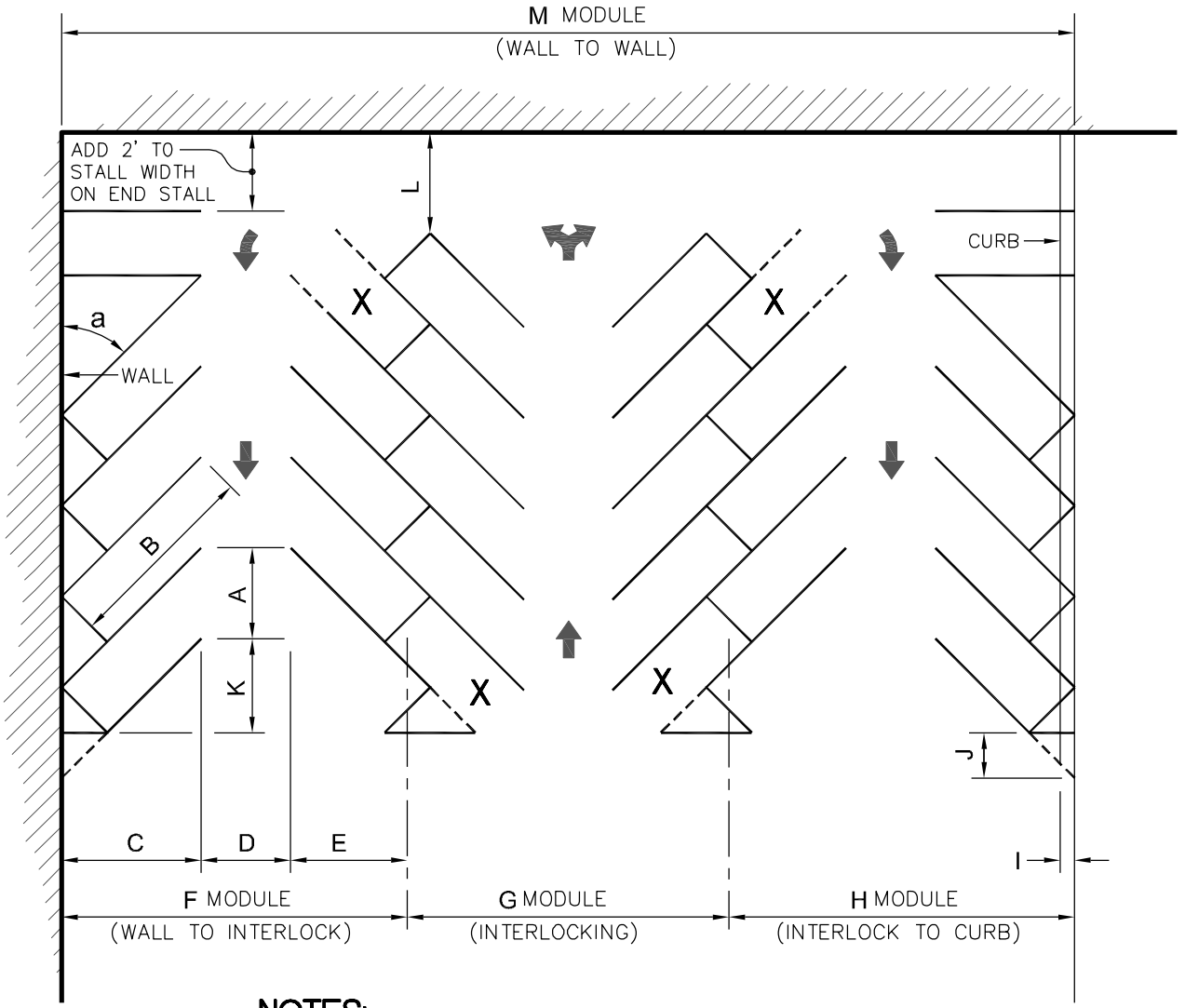
No.	Date	Description
1	9/16/11	APPROVAL

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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No.	Date	Description
1	9/16/11	APPROVAL

MINIMUM PARKING STANDARDS

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

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No.	Date	Description
1	9/16/11	APPROVAL

MINIMUM PARKING STANDARDS

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

TABLE OF DETAILS

RESIDENTIAL 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 three alternatives may be used to determine the soil support value (SSV).

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 - Assigned SSV from Soil Classification of the Pit County Soil Survey Map

The soil types may be determined by using the "Soil Survey of Pitt County, North Carolina" prepared by the United States Department of Agriculture, Soil Conservation Service, issued in November, 1974. A copy is available for use in the Engineering Department offices. To use this publication, locate the proposed street areas on the soil maps in the back of the publication and determine the soil types along the proposed street right-of-way. Then use Table 6, Pages 50-53 of the publication, to determine the AASHTO classifications of the soil types.

Soil support values (SSV) shall be assigned to these classifications using Std. detail No. 491.01, Table A. Soil support values from this table were derived from Std. detail No. 491.01, Table B and conservative estimates of the assigned soil types. The entire street shall be designed using the lowest SSV obtained along any portion of the street.

NOTE: Method B is generally much more conservative than Method A and will usually require a thicker pavement section.

METHOD C: 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 either Method A or B, 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:

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

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

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 details No. 492.01, 02, 03, 04 (for the City of Greenville, use Std. detail No. 492.03; 15-year design life). From these figures, derive a structural number (SN) for the pavement section. For collector streets, add 1.0 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.

CONSTRUCTION CONSIDERATION

Subgrade Preparation

1. If Method A or C was used to obtain the SSV in Step 1 of the DESIGN PROCEDURES, 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 C was used, the upper 18 inches of soil below the pavement section must be compacted. At least one in-place density test must be performed per 100 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.

2. No 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 with a rubber-tired proof roller (loaded dump truck) and have a minimum gross weight of at least 20,000 pounds under the observation of a representative of the Engineering Department. Proof rolling must be done within ten days prior to placement of the asphalt. The proof roller and operator shall be furnished by the developer. All areas of the subgrade 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 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 15-year design life of the street, the street may be paved without making repairs to the subgrade.

Pavement Structures

1. No pavement section shall be placed in a one course paving operation without prior approval of the city engineer.

2. All required testing shall be performed by an approved independent testing laboratory, in accordance with NCDOT Standards & Specs. All materials should be placed in accordance with NCDOT Standards & Specs.

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: DEVELOPMENT CONSISTING OF 100 LOTS IN R-9 ZONING CLASSIFICATION. NO CBR TEST AVAILABLE - SOIL TYPE A-3 FROM PITT COUNTY SOIL SURVEY. ASSUME NORMAL TRUCK LOADING. DESIGN FOR FULL DEVELOPMENT AND 15-YEAR DESIGN LIFE.

SOLUTION:

STEP 1 - Determine the Soil Support Value (SSV) since a CBR is not available and therefore the formula SSV = 5.32 (log CBR) -1.52 cannot be used, go to Std. detail No. 491.01 to get a SSV.

SSV = 3.5

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

Std. detail No. 491.02 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. 491.03 assuming fully developed subdivision which implies 0.5% annual increase in traffic.

$$\overline{ADT} = \frac{820 + (1.05 \times 820)}{2} = 840 \text{ trip/day}$$

STEP 3 - Determine $\overline{N}$

Use Std. Detail No. 491.04 or the equation on Std. detail No. 491.04 to get a $\overline{N}$ of approximately 14.

STEP 4 - Determine the Structural No. (SN)

Go to Std. detail No. 492.02 with a SSV of 3.5 and a $\overline{N}$ of 14 SN = 2.02

STEP 5 - Determine Pavement Section

Go to Std. detail No. 491.05 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 < 2.02	DESIGN INSUFFICIENT	
(b)	Trial 2 -	6" CABC	6 x 0.14 =	0.84
		3" S9.5B	3 x 0.44 =	1.32
				2.16
		2.16 > 2.08	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 > 2.02	DESIGN OK	

SUFFICIENT NUMBER OF LABORATORY CBR'S (CALIFORNIA BEARING RATIO) TO COVER THE RANGE OF SOIL CONDITIONS ENCOUNTERED WITHIN THE AREA TO BE PAVED SHALL BE MADE.

CERTIFICATION AND A REPORT OF SAID TESTS SHALL BE SUBMITTED TO THE CITY ENGINEERING DEPARTMENT BY AN APPROVED SOILS LABORATORY.

IN LIEU OF, THE DESIGNER SHALL SUBMIT TO THE CITY ENGINEERING DEPARTMENT A LIST OF THE SOIL TYPES ENCOUNTERED WITHIN THE AREA TO BE PAVED ACCORDING TO THE PITT COUNTY SOIL SURVEY AS PUBLISHED BY THE SOIL CONSERVATION SERVICE.

A COPY OF THE SOIL SURVEY MAP WITH THE BOUNDARIES OF THE SUBDIVISION AND AREAS TO BE PAVED, SUBSCRIBED THEREON, SHALL ALSO BE SUBMITTED.

FROM THIS INFORMATION, THE SOIL SUPPORT VALUE ACCORDING TO TABLE b SHALL BE ASSIGNED.

TABLE A

AASHTO SOIL CLASSIFICATION	ASSIGNED SOIL SUPPORT VALUE (SSV)
A-1-a	4.2 *
A-1-b	4.2 *
A-3	3.5
A-2-4	4.2 *
A-2-5	4.2 *
A-2-6	3.4
A-2-7	3.4
A-4	1.0
A-5	1.0
A-6	1.0
A-7-5	1.0
A-7-6	1.0

* SUGGESTED MAXIMUM SSV BY N.C.D.O.T. WITHOUT CBR TEST ALTHOUGH AASHTO SOIL CLASSIFICATION INDICATES HIGHER.

TABLE B

CALIFORNIA BEARING RATIO (CBR)

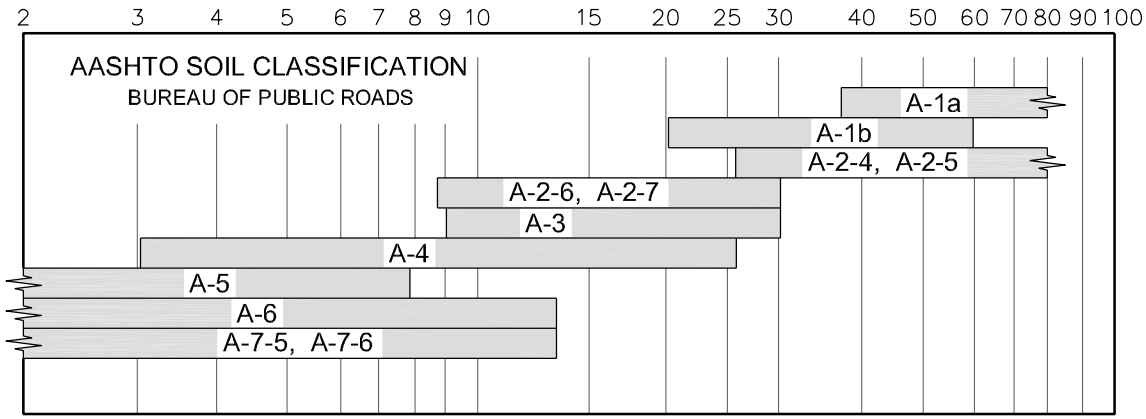

TABLE A IS A VERY CONSERVATIVE DERIVATION OF TABLE B. THE LOWEST CBR FOR EACH SOIL TYPE WAS USED TO CALCULATE THE ASSOCIATED SSV.

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Scale: not to scale | Sheet #: 1 of 1 | Detail # 491.01

TRIP GENERATION

THE FOLLOWING SHALL BE USED TO DETERMINE THE "AVERAGE DAILY TRAFFIC" (ADT) WITHIN NEW RESIDENTIAL DEVELOPMENTS. THE DESIGN LIFE FOR ALL PAVEMENTS SHALL BE A MINIMUM OF 15-YEARS. 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 FACTORS ON AN INDIVIDUAL BASIS BY THE CITY ENGINEERING DEPARTMENT, USING THE TRIP GENERATION INTENSITY FACTORS AND SUPPLEMENTS THEREOF PUBLISHED BY THE ARIZONA DEPARTMENT OF TRANSPORTATION 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.

ZONE CLASSIFICATION		TRIPS/DAY/DWELLING
R-6	MULTIFAMILY	6.7
R-9	HIGH DENSITY SINGLE FAMILY	8.2
A-3	MEDIUM DENSITY SINGLE FAMILY	10.0
A-2-4	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
CONNECTOR 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) $\overline{ADT} = \frac{ADT + (G \times ADT)}{2}$

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

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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.

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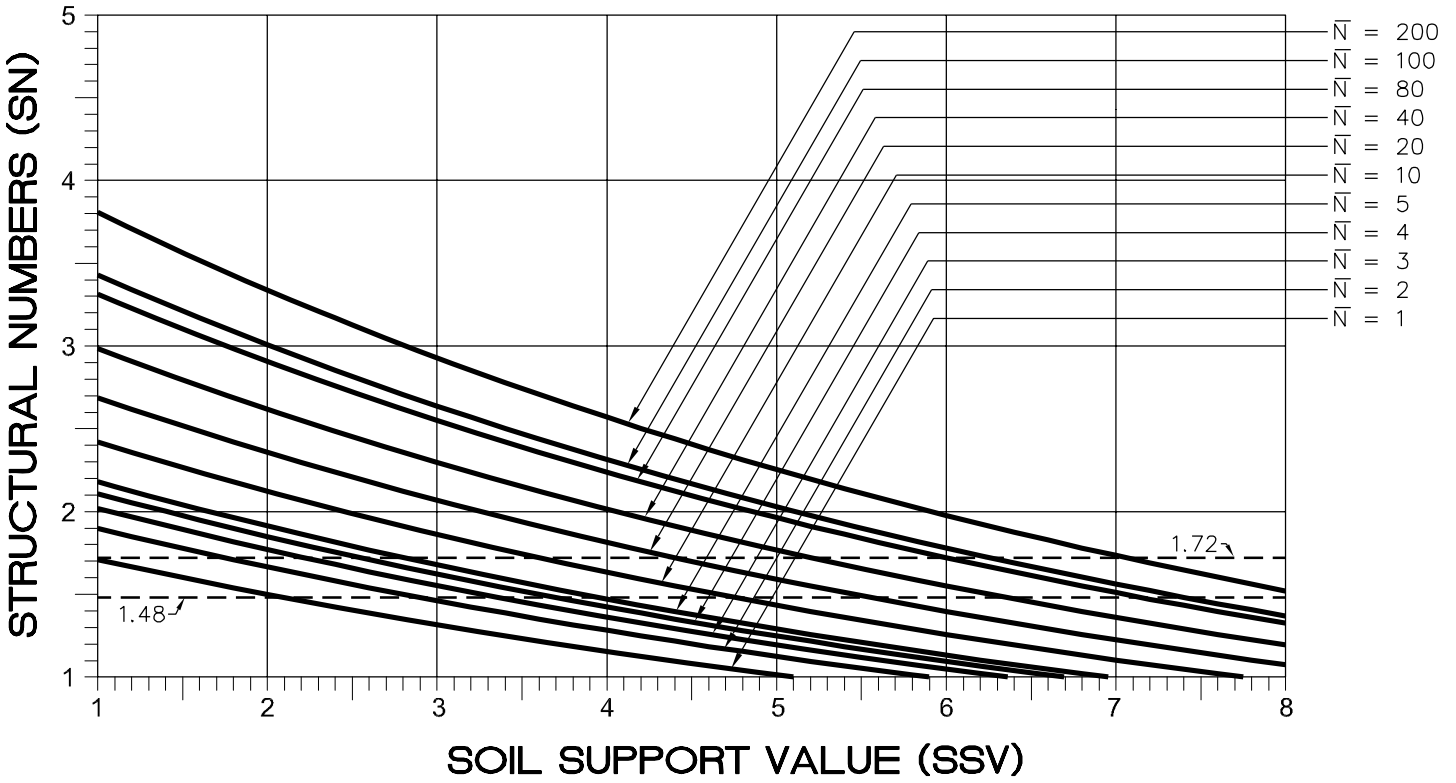
NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

$$SN = \frac{1.95\,(\overline{N})^{\,0.151}}{(1.14)^{\,SSV}}$$

5 YEAR DESIGN LIFE



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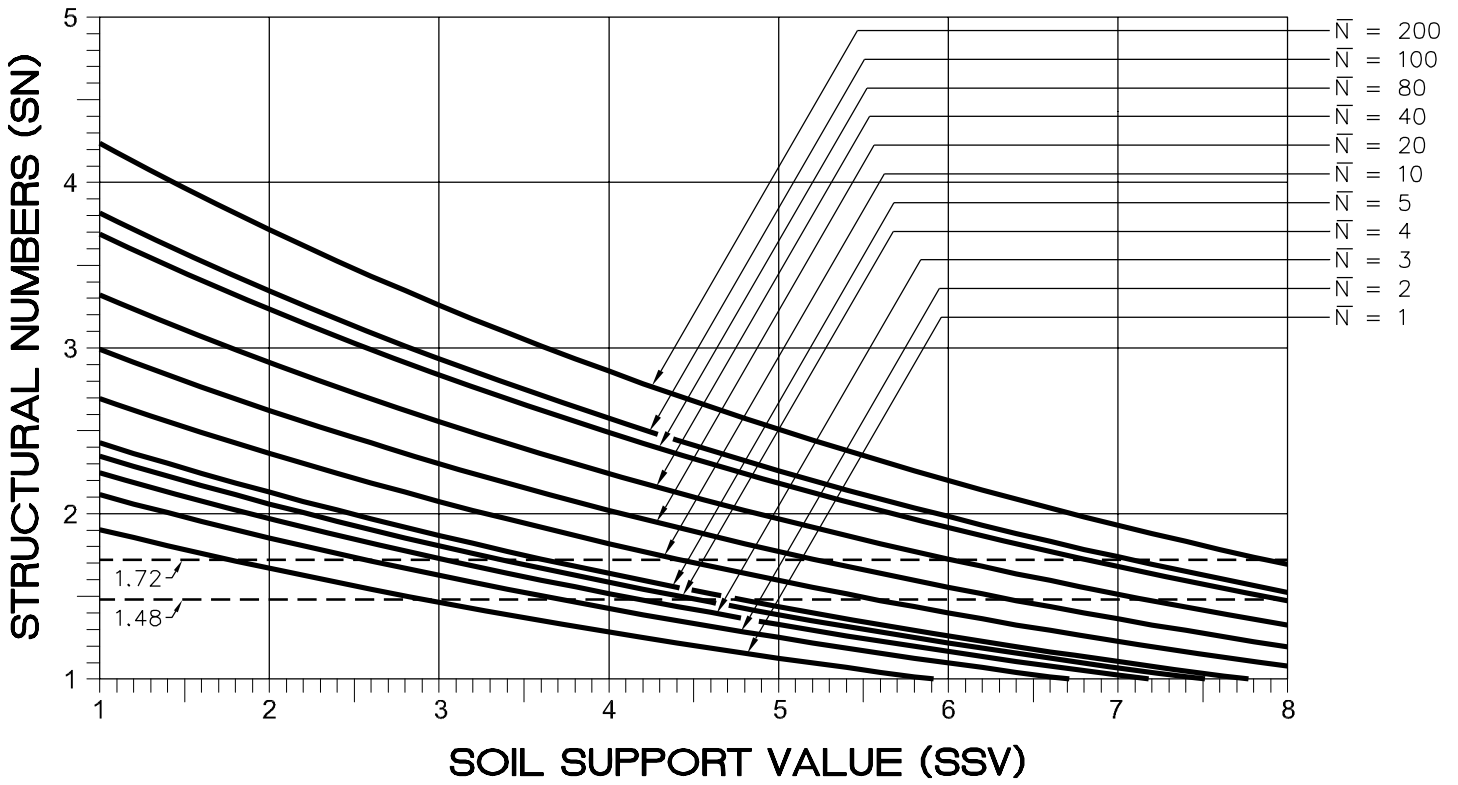
NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

$$SN = \frac{2.17\,(\overline{N})^{\,0.151}}{(1.14)^{\,SSV}}$$

10 YEAR DESIGN LIFE



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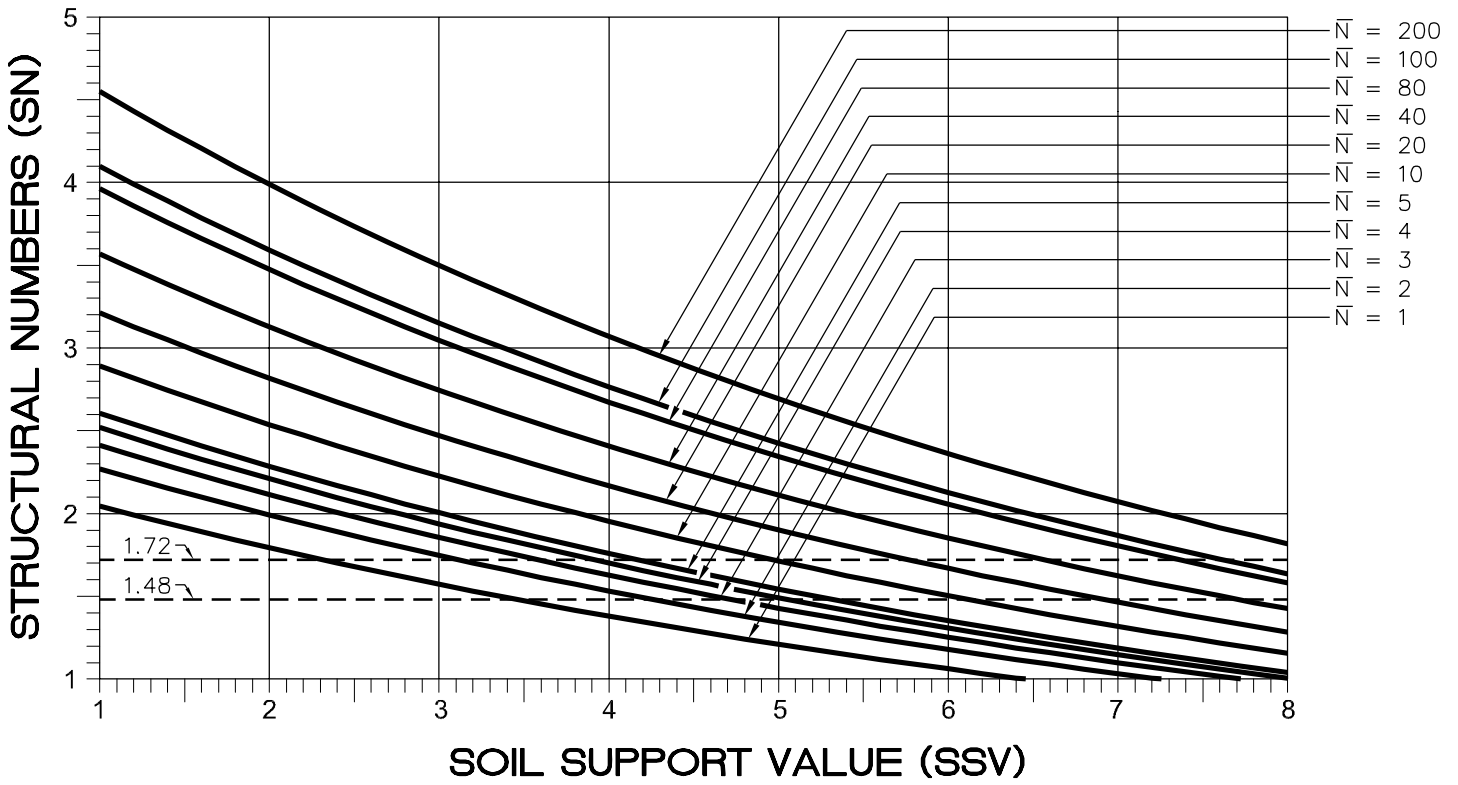
NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

$$SN = \frac{2.33\,(\overline{N})^{\,0.151}}{(1.14)^{\,SSV}}$$

15 YEAR DESIGN LIFE



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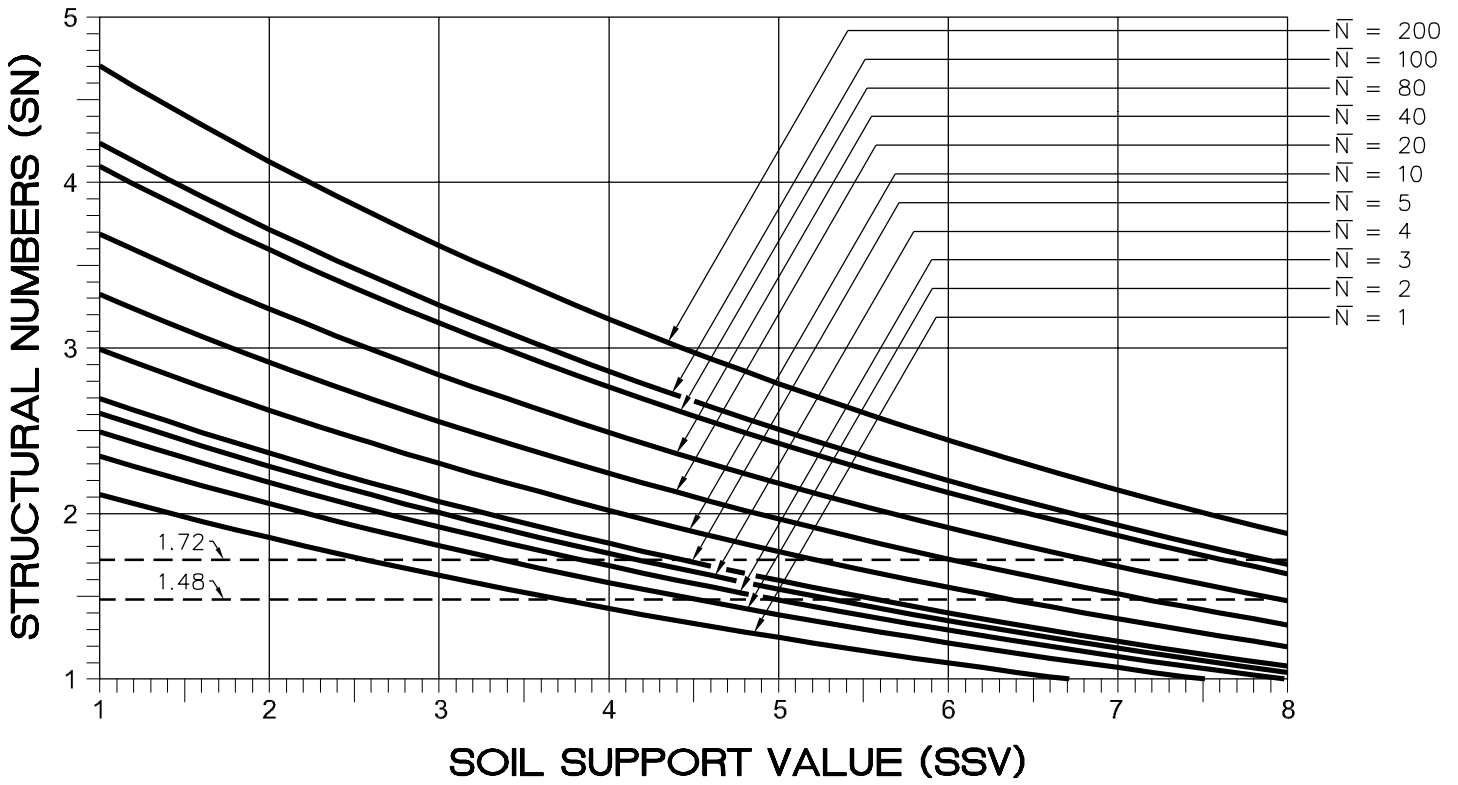
NO SN BELOW 1.72 FOR POOR TO FAIR SUBGRADE SOILS NOR 1.48 FOR GOOD TO EXCELLENT SUBGRADE SOILS SHOULD BE USED.

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

20 YEAR DESIGN LIFE



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RESIDENTIAL STREET SECTION DESIGN

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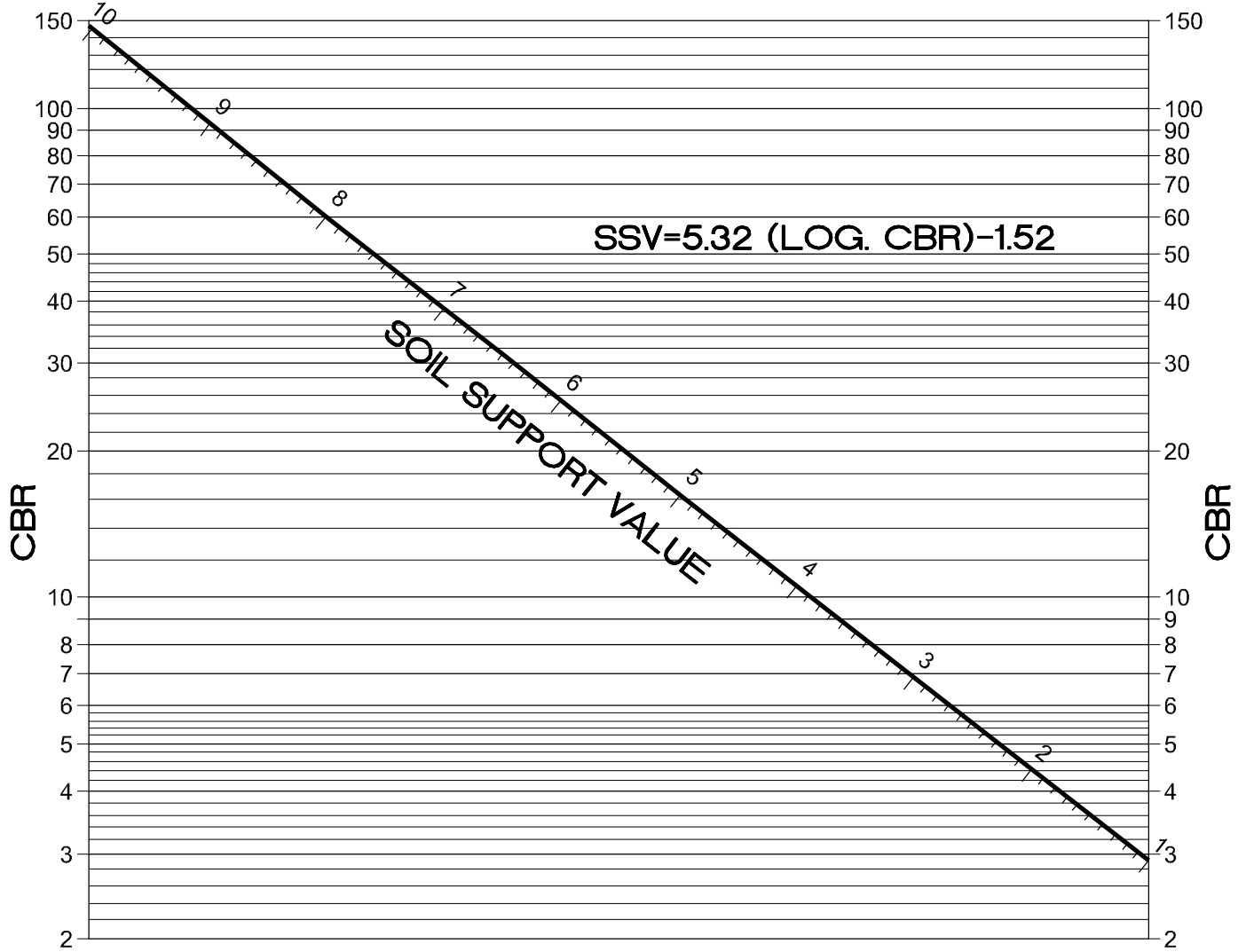

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TABLE OF DETAILS

CATCH BASIN & JUNCTION BOX STANDARD NOTES

1. Mortar Joints 1/2" ± 1/8" thick. Concave tool all exposed mortar joints.
2. Class "A" concrete to be used. Chamfer all exposed corners 1".
3. The pouring of floor slab to be accomplished by forming.
4. All catch basins over 3'-6" in depth shall be provided with steps 1' on centers. Steps shall be in accordance with std. detail No. 615.01.
5. Concrete brick may be used in lieu of clay brick. Jumbo brick will be permitted.
6. Engineered pre-cast boxes are permitted with the City Engineer's approval.
7. For 8'-0" in height or less use 8" wall. Over 8'-0" in height use 12" wall to 6'-0" from top of wall, and 8" wall for the remaining 6'-0". Adjust quantities accordingly.
8. Leave weep holes as directed by the engineer.
9. Construct with pipe crowns matching.
10. All drawings not to scale.

MANHOLE STANDARD NOTES

1. Mortar Joints 1/2" ± 1/8" thick. Concave tool all exposed mortar joints.
2. Class "A" concrete to be used. Chamfer all exposed corners 1".
3. Forms to be used for the construction of the base.
4. Where the manhole top is exposed to road traffic, the top of the manhole is to be flush with the ground. At other locations it should be a minimum of 9" above the ground.
4. Manholes over 3'-6" in depth shall be provided with steps 1' on centers. Steps shall be in accordance with Std. detail No. 615.01.
5. Over 36" pipe design requires City Engineer's approval.
6. For manholes over 12 ft. vertical wall depth, brick masonry wall thickness shall be 12"
7. For manholes with a vertical wall depth less than 12 ft., brick masonry wall thickness shall be 8".
8. All drawings not to scale.

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STANDARD CATCH BASIN AND MANHOLE NOTES

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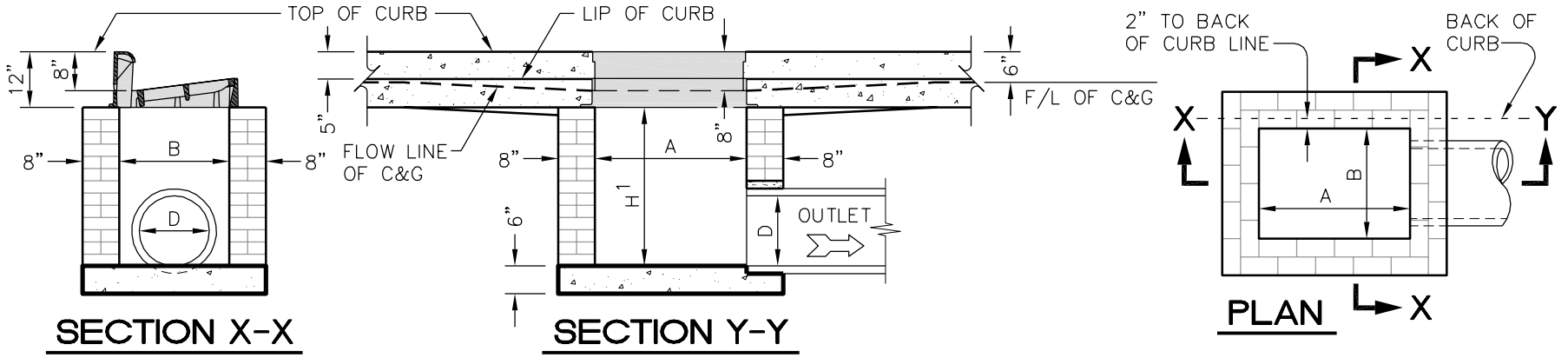
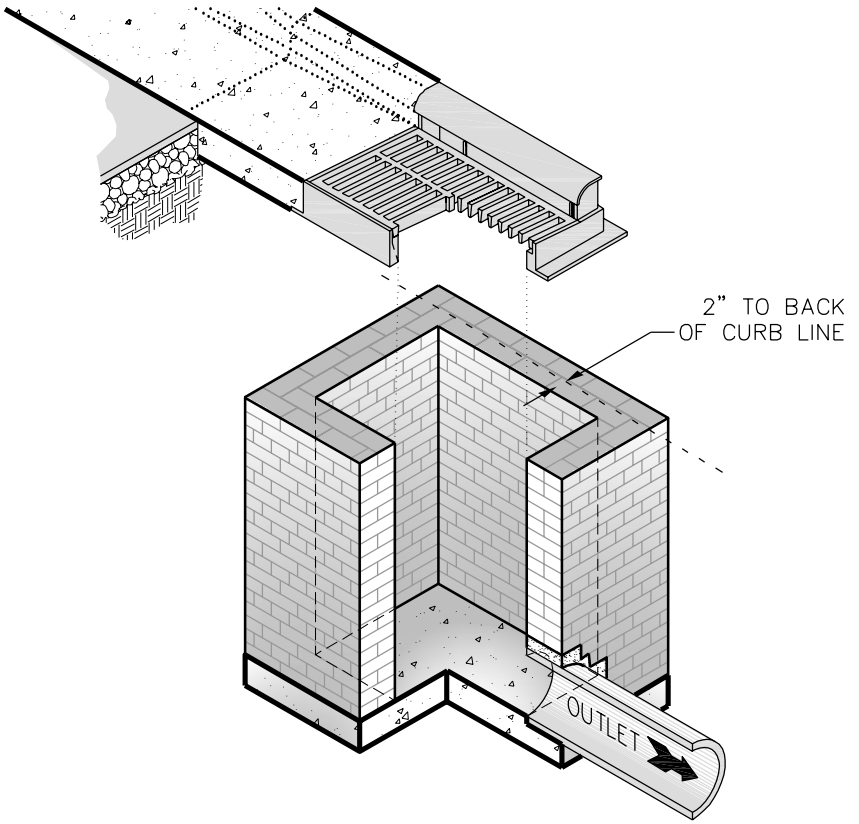


WHERE UP TO 24" PIPE IS USED



NOTES:

1. See sheet 4 of 4 for dimensions.
2. See Std. detail No. 610.01 for standard notes.

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STANDARD BRICK CATCH BASIN (15" THRU 54" PIPE)

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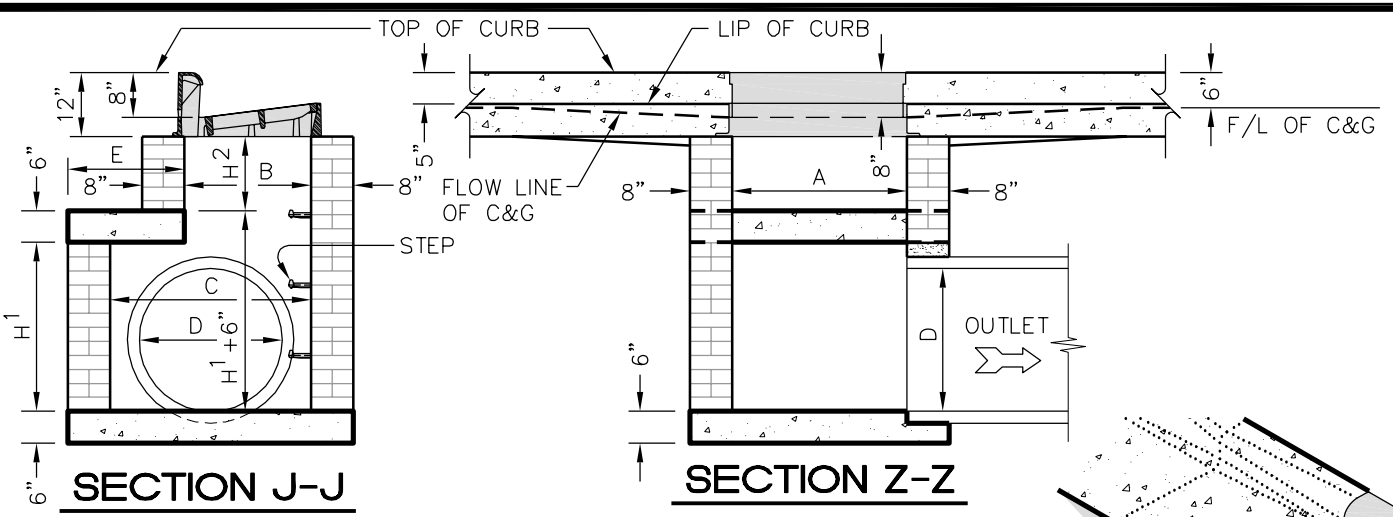

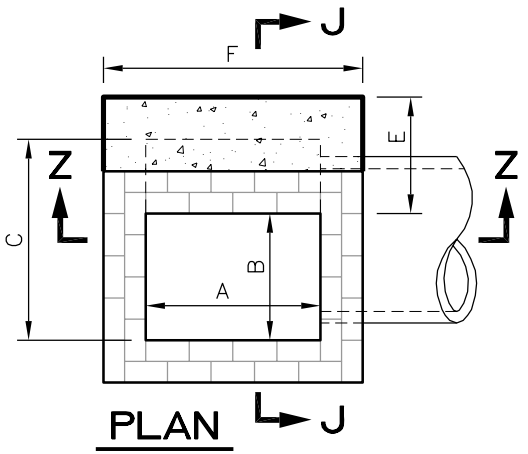

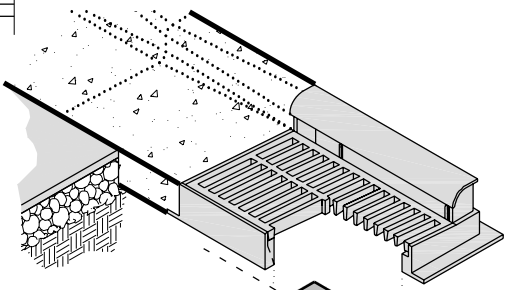

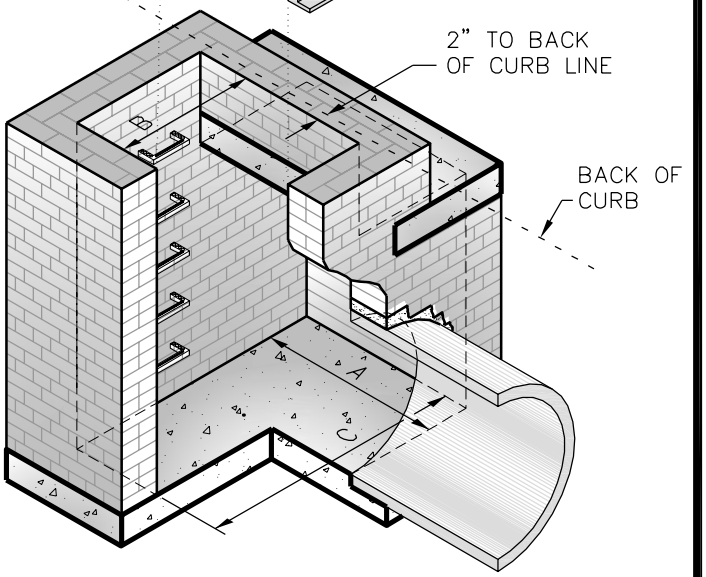

WHERE 30" TO 36" PIPE IS USED

NOTES:

1. See sheet 4 of 4 for dimensions.
2. See Std. detail No. 610.01 for standard notes.

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STANDARD BRICK CATCH BASIN (15" THRU 54" PIPE)

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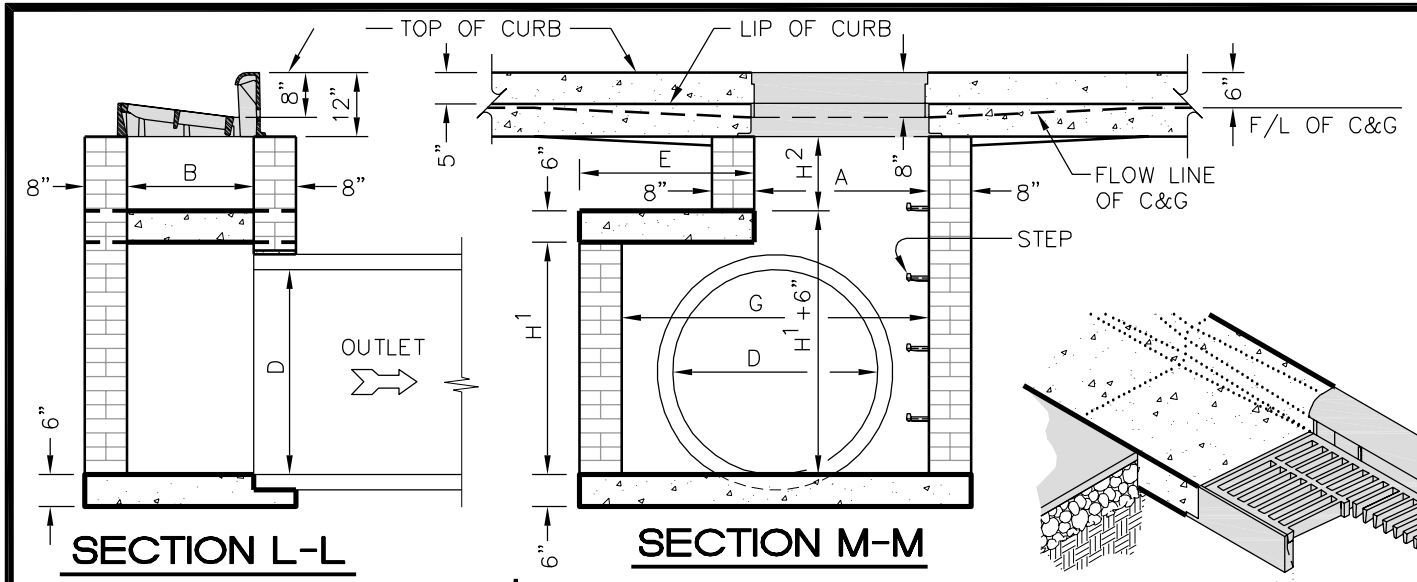
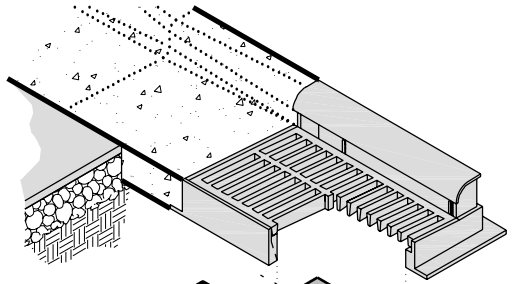
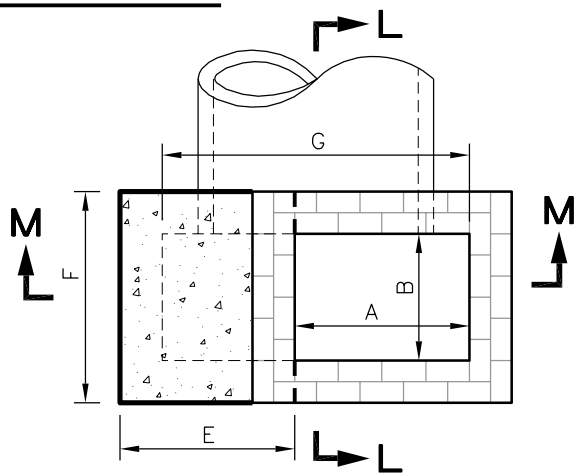


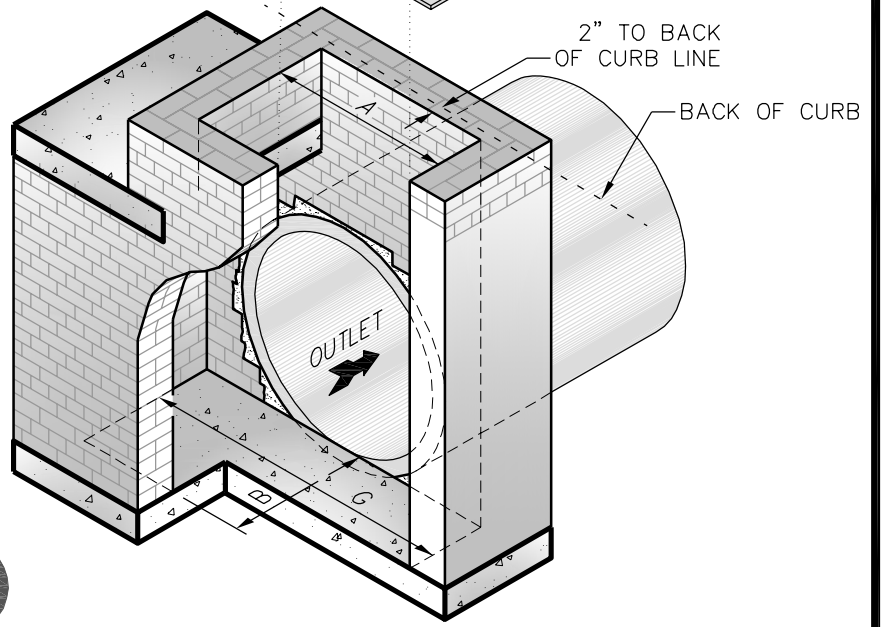
SECTION L-L

SECTION M-M





PLAN



WHERE 42" TO 54" PIPE IS USED

NOTES:

1. See sheet 4 of 4 for dimensions.
2. See Std. detail No. 610.01 for standard notes.

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STANDARD BRICK CATCH BASIN (15" THRU 54" PIPE)

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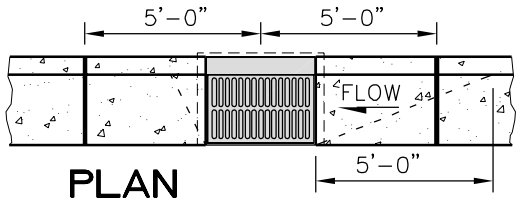
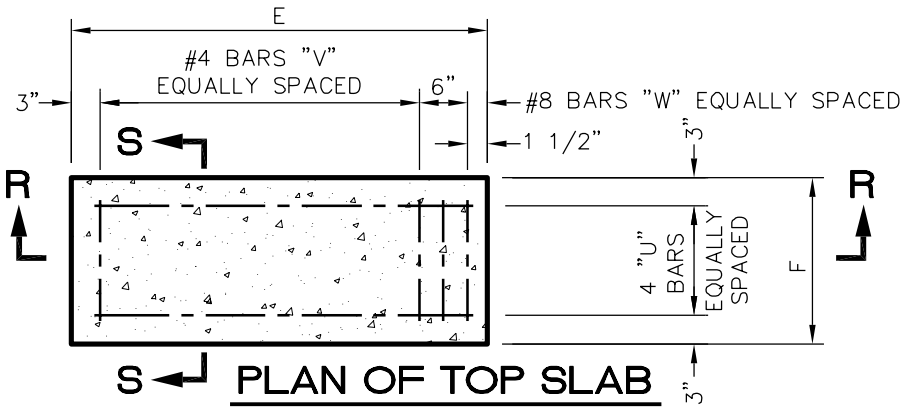
DIMENSIONS AND QUANTITIES FOR BRICK CATCH BASIN

DIMENSIONS OF BOX & PIPE							COVER DIMENSIONS		REINFORCEMENT							CUBIC YARDS OF CONCRETE IN BOX			BRICK MASONRY	
PIPE	SPAN	WIDTH	WIDTH	SPAN	HEIGHT	HEIGHT			BARS-U		BARS-V		BARS-W		TOTAL				H [1]	
D	A	B	C	G	MIN. H [1]	MIN. H [2]	E	F	Qty.	LGTH	Qty.	LGTH	Qty.	LGTH	LBS.	TOP SLAB	FLOOR	TOTAL	CU. YDS.	PER FT. OF HEIGHT
15"	3'-0"	2'-2"	-	-	2'-6"	-	-	-	-	-	-	-	-	-	-	-	0.281	0.281	0.802	0.321 ABOVE MIN. H [1]
18"	3'-0"	2'-2"	-	-	2'-10"	-	-	-	-	-	-	-	-	-	-	-	0.281	0.281	0.909	
24"	3'-0"	2'-2"	-	-	3'-4"	-	-	-	-	-	-	-	-	-	-	-	0.281	0.281	1.070	
30"	3'-0"	2'-2"	3'-4"	-	3'-2"	VARIABLE	1'-10"	4'-4"	4	1'-6"	3	4'-1"	3	4'-1"	45	0.147	0.374	0.521	1.306	0.321 ABOVE MIN. H [2]
36"	3'-0"	2'-2"	3'-10"	-	3'-8"		2'-4"	4'-4"	4	2'-0"	4	4'-1"	3	4'-1"	49	0.187	0.415	0.602	1.586	
42"	3'-0"	2'-2"	-	4'-5"	4'-4"		2'-1"	3'-6"	4	1'-9"	3	3'-3"	3	3'-3"	38	0.135	0.373	0.508	1.811	
48"	3'-0"	2'-2"	-	5'-0"	4'-10"		2'-8"	3'-6"	4	2'-6"	4	3'-3"	3	3'-3"	40	0.173	0.410	0.583	2.146	
54"	3'-0"	2'-2"	-	5'-7"	5'-4"		3'-3"	3'-6"	4	3'-0"	6	3'-3"	3	3'-3"	48	0.211	0.448	0.659	2.510	

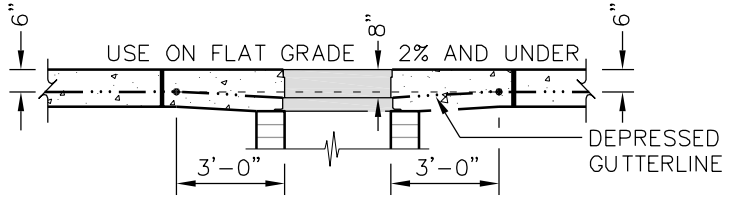


PLAN

CURB & GUTTER W/ CATCH BASIN ON STEEP GRADE

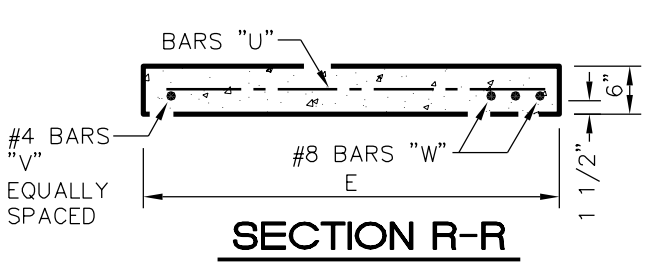


PLAN OF TOP SLAB

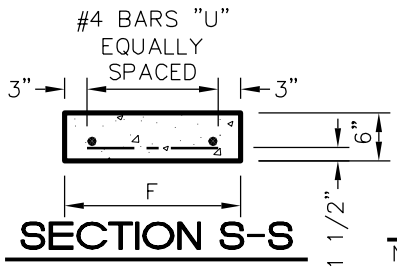


ELEVATION

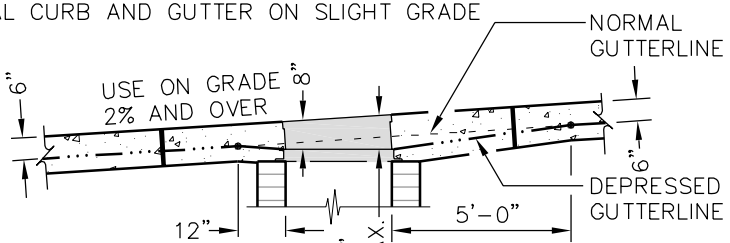
NORMAL CURB AND GUTTER ON SLIGHT GRADE



SECTION R-R



SECTION S-S



ELEVATION

NORMAL CURB AND GUTTER ON STEEP GRADE

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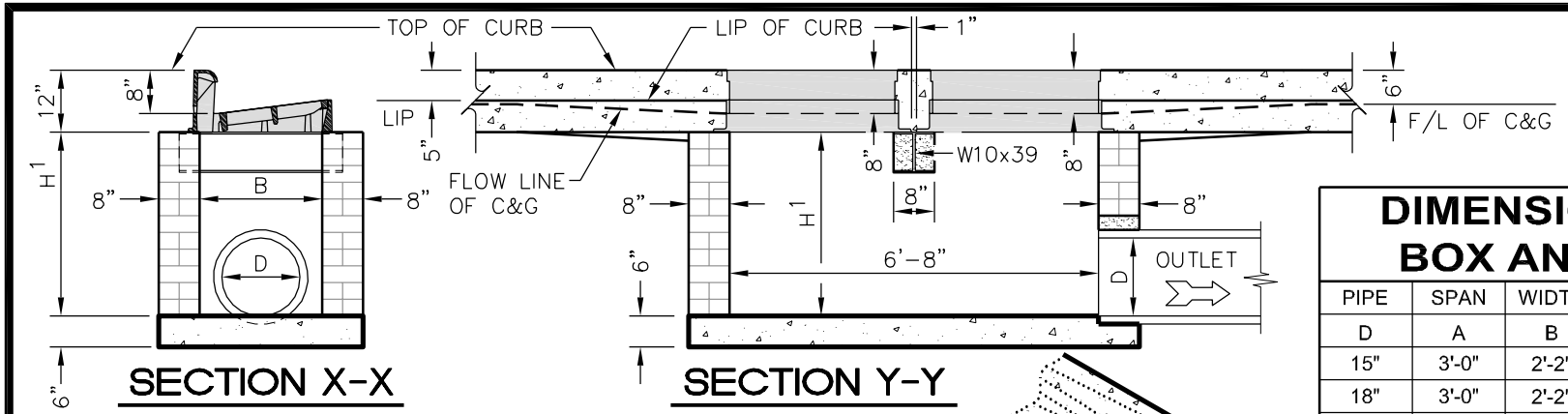
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD BRICK CATCH BASIN (15" THRU 54" PIPE)

Scale:	Sheet #:	Detail #
not to scale	4 of 4	610.02

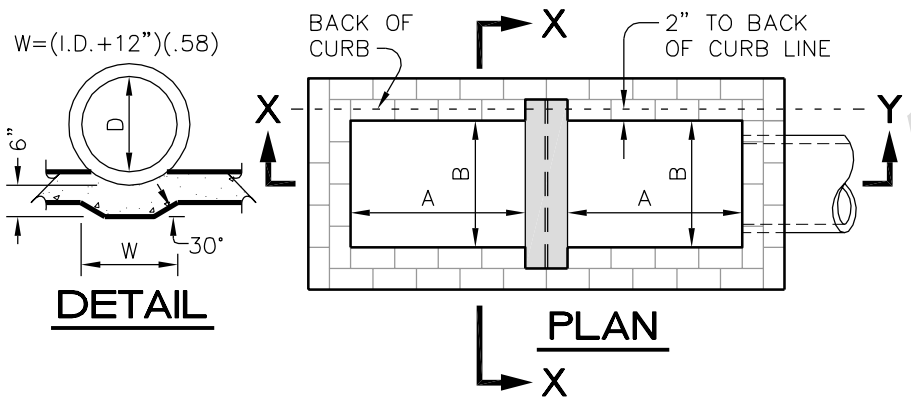


SECTION X-X

SECTION Y-Y

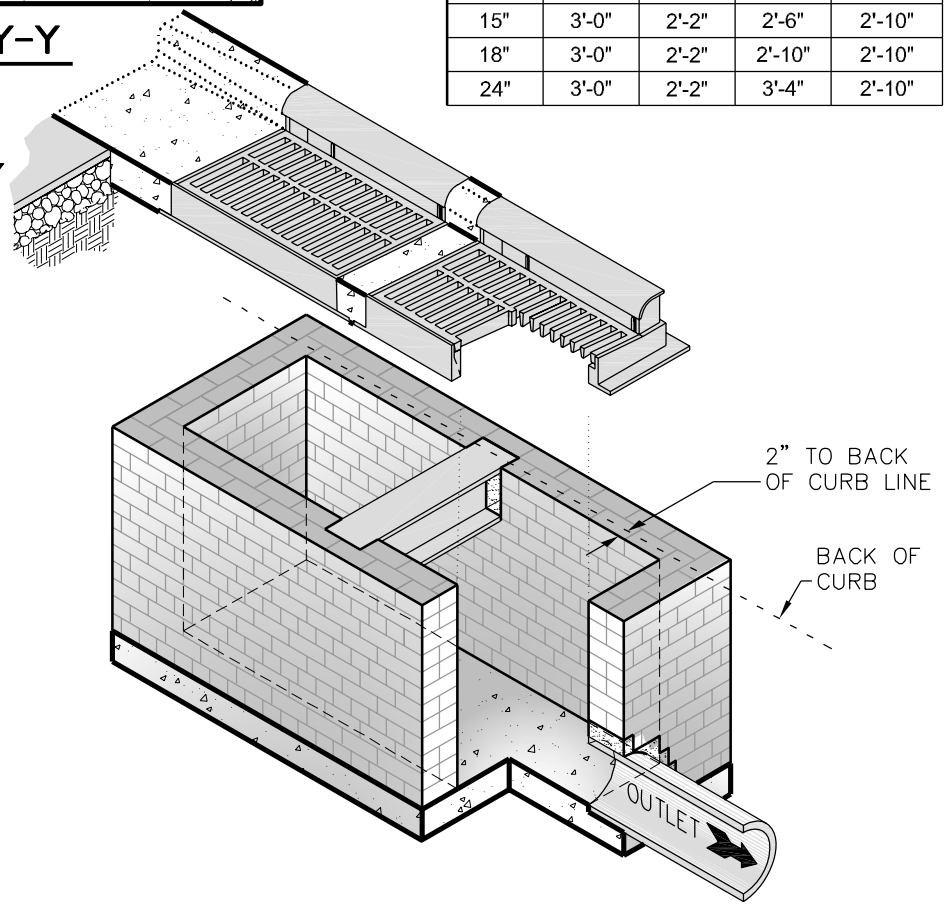
DIMENSIONS OF BOX AND PIPE

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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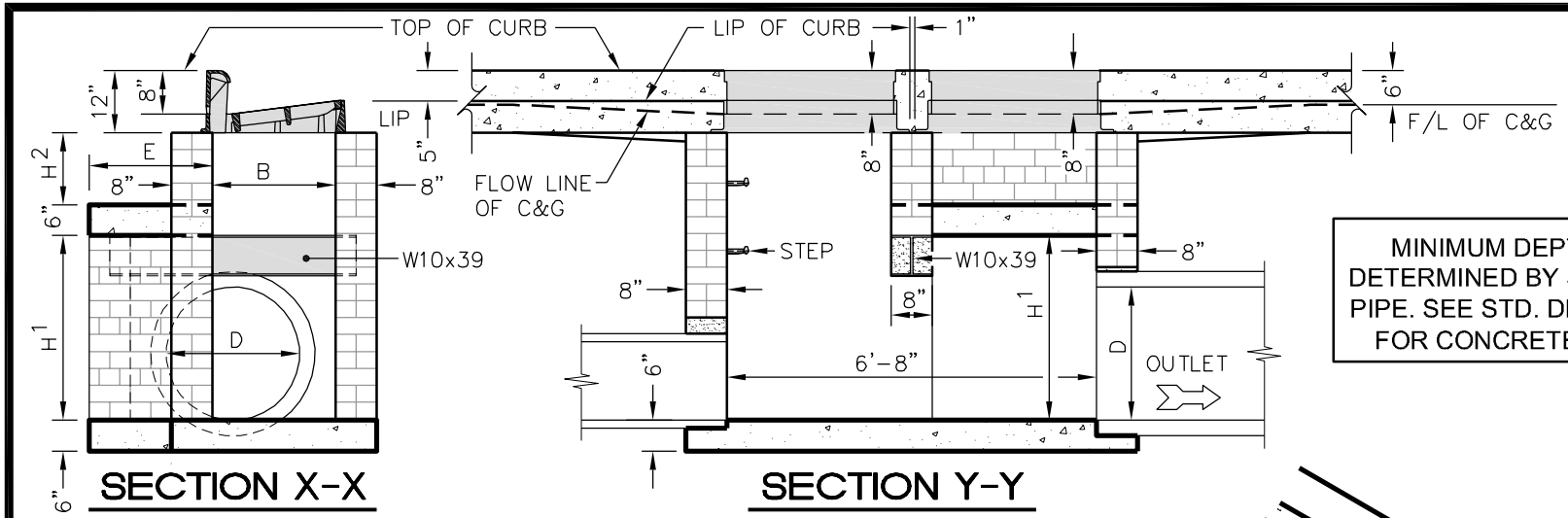
No.	Date	Description
1	9/16/11	APPROVAL

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

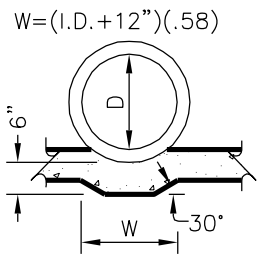
Scale:	Sheet #:	Detail #
not to scale	1 of 1	610.03



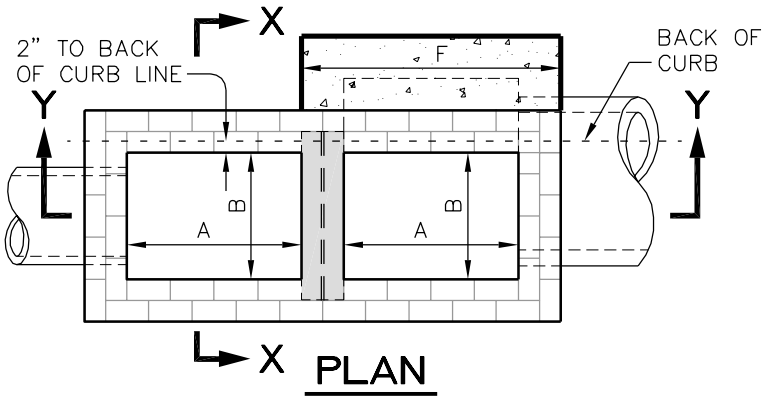
SECTION X-X

SECTION Y-Y

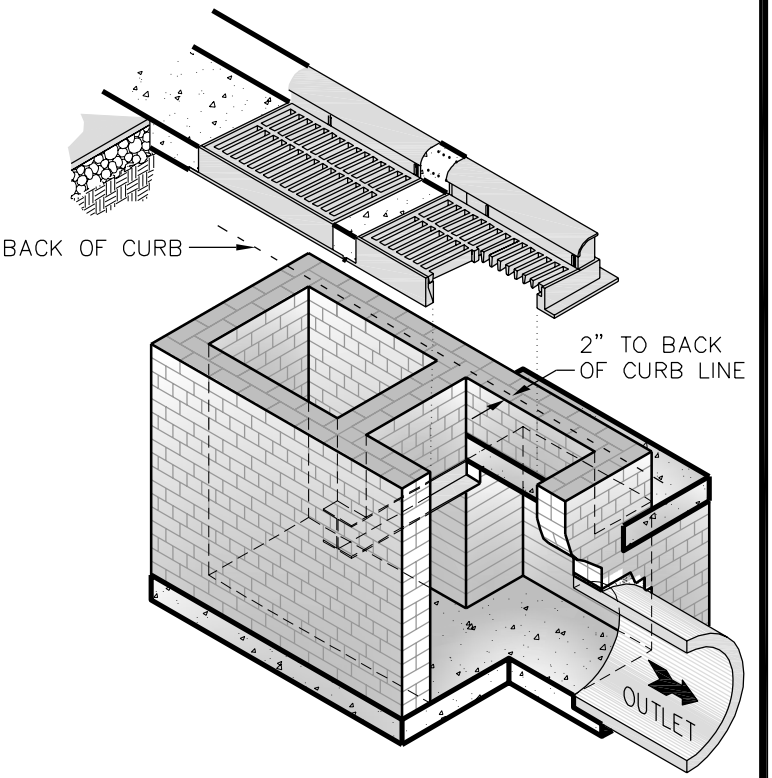
MINIMUM DEPTH (H^1) TO BE DETERMINED BY SIZE OF OUTLET PIPE. SEE STD. DETAIL NO. 610.02 FOR CONCRETE SLAB DETAIL



DETAIL



PLAN



NOTES:

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

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No.	Date	Description
1	9/16/11	APPROVAL

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

Scale:	Sheet #:	Detail #
not to scale	1 of 2	610.04

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

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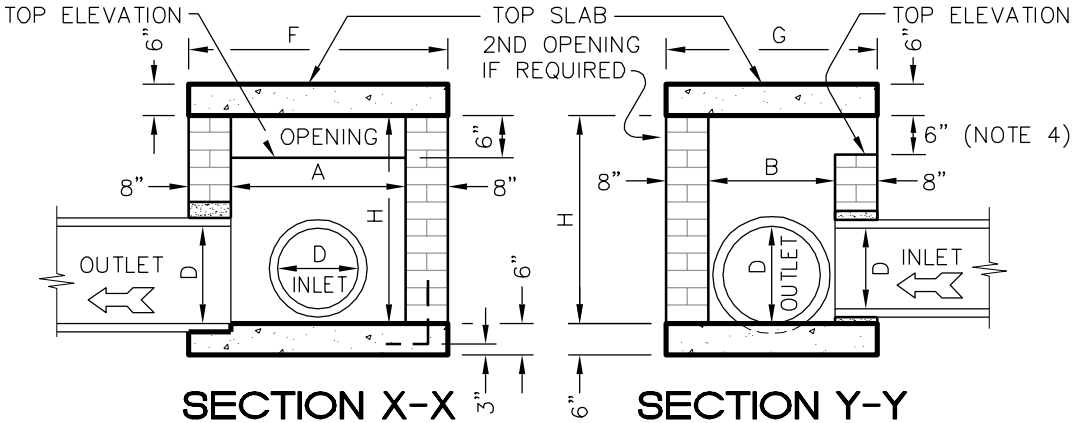
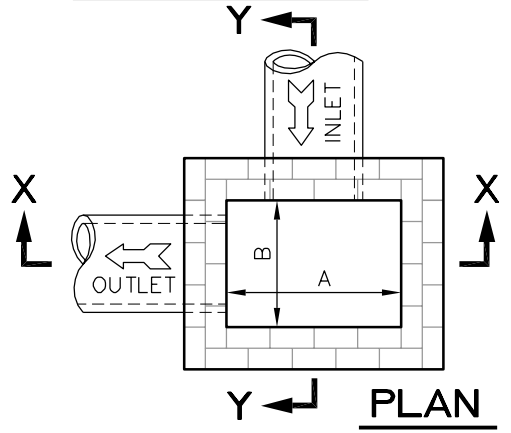
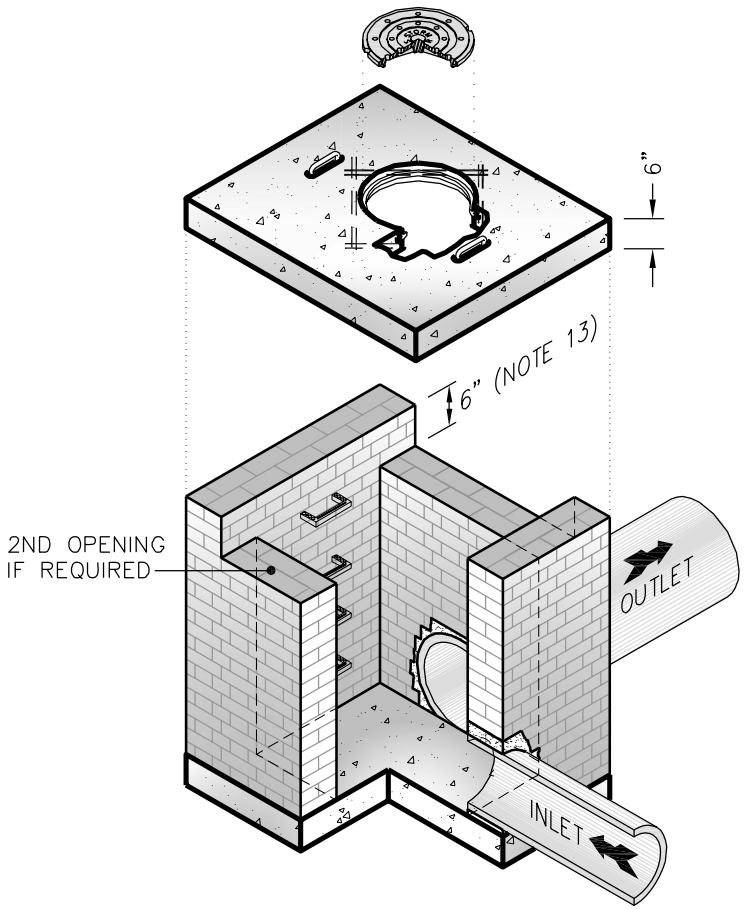
No.	Date	Description
1	9/16/11	APPROVAL

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

Scale: not to scale | Sheet #: 2 of 2 | Detail # 610.04







NOTES:

1. Use #5 bar dowels at 12" centers.
2. Deduct for pipe(s) from total cu. yds. of brick masonry.
3. If reinforced concrete pipe is set in bottom slab of box, add to slab as shown on Std. detail No. 610.03.
4. Increase the size of the 6" opening to 8" max., as directed by the City Engineer by adding 2" to the wall height above the top elevation. Adjust quantities accordingly.
5. See sheet 2 of 2 for dimensions.
6. See Std. detail No. 610.01 for standard notes.

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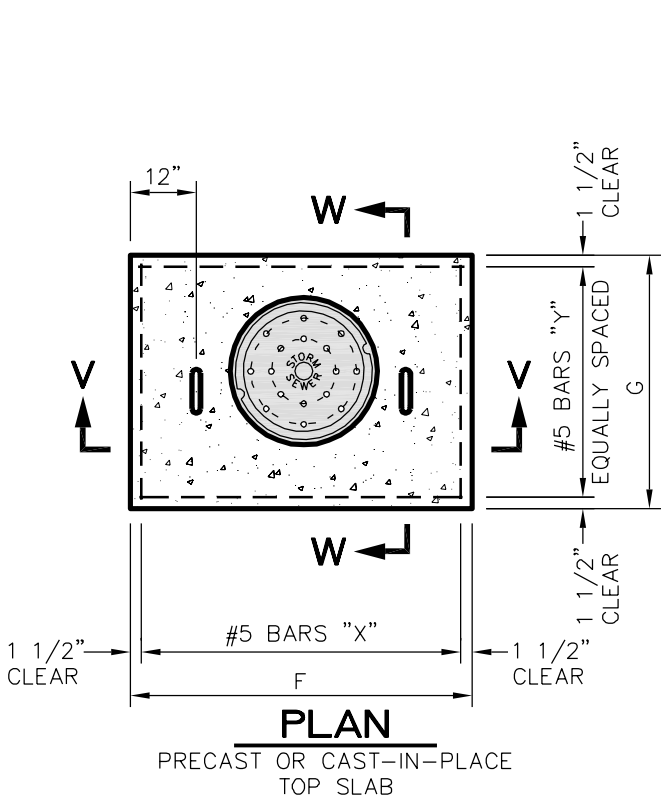
No.	Date	Description
1	9/16/11	APPROVAL

BRICK OPEN THROAT CATCH BASIN (15" THRU 48" PIPE)

Scale:	Sheet #:	Detail #
not to scale	1 of 2	610.05

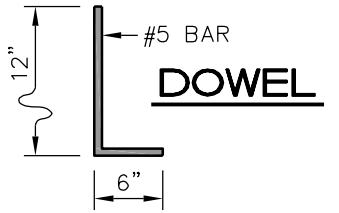
MIN. DIMENSIONS AND QUANTITIES FOR CATCH BASIN (BASED ON MIN. HEIGHT, H)

DIMENSIONS OF BOX & PIPE				REINFORCING					SLAB DIMENSIONS		CUBIC YARDS CONC. IN BOX			TOTAL BRICK MASONRY		DEDUCTION ONE PIPE		DED. ONE 6" THROAT OPENING
PIPE	SPAN	WIDTH	HEIGHT	BARS - X		BARS - Y		TOTAL										
D	A	B	H	Qty.	LENGTH	Qty.	LENGTH	LBS	F	G	COVER	FLOOR	TOTAL	PER FT. HT.	MIN. H	C.S.	R.C.	CU. YDS
15"	3'-6"	2'-3"	2'-1"	5	3'-4"	7	4'-7"	28	4'-10"	3'-7"	0.214	0.321	0.535	0.350	0.744	0.031	0.059	0.043
18"	4'-0"	2'-8"	2'-4"	6	3'-9"	8	5'-1"	36	5'-4"	4'-0"	0.263	0.395	0.658	0.395	0.938	0.044	0.081	0.049
24"	4'-0"	2'-8"	2'-10"	6	3'-9"	9	5'-1"	36	5'-4"	4'-0"	0.263	0.395	0.658	0.395	1.136	0.078	0.134	0.049
30"	4'-0"	3'-6"	3'-4"	6	4'-7"	10	5'-1"	44	5'-4"	4'-10"	0.318	0.477	0.795	0.436	1.472	0.122	0.199	0.049
36"	4'-6"	4'-0"	3'-10"	6	5'-1"	11	5'-7"	52	5'-10"	5'-4"	0.384	0.576	0.960	0.485	1.879	0.176	0.278	0.056
42"	5'-0"	4'-6"	4'-4"	6	5'-7"	13	6'-1"	65	6'-4"	5'-10"	0.456	0.684	1.140	0.535	2.340	0.240	0.371	0.062
48"	5'-0"	5'-0"	4'-10"	6	6'-1"	14	6'-1"	71	6'-4"	6'-4"	0.495	0.743	1.238	0.559	2.725	0.313	0.476	0.062

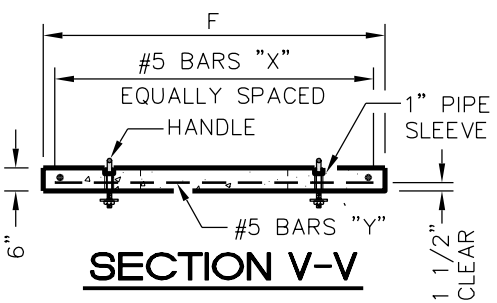


PLAN

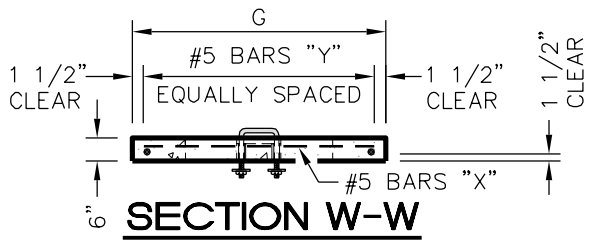
PRECAST OR CAST-IN-PLACE TOP SLAB



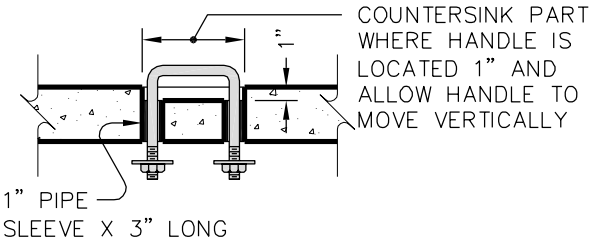
DOWEL



SECTION V-V

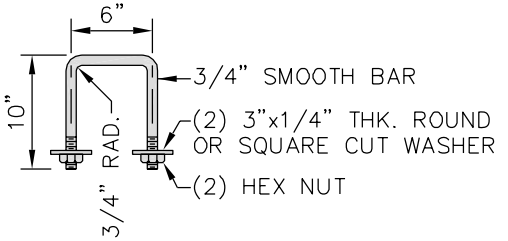


SECTION W-W



PART SECTION

THRU COVER SHOWING HANDLE



DETAIL OF HANDLE

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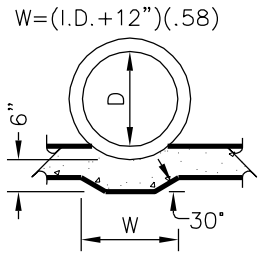
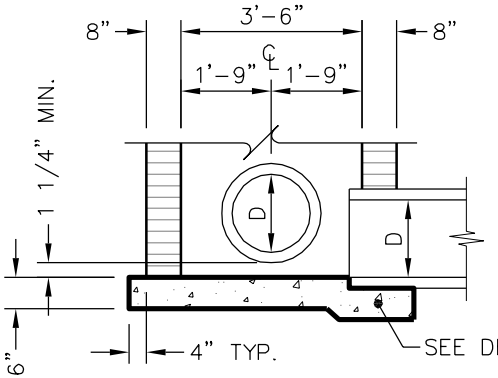
No.	Date	Description
1	9/16/11	APPROVAL

BRICK OPEN THROAT CATCH BASIN (15" THRU 48" PIPE)

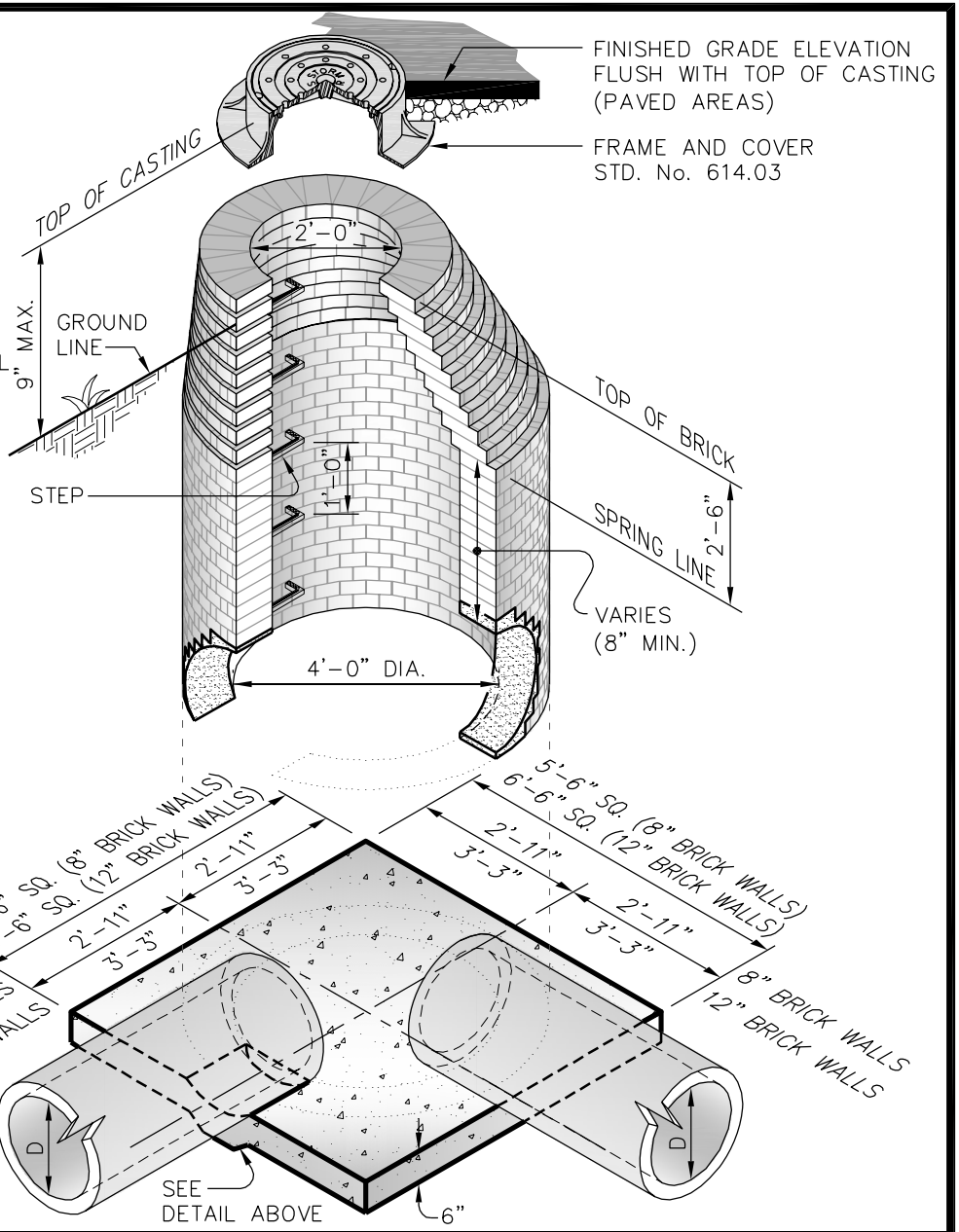
Scale:	Sheet #:	Detail #
not to scale	2 of 2	610.05



DETAIL



PARTIAL SECTION



NOTES:

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

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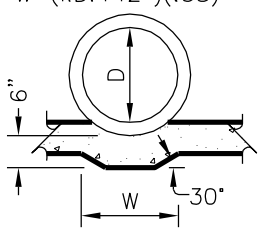
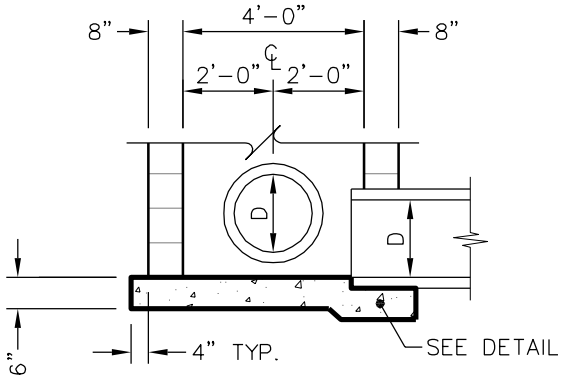
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD BRICK MANHOLE (15" THRU 36" PIPE)

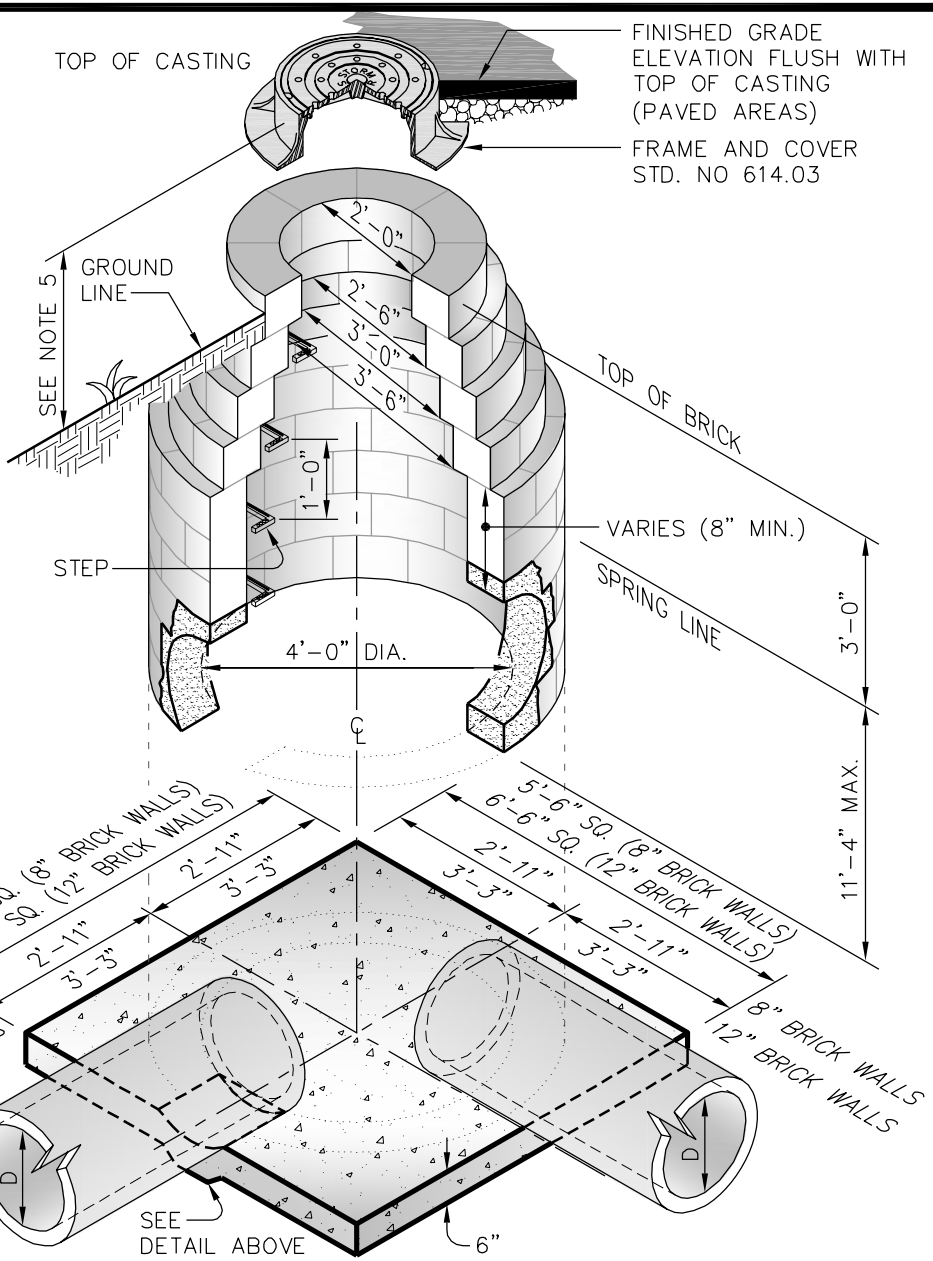
Scale:	Sheet #:	Detail #
not to scale	1 of 1	612.01



DETAIL



PARTIAL SECTION



NOTES:

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

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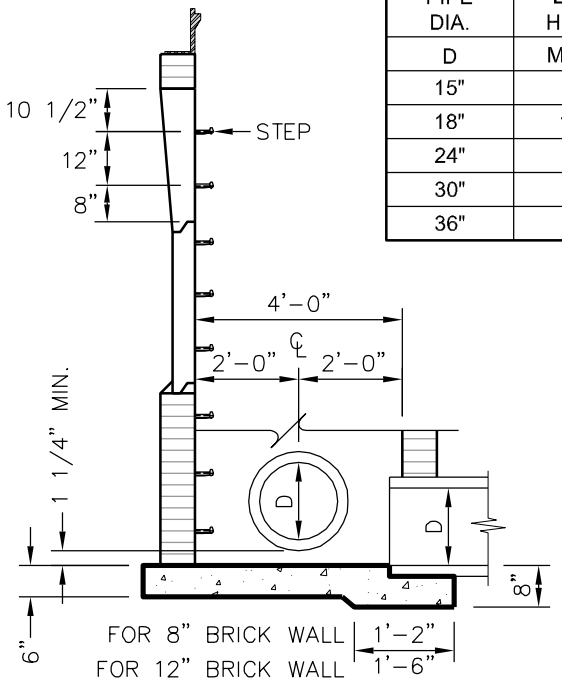
No.	Date	Description
1	9/16/11	APPROVAL

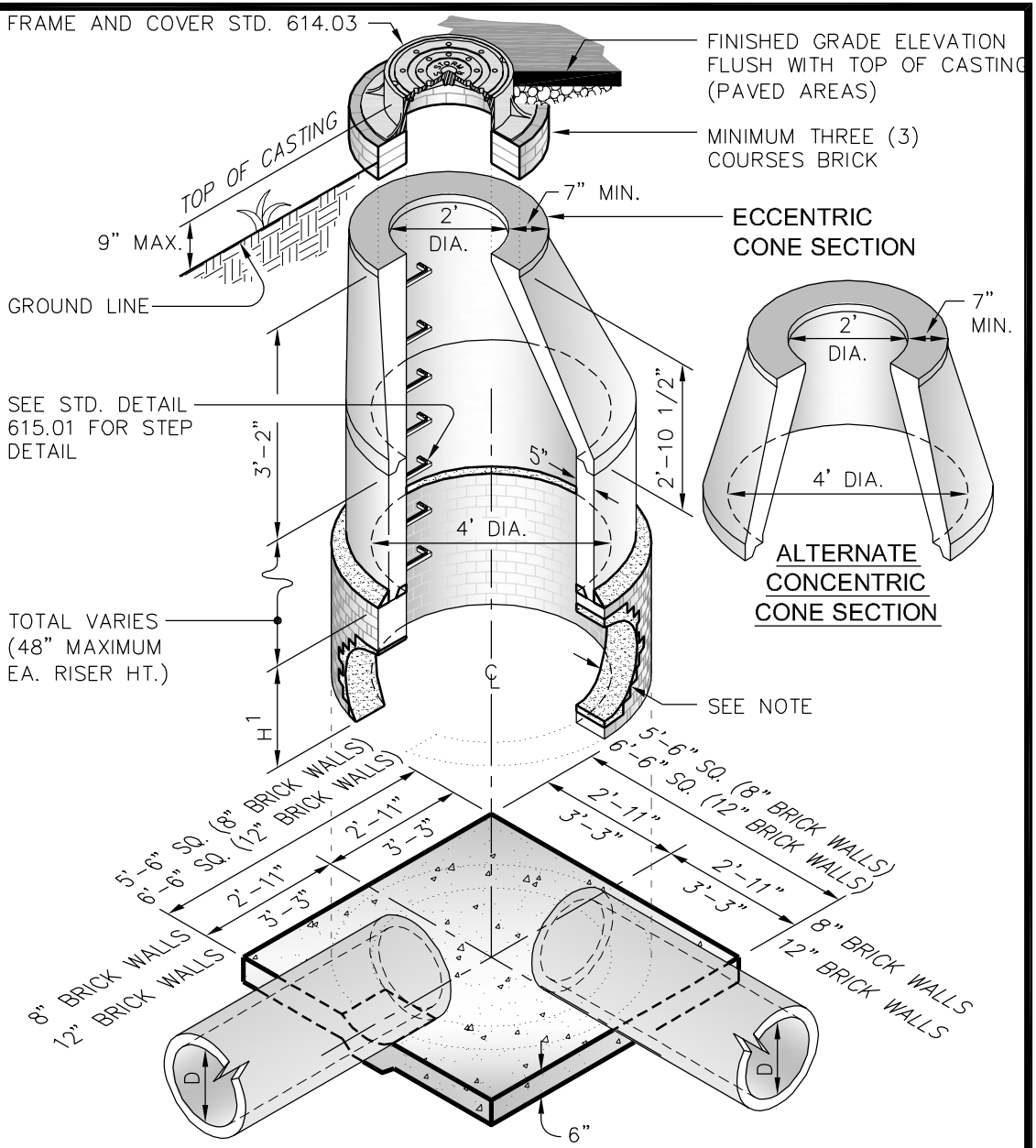
STANDARD BLOCK MANHOLE (15" THRU 36" PIPE)

Scale:	Sheet #:	Detail #
not to scale	1 of 1	612.02

DIMENSIONS	
PIPE DIA.	BRICK HEIGHT
D	MIN. H [1]
15"	1'-8"
18"	1'-11"
24"	2'-6"
30"	3'-0"
36"	3'-7"



PARTIAL SECTION



NOTES:

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

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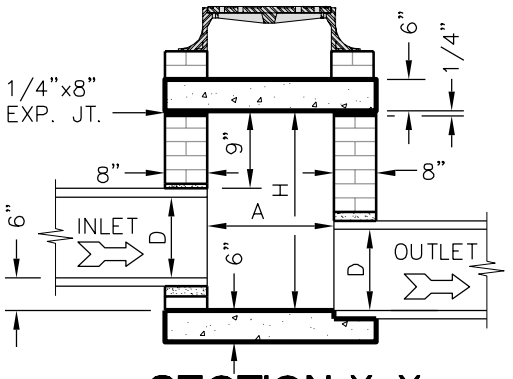
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD PRECAST MANHOLE (15" THRU 36" PIPE)

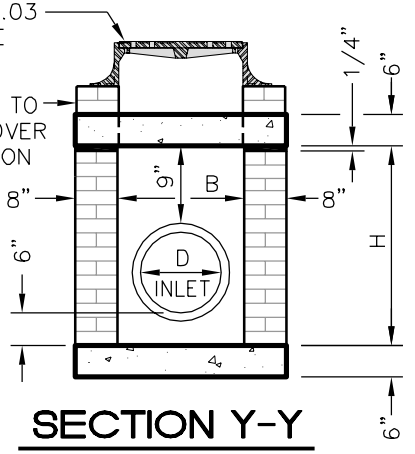
Scale:	Sheet #:	Detail #
not to scale	1 of 1	612.03



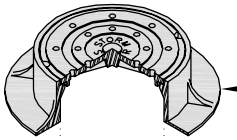
SECTION X-X

SEE STD. DETAIL 614.03 FOR MANHOLE FRAME AND COVER

BRICK MAY BE USED TO ADJUST FRAME & COVER TO SURFACE ELEVATION MAX. 1'–0".

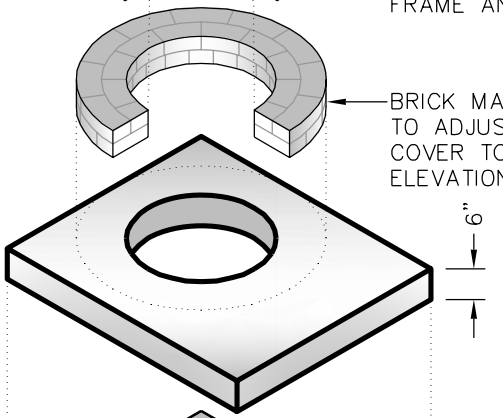


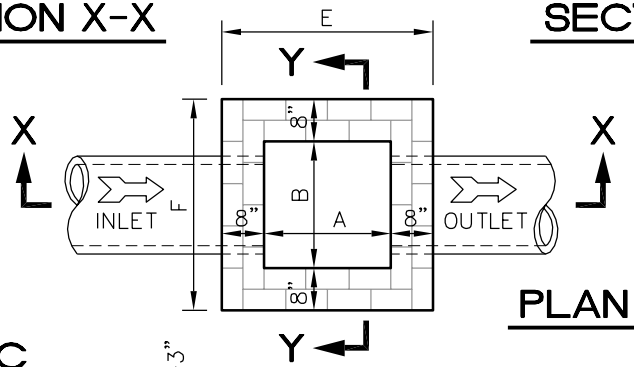
SECTION Y-Y



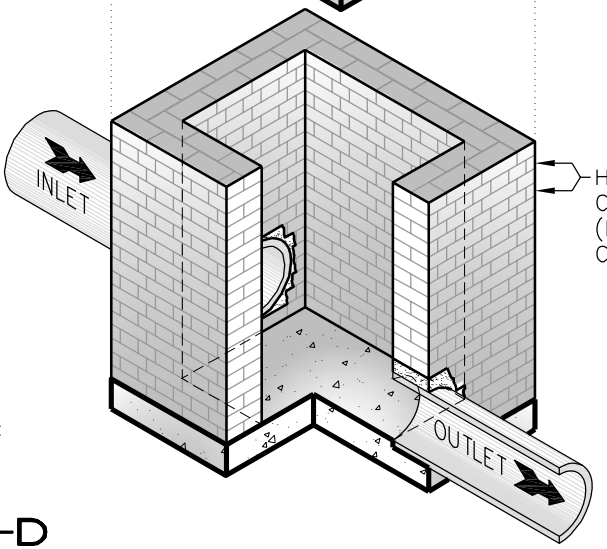
SEE STD. DETAIL 614.03 FOR MANHOLE FRAME AND COVER

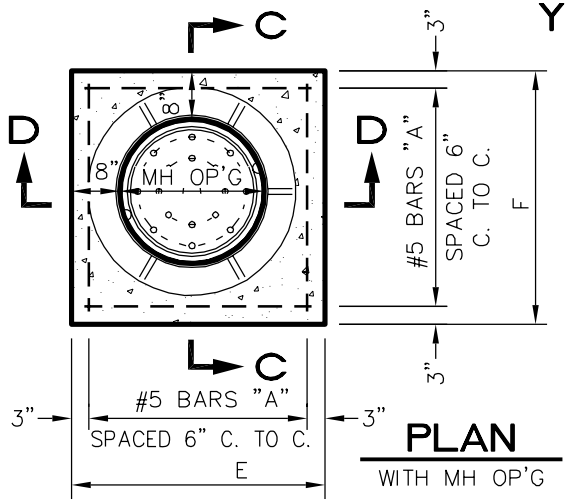
BRICK MAY BE USED TO ADJUST FRAME & COVER TO SURFACE ELEVATION MAX. 1'–0".



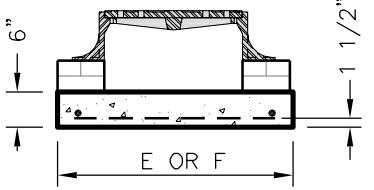


PLAN





PLAN
WITH MH OP'G



SECTION C-C OR D-D

15" TO 66" PIPE IS USED

NOTES:

1. See sheet 2 of 2 for dimensions.

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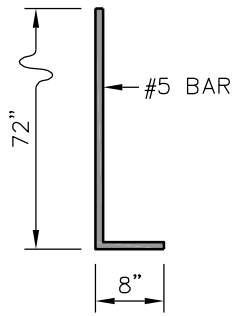
No.	Date	Description
1	9/16/11	APPROVAL

BRICK JUNCTION BOX WITH MANHOLE

Scale:	Sheet #:	Detail #
not to scale	1 of 2	613.01

DIMENSIONS AND QUANTITIES FOR BRICK JUNCTION BOXES

DIMENSIONS OF BOX & PIPE				REINFORCEMENT BARS		COVER DIMENSIONS		CUBIC YARDS			DEDUCTIONS FOR ONE PIPE CU. YDS.	
PIPE	SPAN	WIDTH	HEIGHT					CONC.	BRICK MASONRY			
D	A	B	H	Qty.	LENGTH	E	F	BASE & COVER CU. YD.	MIN. HEIGHT CU. YD.	WALL PER FT. HT. CU. YD.	C.S.	R.C.
15"	2'-0"	2'-0"	2'-6"	12	3'-1"	3'-4"	3'-4"	0.412	0.657	0.263	0.031	0.047
18"	2'-4"	2'-4"	2'-9"	14	3'-5"	3'-8"	3'-8"	0.498	0.814	0.296	0.044	0.065
24"	3'-0"	3'-0"	3'-3"	16	4'-1"	4'-4"	4'-4"	0.695	1.176	0.362	0.078	0.133
30"	3'-4"	3'-4"	3'-9"	16	4'-5"	4'-8"	4'-8"	0.807	1.481	0.395	0.122	0.170
36"	4'-0"	4'-0"	4'-3"	20	5'-1"	5'-4"	5'-4"	1.053	1.959	0.461	0.176	0.238
42"	4'-8"	4'-8"	4'-9"	22	5'-9"	6'-0"	6'-0"	1.333	2.503	0.527	0.240	0.323
48"	5'-0"	5'-0"	5'-3"	24	6'-1"	6'-4"	6'-4"	1.486	2.940	0.560	0.313	0.422
54"	5'-6"	5'-6"	5'-9"	26	6'-7"	6'-10"	6'-10"	1.729	3.502	0.609	0.396	0.535
60"	6'-0"	6'-0"	6'-3"	28	7'-1"	7'-4"	7'-4"	1.992	4.118	0.658	0.489	0.660
66"	6'-6"	6'-6"	6'-9"	30	7'-7"	7'-10"	7'-10"	2.273	4.778	0.708	0.591	0.798



DOWEL

NOTES:

1. Use #5 bar dowels at 12" centers
2. If reinforced concrete pipe is set in base slab of box, add to base as shown on std. detail 610.03.
3. Adjust the steel, concrete and brick masonry quantities to include the addition of the manhole (i.e. diagonal bars shortened around opening in top slab, additional variable height brick masonry, opening in top slab.)
4. Maximum depth of this structure from top to bottom slab to top elevation is 12'-0".
5. See Std. detail No. 610.01 for standard notes.

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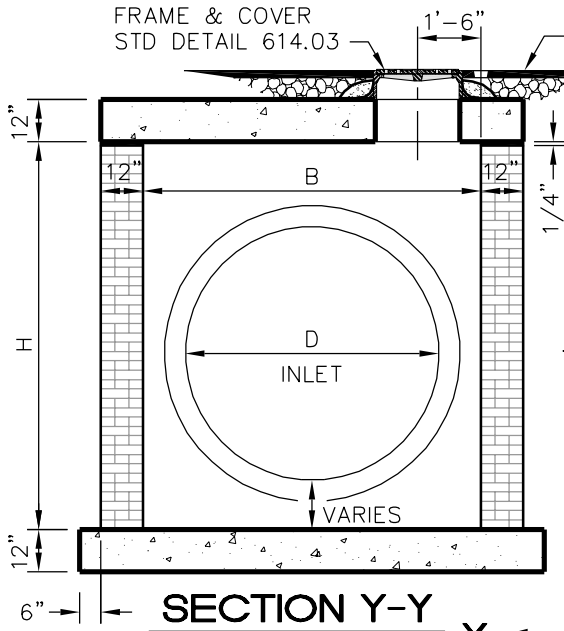
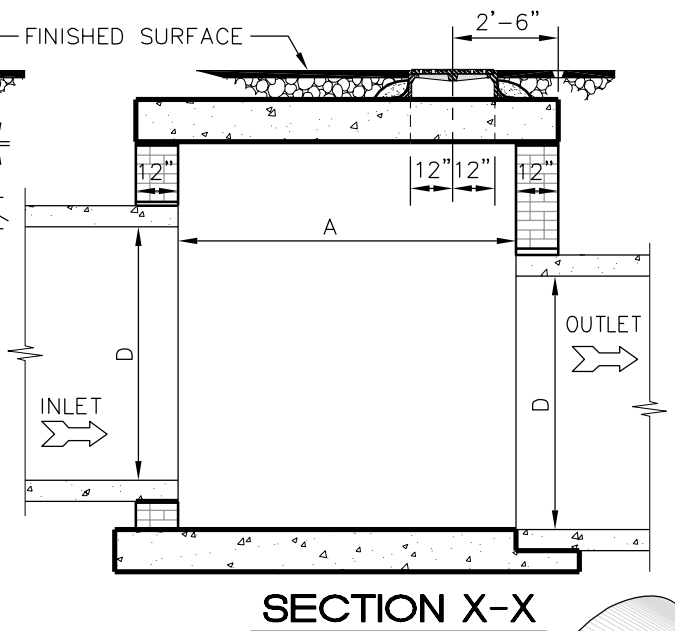
No.	Date	Description
1	9/16/11	APPROVAL

BRICK JUNCTION BOX WITH MANHOLE

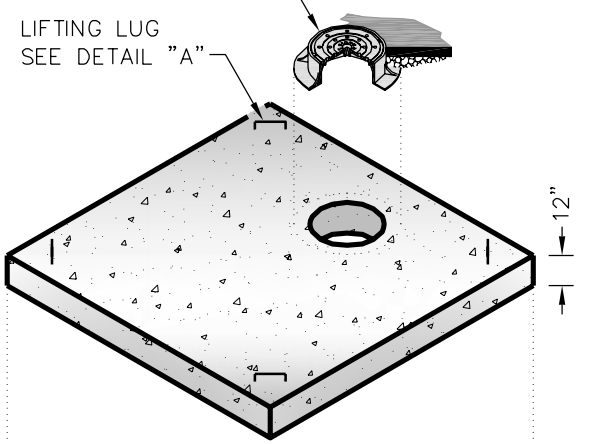
Scale: not to scale | Sheet #: 2 of 2 | Detail # 613.01

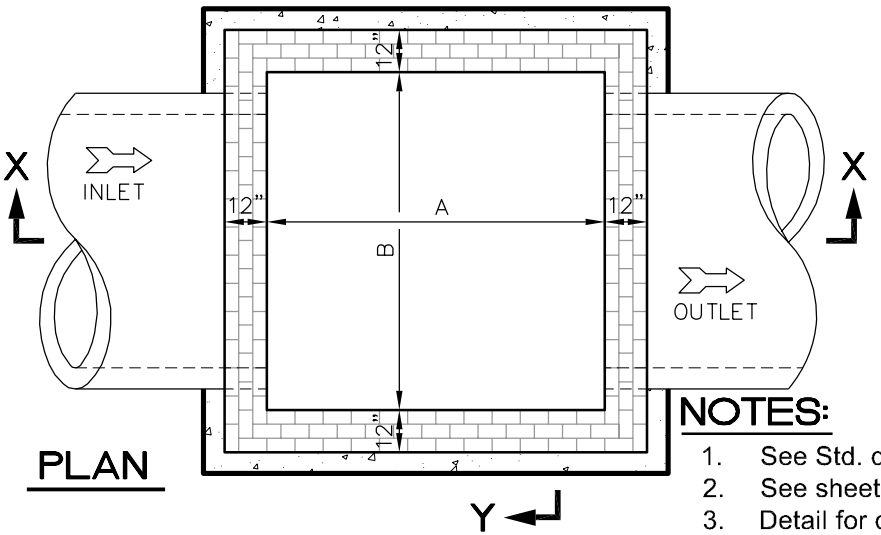


SECTION Y-Y

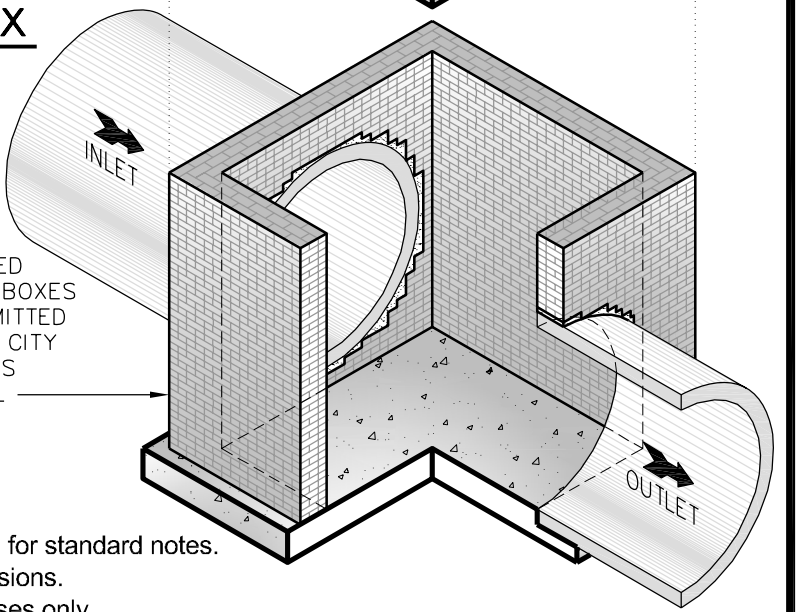


SECTION X-X





PLAN



NOTES:

1. See Std. detail No. 610.01 for standard notes.
2. See sheet 2 of 2 for dimensions.
3. Detail for dimension purposes only.
   All boxes of this type to be designed by professional engineer.

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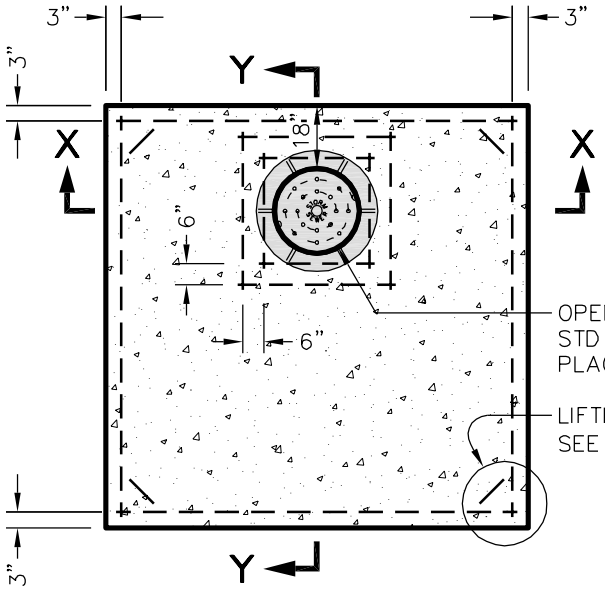
No.	Date	Description
1	9/16/11	APPROVAL

STD. BRICK JUNCTION BOX (72" THRU 120" PIPE)

Scale:	Sheet #:	Detail #
not to scale	1 of 2	613.02

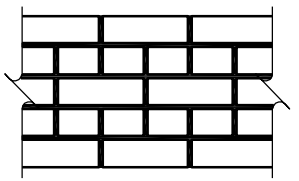
SLAB SECTION X-X



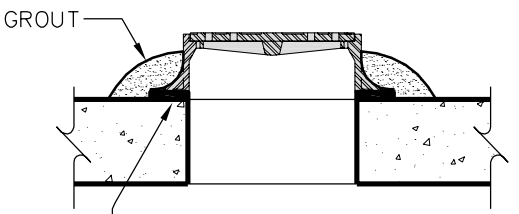
TOP SLAB

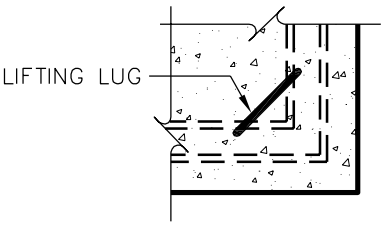
DIMENSIONS AND QUANTITIES FOR BRICK JUNCTION BOXES

DIMENSIONS OF BOX & PIPE			
PIPE	SPAN	WIDTH	HEIGHT
D	A	B	H
72"	7'-0"	7'-0"	MIN. 8'-0"
84"	8'-0"	8'-0"	
96"	9'-0"	9'-0"	
108"	10'-0"	10'-0"	MAX. 12'-0"
120"	11'-0"	11'-0"	



PROFILE OF BRICK PATTERN





DETAIL A

NOTES:

1. See Std. detail No. 610.01 for standard notes.
2. Detail for dimension purposes only.
   All boxes of this type to be designed by professional engineer.

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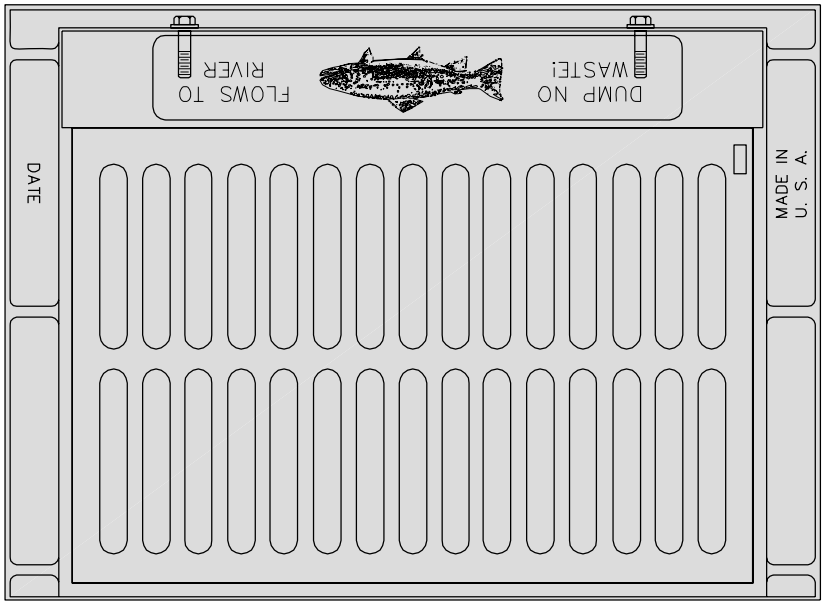
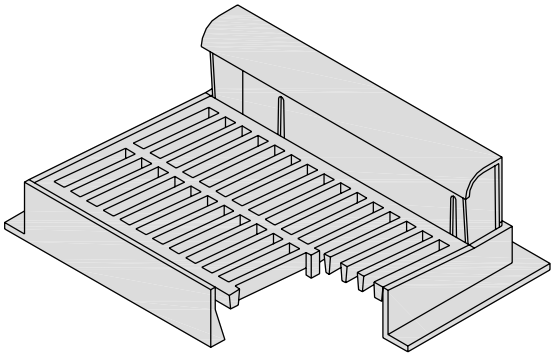
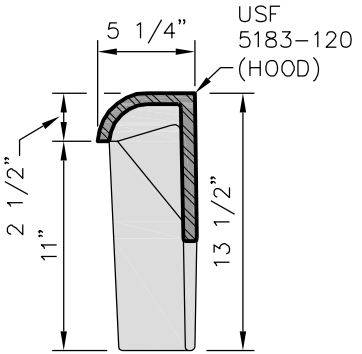
No.	Date	Description
1	9/16/11	APPROVAL

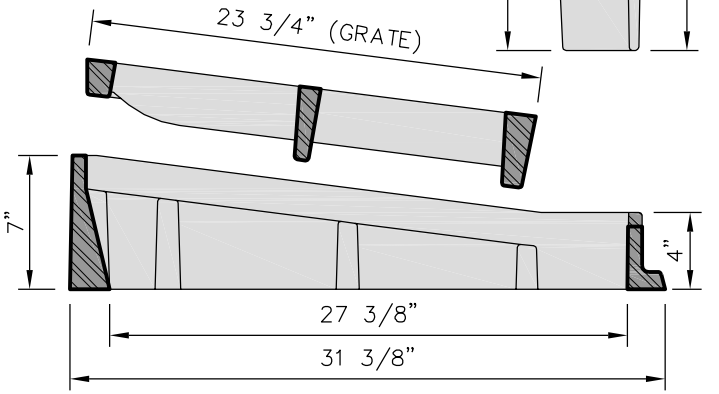
STD. BRICK JUNCTION BOX (72" THRU 120" PIPE)

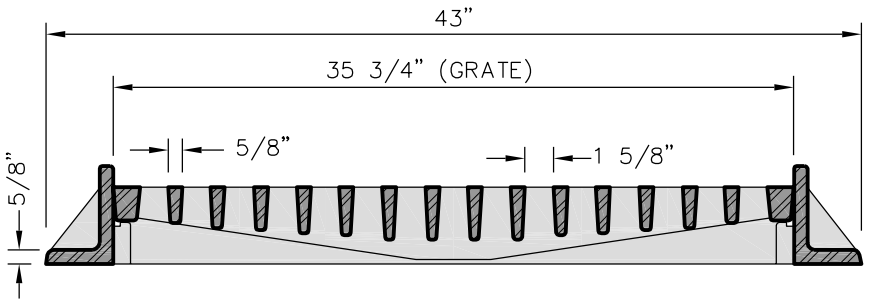
Scale:	Sheet #:	Detail #
not to scale	2 of 2	613.02

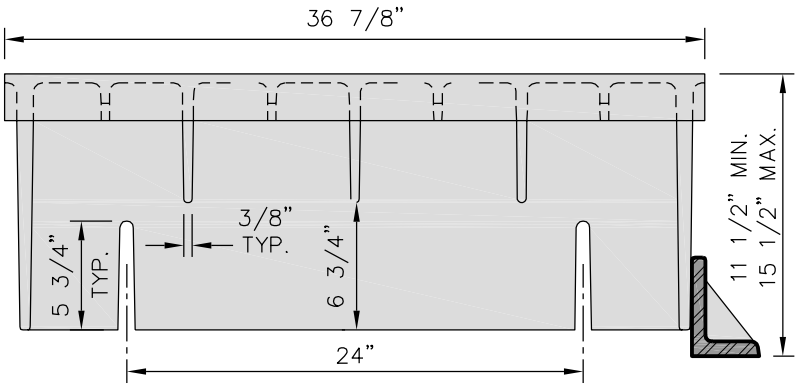












NOTES:

1. All hoods must be stamped "FLOWS TO RIVER"
2. All grates must be "MADE/MANUFACTURED IN USA" and indicated on grate.
3. All castings shall be coated with coal tar pitch varnish while hot.

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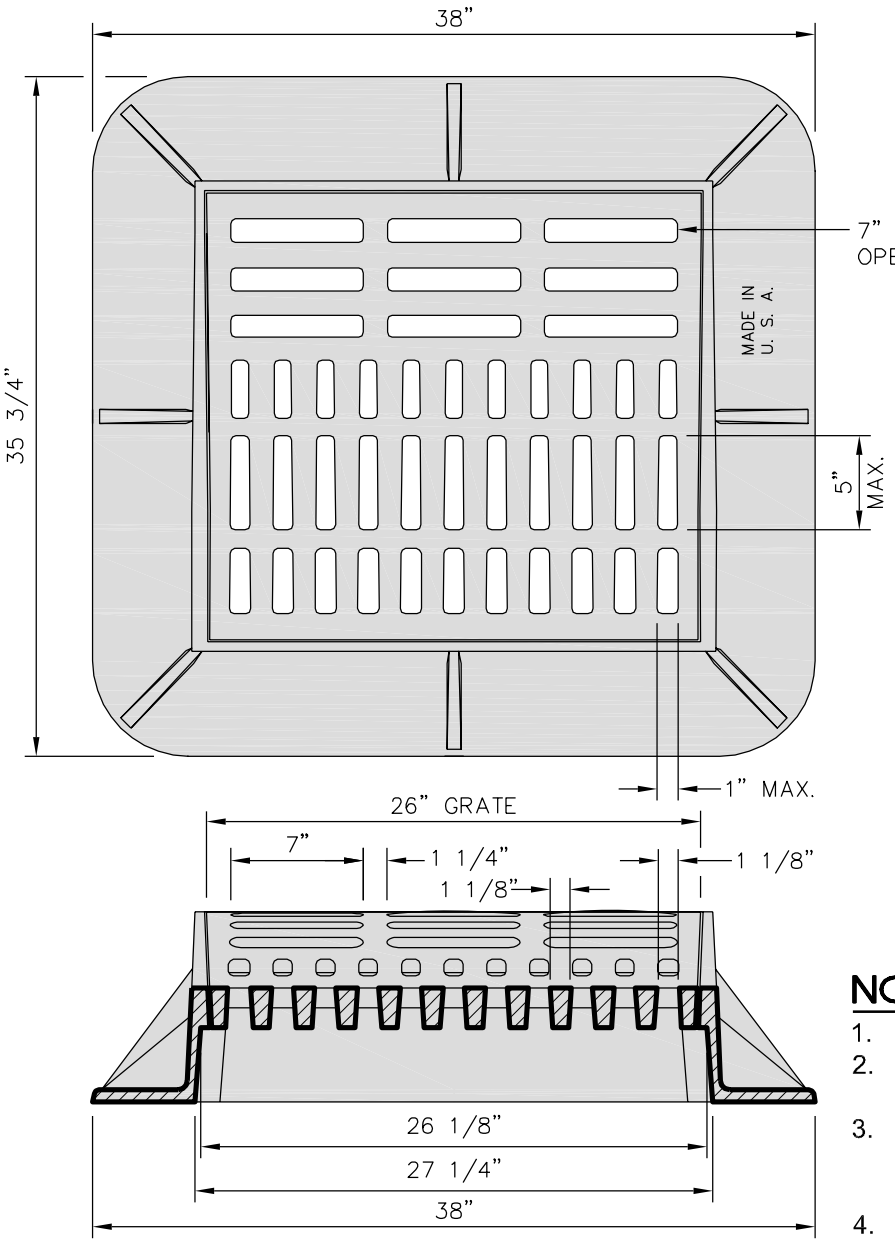
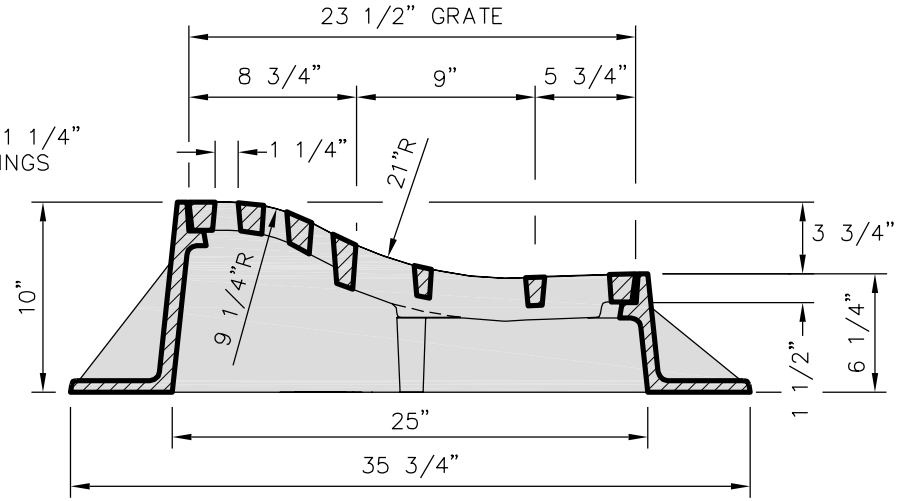
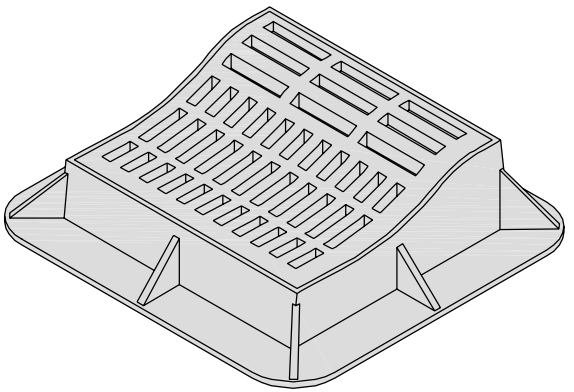
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD CATCH BASIN ASSEMBLY FRAME, HOOD & GRATE

Scale:	Sheet #:	Detail #
not to scale	1 of 1	614.01







NOTES:

1. Roll type catch basin will NOT be allowed to be placed in driveways.
2. Roll type catch basins must have a minimum of 2' separation from the closest edge of driveway.
3. Roll type catch basins shall meet the specifications of the attached detail or be an equal approved by the City Engineer. Grate openings must be perpendicular to the direction of travel for the lower portion of the grate.
4. All grates must be "MADE/MANUFACTURED IN USA" and indicated on grate.

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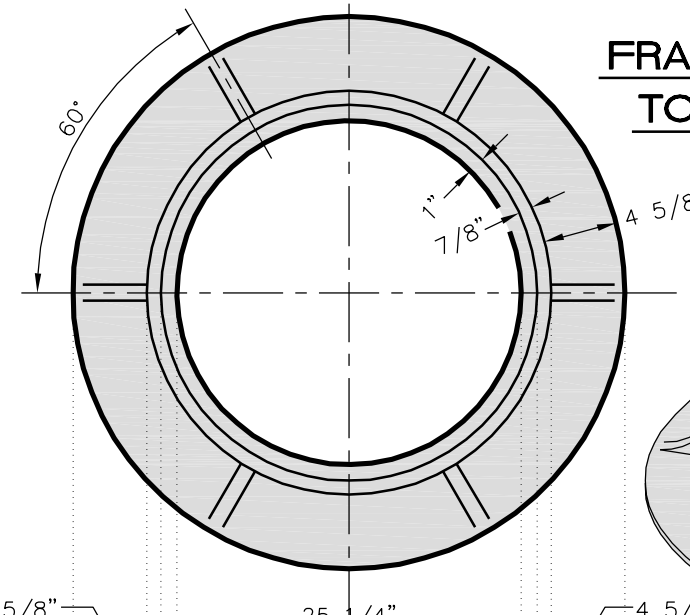
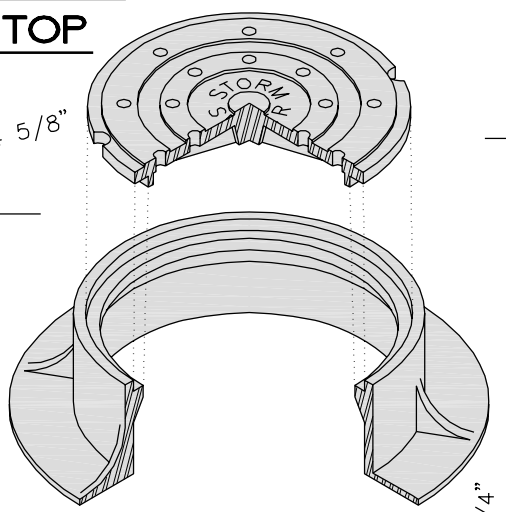
No.	Date	Description
1	9/16/11	APPROVAL

ROLL TYPE CATCH BASIN ASSEMBLY FRAME & GRATE

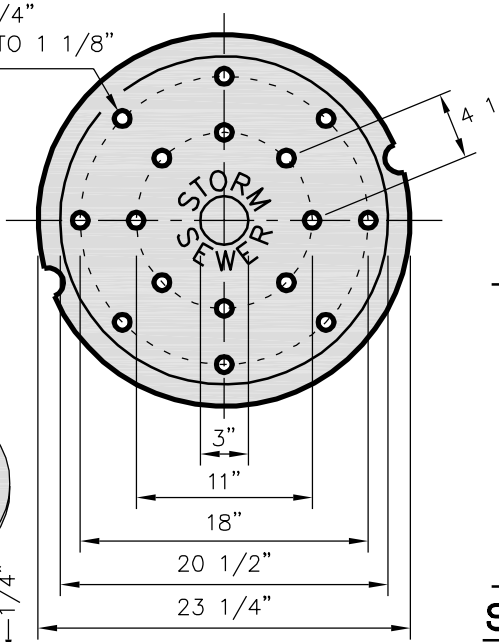
Scale:	Sheet #:	Detail #
not to scale	1 of 1	614.02



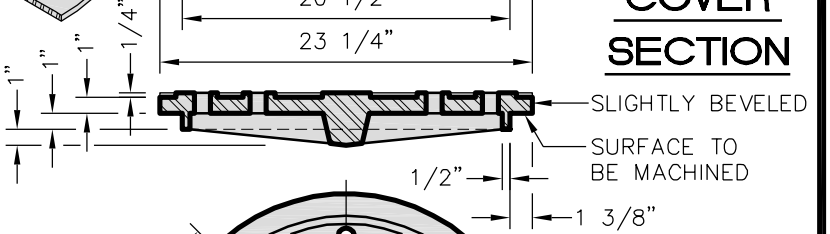
FRAME TOP



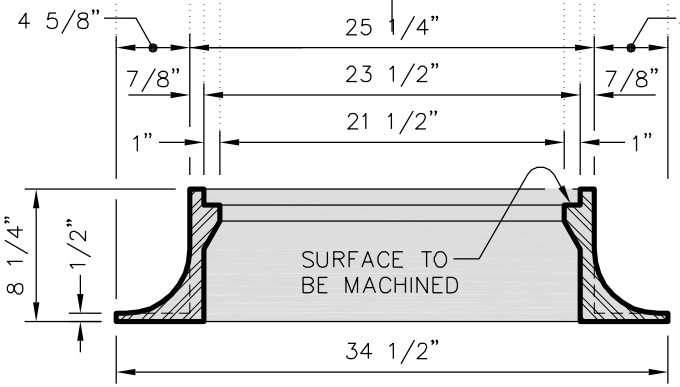
1/4" RIM RAISED 1/4"
1" HOLE TAPERED TO 1 1/8"
ON REVERSE SIDE



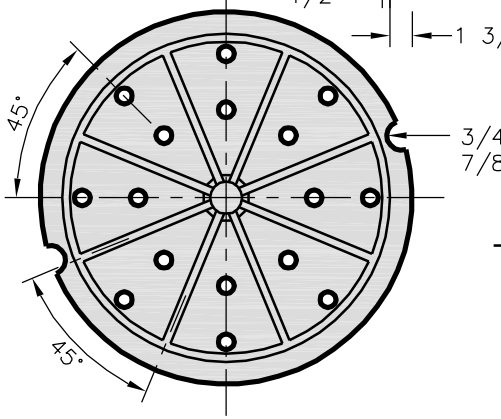
COVER FACE



COVER SECTION



FRAME SECTION



COVER BACK

1. Approximate weight 383 pounds.
2. All castings shall be made of clean even grain, tough gray cast iron. Casting shall be smooth, true to pattern and free from projections, sand holes, warp and other defects.
3. All castings shall be coated with coal tar pitch varnish while hot.
4. The iron used for these castings shall conform to the specifications of ASTM Designation A48 for Class 30 Gray Iron.
5. All castings used for storm drain structures shall have "STORM SEWER" cast on them.
6. All covers must be "MADE/MANUFACTURED IN USA" and indicated on cover.

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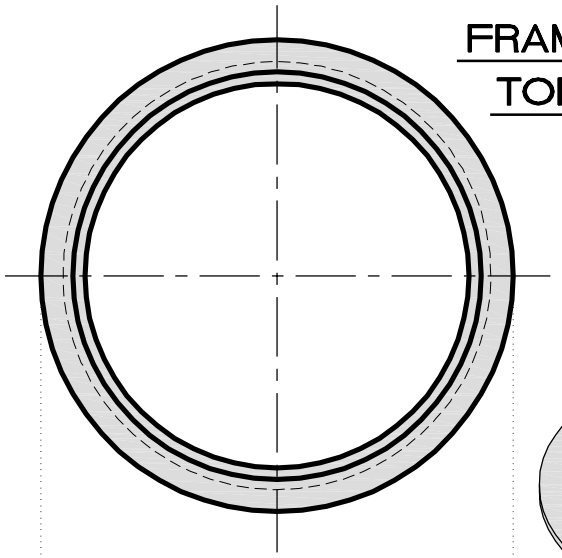
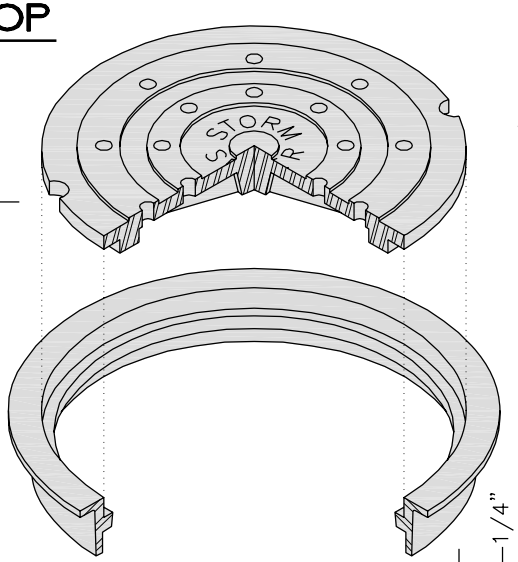
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD MANHOLE FRAME & COVER

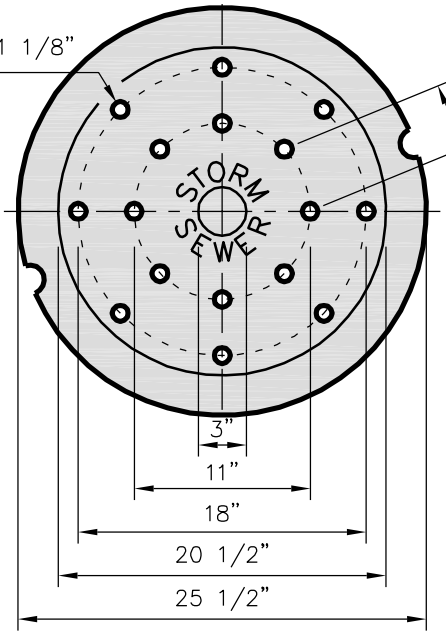
Scale:	Sheet #:	Detail #
not to scale	1 of 1	614.03



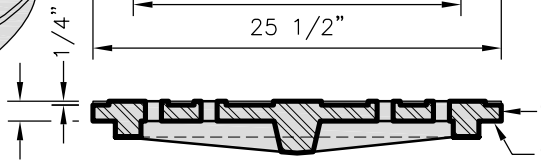
FRAME
TOP



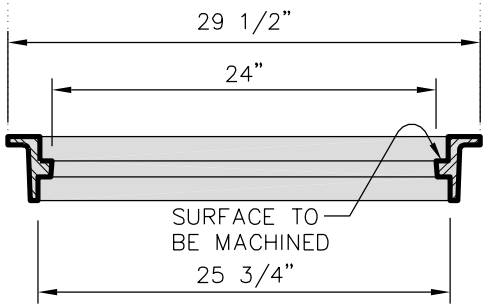
1/4" RIM RAISED 1/4"
1" HOLE TAPERED TO 1 1/8"
ON REVERSE SIDE



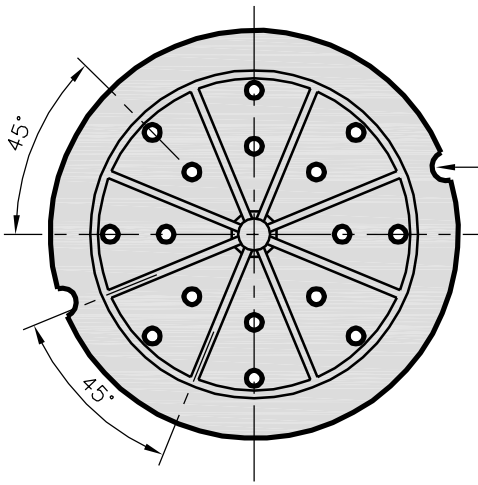
COVER
FACE



COVER
SECTION



FRAME
SECTION



COVER
BACK

1. Approximate cover weight 205 pounds.
2. All castings shall be made of clean even grain, tough gray cast iron. Casting shall be smooth, true to pattern and free from projections, sand holes, warp and other defects.
3. All castings shall be coated with coal tar pitch varnish while hot.
4. The iron used for these castings shall conform to the specifications of ASTM Designation A48 for Class 30 Gray Iron.
5. All castings used for storm drain structures shall have "STORM SEWER" cast on them.
6. All covers must be "MADE/MANUFACTURED IN USA" and indicated on cover.

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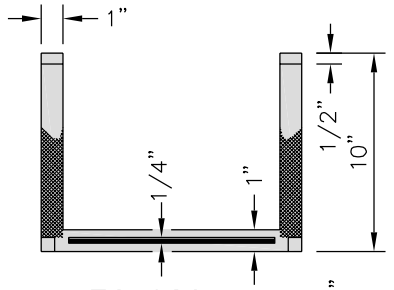
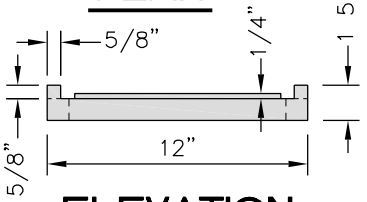
No.	Date	Description
1	9/16/11	APPROVAL

STANDARD MANHOLE FRAME & COVER

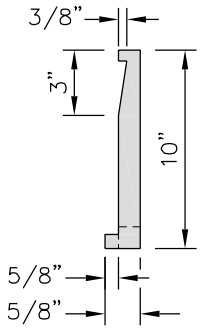
Scale:	Sheet #:	Detail #
not to scale	1 of 1	614.04



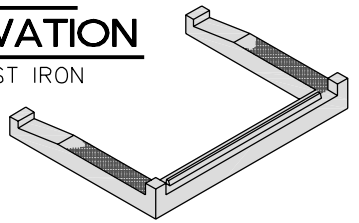
PLAN



ELEVATION

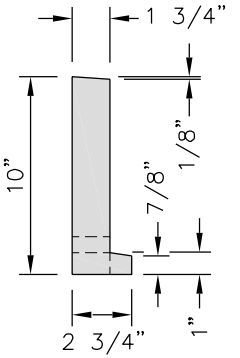


SIDE ELEVATION
CAST IRON

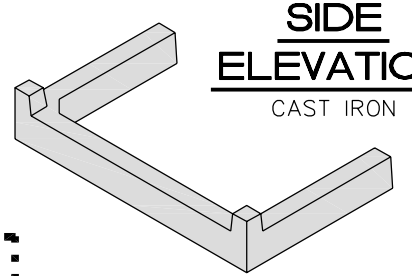


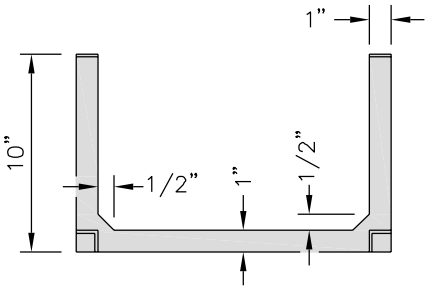
NOTES:

1. Steps differing in dimensions, configuration, or materials from those shown may also be used provided the contractor has furnished the City with details of the proposed steps and has received written approval from the city for the use of such steps.
2. All steps shall protrude from inside face of structural wall.

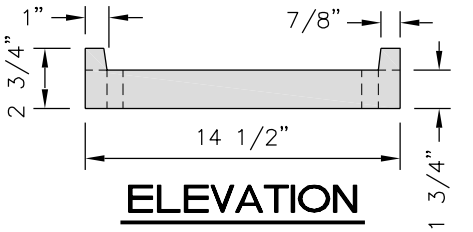


SIDE ELEVATION
CAST IRON

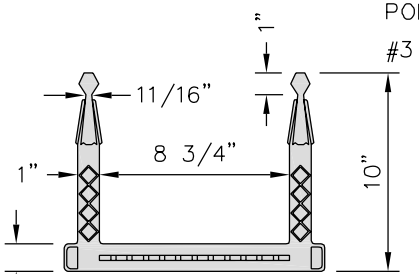




PLAN

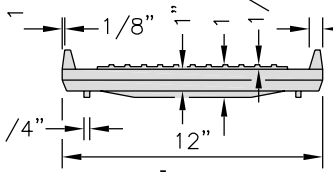


ELEVATION

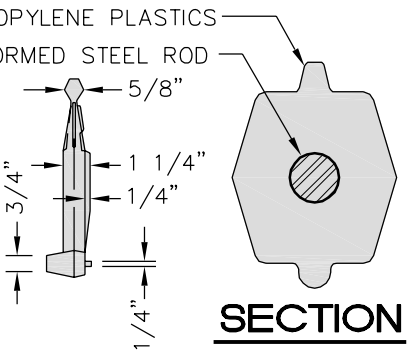


PLAN

A

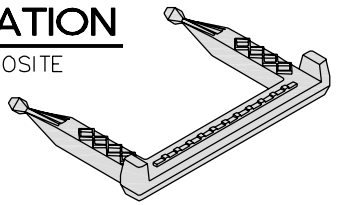


A ELEVATION

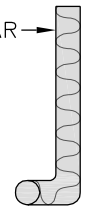


SECTION A-A

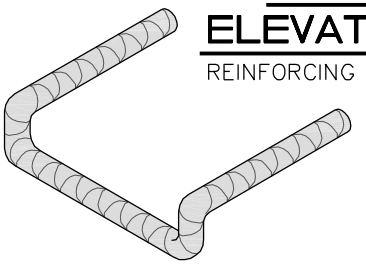
SIDE ELEVATION
COMPOSITE

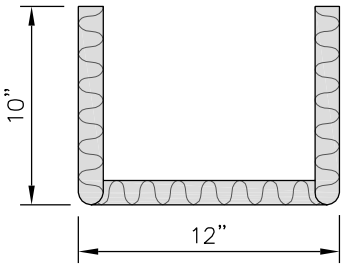


NOTE: NOT TO BE USED IN SANITARY SEWER MANHOLE

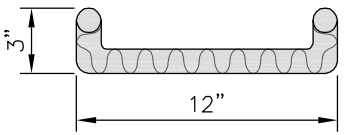


SIDE ELEVATION
REINFORCING STEEL





PLAN



ELEVATION

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No.	Date	Description
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STANDARD STEPS

Scale:	Sheet #:	Detail #
not to scale	1 of 1	615.01

TABLE OF DETAILS

GENERAL NOTES:

1. All corners are to be chamfered 1".
2. The contractor will be required to place (2) #6 bars "Y" in the top of all endwalls for pipe culverts 42" and over with a minimum of 3" cover and a length of 6" less than endwall.
3. Forms are to be used for construction of bottom slab.
4. Wall thickness (T) shown is not to be interpreted to mean the thickness acceptable, but is used only in computing endwall quantities.
5. If contractor elects to use construction joint at bottom of pipe and pours base separately, the top of the base shall be left rough.
6. When contractor elects to use construction joint at bottom of pipe, bar "X" (dowels) shall be placed in the base as shown on plans, spacing of bars to be approximately 12" centers unless engineers direct otherwise.
7. When skew angle of pipe is over 45°, use G-1 dimensions for 45° plus 6" for each 5° over 45°, G2 dimension will be the new dimension divided by the cosine of the angle of pipe skew.
8. Class "AA" concrete shall be used.
9. All pipes will meet the NCDOT-Division of Highways specifications for load bearing capacities.

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No.	Date	Description
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ENDWALLS NOTES

Scale:	Sheet #:	Detail #
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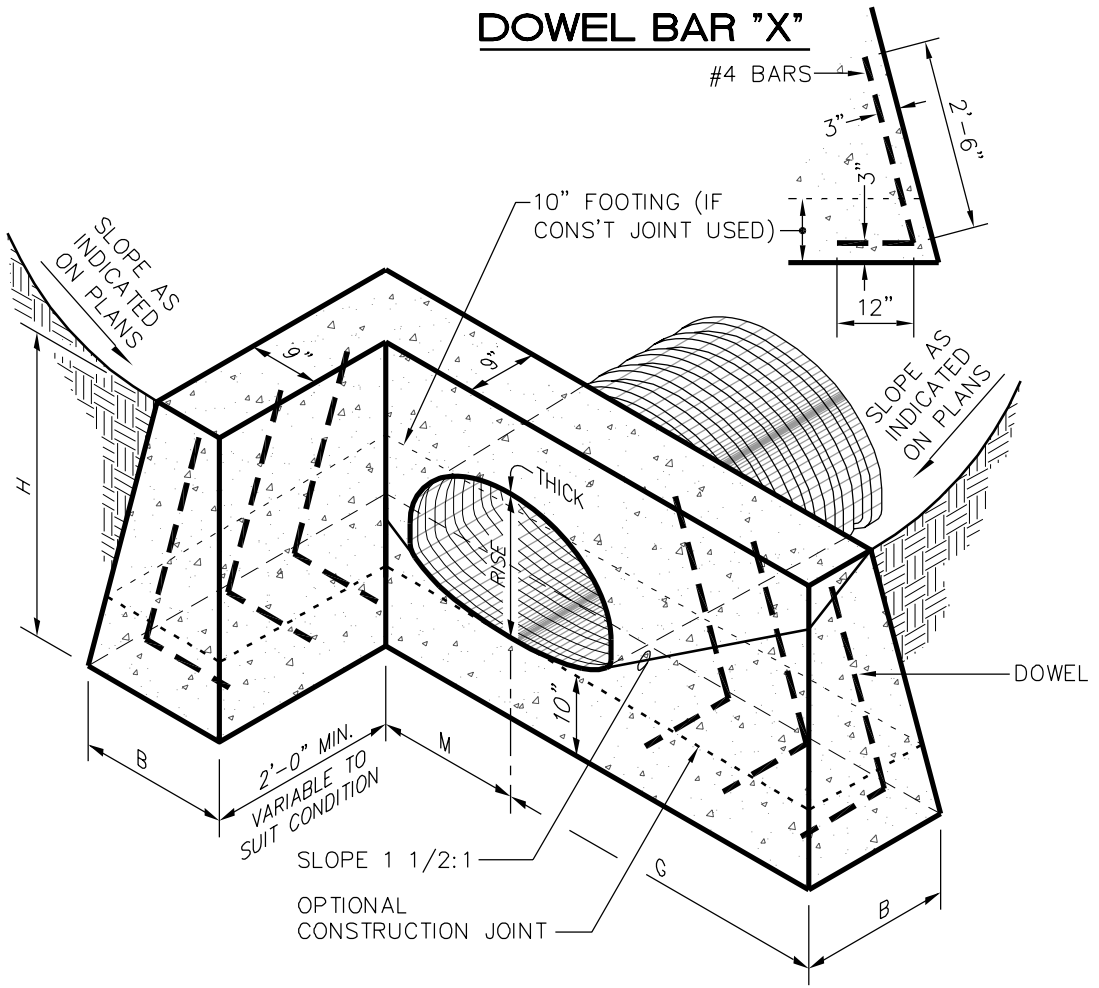

REINFORCING QUANTITIES										
SPAN	18"	22"	25"	29"	36"	43"	50"	58"	65"	72"
BARS	X	←							→	X
QTY.	5	5	5	6	6	7	7	7	8	8
LBS.	12	12	12	14	14	16	16	16	19	19

DIMENSIONS AND CONCRETE QUANTITIES							
COMMON DIMENSIONS USING C.M. ARCH PIPE							TOTAL CONC.
SPAN	RISE	THICK	H	B	G	M	CU. YD.
18"	11"	.064	2'-7"	1'-4"	2'-5"	1'-0"	0.604
22"	13"	.064	2'-9"	1'-5"	2'-9"	1'-2"	0.712
25"	16"	.064	3'-0"	1'-6"	3'-3"	1'-4"	0.877
29"	18"	.079	3'-2"	1'-7"	3'-7"	1'-6"	1.015
36"	22"	.079	3'-6"	1'-9"	4'-3"	1'-9"	1.306
43"	27"	.079	3'-11"	2'-0"	5'-1"	2'-1"	1.796
50"	31"	.109	4'-3"	2'-2"	5'-9"	2'-4"	2.206
58"	36"	.109	4'-8"	2'-4"	6'-7"	2'-8"	2.794
65"	40"	.138	5'-0"	2'-6"	7'-4"	3'-0"	3.387
72"	44"	.138	5'-4"	2'-8"	8'-0"	3'-3"	3.995

QUANTITIES BASED ON 2'-0"

18" THRU 72" PIPE ARCH PIPE

NOTES:

1. See Std. detail No. 630.01 for general notes.

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No.	Date	Description
1	9/16/11	APPROVAL

STD. CONC. "L" ENDWALL FOR SINGLE PIPE CULVERTS

Scale: not to scale | Sheet #: 1 of 1 | Detail # 631.01

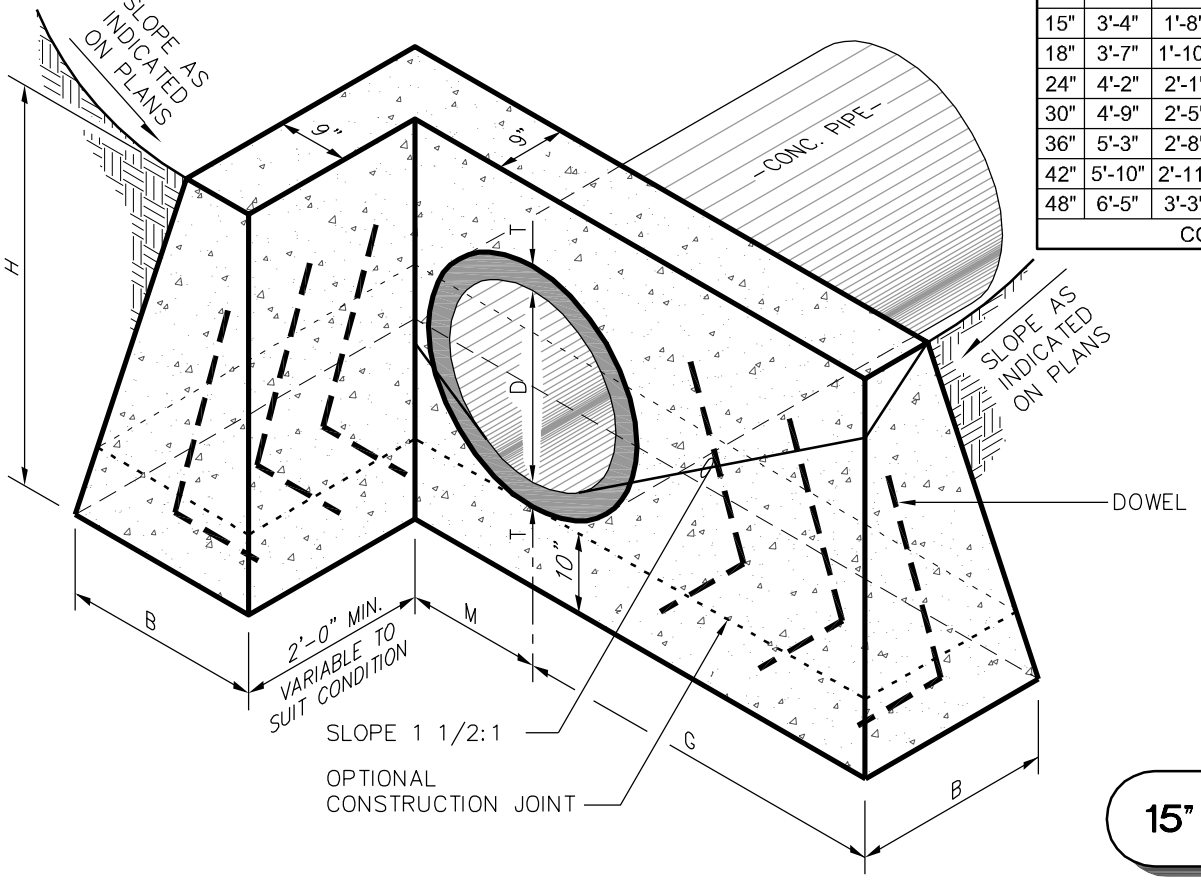
DIMENSIONS AND CONCRETE QUANTITIES

COMMON DIMENSIONS						
D	H	B	G	M	T	CU. YD.
15"	3'-4"	1'-8"	2'-9"	1'-10"	1 7/8"	0.960
18"	3'-7"	1'-10"	3'-2"	1'-2"	2"	1.193
24"	4'-2"	2'-1"	4'-0"	1'-5"	2 1/2"	1.711
30"	4'-9"	2'-5"	4'-7"	1'-9"	2 1/4"	2.394
36"	5'-3"	2'-8"	5'-6"	2'-0"	3"	3.169
42"	5'-10"	2'-11"	6'-4"	2'-4"	3 1/2"	4.139
48"	6'-5"	3'-3"	7'-2"	2'-11"	4"	5.422
CONCRETE PIPE						

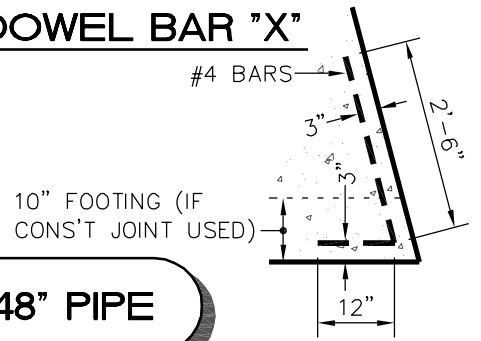
COMMON DIMENSIONS				
H	B	G	M	CU. YD.
3'-0"	1'-5"	2'-6"	0'-11"	0.770
3'-3"	1'-8"	2'-11"	1'-0"	0.964
3'-9"	1'-11"	3'-8"	1'-3"	1.385
4'-3"	2'-2"	4'-5"	1'-6"	1.908
4'-9"	2'-5"	5'-2"	1'-9"	2.544
5'-3"	2'-8"	5'-11"	2'-0"	3.301
5'-9"	2'-11"	6'-8"	2'-3"	4.193
METAL PIPE				

REINFORCING QUANTITIES

SPAN	15"	18"	24"	30"	36"	42"CM		42"RC		48"CM		48"RC	
BARS	X	X	X	X	X	X	Y	X	Y	X	Y	X	Y
QTY.	5	5	6	6	7	7	2	7	2	8	2	8	2
LBS.	12	12	14	14	16	47		49		52		55	



DOWEL BAR "X"



15" THRU 48" PIPE

NOTES:

1. See Std. detail No. 630.01 for general notes.

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No.	Date	Description
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STD. CONC. "L" ENDWALL FOR SINGLE PIPE CULVERTS

Scale:	Sheet #:	Detail #
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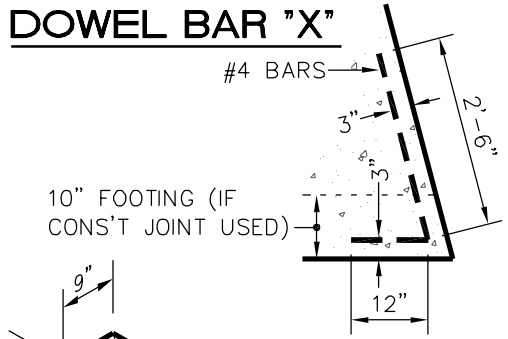
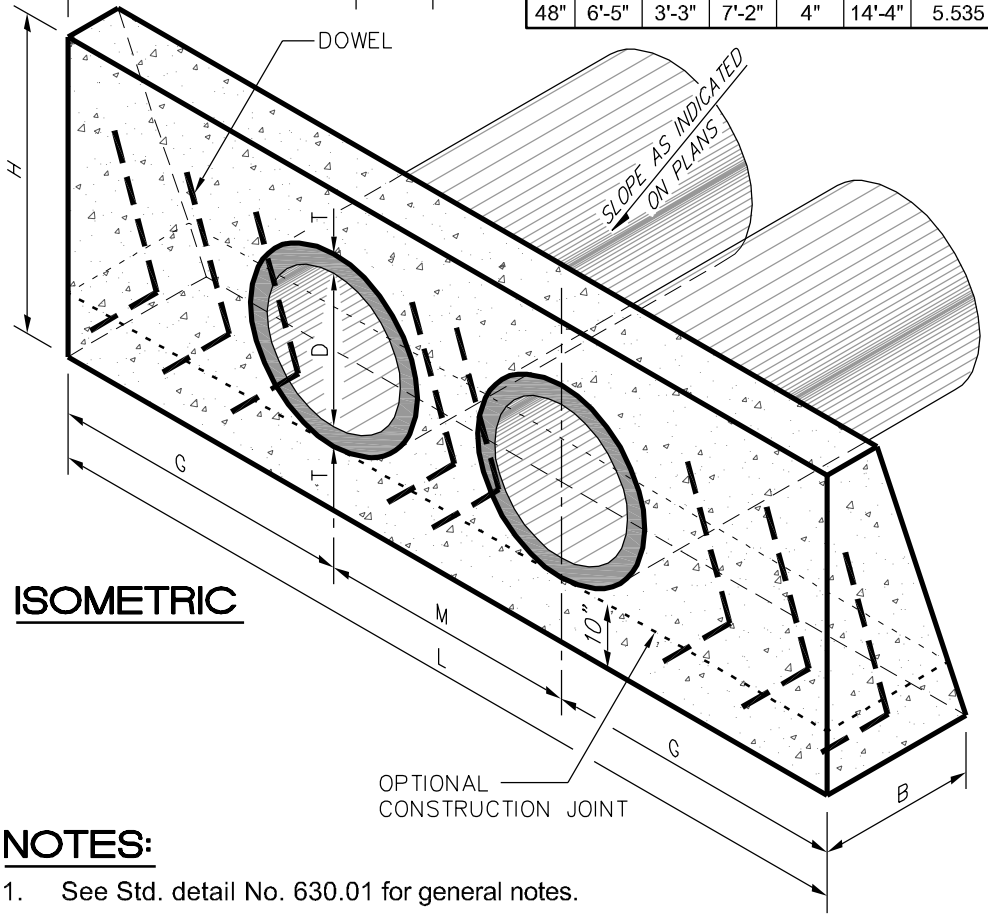
DOWEL BAR "X"



DIMENSIONS AND CONCRETE QUANTITIES

CONCRETE PIPE										CORRUGATED METAL PIPE							
	COMMON DIMENSIONS				SINGLE PIPE		DOUBLE PIPE			COMMON DIMS.			SINGLE PIPE		DOUBLE PIPE		
D	H	B	G	T	L	CU. YD.	M	L	CU. YD.	H	B	G	L	CU. YD.	M	L	CU. YD.
15"	3'-4"	1'-8"	2'-9"	1 7/8"	5'-6"	0.734	2'-2"	7'-8"	0.970	3'-0"	1'-6"	2'-6"	5'-0"	0.573	1'-11"	6'-11"	0.780
18"	3'-7"	1'-10"	3'-2"	2"	6'-4"	0.958	2'-7"	8'-11"	1.274	3'-3"	1'-8"	2'-11"	5'-10"	0.767	2'-3"	8'-1"	1.014
24"	4'-2"	2'-1"	4'-0"	2 1/2"	8'-0"	1.506	3'-5"	11'-5"	2.010	3'-9"	1'-11"	3'-8"	7'-4"	1.200	3'-0"	10'-4"	1.597
30"	4'-9"	2'-5"	4'-7"	2 3/4"	9'-2"	2.145	4'-3"	13'-5"	2.920	4'-3"	2'-2"	4'-5"	8'-10"	1.757	3'-9"	12'-7"	2.340
36"	5'-3"	2'-8"	5'-6"	3"	11'-0"	3.040	5'-0"	16'-0"	4.086	4'-9"	2'-5"	5'-2"	10'-4"	2.455	4'-6"	14'-10"	3.288
42"	5'-10"	2'-11"	6'-4"	3 1/2"	12'-8"	4.120	5'-10"	18'-6"	5.534	5'-3"	2'-8"	5'-11"	11'-10"	3.310	5'-3"	17'-1"	4.434
48"	6'-5"	3'-3"	7'-2"	4"	14'-4"	5.535	6'-8"	21'-0"	7.427	5'-9"	2'-11"	6'-8"	13'-4"	4.337	6'-0"	19'-4"	5.812



ISOMETRIC

DOWELS IN ENDWALL WITH REINFORCED CONC. PIPE

LOC.	PIPE DIA.	SINGLE PIPE									DOUBLE PIPE								
		15"	18"	24"	30"	36"	42"		48"		15"	18"	24"	30"	36"	42"		48"	
	BARS	X	X	X	X	X	X	Y	X	Y	X	X	X	X	X	X	Y	X	Y
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
M	QTY.	-	-	-	-	-	-	2	-	2	1	1	2	2	2	2	2	3	2
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
TOT. LBS.		9	9	14	14	19	55		65		12	12	19	19	23	77		92	

SEE NOTE

DOWELS IN ENDWALL WITH CORRUGATED METAL PIPE

LOC.	PIPE DIA.	SINGLE PIPE									DOUBLE PIPE								
		15"	18"	24"	30"	36"	42"		48"		15"	18"	24"	30"	36"	42"		48"	
	BARS	X	X	X	X	X	X	Y	X	Y	X	X	X	X	X	X	Y	X	Y
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
M	QTY.	-	-	-	-	-	-	2	-	2	1	1	1	2	2	2	2	2	2
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
TOT. LBS.		9	9	14	14	19	53		62		12	12	16	19	23	73		85	

SEE NOTES

15" THRU 48" PIPE
90° SKEW

NOTES:

1. See Std. detail No. 630.01 for general notes.

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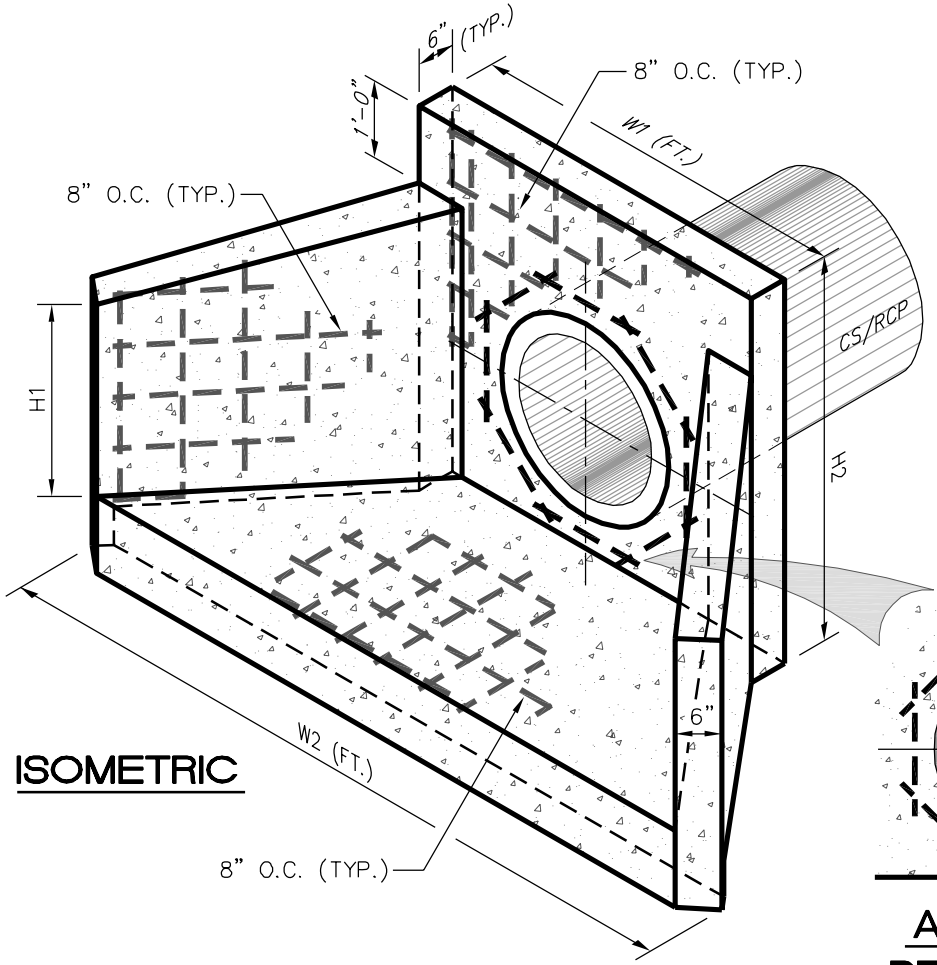
No.	Date	Description
1	9/16/11	APPROVAL

STD. CONC. ENDWALL FOR SINGLE & DOUBLE PIPE CULVERTS

Scale: not to scale | Sheet #: 1 of 1 | Detail # 632.01

ENDWALL DIMENSIONS						
FT.	MINIMUM	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.
PIPE DIA.	BAR SIZE	H1 (FT.)	H2 (FT.)	D (FT.)	W1	W2
1.0	#5 @ 8"	1.25 / 2.00	2.00 / 3.75	1.25 / 1.75	3.00 / 3.75	5.50 / 6.00
1.25	#5 @ 8"	1.25 / 2.00	3.00 / 3.75	1.25 / 2.00	3.50 / 3.75	6.50 / 6.75
1.50	#5 @ 8"	1.25 / 2.00	3.00 / 4.25	1.50 / 2.50	3.50 / 3.75	6.50 / 6.75
2.0	#5 @ 8"	1.50 / 2.50	4.00 / 4.75	1.75 / 2.50	4.00 / 4.25	7.50 / 8.25
2.5	#5 @ 8"	2.50 / 3.50	4.00 / 6.00	2.00 / 3.00	4.50 / 5.50	10.00 / 11.50
3.0	#5 @ 8"	3.00 / 3.50	5.00 / 6.00	2.75 / 3.50	5.25 / 5.75	11.50 / 11.75
3.5	#5 @ 8"	3.25 / 4.50	6.00 / 6.75	3.25 / 3.50	6.00 / 6.75	12.00 / 13.25
4.0	#5 @ 8"	3.50 / 4.50	6.50 / 7.00	3.25 / 3.50	6.50 / 6.75	13.00 / 13.25
4.5	#5 @ 8"	4.00 / 5.00	6.50 / 8.50	3.25 / 4.00	7.00 / 9.25	13.50 / 15.75
5.0	#5 @ 8"	4.50 / 5.00	7.00 / 8.50	3.25 / 4.00	7.25 / 9.25	13.75 / 15.75
5.5	#5 @ 8"	4.50 / 5.00	7.50 / 8.50	3.25 / 4.00	7.25 / 9.25	14.00 / 15.75
6.0	#5 @ 8"	4.50 / 5.00	7.50 / 8.50	3.25 / 4.00	7.75 / 9.25	14.75 / 16.75



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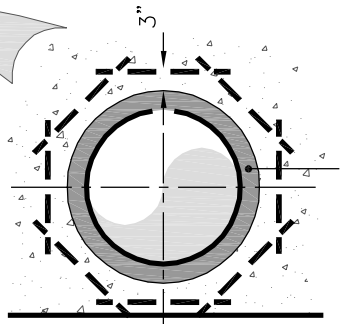
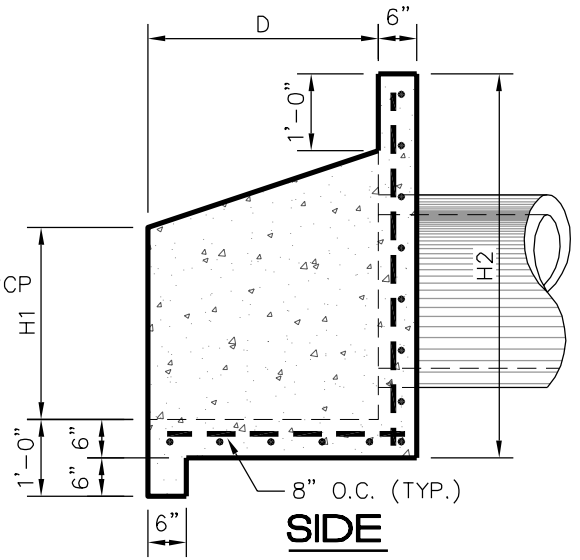


ADD'L PIPE REINFORCING



SIDE

NOTE: THE MINIMUM BAR SIZE SHALL BE #5 BARS AT 8" CTS. THE CONTRACTOR WILL HAVE THE OPTION TO INCREASE THIS BAS SIZE AS NEEDED

12" THRU 72" PIPE 90° SKEW

NOTES:

1. See Std. detail No. 630.01 for general notes.

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No.	Date	Description
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PRECAST CONC. ENDWALL FOR SINGLE PIPE CULVERTS

Scale: not to scale | Sheet #: 1 of 1 | Detail # 633.01

TABLE OF DETAILS

STORM DRAINAGE DESIGN

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).

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 pipe will be required at the influent and effluent of all pipe systems.

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

b. Design storm intensity adjusted for duration

c. Design flow

d. Coefficient of runoff

e. Grade of pipe

f. Type of pipe

g. Size of pipe

h. Velocity of flow

i. Maximum capacity

j. Hydraulic grade lines

D-13 Not more than one acre may drain in the street at a single concentrated point.

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 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-16 Maximum distance between manholes/boxes shall be 300'.

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 shall be in accordance to manufacturers recommendations.
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, 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.

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 and meet the manufacturers recommended minimum and maximum fill heights.
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.

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. Pipes installation shall be per NCDOT recommended practices and meet the manufacturers recommended minimum and maximum fill heights.
5. In areas where high groundwater exists, joints shall meet or exceed leakage rate found in ASTM C443.
6. All pipes shall be designed to meet a minimum H-20 load condition.

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 in accordance with the manufacturer's recommendations, but shall not be backfilled with materials less than an NCDOT Class II or better unless compaction is field verified, and backfill meets manufacturer's standards.
5. In areas where high ground water exists, joints shall meet or exceed leakage rate found in ASTM C443.
6. All pipes shall be designed to meet a minimum H-20 load condition.

COMPACTION AND BACKFILL

Backfill type and Compaction for reinforced concrete, corrugated high density polyethylene, and corrugated aluminum pipe shall be in accordance with NCDOT Standard Specifications for Road and Structures.

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.

DETERMINATION OF DISCHARGE:

The most widely used method for determining discharge in storm drainage is the Rational Method and shall be the method used for the purpose of this manual. It should be noted, however, that this method should be used with caution since it does not adequately recognize all of the complications of the runoff process. The basic formula may be reduced to "Q=CIA", where:

Q = Discharge, in cubic feet per second.

C = "Runoff" coefficient, unitless

I = Intensity of rainfall, inches per hour

A = Drainage basin area, acres

These factors are explained in detail in the following paragraphs.

C.....RUNOFF COEFFICIENT

The runoff coefficient is the proportion of the total rainfall which runs off the basin area into the drainage system. The runoff coefficients to be used for the Greenville area are listed on Std. detail No. 682.03.

I.....INTENSITY

Values for the rainfall intensity for the Greenville area may be derived from Std. detail No. 682.01 and 682.02. The design procedures for runoff for the City of Greenville shall be based on a 10-year rainfall and the time of concentration (Tc).

$T_C = [(L^3/H)^{0.385}]/128$

L = Maximum length of travel time of water (feet)
H = Difference in elevation between the most remote point on the basin and the outlet (feet)

NOTES: Overland flow, grass, multiply Tc by 2.
Overland flow, concrete or asphalt, multiply Tc by 0.4
Concrete channel, multiply Tc by 0.2

A.....DRAINAGE BASIN AREA

The drainage basin area can be calculated with the use of topographic maps by marking the basin ridgeline and planimetering the designated areas. When marking the basin ridgeline, it should be remembered that water runoff flows perpendicular to contour lines.

Q.....DISCHARGE

After determining the coefficient of runoff, rainfall intensity, and drainage basin area; the discharge can be computed by the use of rational formula "Q=CIA".

CATCH BASIN DESIGN

DESIGN PROCEDURE:

The following procedure for the location and design of catch basins for the City of Greenville is based on the actual hydraulic characteristics of the standard catch basin for the City as depicted in Std. detail No. 682.04. Catch basin design shall be based on a 2-year storm. Double basins are permitted. The catch basin data sheets, Std. detail No. 682.05 or approved equivalent shall be completed and submitted with each pan.

1 - DETERMINE DRAINAGE LIMITS:

The drainage limits should be calculated by the use of topographic maps by marking the basin ridge line. It should be noted that the centerline of the streets will usually represent a ridge line on a normal crown.

2 - DETERMINE DEPTH OF FLOW:

The depth of flow allowed is the depth of the water in the gutter line which will be tolerated in flooding conditions.

3 - DETERMINE LONGITUDINAL SLOPE (S_L) OF THE STREET:

Determine the slope of the street in percent.

4 - DETERMINE TRANSVERSE SLOPE (S_T) OF THE STREET:

This can be determined from the typical section of the street and will usually consist of the vertical distance from the gutter line to the crown of the street divided by the horizontal distance from the gutter line to the crown of the street.

5 - DETERMINE CAPACITY OF THE BASIN:

The capacity of the basin can be determined by the chart on Std. detail No. 682.04. Enter the bottom of the chart with the transverse slope and draw a vertical line to the longitudinal slope. Then, using this as a turning point, draw a horizontal line to intersect the "K" factor. Then use the equation.

$Q = KD^{1.67}$, where:

Q = the capacity of the basin in cubic feet per second
K = a dimensionless factor determined from said chart
D = the depth of flow in the gutter line in feet

With this information, complete columns 1, 2, 3 and 4 of the catch basin design data sheet (Std. detail 682.05).

6 - DETERMINE AREA SERVED BY THE BASIN:

STEP NO. 1: Assume a trial coefficient and a trial intensity for the design area and place these figures in columns 5 and 6 of the data sheet. At this point, an approximate area served by the catch basin may be determined by dividing the catch basin capacity by the trial coefficient of runoff and the trial intensity (column 5 x column 6). This derived area should be placed in column 7 in the design data sheet. This gives an approximate area served by the catch basin. With this area and topographic lines, a trial location of the proposed basin should be made.

STEP NO. 2: To ensure that the location as derived in Step No. 1 is appropriate and that the trial coefficient of runoff and trial intensity are in order, the runoff for the area determined by the proposed location of the basin should be calculated. This is accomplished by calculating the runoff as established in the RUNOFF DETERMINATIONS listed in the previous section and completing columns 8 through 13. If column 13 varies by more than 10% from the column 7, this would indicate that the trial coefficient and/or trial intensity were not in line with the actual coefficient and intensity, and therefore, the basin is not properly located. The procedure in Step No.1 should then be repeated and then adjust the trial coefficient of runoff (col. 5) and trial intensity (col.6) accordingly. Once all the basins have been property located, the pipe design associated with the basins may be completed according to the PIPE SYSTEM DESIGN PROCEDURES listed in this chapter.

CULVERT DESIGN

DESIGN PROCEDURE:

There are two steps in storm drainage design. The first step is to determine the amount of water discharged at the point of design. This can be accomplished by using the RUNOFF DETERMINATION section of this manual. The second step is the actual selection of a size for the structure, based on the calculated discharge.

DETERMINE OF STRUCTURE SIZE:

There are essentially two types of control which must be considered in every culvert design situation: inlet control and outlet control. Both types of control must be considered separately in the design of culverts.

INLET CONTROL:

Inlet control exists in cases where the culvert is not flowing full. The inlet control charts (Std. details No. 683.01 through 683.11) have headwater depth as the controlling criteria. Headwater depth is the depth of the water on the upstream side of the culvert, expressed in diameters of the pipe under study.

The maximum allowable headwater is limited by either the controlling flood elevation or existing or proposed development. However, the maximum headwater depth should not exceed 1.2 times the open height of the culvert for a 10-year storm.

OUTLET CONTROL:

Outlet control exists in cases where the culvert is flowing full. Before using the outlet control charts (Std. details No. 683.07 through 683.11), it is necessary to determine the coefficient of entrance loss “Ke”. These valves are found in the coefficient of entrance loss table on Std. detail No. 682.07.

A controlling criteria for outlet control is tailwater depth, which is represented in the tables by the amount of “head”. Head is the difference in elevation of the water surface on the upstream side of the culvert and the downstream water surface. The tailwater elevation is determined by downstream conditions and may be calculated if these conditions are known. In any case, the tailwater elevation will not be below the design year flood elevation at the outlet. If flood data is not available, the assumption may be made that the tailwater elevation is the crown of the culvert.

PIPE SYSTEM DESIGN

Once all the catch basins have been located according to the CATCH BASIN DESIGN PROCEDURES, the next step is to design the pipe systems to serve the basins. For the purpose of this manual and for the City of Greenville, 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. The Storm Drainage Design Data Sheet, Std. detail No. 682.06, or an approved equivalent, should be completed and submitted with each plan.

GENERAL NOTES:

1. FOR OPEN CHANNELS THE MINIMUM EASEMENT MUST CONTAIN THE WIDTH OF THE CHANNEL FROM TOP OF BANK TO TOP BANK PLUS (+) 10' ON EACH SIDE OF CHANNEL.
2. WIDER EASEMENT WIDTHS MAY BE REQUIRED FOR PIPE DEPTHS GREATER THAN EIGHT FEET.
3. PIPE SYSTEMS AND OPEN CHANNELS ON PRIVATE PROPERTY CONVEYING STORMWATER FROM MULTIPLE PROPERTIES SHALL BE PLACED IN A STORM DRAINAGE EASEMENT.

Easement Requirements for Storm Drain Pipe

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

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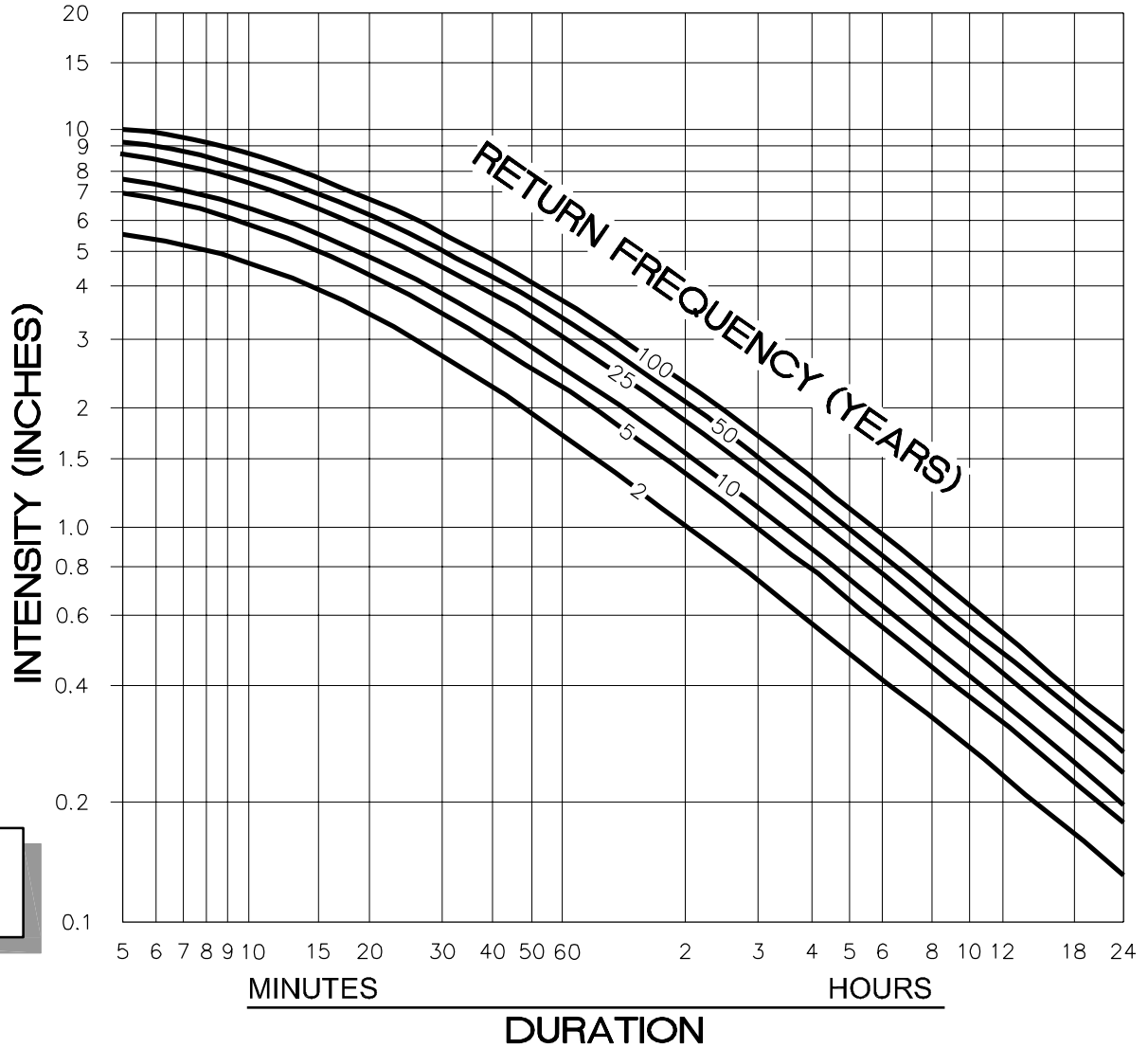
DRAINAGE ESM'T REQMTS FOR STORM DRAIN PIPES & OPEN CHANNELS

Scale: not to scale | Sheet #: 1 of 1 | Detail # 681.01



NOTE: ASSUME TIME OF CONCENTRATION EQUALS DURATION

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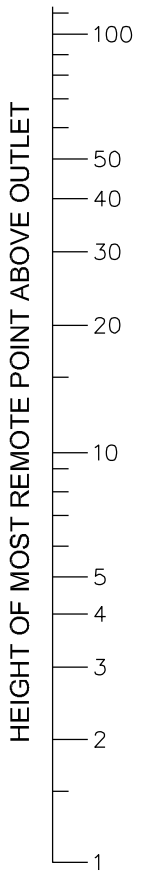
RAINFALL INTENSITY VS. DURATION

Scale:	Sheet #:	Detail #
not to scale	1 of 1	682.01



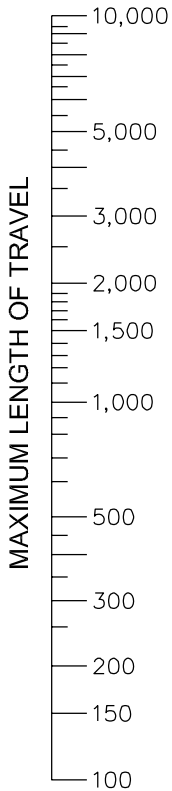
Use nomograph T_C for natural basins with well defined channels for overland flow on bare earth, and for mowed grass roadside channels.

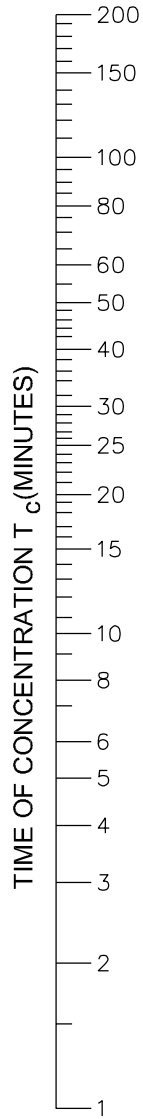
For overland flow, grassed surfaces, multiply T_C by 2.

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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TIME OF CONCENTRATION

Scale: not to scale | Sheet #: 1 of 1 | Detail # 682.02

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:				0.30

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RUNOFF COEFFICIENTS

Scale: not to scale | Sheet #: 1 of 1 | Detail # 682.03

CAPACITY OF BASIN =

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

WHERE:

Q= C.F.S.

D= DEPTH OF GUTTER FLOW IN FEET

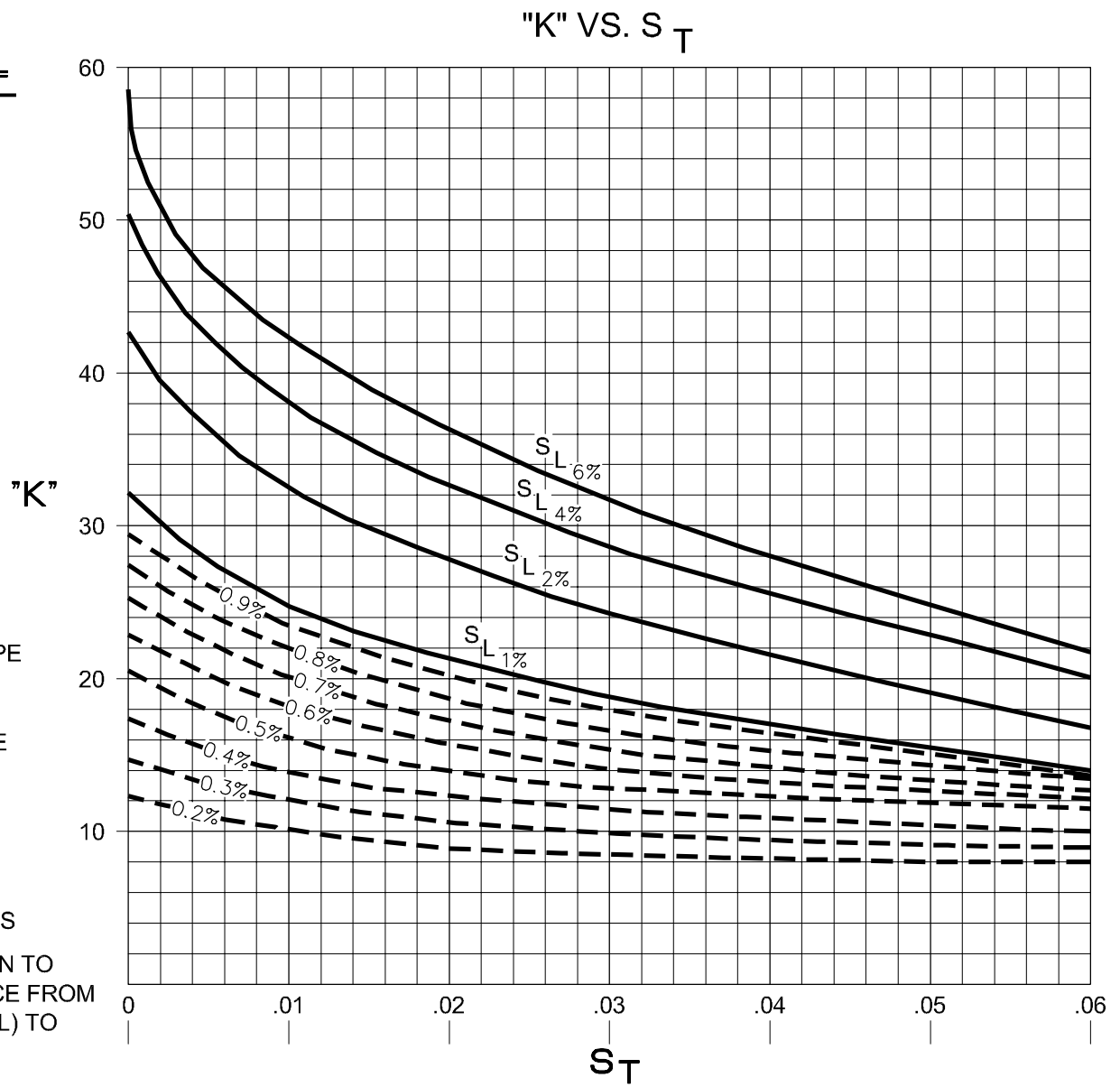
S_L = LONGITUDINAL GUTTER SLOPE

S_T = TRANSVERSE GUTTER 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

Scale:	Sheet #:	Detail #
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CATCH BASIN DESIGN DATA SHEET

PROJECT _____ COMPUTED BY_____ DATE_____,20____

LOCATION _____ CHECKED BY _____ DATE_____,20____

STORM FREQUENCY _____ YEARS

	1	2	3	4	5	6	7	8	9	10	11	12	13	
CATCH BASIN NO.	LONGITUDINAL STREET GRADE (S_L)%	TRANSVERSE STREET GRADE (S_T)	MAX. DEPTH OF OF FLOW IN GUTTER (FT.)	CAPACITY OF BASIN (C.F.S.) $Q=KD^{8/3}$	TRIAL COEF. OF RUNOFF	TRIAL INTENSITY (in.)	DERIVED AREA $=\frac{4}{5 \times 6}$	LENGTH OF DRAINAGE AREA	HEIGHT ABOVE MOST REMOTE POINT	COEF. OF RUNOFF	TIME OF CONCENTRATION (T_C)	ACTUAL INTENSITY (in.)	MAX. ALLOWABLE DRAINAGE AREA $=\frac{4}{10 \times 12}$	REMARKS (COLUMN 13 MUST BE W/N 10% OF COLUMN 7)

STORM DRAINAGE DESIGN DATA SHEET

PROJECT _____ DESIGNED BY_____ DATE_____,20___

LOCATION _____ CHECKED BY _____ SHEET _____ OF _____

STORM FREQUENCY _____ YEARS

LOCATION		AREA (ACRE)		C	INTENSITY			Q=CIA (C.F.S. REQ'D)	PIPE DATA							HGL	REMARKS
FROM	TO	SUB TOTAL	TOTAL		H	L	I		TYPE	N	S%	LENGTH	SIZE	VEL. (OF Q REQ'D)	Q AVAIL.		

C = RUNOFF COEFFICIENT
H = HEIGHT ABOVE INLET OF MOST REMOTE POINT
L = LENGTH OF DRAINAGE AREA
I = INTENSITY OF STORM (INCHES)
N = COEFFICIENT OF FRICTION
S = SLOPE (%)
Q = FLOW (C.F.S.)

NOTE: DESIGN BASED ON THE SUM OF AREAS AND NOT THE SUM OF THE DISCHARGES.

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STORM DRAINAGE DESIGN DATA SHEET

Scale: not to scale | Sheet #: 1 of 1 | Detail # 682.06

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

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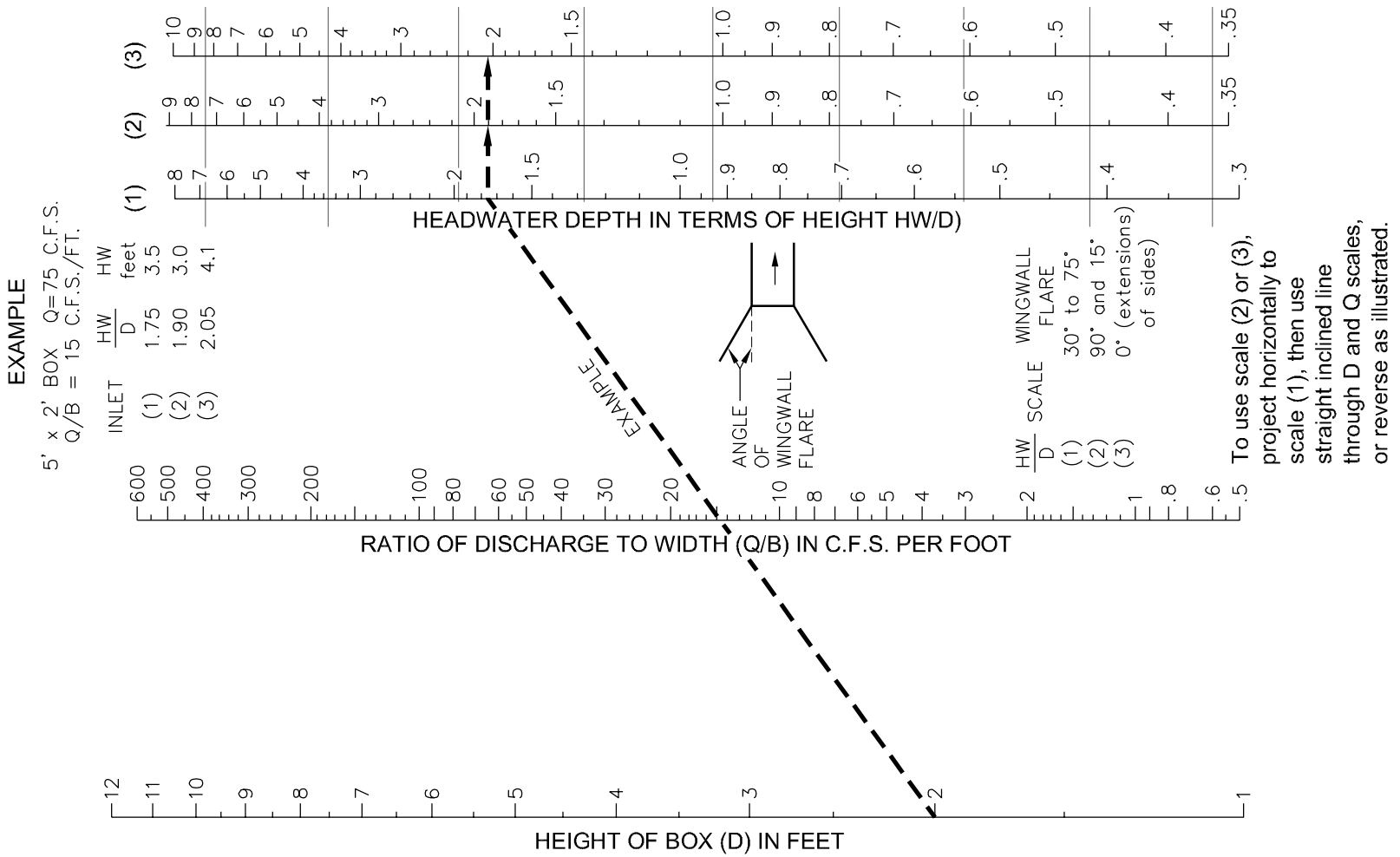
COEFFICIENT OF ENTRANCE LOSS, "ke"

Scale: not to scale | Sheet #: 1 of 1 | Detail # 682.07



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

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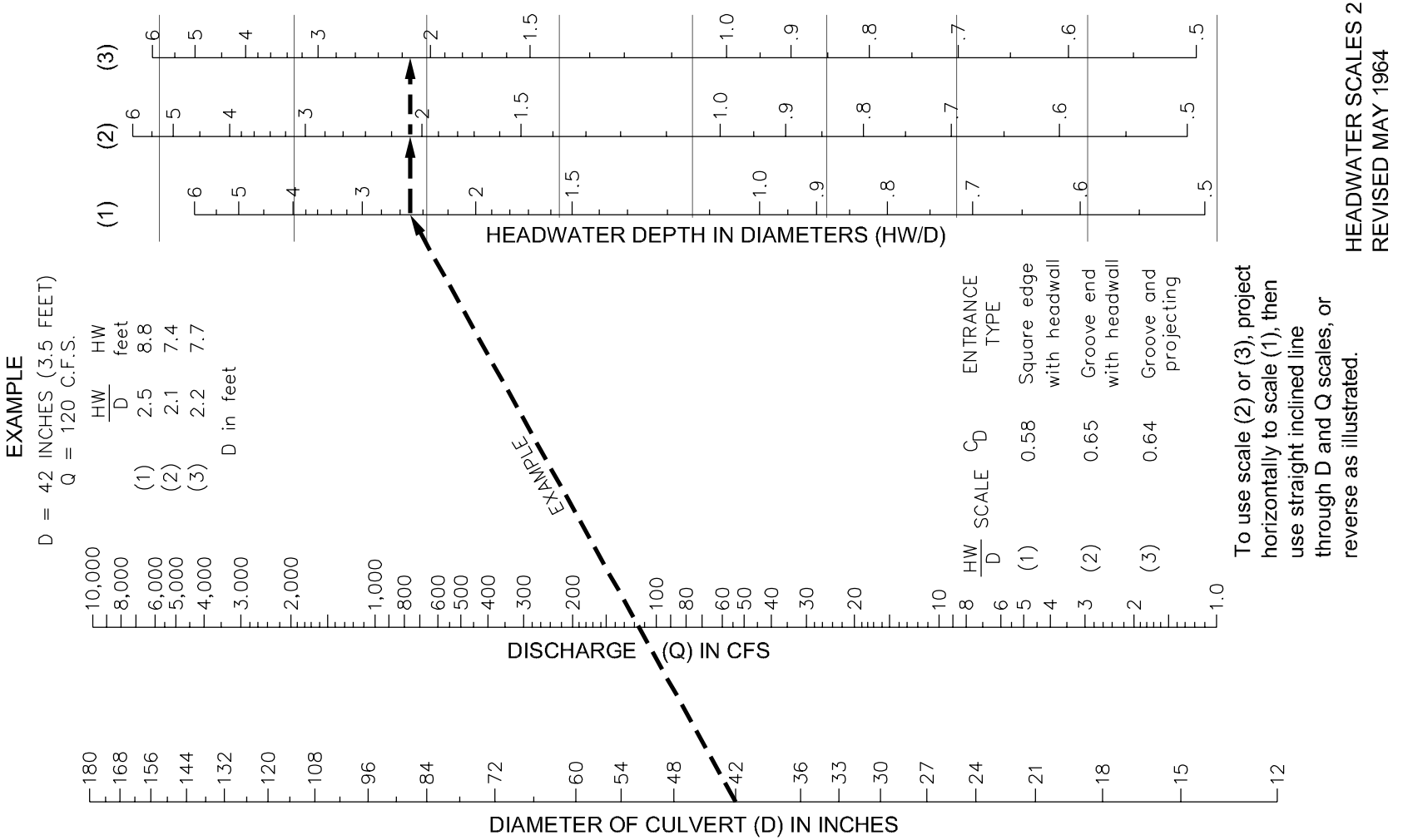
BOX CULVERT DESIGN - INLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.01



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

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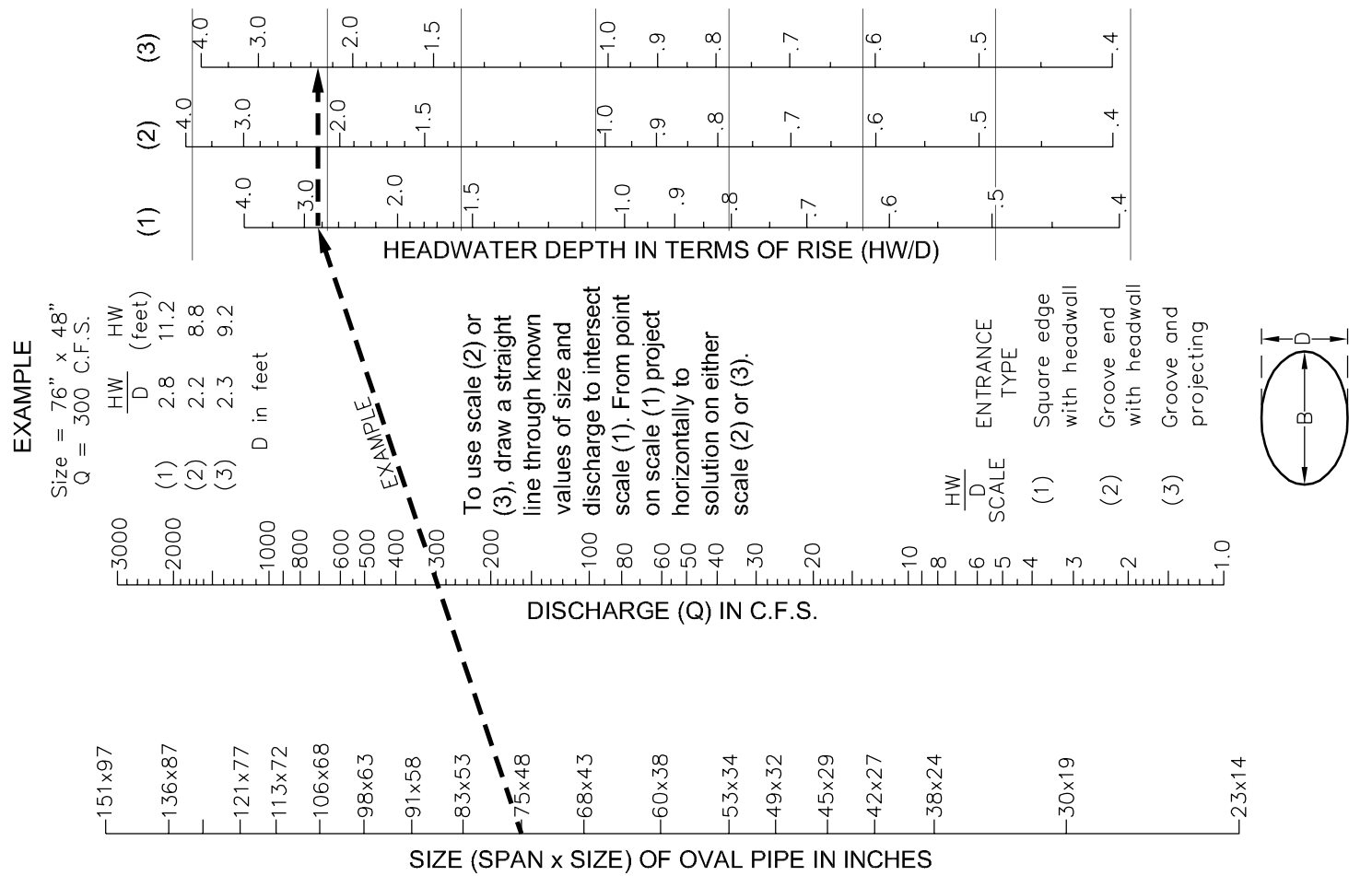
CONCRETE PIPE CULVERTS - INLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.02



HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL WITH INLET CONTROL

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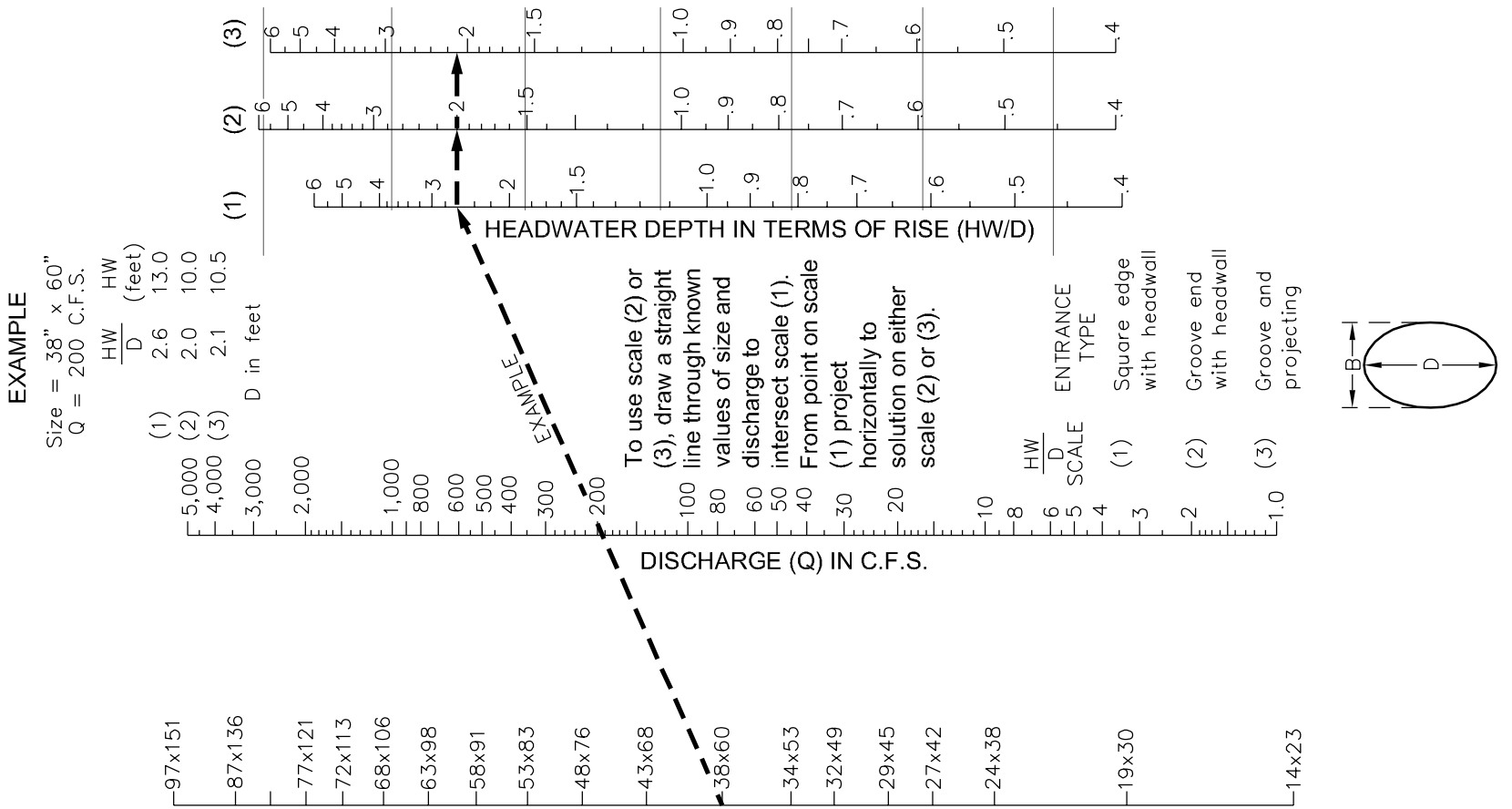
ELLIPTICAL CONCRETE PIPE CULVERTS - INLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.03



HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS VERTICAL WITH INLET CONTROL

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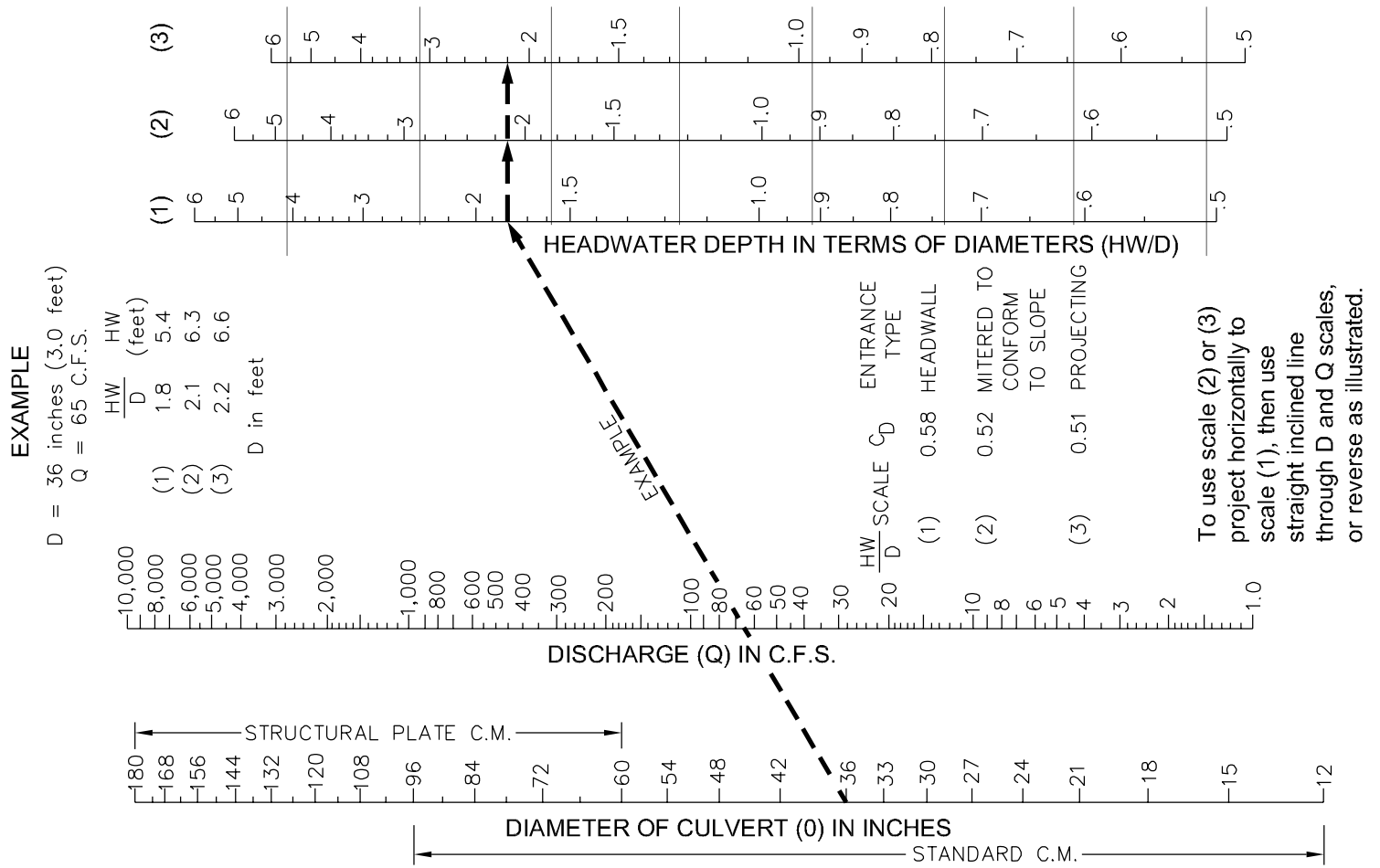
ELLIPTICAL CONCRETE PIPE CULVERTS - INLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.04



HEADWATER DEPTH FOR C.M. PIPE CULVERTS WITH INLET CONTROL

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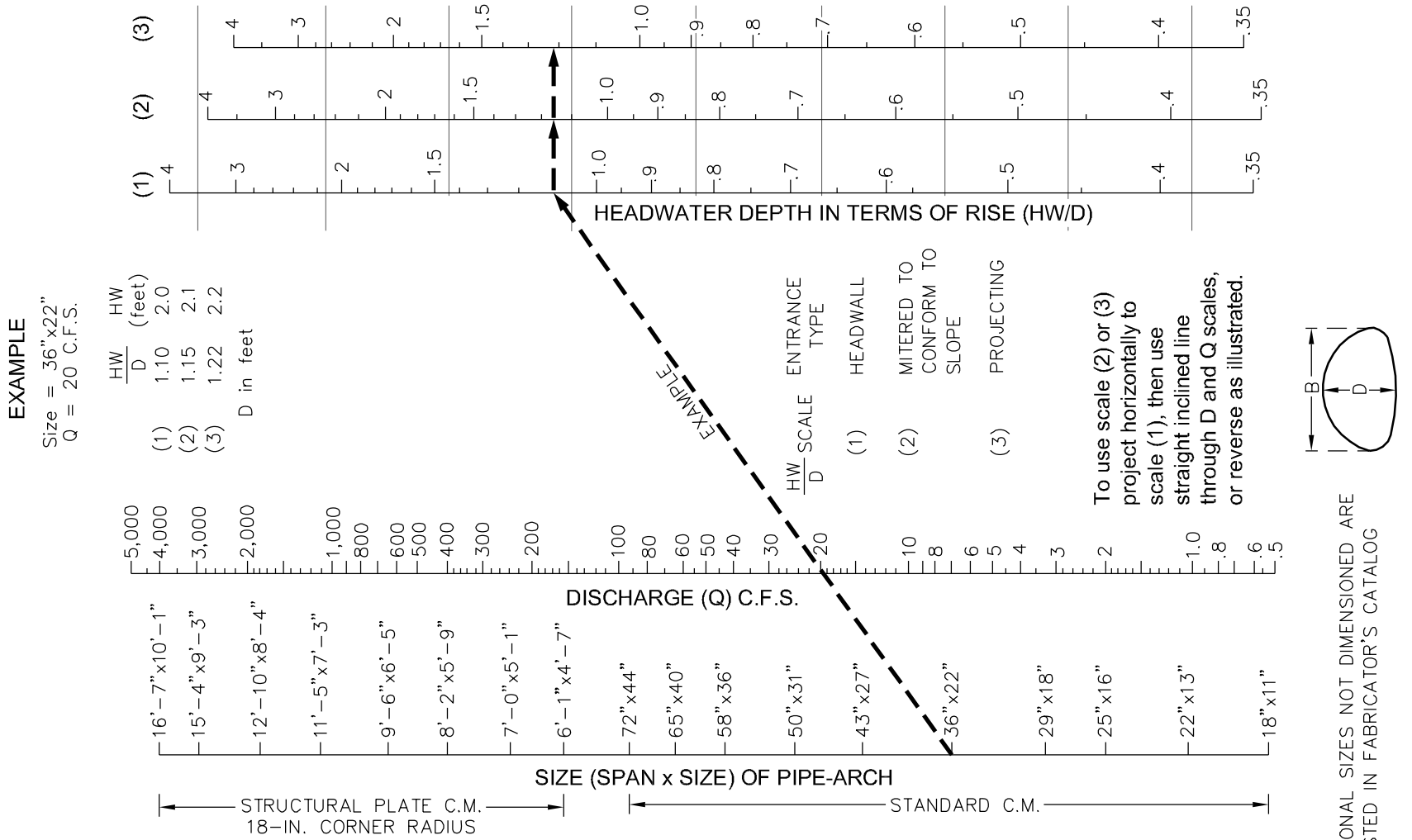
No.	Date	Description
1	9/16/11	APPROVAL

C.M. PIPE CULVERTS - INLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.05



HEADWATER DEPTH FOR C.M. PIPE-ARCH CULVERTS WITH INLET CONTROL

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No.	Date	Description
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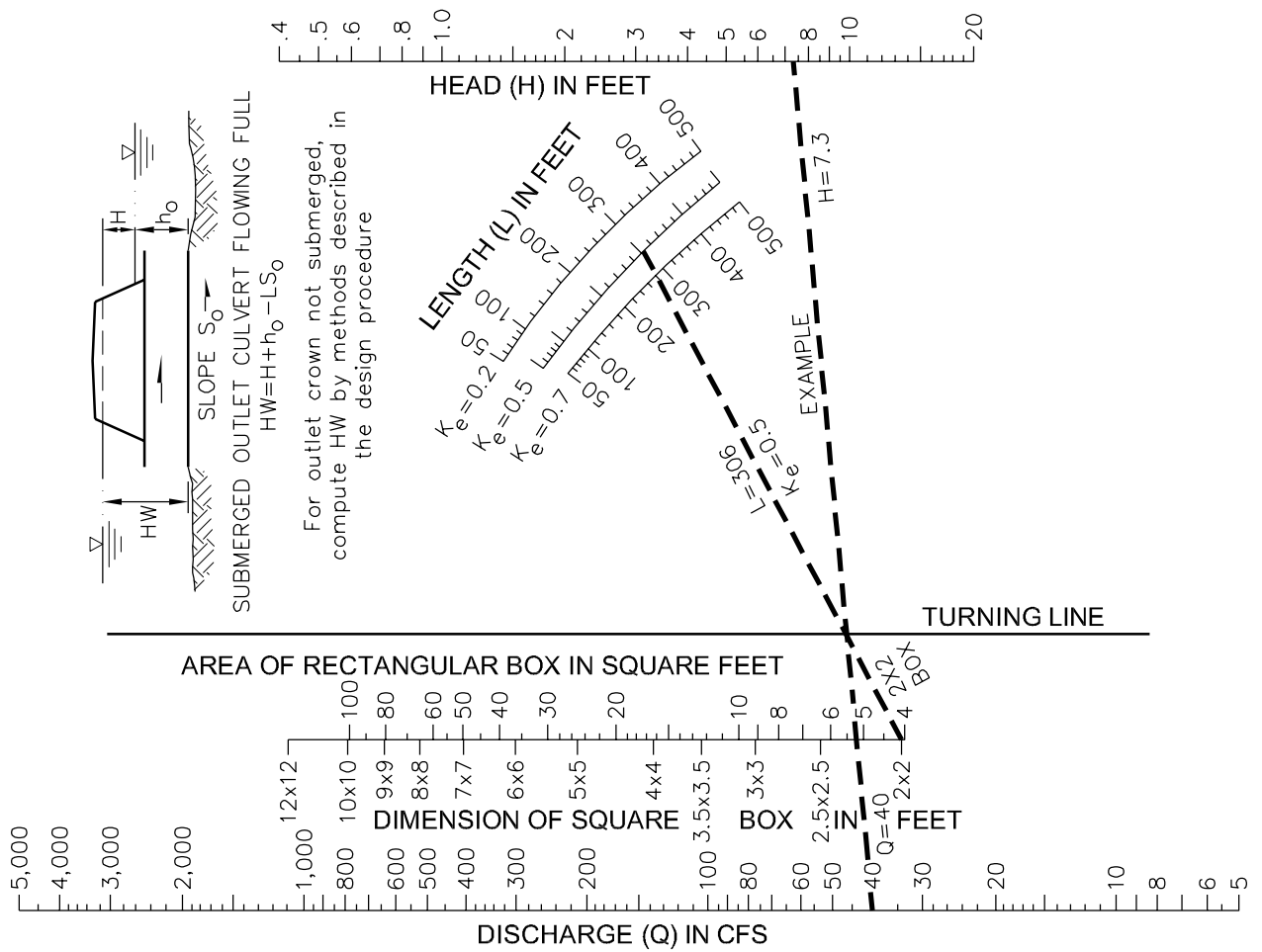
C.M. PIPE ARCH CULVERTS - INLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.06



HEAD FOR CONCRETE BOX CULVERTS FLOWING FULL n=0.013

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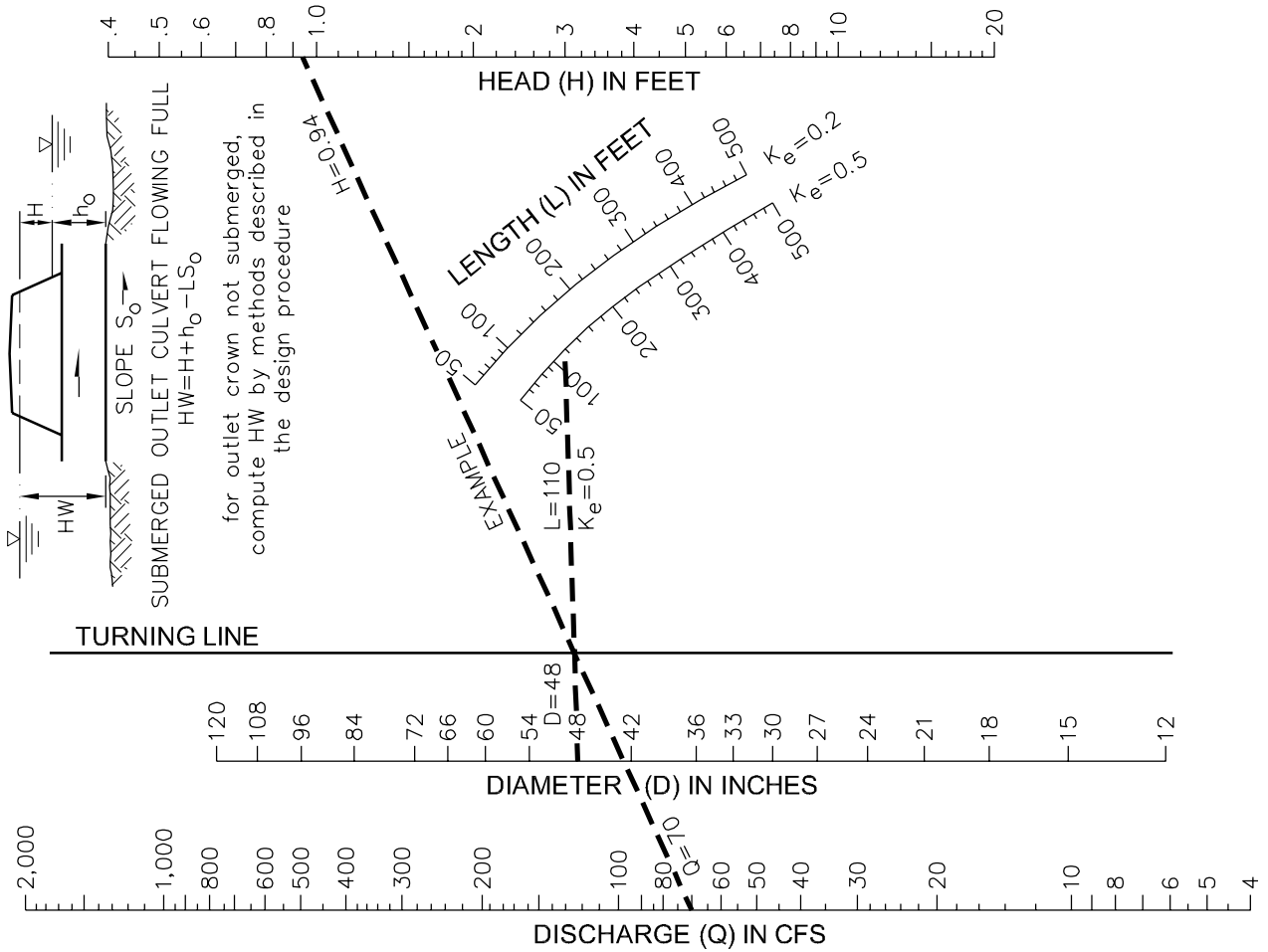
No.	Date	Description
1	9/16/11	APPROVAL

CONCRETE BOX CULVERTS - OUTLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.07



HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL n=0.013

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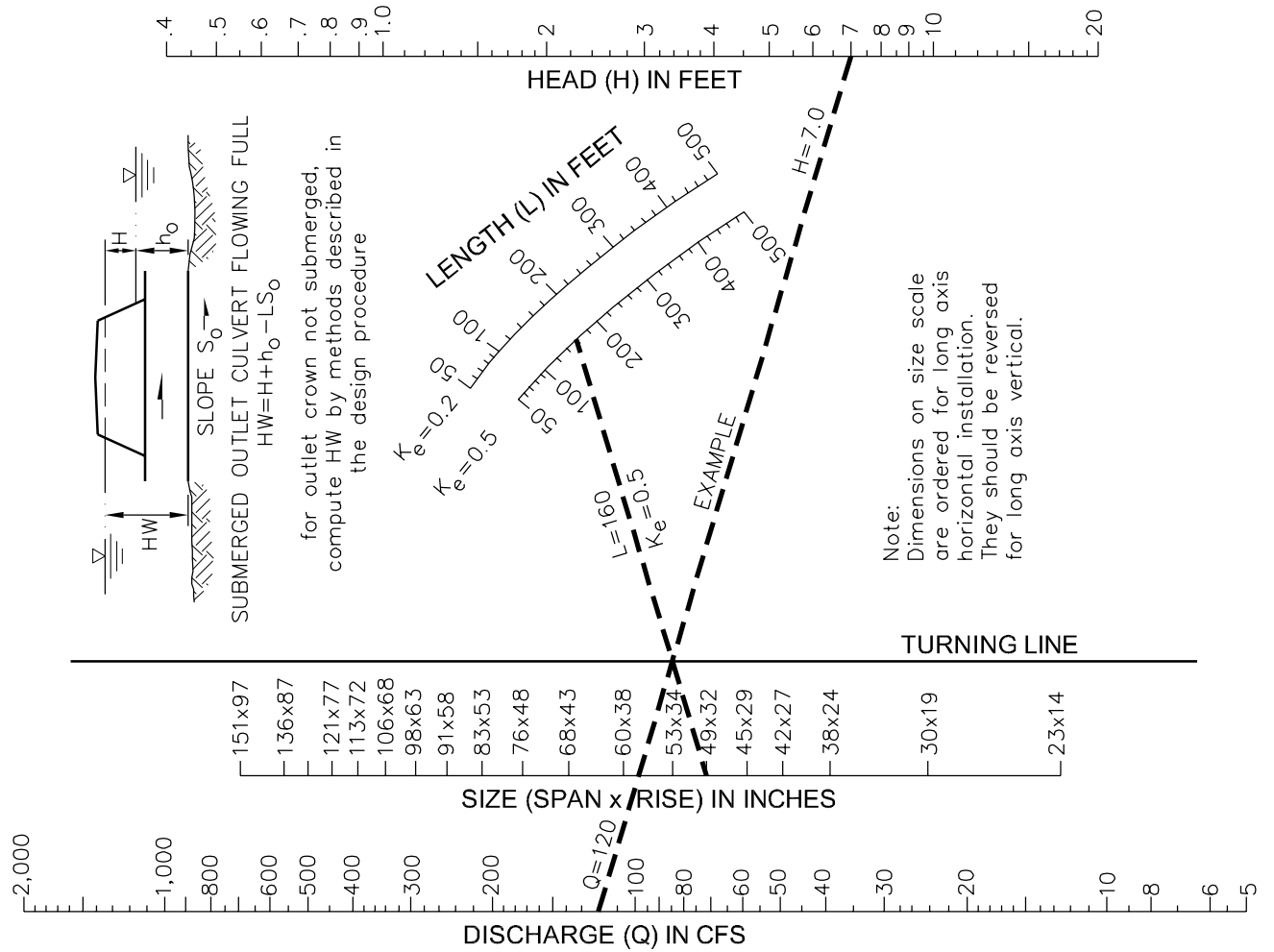
1	9/16/11	APPROVAL

CONCRETE PIPE CULVERTS - OUTLET CONTROL

Scale:	Sheet #:	Detail #
not to scale	1 of 1	683.08



HEAD FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL OR VERTICAL FLOWING FULL n=0.013

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ELLIPTICAL CONCRETE PIPE CULVERTS - OUTLET CONTROL

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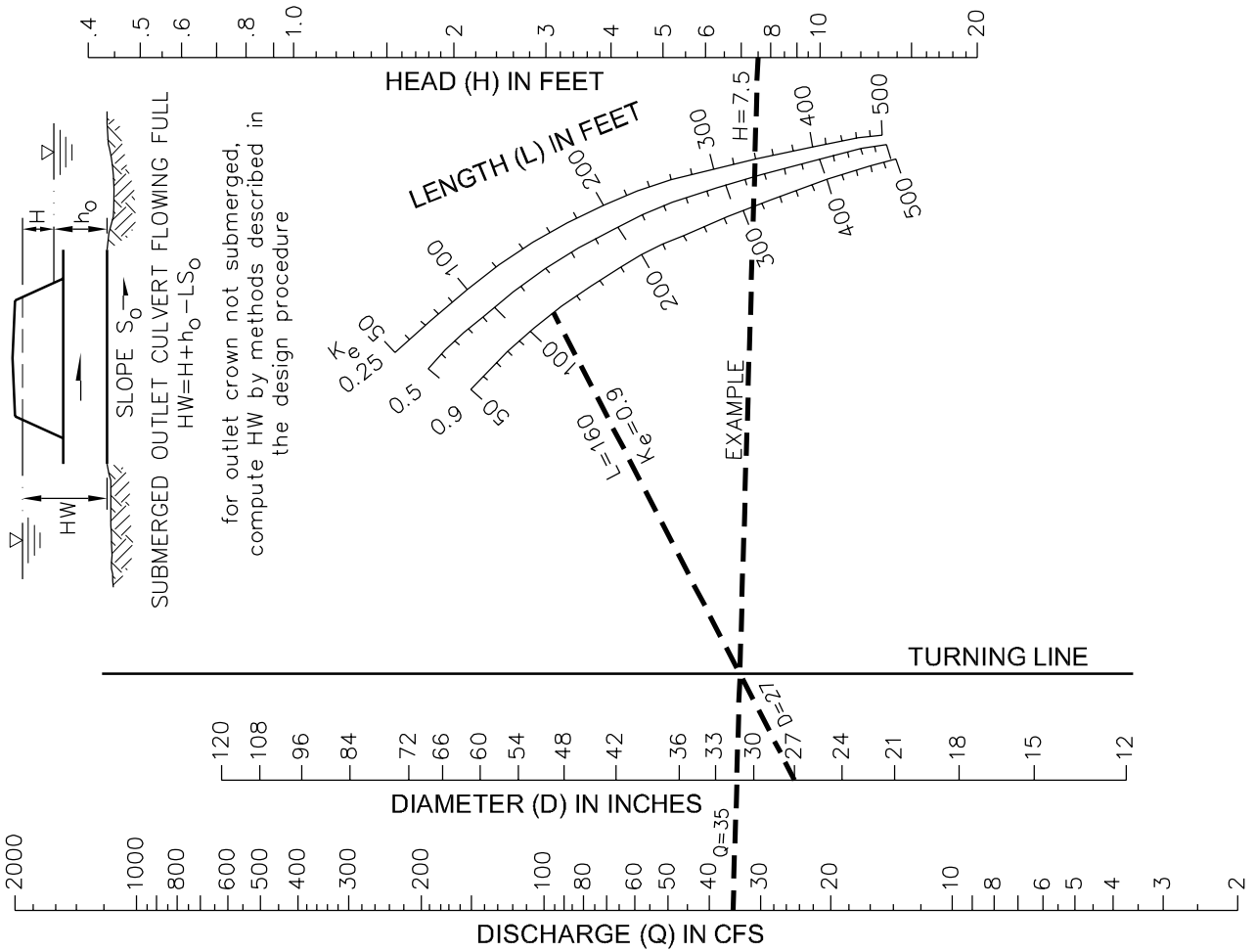

HEAD FOR STANDARD C.M. PIPE CULVERTS FLOWING FULL n=0.024

BUREAU OF PUBLIC ROADS - JAN. 1963

PUBLIC WORKS DEPARTMENT
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C.M. PIPE CULVERTS - OUTLET CONTROL

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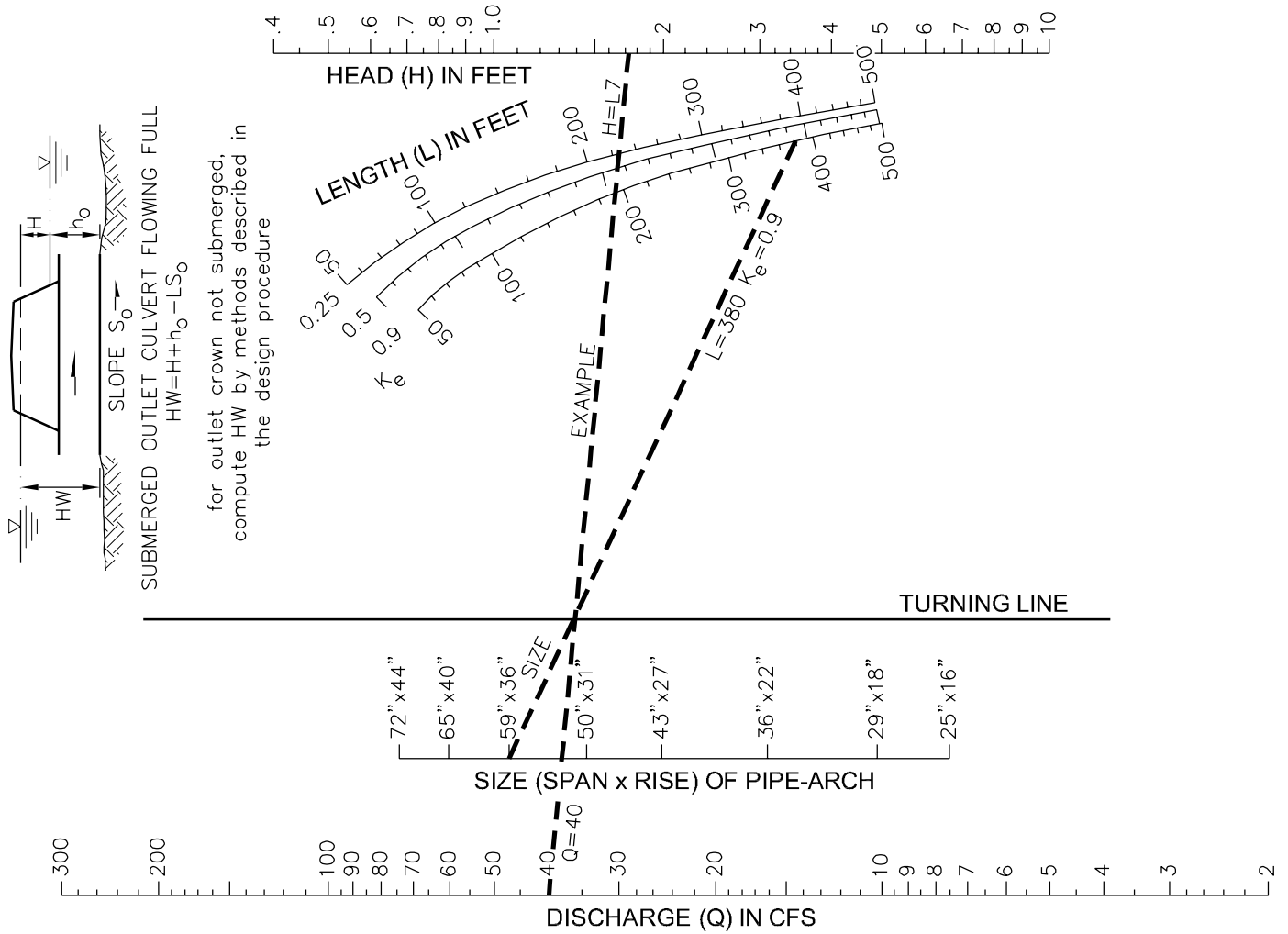

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1	9/16/11	APPROVAL

C.M. PIPE ARCH CULVERTS - OUTLET CONTROL

Scale:	Sheet #:	Detail #
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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.
- 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

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 (BMP's, pipe systems, ditches/streams, ponds, etc.)

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

   iii. Drainage area map

   iv. Soil types

c. Calculations

   i. First Flush

   ii. Attenuation of 1-year, 24-hour storm

   iii. Underdrain calculations (if necessary)

   iv. Sizing of treatment area

   v. Pipe/swale sizing calculations

d. Maintenance

   i. BMP 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 BMP erosion control measures (if necessary)

II. Stormwater Management Narrative

a. Description of project

b. Calculations of runoff

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 Division of Water Quality Stormwater Best Management Practices 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 is less than or equal to the rate of stormwater runoff prior to the installation of the impervious cover for storms up to and including the 1-year (80% of 2-year) storm. 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 1-year (80% of 2-year) storm. This rate can be calculated according to the Rational Method described in this manual.

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.