CITY OF NEWTON, KANSAS

STANDARD ENGINEERING DESIGN CRITERIA

FOR

PAVING AND DRAINAGE IMPROVEMENTS

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No.	Revision	Date

THE CITY
OF
NEWTON, KANSAS

STANDARD ENGINEERING DESIGN CRITERIA
AND
GENERAL IMPROVEMENT POLICY

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STANDARD ENGINEERING DESIGN CRITERIA
AND
GENERAL IMPROVEMENT POLICY

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I. GENERAL

A. Purpose

The City of Newton is striving to provide uniformity in construction efforts involving public works. To accomplish this it is important that initial design comply with established standards and specifications approved by the City. In addition to initial design, there are many construction activities that will be performed which will not require design and construction documents, which must also comply with uniform City standards. The following document will serve as the standard guideline for all public works construction.

B. Scope

This document includes design criteria and typical construction details for Streets, Trafficways, Storm Drainage and Flood Control Systems. In addition a brief material specification will be outlined.

C. Variation from Design Criteria

Variations will be considered from the Standard Engineering Design Criteria and General Improvement Policy when a formal request is made to the City. The request will involve the following:

1. List any and all variations being requested.
2. Provide a justification for each variation in writing. In the case of a detail, provide a sketch or an engineered drawing indicating the modification requested.
3. Request a formal meeting with the City to discuss the suggested variation.
4. Obtain in writing an approval/decision of the modification.

Special circumstances may be encountered where a specific item is not included in the Standard Engineering Design Criteria and General Improvement Policy. If

this occurs, a formal request shall be made to the City and shall meet the requirements as shown above for a variation.

D. Compliance with Applicable Statutory Requirements

Compliance with all Federal, State and Local Laws will be required. Where permits are required by Federal, State and Local Agencies, the Project Owner will be required to complete all filing, pay all fees, and obtain an approved permit. All information including maps, plans, specifications, etc., required to obtain an approved permit shall be provided to the City. Traffic control for all projects shall be established and shall conform to the latest version Manual on Uniform Traffic Control (MUTCD).

E. Amendment to Standard Engineering Design Criteria

Amendments to the Standard Engineering Design Criteria and General Improvement Policy will be approved by the City. The Amendments will be made available by the City for insertion into this document. It is the responsibility of the holder of this document to assure themselves that they have all the amendments or a current document.

F. General Development Plan or Plat

Any development plan or proposed plat shall be submitted to the City with utilities and pavement generally located within the boundary of the plan or plat. For plats the utilities will be located within dedicated easements and right-of-ways. The general development plan or plat shall show preliminary elevations for all sanitary sewers, streets, and storm drainage conveyance systems. In addition, the project owner for a plat shall submit a four corner lot grading plan indicating elevations at each corner for the subdivision that is being developed. The four corner lot grading plans will be placed on file with the City and will be reviewed during requests for building permits.

II. STREETS

All street improvements shall be designed and constructed to City Engineering Standards and Specifications, as outlined in this section. Standard typical section details for asphalt pavement are included as Figure II-1.

A. Pavement

1. Types

Standard pavement for City street projects shall normally be concrete. Asphalt pavement may be used when approved by the City Engineer. Sand, Gravel, or other surfacing materials shall not be used unless specifically approved by the governing body.

2. Minimum Thicknesses

Thicknesses for the various pavements will vary depending on the intended use. The table below shows minimum pavement depths to be used for City projects.

	Local Access/ Residential	Collector	Arterial	Industrial/ Commercial
Concrete Pavement	6”	6”	7”	8”
Asphalt Pavement	6”	6”	8”	8”

*Use 8” Subgrade as shown in Figure II-1A.

3. Width

In general, the width of city streets shall be determined by the platted right-of-way. Refer to City of Newton Subdivision Regulations (Section 24-406) for Minimum Design Standards.

4. Bituminous Base Under Curb & Gutter

On curb & gutter sections with asphalt pavement, the first lift of asphalt base course shall extend to a width of 2" behind each back of curb. The extra width of bituminous base shall be considered a separate bid item and shall be measured and paid for separately from other asphalt pavement items.

B. Subgrade Treatment

1. Types of Treatment

Allowable subgrade treatments are lime, fly-ash, or crushed rock base with Tensar geo-grid.

2. Limits of Treatment

Lime , fly-ash treated, or crushed rock subgrade shall be constructed to a depth as shown in Figures II-1 and II-1A and to a width of 12" beyond the back of each curb line, unless otherwise indicated by the plans or specifications.

3. Application Rate

Application rate of the treatment agent shall be as determined by an approved laboratory using standard testing methods. This rate shall be shown on the project construction plans; however, the rate may be adjusted during construction if approved in writing by the Engineer.

Determination of subgrade and pavement type should be determined following soils tests unless otherwise directed by City.

4. Compaction Requirements

Compaction of all subgrades, whether treated or not, shall be to 95% of maximum density as determined by ASTM D698, except as noted below for rock base. Rock Base is to be compacted and smoothed with a steel faced roller prior to placement of the pavement.

C. Curb and Gutter

1. Types

See Figure II.2 for the following standard types of curb and gutter to be used on City paving projects:

- Monolithic Combined Curb & Gutter (6 5/8")
- Monolithic Combined Curb & Gutter (3 5/8" Roll)
- Combined Curb & Gutter (6 5/8")
- Combined Curb and Gutter (3 5/8")
- Median Combined Curb and Gutter (6 5/8")

2. Construction Requirements

a. Joints

Contraction joints shall be placed in curb and gutter at intervals of 10 feet or less. The joints shall be sealed with an approved hot-poured joint sealing compound meeting ASTM D1190 which will adhere to the vertical portion of the joint through the curb face. Expansion joints shall be installed at the end of all curb returns and approximately every 250 feet on long runs.

b. Curb Through Driveway Approaches

Where combined curb & gutter crosses a driveway entrance, the curb portion shall be laid down to a height of 1-1/2" through the entrance.

D. Geometric Design Criteria

1. Alignment

a. Centerline

Streets shall be centered in the right-of-way unless special circumstances dictate otherwise. Deviations from centering the street in the right-of-way shall be made only by written approval from the Director of Public Works. Where a proposed street is an extension of an existing street, the centerline of the proposed street shall coincide with the centerline of the existing street as closely as is practicable.

2. Street Grades

Street grades shall be indicated on plans along the centerline, high-edge, and top of curb of the roadway, except in cases of non-standard or unusual geometric configurations. On curved roadways, the centerline grade shall be calculated such that the minimum grade requirement is met for curb and gutter along the longest side of the curve.

a. Minimum Grade

To provide proper longitudinal drainage, the minimum allowable street grade shall be 0.33%, except as noted below for valley gutters.

b. Minimum Grade Across Valley Gutters

The minimum desirable grade along the flowline of valley gutters shall be 0.66%, measured across the entire valley gutter including curb returns.

3. Cross Slope

Cross slopes for pavements shall be as indicated below except for localized variations where necessary to match an existing pavement.

Type of Pavement	Minimum Allowable	Maximum Allowable
Asphaltic Pavement	3/8" per foot	1/2" per foot
Concrete Pavement	1/4" per foot	1/2" per foot

4. Minimum/Maximum Fall Around Curb Returns

The table below shows the minimum and maximum allowable difference in elevations between the PC and PT of curb returns for 90° intersections. For intersections with a “delta” of other than 90°, the elevation difference shall be prorated based on the values shown.

Curb Return Radius	Minimum Allowable	Maximum Allowable
20'	0.25'	1.00'
25'	0.30'	1.25'
30'	0.35'	1.50'
35'	0.40'	1.50'
40'	0.45'	1.50'
45'	0.50'	1.50'
50'	0.55'	1.50'

5. Curb Return Radii

a. Both Streets Curb and Gutter

Curb return radii for street intersections shall follow the guidelines in the following table when both streets are constructed with curb & gutter.

Type of Roadway	Intersecting With	Minimum Curb Face Radius
Residential	Residential	20 feet
Residential	Collector or Arterial	30 feet
Commercial, Collector or Arterial	Commercial, Collector or Arterial	50 feet

b. Curb and Gutter Intersecting Road with Ditch Section

Intersection geometrics for intersecting a road without curb & gutter shall be as shown in Figure II.4. Radius requirements shall generally follow the requirements shown above.

6. Walk Grades

The finished elevation at the property lines (referred to as the “walk grade”) shall generally be such that the slope between the back of curb and the property line is at least 1/4" per foot, but not more than 4 horizontal to 1 vertical. Exceptions may be made where absolutely necessary to match an existing situation.

7. Cul-De-Sacs

Permanent cul-de-sacs shall have a face-of-curb radius of 35' for the main “bulb” and a radius of 20' for the throat returns (see Figure II.5). The bulb may be centered, or may be offset to the left or right as dictated by the right-of-way configuration.

Roll type curb and gutter, shall be used on cul-de-sacs, unless there is a specific need for other curb types

E. Sidewalks and Bicycle Paths

Sidewalks shall be constructed in conjunction with paving projects when required by the plat, subdivision regulations, or direction of the City Engineer. Sidewalks shall generally be located immediately adjacent to the right-of-way if possible; however, sidewalk location shall be adjusted where necessary to provide a smooth transition from an existing pedestrian walkway.

Bicycle paths shall be designed in accordance with the AASHTO "Guide for the Development of Bicycle Facilities."

1. Width and Thickness

As a minimum, sidewalks on City projects shall be constructed to the dimensions shown in Figure II.6. Minimum width shall be 5' for sidewalks and 10' for bicycle paths. Minimum pavement depth shall be 4". Sidewalks and Bicycle Paths shall be constructed of Portland Cement Concrete unless otherwise approved by the governing body. Greater width or thickness is acceptable where requested by the owner or required due to special circumstances of a particular site.

2. Wheelchair Ramps

Wheelchairs ramps shall be provided at all curbed street crossings and any other locations which would act as a barrier to persons in a wheelchair. See Figure II.6 for minimum requirements for standard wheelchair ramps.

3. Detectable Warning

Detectable Warning shall be truncated domes of approved rigid polymer or flexible polyurethane sheets or "stamped" into the wet concrete surface. The Detectable Warning shall contrast visually with adjoining surfaces as specified by ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) 4.29. All costs associated with the Truncated Domes Detectable Warning shall be considered subsidiary to the pavement surface.

Truncated Dome Specifications:

- Base diameter of dome – 0.9"
- Top diameter of dome – 0.45"
- Height of dome – 0.2"
- Center to center spacing of domes – 2.35"

F. Driveway and Alley Entrances

Driveway or alley entrances shall be constructed with City paving projects when the paving abuts an existing driveway or alley unless the Owner of the abutting property requests in writing that no entrance be constructed. The entrance or “approach” shall extend from the curb line of the street to the nearest property line.

1. Width

For the purposes of design, the width of proposed drive and alley approaches shall match the existing drive or alley. Except where approved by the City to match an existing condition, the minimum throat dimension shall be 12 feet for driveways or 20 feet for alleys, and the maximum throat width shall be 30 feet. Drive approaches shall only be constructed to serve a specific existing drive or alley, or location for which there is a valid building permit.

2. Return Types/Radii

Standard drive approaches shall be constructed as shown in Figure II.6. Return radii for standard entrances are shown below.

	Minimum Radius	Maximum Radius
Residential Drive	10'-6"	10'-6"
Commercial Drive	10'-6"	40'
Alley	20'	40'

3. Drive Request

The owner may request additional thickness or reinforcement at his cost. If no request or confirmation is obtained from the Owner, the drive approach shall be constructed to match the existing drive location and width.

G. Street Signing

In general, design of paving projects shall include all necessary signing, including regulatory, warning, and street name signs. However, installation of certain regulatory signs, such as STOP signs, may be subject to approval by the City based on an engineering study. (See Figure II-7 for Signing Details.)

1. MUTCD Requirements

All signs and other traffic control devices, and the installation and use thereof, shall conform to the requirements of the latest version of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), published by the Federal Highway Administration. All devices shall be reflectorized on the side facing traffic.

2. Minimum Sizes

The minimum allowable size for regulatory and warning signs shall be the size denoted as “Standard” in the publication Standard Highway Signs published by the Federal Highway Administration.

H. Partial List of Standard Bid Items

To the extent possible, standard bid items shall be used in designing and bidding projects. Additional bid items will occasionally be necessary due to the varying nature of projects. A partial list of common bid items and their units of measurement are listed here for information.

6" Reinforced Concrete Pavement	SY
Manipulation for Treated Subgrade	SY
Hydrated Lime	Ton
RCVG Pavement (7")	SY
Combined Curb & Gutter (Type)	LF
Sidewalk Concrete (4")	SF
Sidewalk Wheelchair Ramp	EA
Excavation	CY
Compacted Fill	CY
SWS Pipe RCP (diameter)	LF
Inlet, Curb 1A (L=6'-4", W=4'-4")	EA
Rip-Rap	SY
Flowable Fill	LF
Manhole, Std.	EA
Street Signage	LS
Site Clearing & Restoration	LS
Project Seeding	LS
Sediment Barriers	EA
Erosion Control Mat	SY
Construction Entrance	EA

I. Erosion Control

All projects shall incorporate the use of best management practices to reduce erosion on the project and eliminate discharges of pollutants from the project site. Erosion control measures shall conform to the City of Newton’s Erosion and

Sediment Control Manual. All applicable requirements for the NPDES storm water pollution prevention shall be met. This may include a pollution prevention plan be prepared and submitted to the Kansas Department of Health and Environment if the disturbed construction area exceeds the requirements.

III. DRAINAGE AND STORM SEWER POLICY FOR DESIGN CRITERIA AND DOCUMENTATION

GENERAL

Every urban area has four separate and distinct drainage systems: (1) is the major system which frequently consists of open channels and may include storage areas in the channels or in ponds; (2) is the initial system which usually consists of a closed conduit with area inlets and curb inlets; (3) is paved streets which are used to convey runoff from individual lots to the initial system; and (4) is proper individual lot grading to convey runoff from the lot to the paved street and/or area inlets. Obviously the primary function of streets is to convey traffic and drainage must be considered secondary in varying degrees to traffic needs.

The designer must address all 4 systems.

Two manuals have been selected for adoption and are to be used for design. They are titled (1) "Design of Urban Highway Drainage - The State of the Art" (Manual No. 1) prepared by Reitz and Jens, Inc., Consulting Engineers, under the sponsorship of the United States Department of Transportation, reprinted in April 1980; and (2) "Drainage of Highway Pavements" (Manual No. 2) prepared by Tye Engineering, Inc. under the sponsorship of the United States Department of Transportation, dated March, 1984.

These manuals are available from the National Technical Information Service, Springfield, Virginia 22101.

The following statements are to be added to Manual No. 1:

A. List of Symbols Comments and Modifications

Symbols used in drainage calculations and tabulations shall conform to the list of symbols shown on pages III, IV, V, VI, VII and VIII of the manual. Symbols used in calculations and tabulations which are not shown on this list shall be clearly identified in the calculations or tabulations. All drainage calculations shall be performed using English units of measurement.

B. Chapter 1 Comments and Modifications - "General Principles of Stormwater Design"

Narrative in Chapter 1 shall be considered as background information and not necessarily adopted as City policy. The City does not presently require treatment of storm water sewer discharges. Consultants are encouraged, however, to incorporate measures in all projects which will reduce pollution especially from soil erosion.

General drainage criteria in the City shall be as identified in the following tables for the initial storm:

TABLE I
INITIAL DESIGN STORM FREQUENCY

Land Use	Initial Design Storm Return Period
1. Local and Collector Streets	2 years
2. Arterial Streets	5 years

TABLE II
ALLOWABLE PAVEMENT ENCROACHMENT FOR INITIAL DESIGN STORM

Street Classification	Allowed Encroachment
1. Local	No curb overtopping. Flow may spread across crown.
2. Collector	One 8' lane width must be free of water.
3. Arterial	One 8' through lane width in each direction must be free of water.

An additional requirement to the initial system criteria is that the runoff from the 100-year frequency major storm for time of concentrations identical to the initial system design must be retained within public rights-of-way in all cases. This 100-year frequency major storm requirement must be evaluated for projects in existing developed areas and when identified as prohibitive because of estimated costs, the consultant shall provide criteria recommendations to the City for such projects which will provide a reasonable cost/benefit ratio for the project.

C. Chapter 2 Comments and Modifications - "Precipitation"

Precipitation intensity for the various durations and frequencies shall be as shown in the table attached to this document and identified as "Attachment A". When intensities are required for durations not shown in the table in the range between 2-hour and 24-hour durations, such intensities shall be computed as straight-line interpolations.

D. Chapter 3 Comments and Modifications - "Runoff"

Logic and documentation for the following items shall be provided in writing when final drainage computations are submitted to the City for approval.

1. Interception by vegetation is not a required consideration.

2. Infiltration loss on pervious surfaces shall be considered in those cases where such losses become significant. Infiltration loss for pervious surfaces for use with the S.C.S. dimensionless unit hydrograph method shall conform to the table attached to this document and identified as "Attachment B". Infiltration losses are included in the coefficients of runoff provided for use with the modified rational method.

3. Depression storage loss shall be considered in those cases where such losses become significant. Depression storage loss for pervious and impervious surfaces for use with the S.C.S. dimensionless unit hydrograph method shall conform to the table attached to this document and identified as "Attachment C". Depression storage losses are included in the coefficients of runoff provided for use with the modified rational method.

4. Reduction for gutter storage shall be taken into account where such storage is a significant factor. Use of this reduction will be by specific approval from the City on a case-by-case basis.

5. Reduction of peak flow rate due to conduit storage will not usually be a consideration. Use of this reduction may be a significant factor where large conduits are required. Use of this reduction will be by specific approval from the City on a case-by-case basis.

6. The rational method with required modifications shall be used to compute design runoff for areas of 320 acres or less tributary to the design point being considered. Design runoff from areas between 320 acres and 750 acres shall be computed using both the rational method and the S.C.S.

dimensionless unit hydrograph method and whichever method produces the larger peak runoff shall be used to design the system for the area tributary to the design point being considered.

7. Coefficients of runoff used in the rational method shall be as indicated in the table attached to this document and identified as "Attachment D" for the storm frequencies shown. Development of composite runoff coefficients for drainage areas and/or sub-areas shall be documented and correlated with such areas shown on a drainage area map.

8. The minimum inlet time or time of concentration used shall be 15 minutes. Inlet time or time of concentration shall be computed using the procedures identified as follows:

    a. Travel time in street gutter sections shall be determined using the procedures identified in Section 4.1.3. of Manual No. 2.

    b. Overland sheet flow time shall be determined using the kinematics wave theory as presented in Section 4.1.3. of Manual No. 2 except that when the product of the rainfall intensity and the length of flow as determined by this method is less than 500, the kinematic wave theory is not valid for this situation and in these cases, the overland flow time shall be determined as identified in (c.) below.

    c. Overland sheet flow time shall be computed using average flow velocities as determined from the attached table identified as "Attachment E" and the estimated flow lengths involved when the kinematic wave theory is determined to be invalid as identified in (b.) above. Velocities for slopes not shown in "Attachment E" shall be computed as a straight line interpolation and/or extrapolation within the ranges shown.

d. When the inlet time or time of concentration computed by the above procedures is less than 15 minutes the minimum of 15 minutes shall be used as the inlet time or time of concentration.

9. Composite infiltration rates for use with the S.C.S. dimensionless unit hydrograph method shall be based on procedures identified in Figure 3-9 of Section 3.3.5.2. of Manual No. 1. See Exhibit Nos. 1 and 2 showing general soil types in the area. (Soil type information is also available on the NRCS website at http://websoilsurvey.nrcs.usda.gov/app/websoilsurvey.aspx.)

10. Format, computation, and documentation required for the S.C.S. dimensionless unit hydrograph shall be as shown in the example provided in Manual No. 1 beginning with Section 3.3.5.9. Documentation to be included in submittal to City for approval shall include all computations in the order identified in the example, a tabulation of unit hydrograph coordinates, a plot of unit hydrograph, a tabulation of effective rainfall, a tabulation of storm hydrograph coordinates for the drainage area, a plot of the storm hydrograph for the drainage area, a map of the drainage area, and computations showing determination of the percentage of impervious surface. Locations of soil types involved shall be shown on the map of drainage area.

E. Chapter 4 Comments and Modifications - "Storage"

1. The Division of Water Resources of the Kansas State Board of Agriculture has adopted specific requirements governing design of dams for detention storage. Such requirements are contained in documents identified as Engineering Guide - 1 and Engineering Guide - 2. Requirements identified in the latest revision of these two documents shall be adhered to when designing facilities addressed by the documents.

Criteria, standards, and documentation identified in Chapter 4 of Manual No. 1 shall be adhered to in all cases where such criteria and standards do not conflict with the Division of Water Resources requirements contained in their engineering guides.

Documentation as indicated in the example problems in said Chapter 4 shall be submitted in writing when final drainage computations are submitted to the City for approval.

F. Chapter 5 Comments and Modifications - "Roadway Drainage"

1. Criteria standards and documentation identified in Manual No. 2 revises and expands upon such items as contained in Chapter 5 of Manual No. 1. Such criteria, standards, and documentation contained in Manual No. 2 shall supersede, revise, and expand like items as contained in Chapter 5 of Manual No. 1, otherwise criteria, standards, and documentation identified in Chapter 5 of Manual No. 1 shall be in effect.

2. Topics contained in Section 4.0., 4.1., 4.1.1., 4.1.2., 4.1.3., 4.1.4., and 4.2. of Manual No. 2 have been discussed previously in this policy statement; therefore, requirements for topics contained in these sections will be as previously identified.

3. Symbols used in computations related to highway or street pavement drainage shall conform to the list of symbols contained on pages 10, 11, and 12 of Manual No. 2. Such computations shall use English units of measure.

4. Curb opening inlets shall be approved and adopted City standards. Inlets proposed for construction on grades in excess of 3.0% shall include curb openings and gutter grate openings. Adopted standards for such curb opening inlets with gutter grates will be developed with projects as needed.

Gutter grates shall be of the curved vane type and incorporate features of existing standard curb opening inlets functioning on the sweeper principle. Inlets with grates must be located to minimize hazards to pedestrians and bicycles. Curved vane gutter grates shall be of the type indicated on page 42 of Manual No. 2.

5. Design and evaluation of City Standard Type I inlets proposed for construction on grade operating as a weir shall follow procedures identified in solution (2) of Example 11 on pages 63 and 64 of Manual No. 2. Design and evaluation of City Standard Type IA inlets proposed for construction on grade operating as a weir shall follow the same procedures as identified above for Type I inlets except the formula used for determining inlet efficiency in Chart 10 shall be revised to $(L + 1) - L_T$ to compensate for increased efficiency of inlets constructed in the set back location.

6. Design and evaluation of City Standard Type I inlets proposed for construction in sumps operating as a weir shall follow procedures identified by Chart 12 on page 77 of Manual No. 2. Design and evaluation of City Standard Type I inlets proposed for construction in sumps operating as an orifice shall follow procedures identified by Chart 14 on page 79 of Manual No. 2. Water depth (d_o) used with Chart 14 shall be based on the formula identified with drawing (b) of Figure 21 on page 75 of Manual No. 2 where d_i in such formula is the distance from the point shown in the drawing for where the angle O is measured to the water surface elevation. Design and evaluation of City Standard Type IA inlets proposed for construction in sumps operating as a weir shall follow procedures identified by Chart 12 on page 77 of Manual No. 2 except the formula used for determining P shall be revised to $P = L + 1 + 1.8\ W$ to compensate for increased efficiency of inlets constructed in the set back location. Design and evaluation of City Standard Type IA inlets proposed

for construction in sumps operating as an orifice shall follow procedures identified by Chart 12 on page 77 of Manual No. 2.

7. Design and evaluation of City Standard Type I and Type IA inlets proposed for construction on grade operating as orifices shall follow procedures identified for design and evaluation of such inlets in sumps operating as orifices.

8. Format, computation, and documentation required for design of storm sewer systems shall be as shown in the example provided in Manual No. 1 beginning with Section 5.11. Documentation to be included in submittal to City Engineer, or his authorized representative, for approval shall include all computations in the order identified in the example, a tabulation of design computations as identified in Table 5-7 in Manual No. 1, a plan of the system as identified in Figure 5-38(a) in Manual No. 1, a profile of the system as identified in Figure 5-38(b) in Manual No. 1, and tabulations of inlet design computations as indicated in Exhibit Nos. 4 and 5. The numbering of the various points for design consideration shall follow procedures indicated in Figure 5-39 in Manual No. 1.

G. Supplementary Design Information and Criteria

Section I: General Criteria for Open Channels Ditches and Related Appurtenances

1. Introduction

Open channels for use in the major drainage system have significant advantage in regard to cost, capacity, multiple use for recreational and aesthetic purposes and potential for detention storage. Disadvantages include right-of-way needs and maintenance costs. Careful planning and

design are needed to minimize the disadvantages and to increase the benefits.

2. Geometric Features

a. Where possible, a primary and an auxiliary channel shall be employed. Purpose of the primary channel is to carry the design flood discharge. Purpose of the auxiliary channel is to contain daily flow, minimize the portion of channel bottom which is normally wet and reduce bank erosion caused by the natural tendency of stream flow to meander from bank to bank.

b. Side slopes of the primary channel shall be no steeper than 4 horizontal to 1 vertical.

c. Minimum bottom width of either primary or auxiliary channel shall be 4 feet.

d. Side slopes of the auxiliary channel shall be 0.5 horizontal to 1 vertical.

e. Maximum width of the auxiliary channel shall be 10 feet.

f. Maximum depth of the auxiliary channel shall be 2 feet.

g. The auxiliary channel shall be centered in the primary channel wherever sufficient bottom width is available.

h. Where primary channel bottom width dictates that the auxiliary channel be set to one side of the primary channel, the near side overbank distance shall be a minimum of 2 feet; the far side

overbank distance shall be a minimum of 10 feet. The cross-slope on the overbank channel shall be 2%.

i. Where primary channel width will not accommodate an auxiliary channel the primary channel shall feature a "V" bottom using 2% cross slope.

j. Auxiliary or "V" geometric features may be disregarded in hydraulic computations, such as computations for water surface profiles.

3. Manning's Formula Constants for Roughness Factor (n).

a. For grass-lined channel - "n" = 0.030.

b. For rip-rap basket gabions, blanket gabions, rock fill - "n" = 0.045.

c. For portland cement concrete-lined channels - "n" = 0.013.

4. Channel Surface Protection

a. Surface protection is an integral part of the design of any channel. Provision for channel surface protection must be made in contract documents and responsibility for maintenance of the channel between the time when earthwork is completed and installation of surface protection should be clearly stated.

b. Where computed average velocity in section exceeds 6 feet per second, an energy dissipater, concrete lining, stone rip-rap, rip-rap bags, fabriform or gabions must be used to protect the channel surface from erosion. Surface protection for velocities 6 feet per

second or less shall be evaluated consistent with involved soil types.

c. Adjustments of channel gradients which are too steep for design conditions are best made by channel drops. Normally it is better to employ several low head drops instead of high drops. Sloped drops which fit channel topography are usually the most cost efficient. Sloped drops should have a rough surface and be no steeper than 2 to 1. All channel drops must be protected from erosion and being washed out.

5. Outfall Structures

a. Protection from erosion is required at all locations where a side drain or storm water sewer enters an open channel.

b. If the open channel is grass-lined, the side drain may employ a headwall, apron and wingwalls which are designed to fit the channel bank; or if the side drain is pipe, an end section may be used provided it is supported by a toewall at least 2' in depth using portland cement concrete, grouted stone rip-rap, rip-rap bags, fabriform or gabions.

c. For grass-lined channels, the erosion protection in the form of portland cement concrete slab, stone rip-rap, rip-rap bags, fabriform or gabions shall extend across the overbank channel, down into and across the auxiliary channel (if applicable) and at least 2 feet up the opposite primary channel bank.

d. Erosion protection shall extend upstream and downstream from the centerline of any side drain a distance of 1 1/2 pipe diameters each direction or a minimum of 3 feet each direction.

6. Water Surface Profiles

a. Channel design must be accompanied by water surface profiles in a format which presents not only the profile but the geometric and hydraulic elements which are employed in the profile computations.

b. Any method which employs the Manning equation in a step-type iterative backwater analysis is acceptable for channel reaches between structures. At structures, an accounting for area reduction and wetted perimeter increase, such as at piers, piles, walls, etc. must be entered into the water surface elevation computations. Suggested text for analysis of flow through structures is "Hydraulics of Bridge Waterways" published by the Bureau of Public Roads, source of which is available by contacting the City/County Engineer.

c. An excellent example of method for computing water surface profiles is the Hydrologic Engineering Center Computer Program designated "HEC-2, Water Surface Profiles".

d. Where access to the HEC-2 computer program is not practical, the procedures outlined in Hydrologic Engineering Center Report, Volume 6, Water Surface Profiles, is recommended.

e. Where the starting elevation of a water surface profile is not known it should be estimated by making a "slope-area" or a "critical depth" computation for the channel being studied.

7. Freeboard

a. To protect against the damaging effects of wave action, air bulking, splash and spray, man-made channels should provide a minimum of one foot of freeboard above the computed water surface profile for the design storm.

b. The minimum freeboard above flood of record or computed flood insurance base flood water surface profiles for natural rivers, creeks, sloughs, etc. shall be one foot.

c. Where buildings are immediately adjacent to a natural or man-made channel, the minimum building pad elevation for such structures is recommended to be one foot above the computed 100-year return flood water surface profile.

Section II: General Criteria for Detention Design and Standards

1. Introduction

Storm water detention is a method by which the peak discharge of a drainage system is reduced through temporary storage in a reservoir having a control structure as its outlet. The capacity of the outlet structure limits the outflow of the reservoir to a quantity less than the inflow. Detention is used to decrease the required capacity of new drainage systems and to relieve or prevent over-charging of existing drainage systems. The City desires that detention storage be sized to reduce and/or limit peak runoff for the 5-year and 100-year frequency storms from urbanized areas to the peak runoff for such storms as if the area was not urbanized.

The purpose of this section is to state the procedure and criteria to be used in the design and construction of detention systems.

As per current Kansas State Statutes, all dams capable of impounding thirty acre-feet or more at maximum stage require design approval and a permit from the Division of Water Resources of the Kansas State Board of Agriculture. Those structures of this size or larger must, therefore, meet both the design standards as herein set forth and the design standards and procedures of the Division of Water Resources.

2. Design Criteria

a. Site Exploration

Prior to design of a detention facility, the site shall be explored for surface and subsurface conditions, such as soil composition, water table, and subsurface geology.

b. Detention Storage Dam Design

All dams to be constructed within the urbanized area of the City shall be designed for Class C High Hazard in accordance with the Engineering Guide - 1 identified previously in comments on Chapter 4 of Manual No. 1.

c. Design Inflow

1. Peak Flow Rates

The methods of computing peak inflow are described in the previous discussion of Manual No. 1.

2. Soil Groups

For both urban and rural basins, the hydrologic soil groups will be found using the S.C.S. "Soil Survey of Harvey County".

d. Inflow Hydrograph

Inflow hydrographs for drainage areas ranging from 320 to 750 acres shall be developed using the S.C.S. dimensionless unit hydrograph procedures previously identified in Chapter 3 of Manual No. 1. Inflow hydrographs for drainage areas less than 320 acres shall be developed based on the 10-minute unit hydrograph equations shown in Table 4-5 of Manual No. 1 and the methodology as presented in the example beginning in Section 4.6.4.2. of Manual No. 1. The value for 0 shall be as identified in the table provided as "Attachment F".

e. Routing Methods

Routing of the inflow storm through the detention pond shall utilize the procedures identified in Chapter 4 of Manual No. 1. Complete dewatering of the detention portion of the facility shall take no more than 4 days.

f. Design and Construction of the Facility

Due to the great variance in soil types and subsurface conditions throughout this area, it is not practical to develop one specification for construction of embankments and ponds. There are, however, several general requirements that can be recommended at this time.

1. As previously mentioned prior to design the site shall be explored for surface and subsurface conditions. This work shall be done by a qualified testing laboratory under the direction of a licensed engineer.

2. The core of the embankment and the core trench shall be composed of impervious material.

3. Side slopes of the pond and embankment will be constructed in accordance with the standards stated in the section on open channel design.

4. Freeboard shall be designed following the same criteria as used in open channel design.

5. All areas above the static pool shall be seeded and mulched or sodded in compliance with the standards of the City.

6. During construction, there will be continual testing and inspection by a qualified testing laboratory under the direction of a licensed engineer with reports submitted to the City.

Section III: General Criteria for Storm Water Sewer Design and Standards

1. Introduction

Storm water sewer systems shall be designed as pressure systems for the initial storm when possible. Hydraulic grade line shall be a minimum of 6" below the street pavement gutter flow line at locations of inlets and manholes.

2. Design Criteria

a. Manning's coefficient of friction shall be as follows:

Reinforced concrete pipe (all sizes) n = 0.013; corrugated metal pipe 2 2/3" x 1/2" helical and circumferential corrugations (all sizes) n = 0.024; corrugated metal pipe 3" x 1" helical and circumferential corrugations (all sizes) n=0.027; corrugated metal pipe 6" x 2" helical and circumferential corrugations (all sizes) n = 0.033.

b. Storm sewers are required to be designed to provide for a minimum cleansing velocity of 2 feet per second at a depth of flow of 0.2 of the diameter or rise of the pipe. See Attachment G for minimum pipe grades necessary to maintain the required cleansing velocity.

Section IV: General Rules of Thumb for Design of Drainage and Storm Water Sewers

1. Whenever possible, set flow line elevations of pipes in structures such that the crowns of the pipes are at the same elevation.

2. Flow lines of pipes in structures may be set at elevations such that the 0.8 depth points of the pipes are at the same elevation.

3. When main line pipe sizes change at a structure, the drop in flow line through the structure should be equal to the difference in the sizes of the pipe.

4. Provide 0.2 foot drop in the main line pipes through structures when the structures includes one side lateral. Provide 0.3 foot drop in the main line pipes through structures when the structures includes two or more laterals.

5. Provide 0.1 foot drop in the main line pipes through structures whenever the horizontal alignment of the main line pipes changes by 45° or greater.

6. A clearance of 2 feet is required between the top of the outside diameter of the pipe and the bottom of the street pavements when pipes are installed under or in close proximity to such pavement. A clearance of less than 2 feet will require specific approval by the City.

7. Manholes used on storm sewers normally will be City standard shallow Type A, shallow Type B, standard Type A, standard Type B, and standard reinforced concrete. Standard reinforced concrete manholes are normally used with pipe sizes 42" or larger. All openings into structures which are to be utilized to facilitate maintenance operations shall be centered on pipes entering and/or exiting such structures when possible.

8. Inlet, manhole, and headwall structures must always be evaluated to ensure that the structures have sufficient size to accommodate the various inflow and outflow pipes based on the alignment shown on the plan.

9. Drainage plans which require construction of erosion protection will be required to include detail drawings for the placement of such erosion protection for each specific location. Such details must show required elevations and horizontal dimensions.

10. All projects which require construction of channels and/or ponds shall include provisions for establishing grass cover as necessary to minimize erosion. Such projects shall also include provisions for mulching of slopes which are more susceptible to erosion. Types of grass cover specified shall be compatible with the types of soil involved. Projects which have

soil types that will not support development of good grass cover will require placement of suitable topsoil.

11. The City prefers inlet-manhole combination structures whenever possible. The City also prefers to construct manholes outside the limits of street pavement whenever possible. When necessary to construct manholes in street pavement, such manholes shall be Type B.

12. State and federal government agencies permit or approval requirements as related to certain types of drainage improvements must be adhered to as follows:

    a. Construction plan approval is required from the Tulsa Branch of the Corps of Engineers whenever a project requires crossing a Corps constructed levee or discharge into a Corps constructed channel.

    b. A Section 404 permit may be required for projects or activities that impact the "Waters of the United States". Information regarding permit requirements and (ENG) Form 4345, Application for a Department of the Army Permit may be obtained from one of the Corps of Engineers local district offices. The designer shall be responsible for obtaining a 404 Permit or a Corps of Engineers determination that a permit is not required.

    c. A permit is required from the Division of Water Resources of the Kansas State Board of Agriculture when projects require excavation or construction of fill in a floodplain. The application of this permit requirement to projects which require construction in floodplains will be determined on an individual project basis on identification of the type and extent of the work involved.

d. A permit is required from the Division of Water Resources of the Kansas State Board of Agriculture for those projects which include construction of a dam which would impound more than 30 acre-feet of water at the elevation of the top of the dam.

e. Contractors are required to obtain a permit from the Division of Water Resources of the Kansas State Board of Agriculture when it is necessary to dewater with wells and well points to facilitate construction.

f. Any construction activities affecting one acre or more which discharge stormwater will require a National Pollutant Discharge Elimination System Permit. The designer shall complete and submit a Notice of Intent (NOI) form and related documents to the Kansas Department of Health and Environment for review and approval. The permit application shall include a stormwater pollution prevention plan (SWP2 plan) which incorporates the use of "Best Management Practices" (BMPs) in regards to stormwater management and erosion control. The NOI form and instructions are available through the Kansas Department of Health and Environment. All construction projects shall include the use of BMPs for storm water management and erosion control regardless of whether a permit is required.

13. Occasionally exceptions to the above-stated rules of thumb may arise. Such exceptions will be evaluated and approved on an individual case basis.

April 15, 1986

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

RAINFALL INTENSITY TABLE

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour

(t_c) DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	i = 4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
44	1.75	2.11	2.61	3.05	3.57	4.03	4.43
45	1.73	2.08	2.57	3.01	3.52	3.98	4.38

DURATION IN MINUTES	1-YR	RETURN PERIODS OF 5-YR	10-YR	25-YR	50-YR	100-YR
46			2.97	3.48	3.93	
47			2.93	3.44	3.88	
48			2.90	3.39	3.84	
49			2.86	3.35	3.79	
50			2.83	3.32	3.75	
51			2.79	3.28	3.71	
52			2.76	3.24	3.67	
53			2.73	3.20	3.63	
54			2.70	3.17	3.59	
55			2.67	3.14	3.55	
56			2.64	3.10	3.51	
57			2.61	3.07	3.48	
58			2.59	3.04	3.44	
59			2.56	3.01	3.41	
60			2.53	2.98	3.37	
61			2.51	2.95	3.34	
62			2.48	2.92	3.31	
63			2.46	2.89	3.28	
64			2.44	2.86	3.25	
65			2.41	2.84	3.22	
66			2.39	2.81	3.19	
67			2.37	2.79	3.16	
68			2.35	2.76	3.13	
69			2.33	2.74	3.10	
70			2.31	2.71	3.08	
71			2.28	2.69	3.05	
72			2.26	2.67	3.02	
73			2.25	2.64	3.00	
74			2.23	2.63	2.98	
75			2.21	2.61	2.95	
76			2.19	2.58	2.93	
77			2.17	2.55	2.90	
78			2.15	2.53	2.88	
79			2.14	2.50	2.86	
80			2.12	2.48	2.84	
81			2.10	2.46	2.82	
82			2.08	2.43	2.79	
83			2.06	2.41	2.76	
84			2.04	2.39	2.74	
85			2.02	2.37	2.71	
86			2.00	2.34	2.69	
87			1.99	2.32	2.66	
88			1.97	2.30	2.64	
89			1.95	2.28	2.62	
90			1.93	2.26	2.59	

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30

DURATION IN HOURS	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
2	0.81	0.99	1.33	1.55	1.81	2.07	2.30
3	0.59	0.72	0.97	1.13	1.32	1.51	1.68
4	0.47	0.58	0.78	0.91	1.06	1.21	1.35
5	0.40	0.49	0.66	0.77	0.89	1.02	1.14
6	0.35	0.42	0.57	0.67	0.78	0.89	0.99
8	0.28	0.34	0.46	0.53	0.62	0.71	0.79
10	0.23	0.29	0.39	0.45	0.52	0.60	0.67
12	0.20	0.25	0.33	0.39	0.45	0.52	0.58
18	0.15	0.18	0.24	0.28	0.33	0.38	0.42
24	0.12	0.15	0.20	0.23	0.27	0.31	0.34

ATTACHMENT B

DRAINAGE CRITERIA MANUAL

INCREMENTAL INFILTRATION VALUES IN INCHES

Time Minutes**	SCS Hydrologic Soil Group			
	A	B	C	D
5	.33	.26	.19	.12
10	.25	.17	.09	.04
15	.18	.11	.05	.02
20	.13	.07	.03	.02
25	.10	.05	.03	.02
30	.08	.05	.03	.02
35	.08	.05	.03	.02
40	.08	.05	.03	.02
45	.08	.05	.03	.02
50	.08	.05	.03	.02
55	.08	.05	.03	.02
60	.08	.05	.03	.02
65	.08	.05	.03	.02
70	.08	.05	.03	.02
75	.08	.05	.03	.02
80	.08	.05	.03	.02
85	.08	.05	.03	.02
90	.08	.05	.03	.02
95	.08	.05	.03	.02
100	.08	.05	.03	.02
105	.08	.05	.03	.02
110	.08	.05	.03	.02
115	.08	.05	.03	.02
120	.08	.05	.03	.02

**Time at end of the time increment

NOTE: Values for 125 minutes and additional 5 minute increments shall be the same as those shown for 120 minutes.

ATTACHMENT C

DEPRESSION STORAGE LOSSES

Surface Type:	Total Loss (inches):
Impervious:	
Paved Areas	0.1
Flat Roofs	0.1
Sloped Roofs	0.05
Pervious:	
Lawns & Grass	0.3
Wooded Areas & Open Fields	0.4

(3 pages)

ATTACHMENT D

DRAINAGE CRITERIA

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or rface Characteristics	Percent Impervious	Frequency 2	5	10	100
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
5. Schools:	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
Undeveloped Urban Areas:					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
Soil Group A					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
Soil Group B					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
Soil Group C					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Soil Group D					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.

ATTACHMENT E

DRAINAGE CRITERIA

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.85	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00

ATTACHMENT F

DETERMINATION OF DIMENSIONLESS WATERSHED CONVEYANCE FACTOR (Ø)

$$\emptyset = \emptyset_1 + \emptyset_2$$

$\emptyset_1$	Classification
0.6	Extensive channel improvement and storm sewer system, closed conduit channel system
0.7	Moderate channel improvement and storm sewer system.
0.8	Some channel improvement and storm sewers, mainly cleaning and enlargement of existing channel.
0.9	Little channel improvement and storm sewers.
1.0	Natural channel conditions.

$\emptyset_2$	Classification
0.0	No channel vegetation.
0.1	Light channel vegetation.
0.2	Moderate channel vegetation.
0.3	Heavy channel vegetation.

ATTACHMENT G

MINIMUM PIPE SLOPES
TO MAINTAIN VELOCITY OF 2 FT/SEC AT DEPTH OF
0.2 × DIAMETER OF PIPE

REINFORCED CONCRETE PIPE (MANNING'S "N" = 0.013)

Pipe Diameter (in.)	Minimum Slope (%)	Pipe Diameter (in.)	Minimum Slope (%)
12	0.51	42	0.10
15	0.38	48	0.08
18	0.30	54	0.07
21	0.24	60	0.06
24	0.20	66	0.05
27	0.17	72	0.05
30	0.15	84	0.04
36	0.12	96	0.03

EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent lopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

SOIL SURVEY OF HARVEY COUNTY, KANSAS

Exhibit 2 (Newton Area - North)

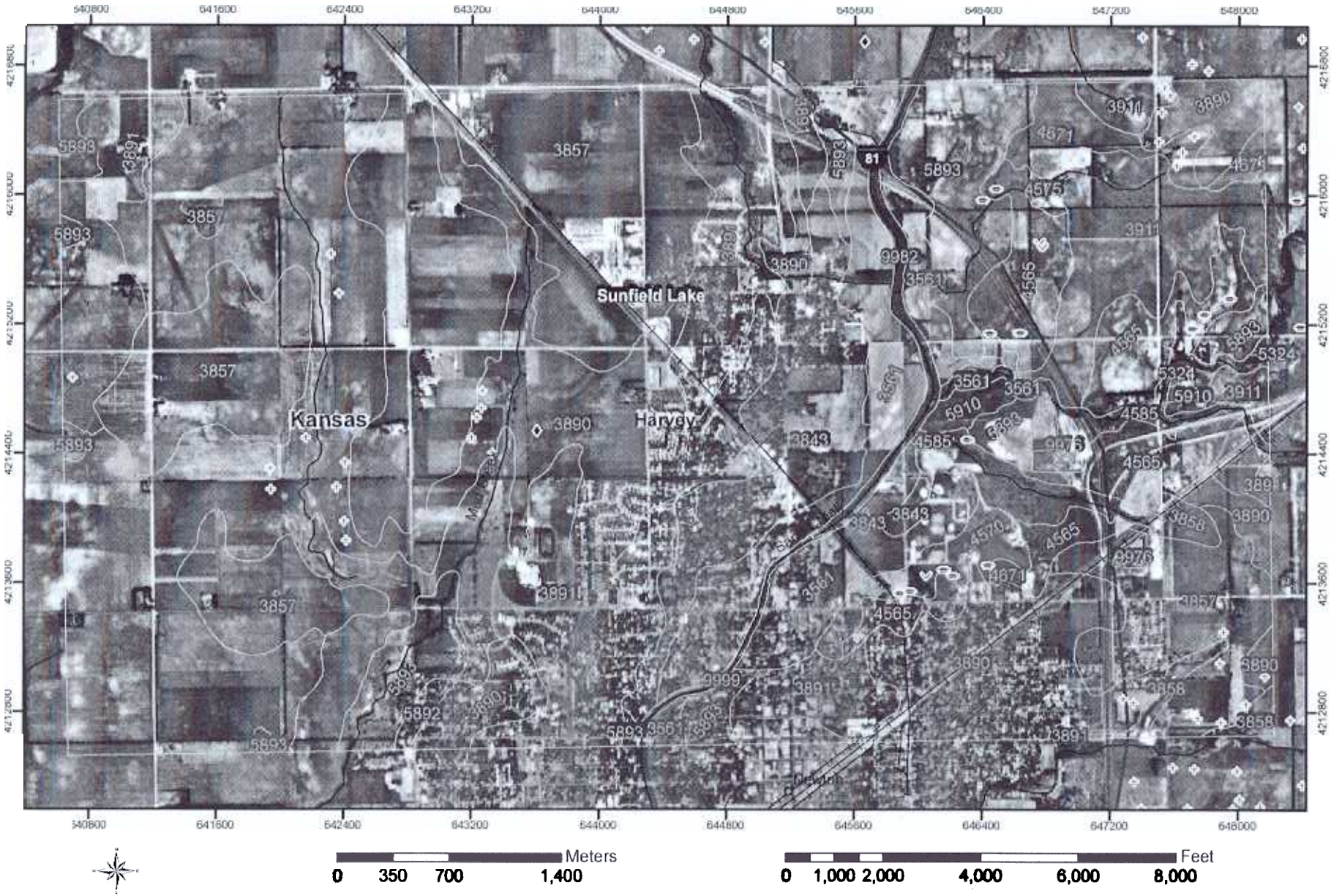


Exhibit 2 (Newton Area - North)

MAP LEGEND

- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 14

Soil Survey Area: Harvey County, Kansas
Spatial Version of Data: 2
Soil Map Compilation Scale: 1:24000

Map comprised of aerial images photographed on these dates:
9/26/1991; 10/1/1991

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend Summary

Harvey County, Kansas

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3561	Hobbs silt loam, occasionally flooded	509.5	6.7
3843	Geary silt loam, 1 to 3 percent slopes	346.1	4.6
3857	Goessel silty clay, 0 to 1 percent slopes	1,570.1	20.7
3858	Goessel silty clay, 1 to 3 percent slopes	60.3	0.8
3890	Ladysmith silty clay loam, 0 to 1 percent slopes	2,262.8	29.8
3891	Ladysmith silty clay loam, 1 to 3 percent slopes	1,091.8	14.4
3911	Rosehill silty clay, 1 to 3 percent slopes	332.1	4.4
4565	Clime silty clay, 1 to 3 percent slopes	431.1	5.7
4570	Clime silty clay, 3 to 7 percent slopes	157.7	2.1
4575	Clime silty clay, 3 to 7 percent slopes, eroded	15.8	0.2
4585	Clime-Hobbs complex, 0 to 20 percent slopes	75.8	1.0
4671	Irwin silty clay loam, 1 to 3 percent slopes	102.6	1.4
5324	Kaski loam, occasionally flooded	6.4	0.1
5892	Farnum loam, 0 to 1 percent slopes	15.5	0.2
5893	Farnum loam, 1 to 3 percent slopes	477.9	6.3
5910	Naron fine sandy loam, 1 to 3 percent slopes	37.4	0.5
9976	Borrow pits	25.7	0.3
9982	Fluvents, frequently flooded	57.0	0.8
9999	Water	18.5	0.2

SOIL SURVEY OF HARVEY COUNTY, KANSAS

Exhibit 2 (Newton Area - South)

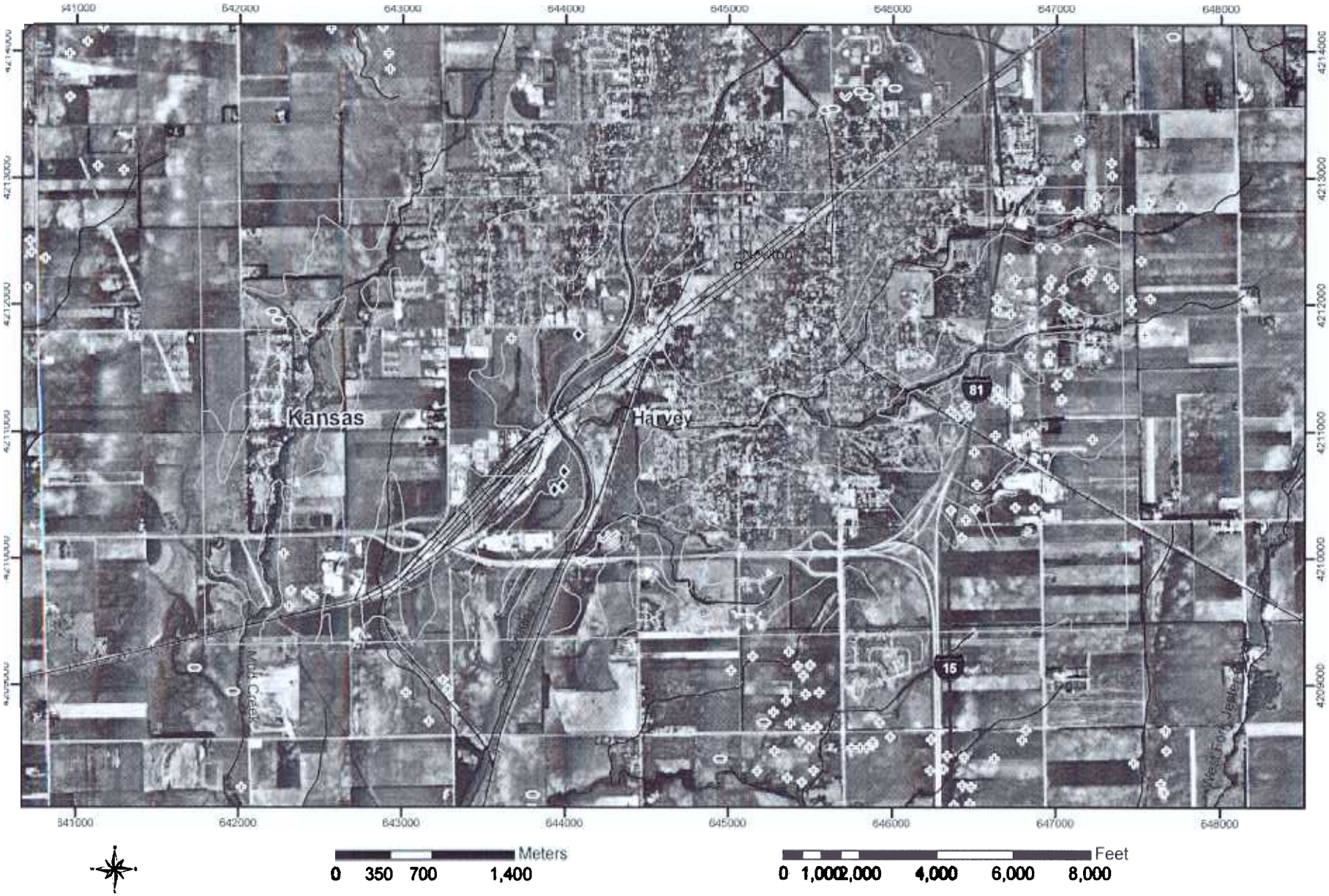


Exhibit 2 (Newton Area - South)

MAP LEGEND

- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 14

Soil Survey Area: Harvey County, Kansas
Spatial Version of Data: 2
Soil Map Compilation Scale: 1:24000

Map comprised of aerial images photographed on these dates:
9/26/1991; 10/1/1991

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend Summary

Harvey County, Kansas

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3561	Hobbs silt loam, occasionally flooded	563.4	8.9
3843	Geary silt loam, 1 to 3 percent slopes	312.1	4.9
3857	Goessel silty clay, 0 to 1 percent slopes	349.9	5.5
3858	Goessel silty clay, 1 to 3 percent slopes	90.6	1.4
3890	Ladysmith silty clay loam, 0 to 1 percent slopes	2,633.1	41.5
3891	Ladysmith silty clay loam, 1 to 3 percent slopes	1,543.8	24.3
3921	Smolan silty clay loam, 1 to 3 percent slopes	0.1	0.0
4565	Clime silty clay, 1 to 3 percent slopes	86.6	1.4
4570	Clime silty clay, 3 to 7 percent slopes	14.5	0.2
4585	Clime-Hobbs complex, 0 to 20 percent slopes	41.4	0.7
4673	Irwin silty clay loam, 3 to 7 percent slopes	28.3	0.4
5892	Farnum loam, 0 to 1 percent slopes	10.4	0.2
5893	Farnum loam, 1 to 3 percent slopes	589.5	9.3
9976	Borrow pits	12.0	0.2
9982	Fluvents, frequently flooded	51.8	0.8
9999	Water	20.0	0.3

EXHIBIT NO. 3

SUMP INLETS DESIGN DATA TABULATION

Project Title _____

Project Number _____ **Gutter Depression at Inlets (Standard = 2")** _____

Design Storm Frequency _____ **Width of Gutter Depression at Inlets (Standard = 2'0")**

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration in Minutes	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Flow Q (cfs)	Carry Over Flow From Other Inlets Qb (cfs)	Inlet Capacit Require Qi (cfs

Inlet Length Required in Feet	Inlet Length Provided in Feet	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification

NOTE: Inlet capacity requred (Qi) must equal the sum of inlet drainage area flow (Q) and carry over flow from other inlets (Qb) for ponding depths and/or pavement spreads allowed by criteria.

EXHIBI. NO. 4

ON GRADE INLETS DESIGN DATA TABULATION

Project Title _____

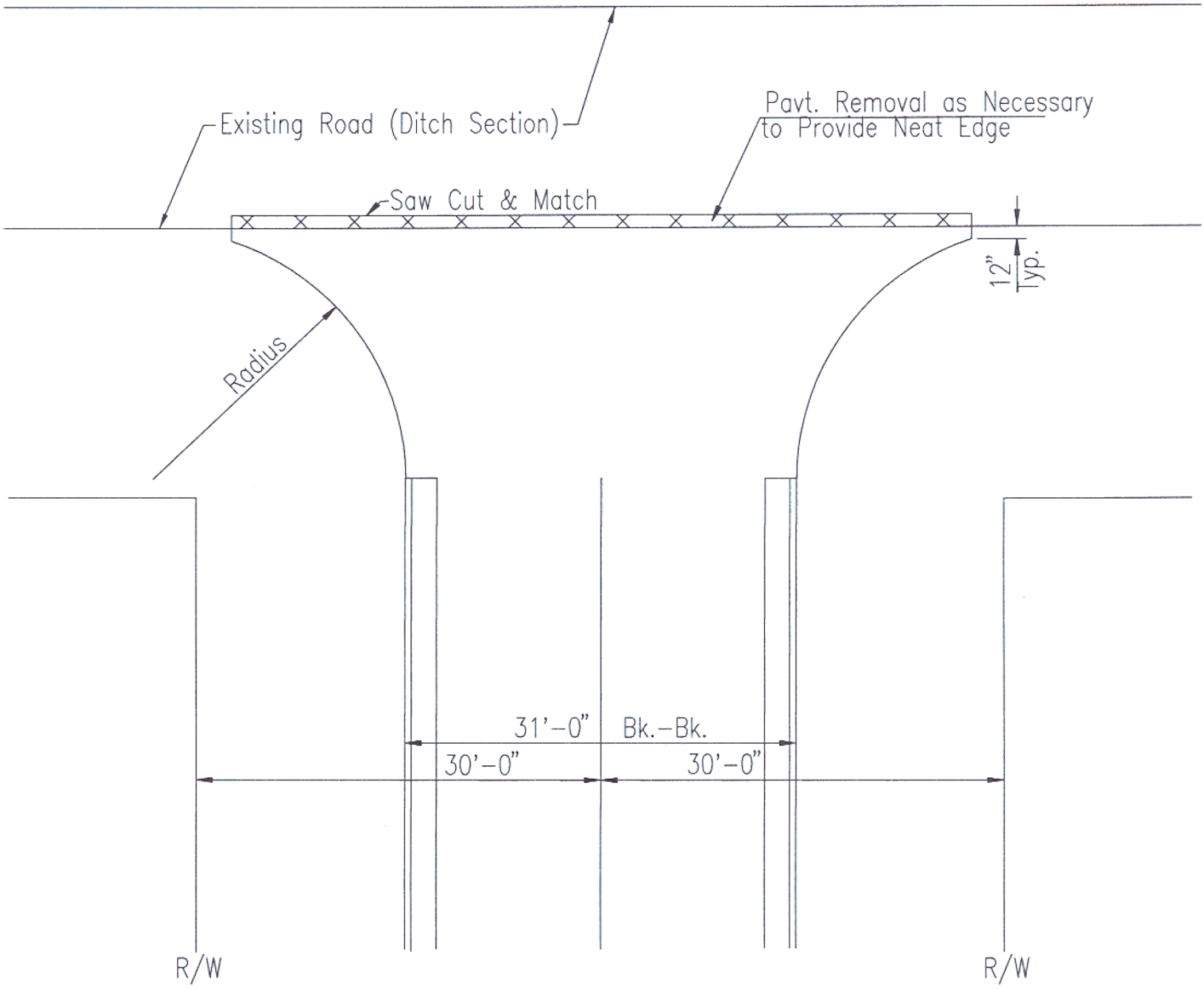
Project Number _____ **Gutter Depression at Inlets (Standard = 2")** _____

Design Storm Frequency _____ **Width of Gutter Depression of Inlets (Standard = 2'0")** _____

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration in Minutes	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Flow Q (cfs)	Carry Over Flow From Upstream Inlets Qb (cfs)	Total Flow to Inlet Qt (cfs)	Inlet Intercept Flow Qi (cfs)	Bypass Flow to Downstream Inlet Qb (cfs)

Inlet Length Required in Feet	Inlet Length Provided in Feet	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Longitudinal Gutter Slope in Ft./Ft.	Street Classification

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.



CURB & GUTTER ROADWAY
INTERSECTION ROAD WITH DITCH SECTION

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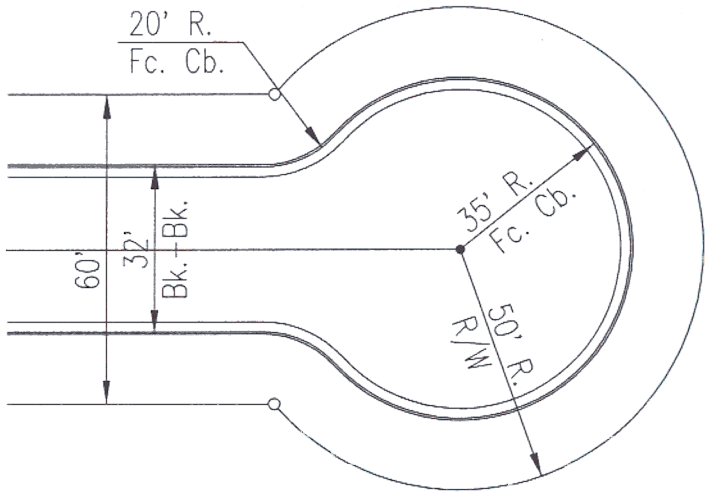
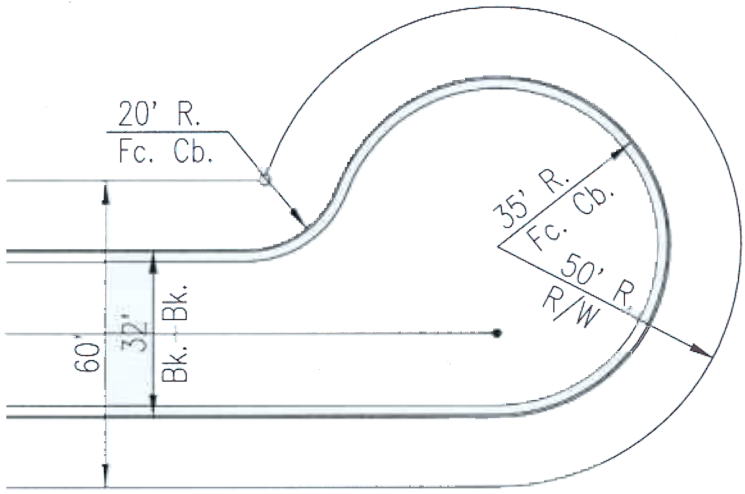
FIGURE II-4



CENTERED



OFF CENTER

STANDARD CUL-DE-SAC LAYOUTS

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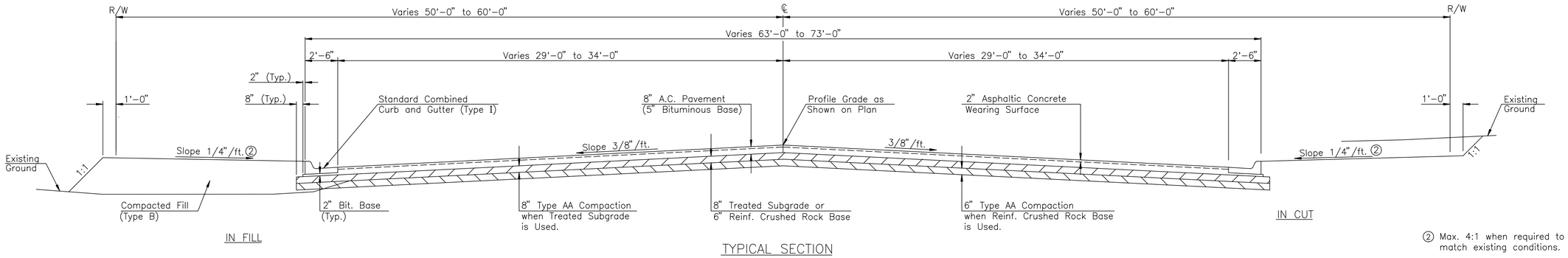
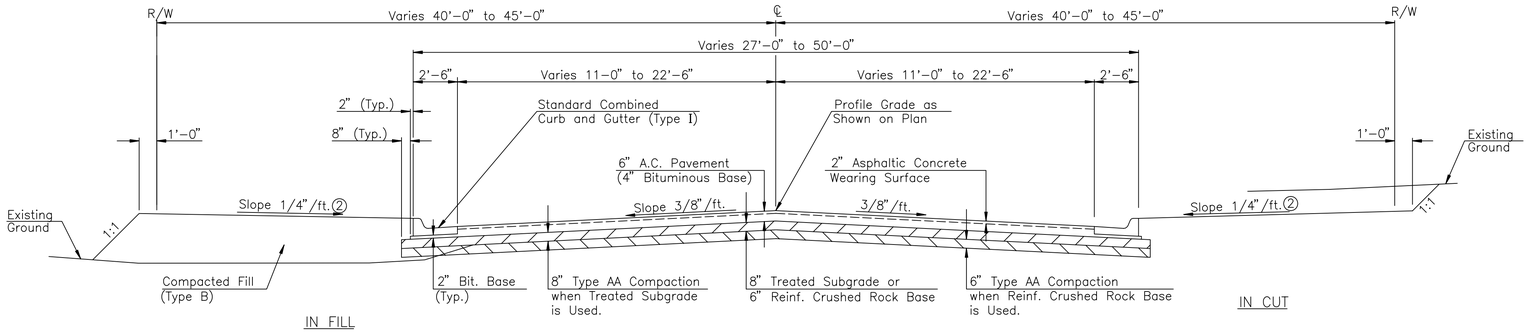


② Max. 4:1 when required to match existing conditions.

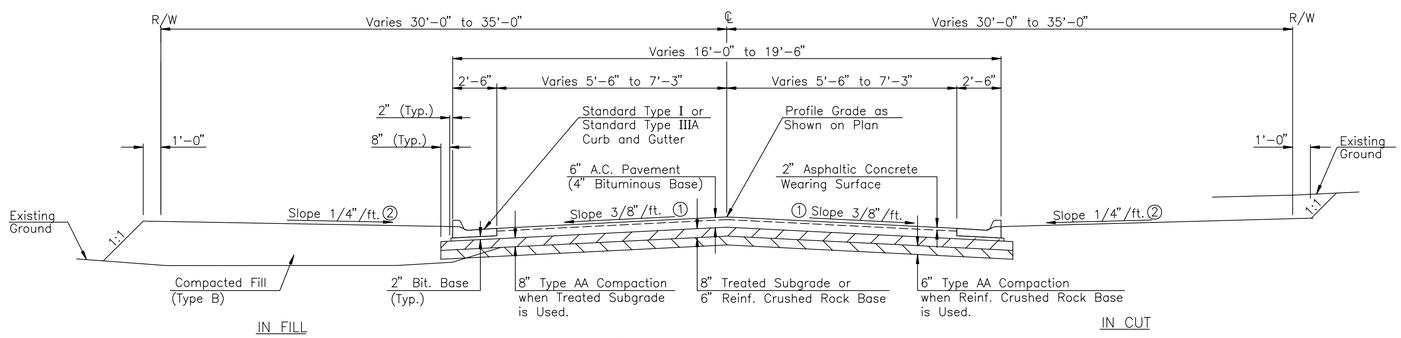
TYPICAL SECTION

Arterial Street
Industrial/Commerical Street



TYPICAL SECTION

Collector Street



① Unless shown otherwise on the Plans.

TYPICAL SECTION

Local Street

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

TYPICAL SECTIONS
ASPHALT PAVEMENT

Designed by	---	Job No.	FIGURE II–1
Drawn by	---	Date December 2006	

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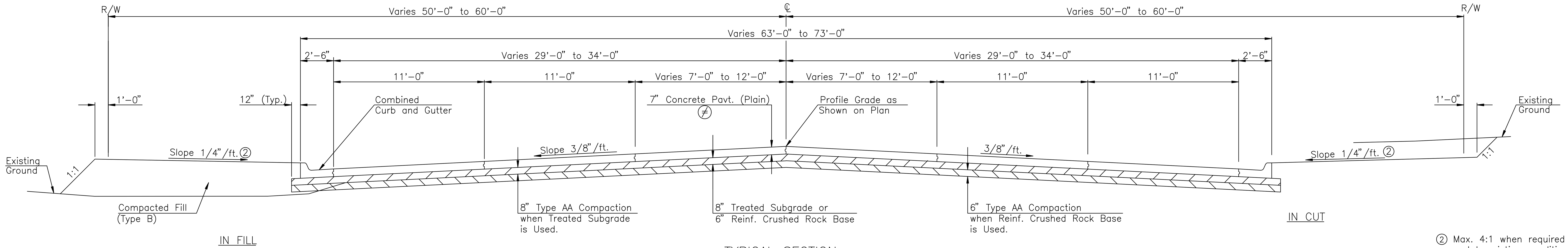
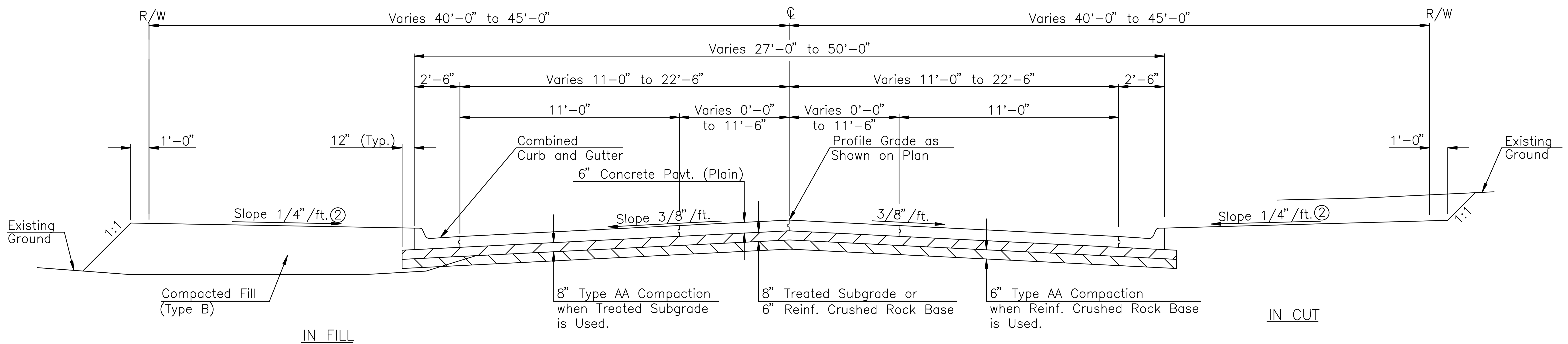


② Max. 4:1 when required to match existing conditions.

TYPICAL SECTION

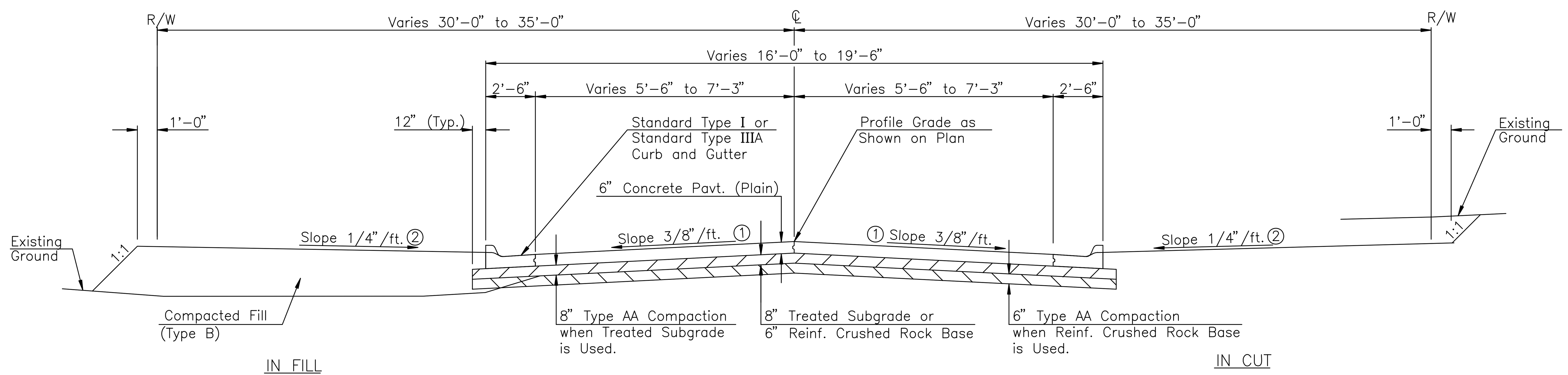
Arterial Street

(≠) 8" for Industrial/Commerical Street



TYPICAL SECTION

Collector Street



① Unless shown otherwise on the Plans.

TYPICAL SECTION

Local Street

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Q:\1999\99129\Newton Standards\Paving\II-01A

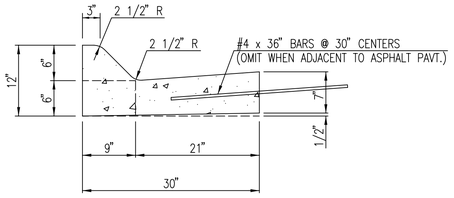
No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

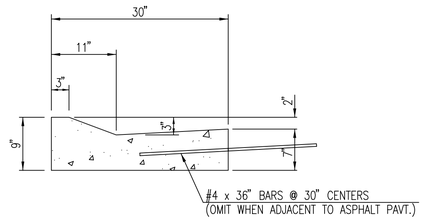
TYPICAL SECTIONS CONCRETE PAVEMENT

Designed by ---
Drawn by ---
Job No.
Date December 2006

FIGURE II-1A



STANDARD CURB & GUTTER TYPE I



STANDARD CURB & GUTTER TYPE IIIA

When adjacent to bituminous pavement, contraction joints shall be constructed in curb & gutter by sawing at right angles to the curb line at no more than 8 ft. Intervals. The saw cuts shall be 1 1/4" in depth (min.) and not more than 3/8" in width. Sealing of curb & gutter joints is not required. When adjacent to concrete pavement, contraction joint locations shall match pavement joints.

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

COMBINED CURB & GUTTER DETAILS

Designed by ---	Job No.	FIGURE II-2
Drawn by ---	Date December 2006	

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Plotted 03-19-2007 11:47:06 AM by KMD
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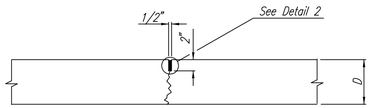
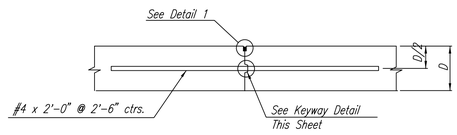
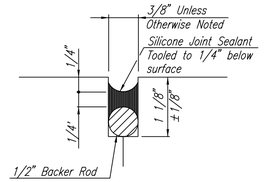


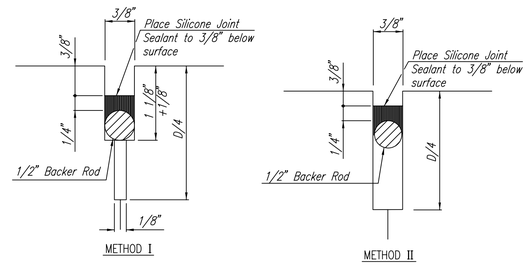
CONTRACTION JOINT (C.J.)
UNREINFORCED PAVEMENT



LONGITUDINAL CONSTRUCTION JOINT (L.J.)
UNREINFORCED PAVEMENT

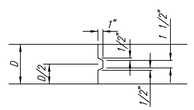


DETAIL 1



DETAIL 2

JOINT SEAL DETAILS



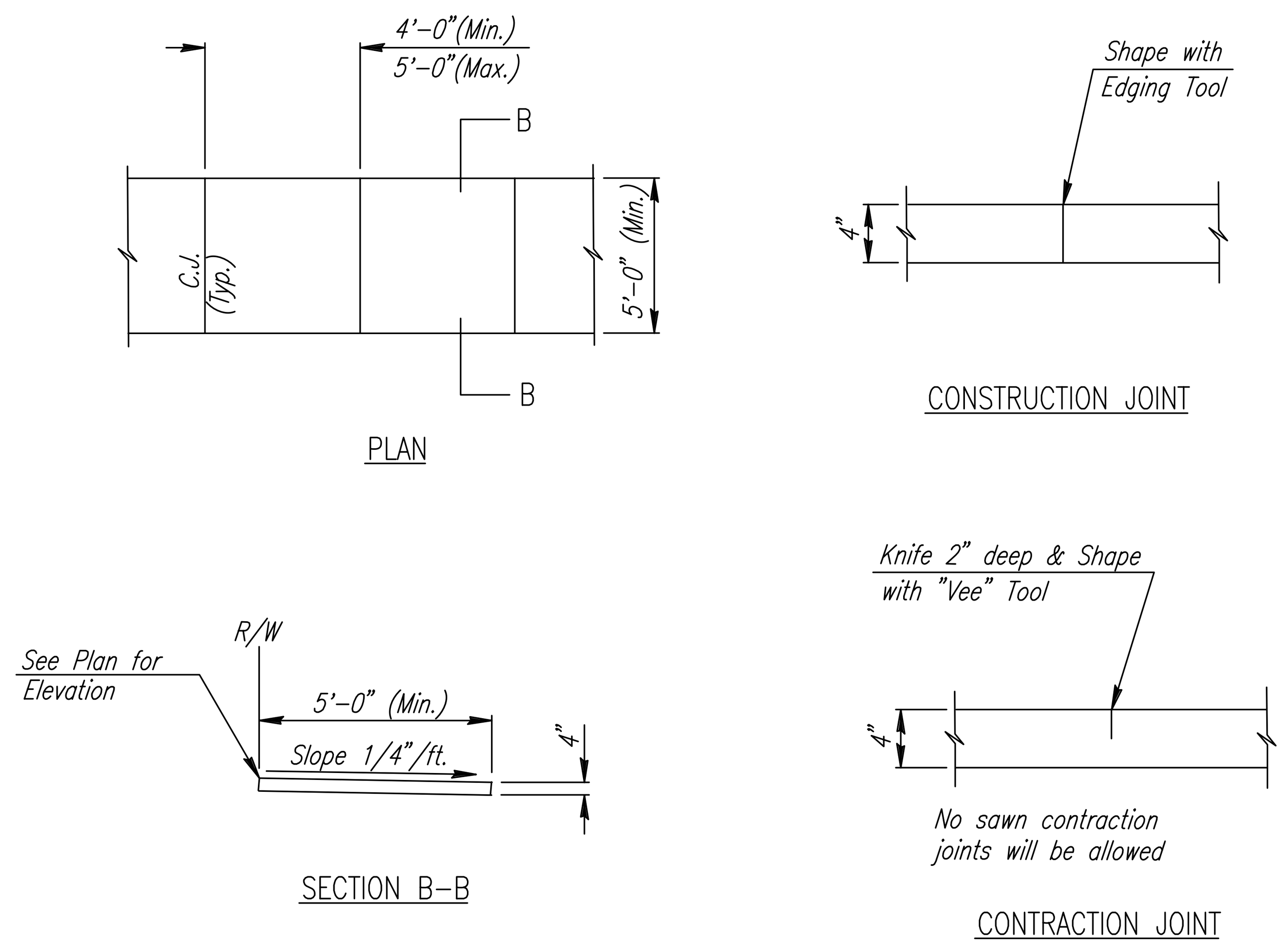
KEYWAY DETAIL

No.	Revision	By	Date

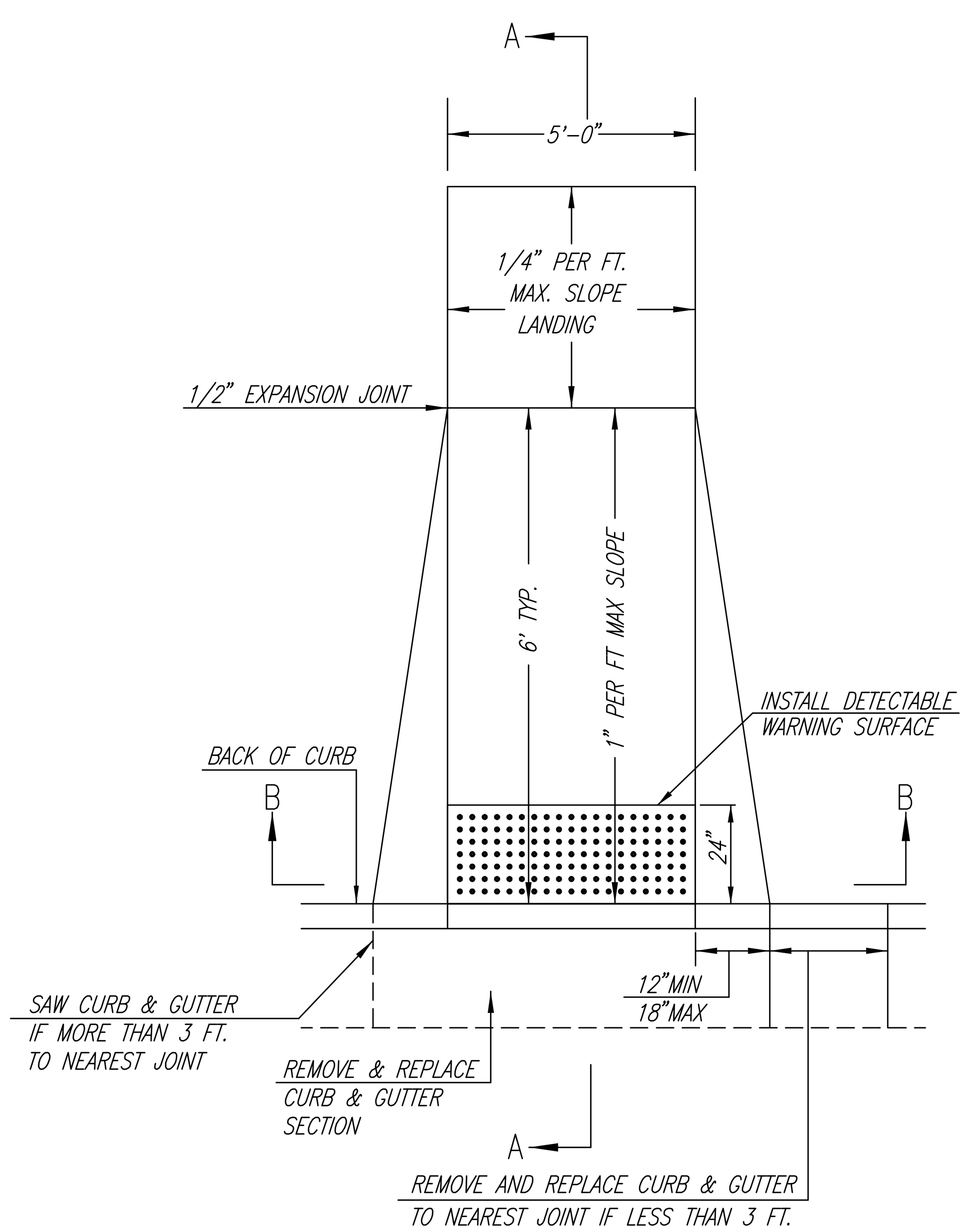
CITY OF NEWTON
HARVEY COUNTY, KANSAS

CONCRETE PAVEMENT DETAILS

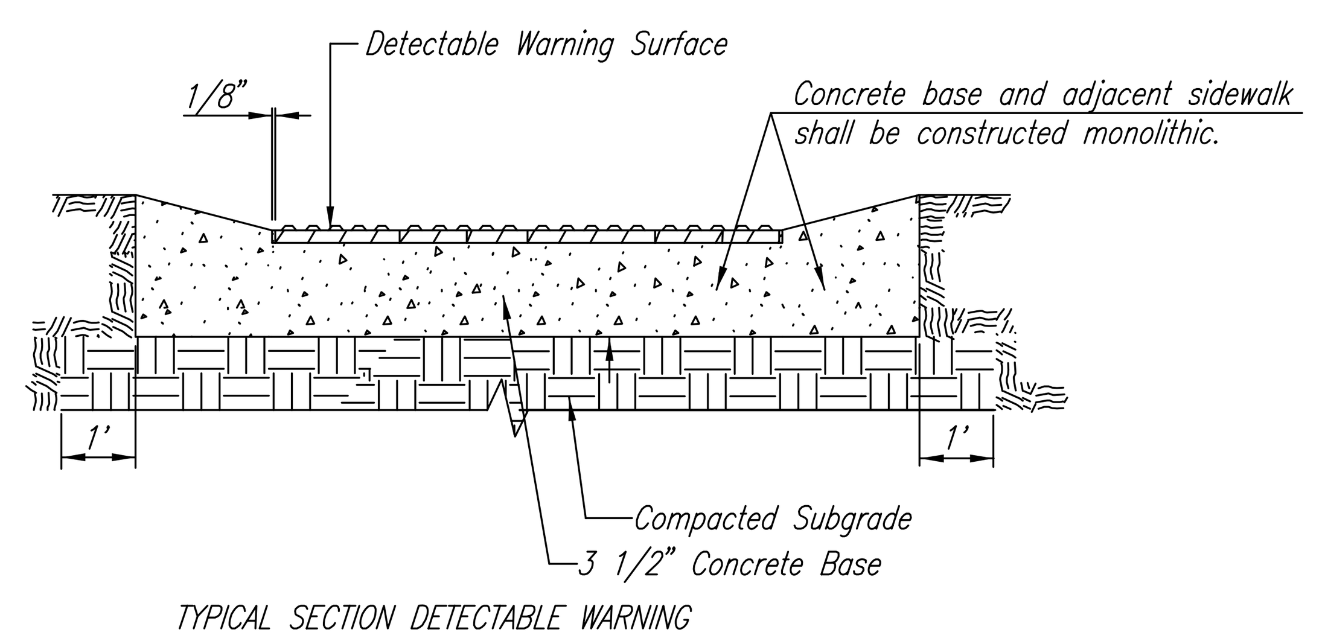
Designed by ---	Job No.	FIGURE II–3
Drawn by ---	Date December 2006	



SIDEWALK DETAILS



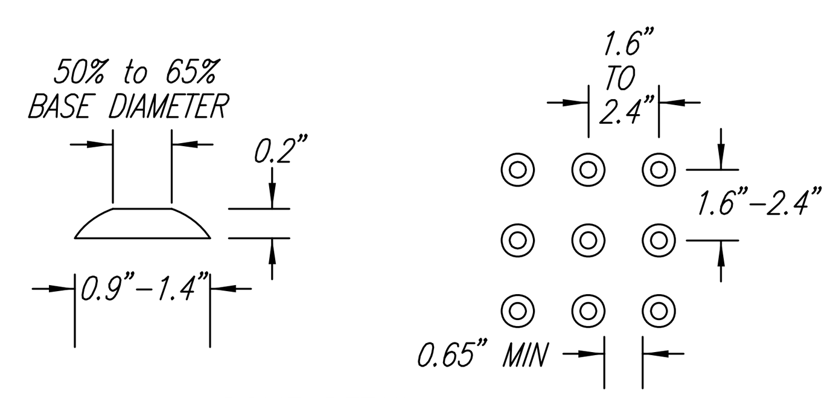
(TYPE A)
STANDARD WHEELCHAIR RAMP
WITH DETECTABLE WARNING
CONSTRUCTION DETAIL FOR STREETS
WITH COMBINED CURB & GUTTER



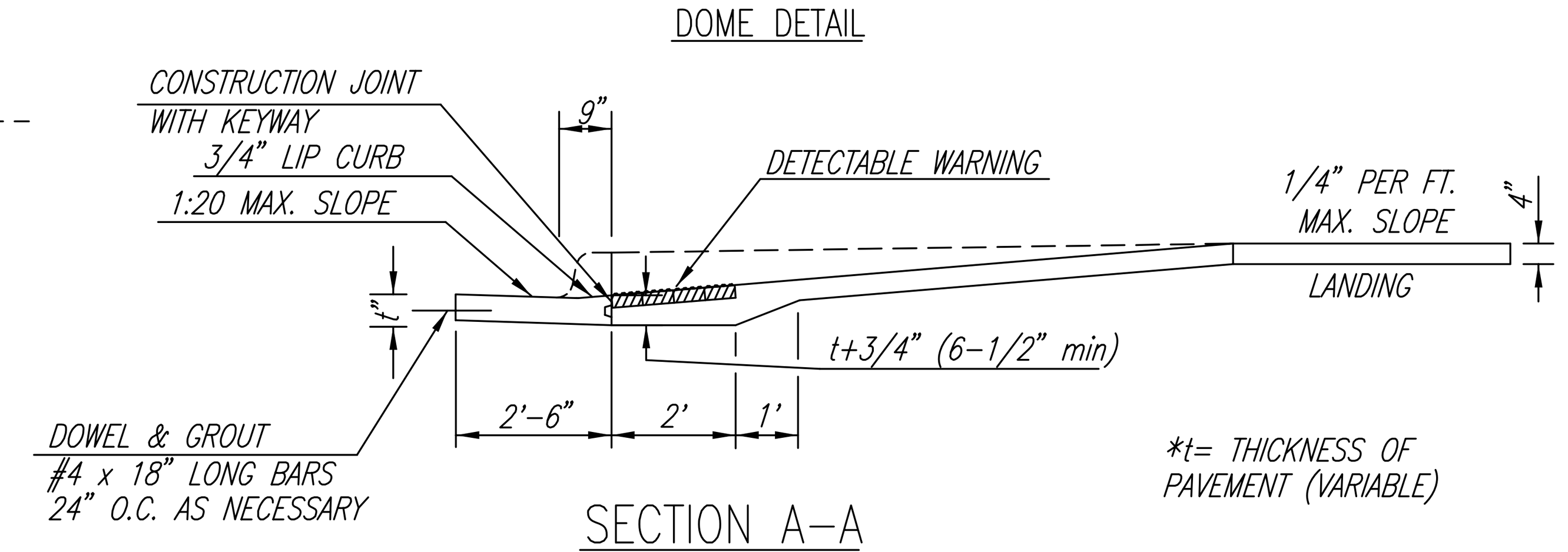
NOTE: RAMPS TO COMPLY WITH LATEST ADAAG GUIDELINES.

THE DETECTABLE WARNING SURFACE SHALL BE MASCO "CAST-IN-TACT" PANELS OR APPROVED EQUIVALENT INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE PANELS SHALL BE RED IN COLOR.

SECTION B-B

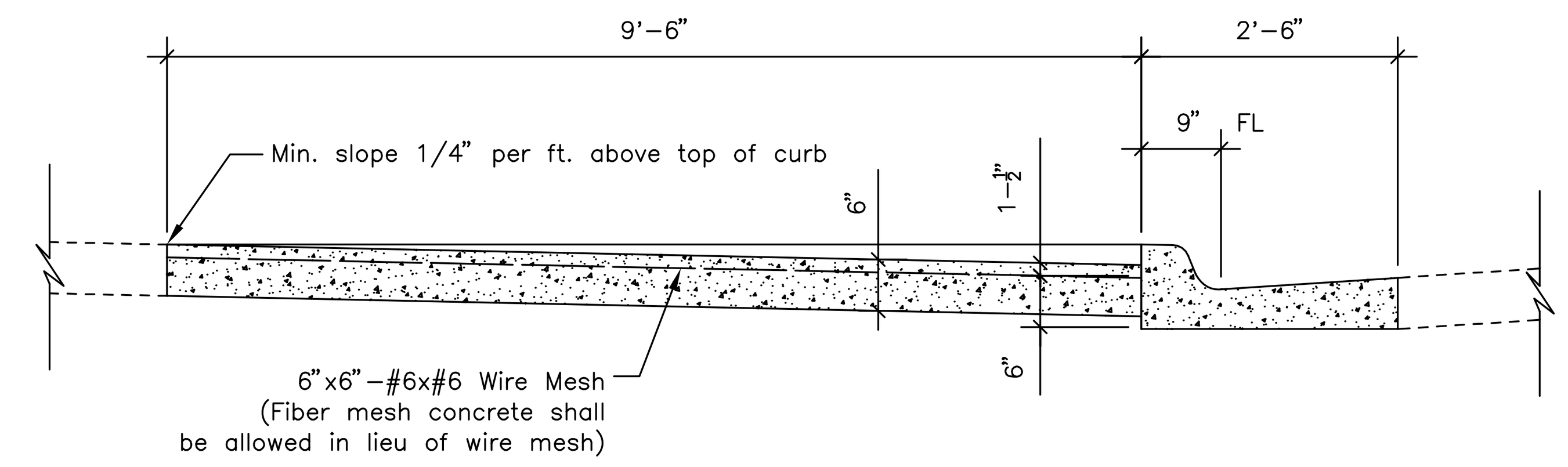


DOME DETAIL



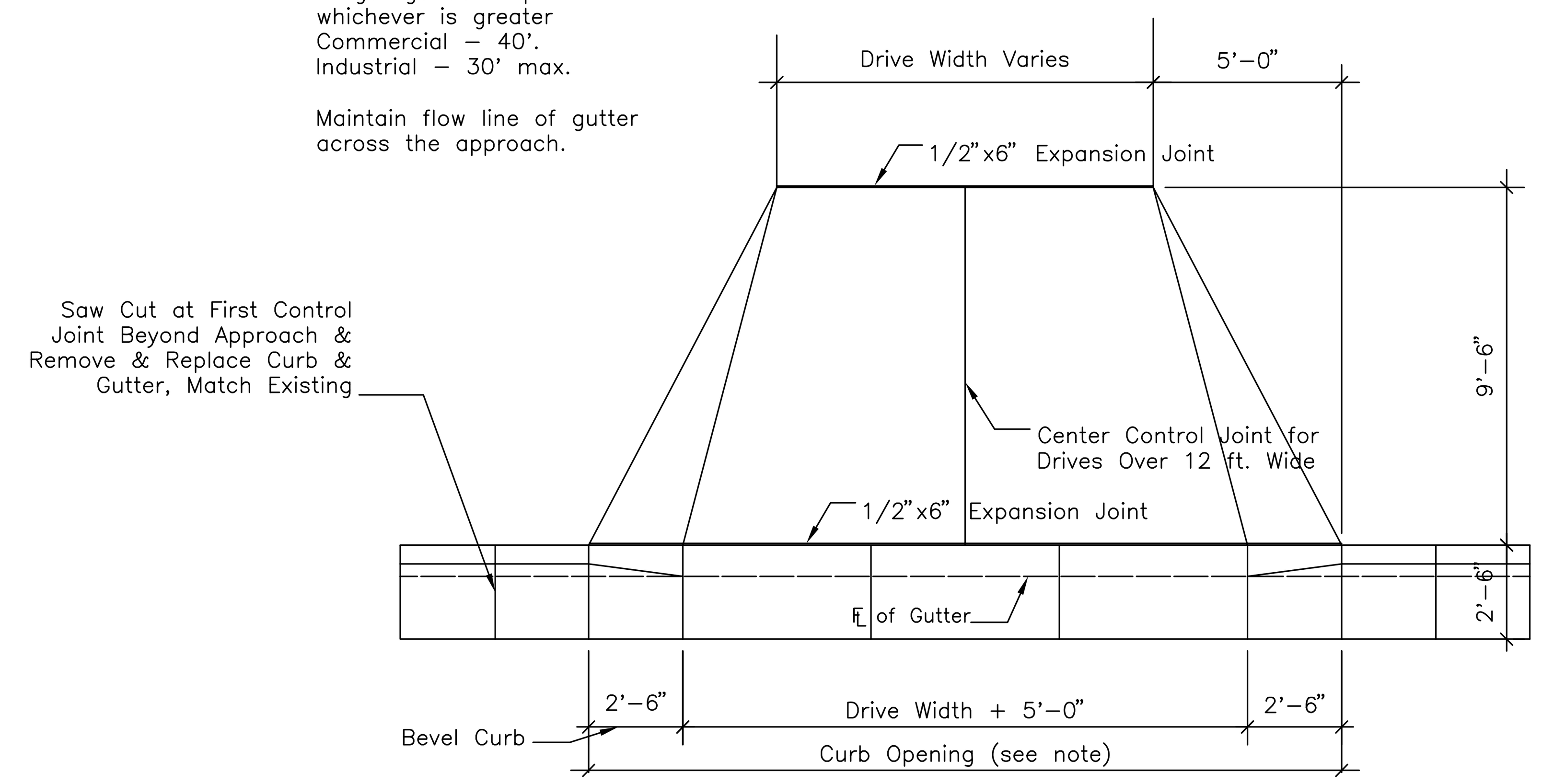
SECTION A-A

TYPICAL WHEELCHAIR RAMP DETAILS

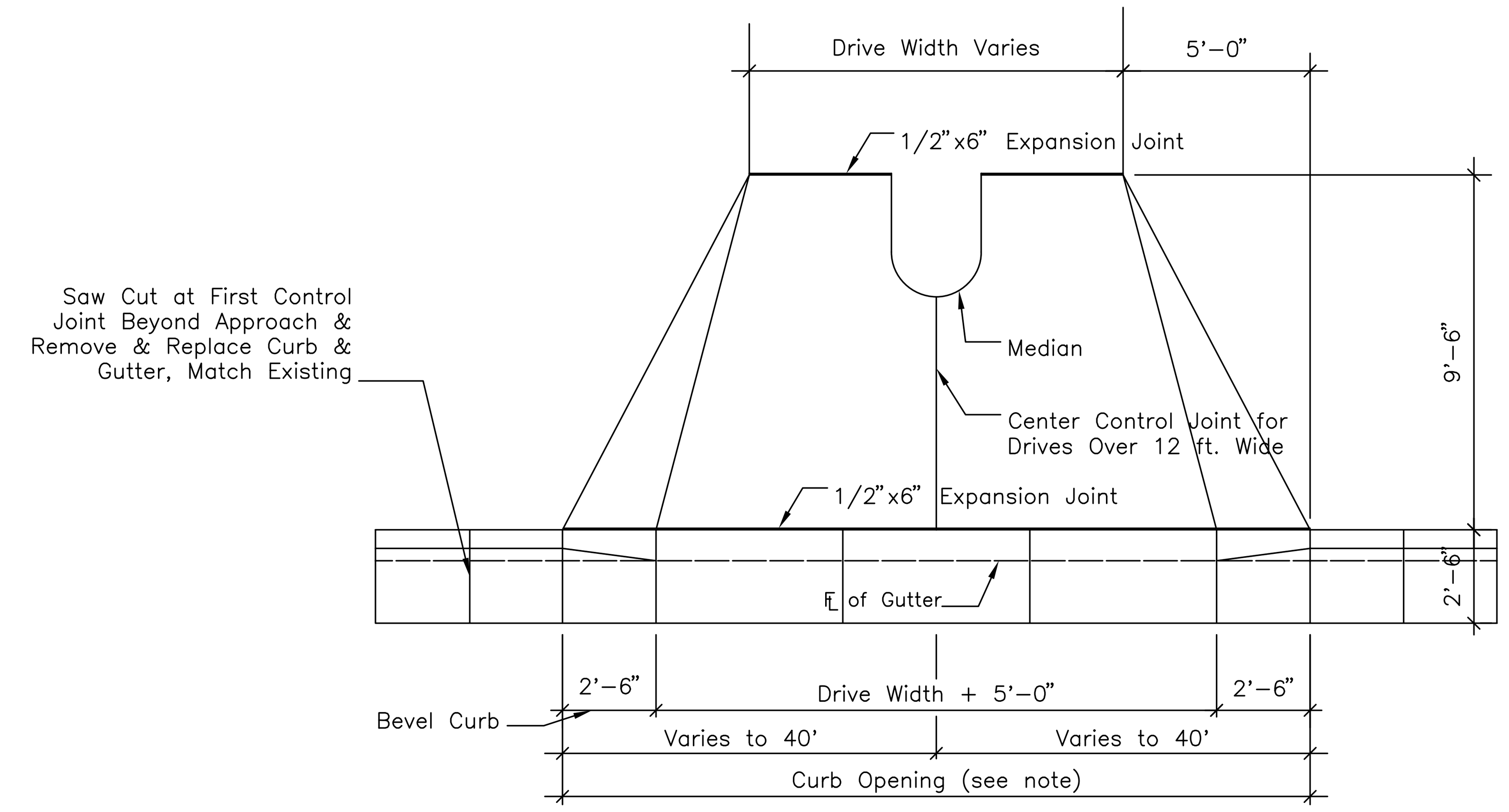


NOTES:
Max: curb openings:
Residential – 30' or width of garage doors plus 10' whichever is greater
Commercial – 40'.
Industrial – 30' max.

Maintain flow line of gutter across the approach.



STANDARD DRIVE APPROACH



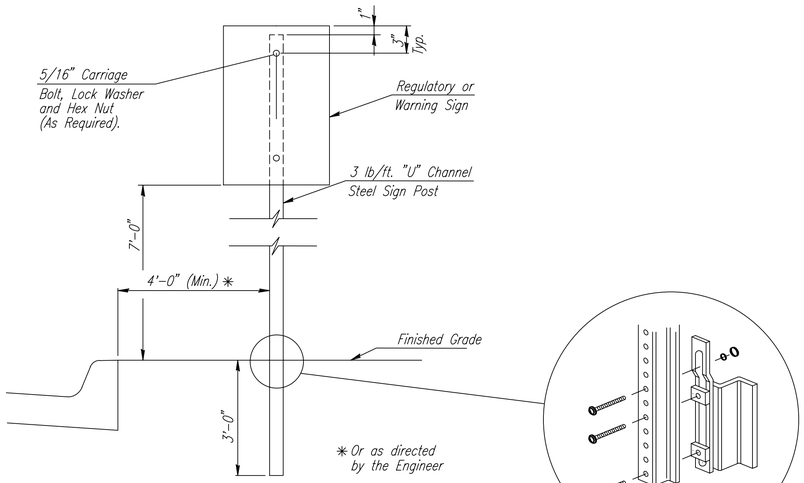
DRIVE APPROACH WITH MEDIAN

No.	Revision	By	Date

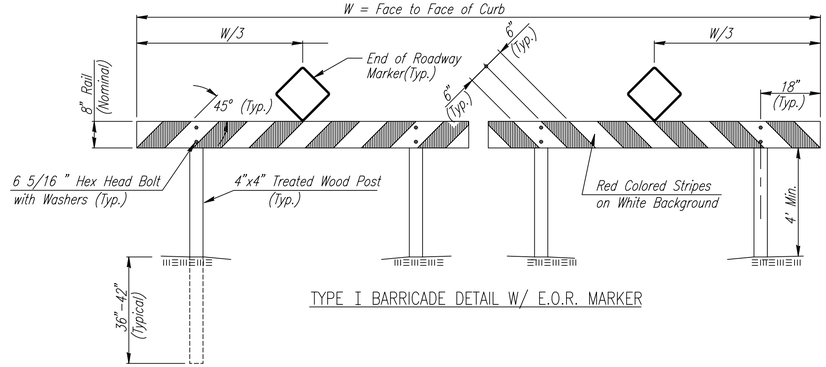
CITY OF NEWTON
HARVEY COUNTY, KANSAS

MISCELLANEOUS PAVING DETAILS

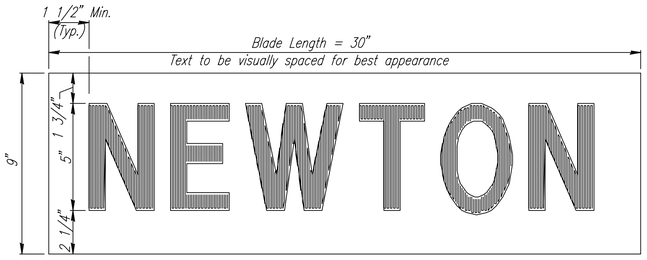
Designed by ---	Job No.		FIGURE II-6
Drawn by ---	Date December 2006		



TYPICAL TRAFFIC CONTROL SIGN INSTALLATION
CURB AND GUTTER SECTION



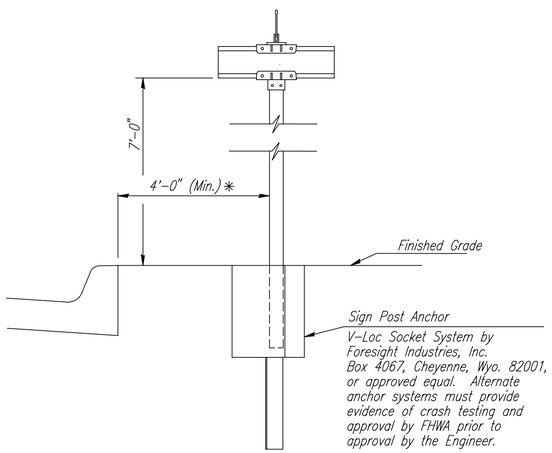
TYPE I BARRICADE DETAIL W/ E.O.R. MARKER



Upper Case Series "C"

DETAIL A
6 3/4" STANDARD

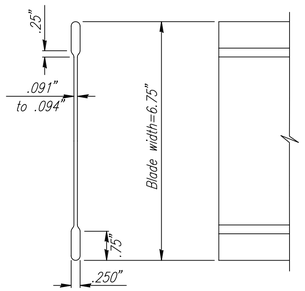
TRAFFIC CONTROL SIGN MOUNTING DETAIL



TYPICAL STREET NAME SIGN INSTALLATION
CURB AND GUTTER SECTION

SIGN ASSEMBLY TABLE				
STREET	STATION	OFFSET	SIGN	QUANTITY ≠
TOTAL				

≠ FOR INFORMATION ONLY



STREET NAME SIGN
BLADE DETAILS

STREET NAME	NO. BLADES REQD. 6 3/4" STD.
	1
	1
	1
	1
	1
	1
	1
	1
	1
TOTAL	1

GENERAL NOTES – SIGNING

NOTE: REFERENCES BELOW TO "STANDARD SPECIFICATIONS" DENOTE "STANDARD SPECIFICATION FOR STATE ROAD AND BRIDGE CONSTRUCTION, EDITION 1990" BY THE KANSAS DEPARTMENT OF TRANSPORTATION.

1. POST ANCHORS. POSTS SHALL BE ANCHORED WITH A YIELDING BASE POST SUPPORT AS DETAILED.
2. POSTS FOR TRAFFIC CONTROL SIGNS. POSTS SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 1620 OF THE STANDARD SPECIFICATIONS EXCEPT THAT ALL POSTS SHALL WEIGH 3 LBS./FOOT MINIMUM.
3. POSTS FOR STREET NAME SIGNS. POSTS SHALL BE 9 FEET LONG, CONSTRUCTED FROM 2 3/8" O.D. GALVANIZED STEEL PIPE WEIGHING A MINIMUM OF 3.65 POUNDS PER FOOT. POSTS SHALL BE POSITIONED SO THAT THE BOTTOM BLADE IS 7 FEET ABOVE GRADE.
4. SIGN BLANKS FOR TRAFFIC CONTROL SIGNS. SIGN BLANKS SHALL BE FABRICATED FROM 0.080" ALUMINUM ALLOY 6063-T6 CONFORMING TO THE REQUIREMENTS OF SUBSECTION 1626 OF THE STANDARD SPECIFICATIONS.
5. SIGN BLADES FOR STREET NAME SIGNS. EXTRUDED ALUMINUM BLADES SHALL BE ALUMINUM ALLOY CONFORMING TO 6063-T6 OR 5052-H38 (ASTM SPECIFICATION B221, LATEST ISSUE). BLADES SHALL HAVE AN ALODINE OR PHOSPHATE ETCHED FINISH. FIBERGLASS SIGN BLANKS MAY BE USED IN LIEU OF EXTRUDED ALUMINUM, PROVIDED THAT THE FIBERGLASS BLANKS MEET THE SIZE AND SHAPE REQUIREMENTS SHOWN ON THIS SHEET. BLADES SHALL HAVE SQUARE CORNERS AND NO HOLES.

   BLADES BEARING THE STREET NAMES SHALL BE FIRMLY ATTACHED TO THE MOUNTING BRACKETS USING ALLEN-TYPE SET SCREWS. THE BLADES SHALL BE ORIENTED PARALLEL TO THE STREET.
6. MOUNTING BRACKETS FOR STREET NAME SIGN. DIE-CAST ALUMINUM BRACKETS SHALL BE ALUMINUM ALLOY 360 HAVING A TENSILE STRENGTH OF 44,000 PSI. THE BRACKETS SHALL BE SMOOTHLY FINISHED FREE OF PITS, BURRS, AND FLAWS. EACH BRACKET SHALL BE TAPPED AND DRILLED FOR 5/16" ZINC-PLATED ALLEN-TYPE SET SCREWS HAVING SELF-LOCKING SAW-TOOTH ENDS.
7. FASTENERS. ALL STEEL FASTENERS FOR TRAFFIC CONTROL SIGNS SHALL BE GALVANIZED AND SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 1614 OF THE STANDARD SPECIFICATIONS.
8. REFLECTIVE SHEETING. ALL SIGNS AND BARRICADES SHALL HAVE RETRO-REFLECTIVE FACES FACING TRAFFIC. REFLECTIVE SHEETING SHALL BE TYPE II - HIGH PERFORMANCE CLASS HA IN ACCORDANCE WITH SUBSECTION 2201 OF THE STANDARD SPECIFICATIONS.
9. PROCESS INK. ALL PROCESS INK SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 2202 OF THE STANDARD SPECIFICATIONS.
10. DETAILS. REGULATORY AND WARNING SIGNS SHALL CONFORM TO THE DETAILS IN "STANDARD HIGHWAY SIGNS", FHWA, 1979.
11. DETAILS – STREET NAME SIGNS. THE REFLECTIVE SHEETING FOR THE 6 3/4" STANDARD SIZE STREET NAME SIGN IS TO BE HIGHWAY GREEN REVERSE SCREENED BACKGROUND WITH SILVER-WHITE #2 COPY WITH 4" UPPER CASE PRIMARY COPY AND SUFFIX COPY, SERIES "C". FACES TO TRIM TO A 6 3/4" WIDTH. (SEE DETAIL A.)

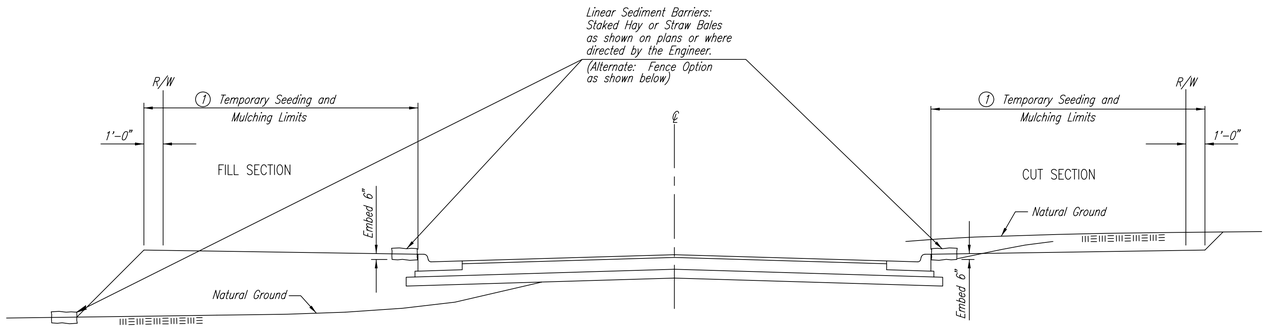
    SHOP DRAWINGS OF LAYOUTS FOR STREET NAME SIGNS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION. THE FINISHED SIGNS AS SUPPLIED SHALL BE OF GOOD APPEARANCE, FREE FROM RAGGED EDGES, CRACKS, SCALES OR BLISTERS AND SHALL BE PACKED IN SUCH MANNER AS TO PREVENT DAMAGE OR DEFACEMENT DURING SHIPMENT OR STORAGE.
12. TRAFFIC CONTROL AND STREET NAME SIGNS. TRAFFIC COONTROL AND STREET NAME SIGNS SHALL BE MEASURED AND PAID FOR AT THE LUMP SUM PRICE FOR SIGNING. THE PAYMENT AS SET FORTH ABOVE SHALL BE CONSIDERED FULL COMPENSATION FOR ALL EXCAVATION, BACKFILLING, POSTS, ANCHORS, FASTENERS, MATERIALS, LABOR, TOOLS AND INCIDENTALS NECESSARY TO COMPLETE THIS WORK.

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

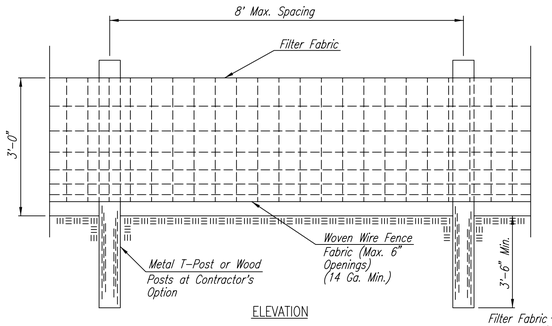
SIGNING DETAILS

Designed by ---	Job No.	FIGURE II-7
Drawn by ---	Date December 2006	



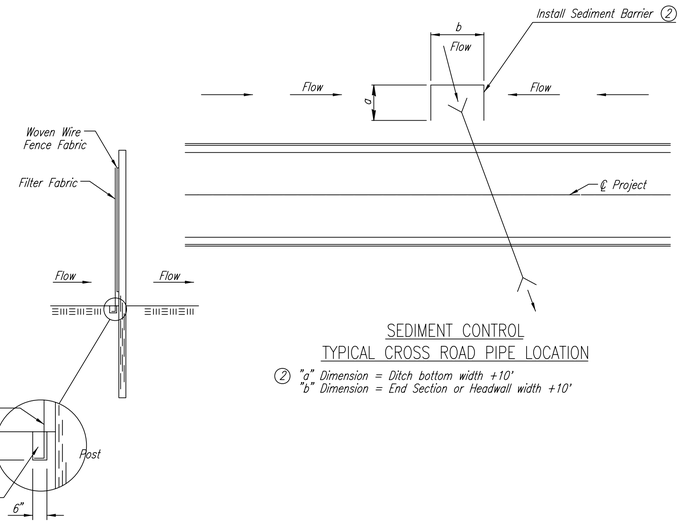
① Seed with Annual Rye at the rate of 4 lbs./1000 S.F.
Mulch with Hay at the rate of 90 lbs./1000 S.F.

SEDIMENT CONTROL
CURB AND GUTTER STREET SECTION



ELEVATION

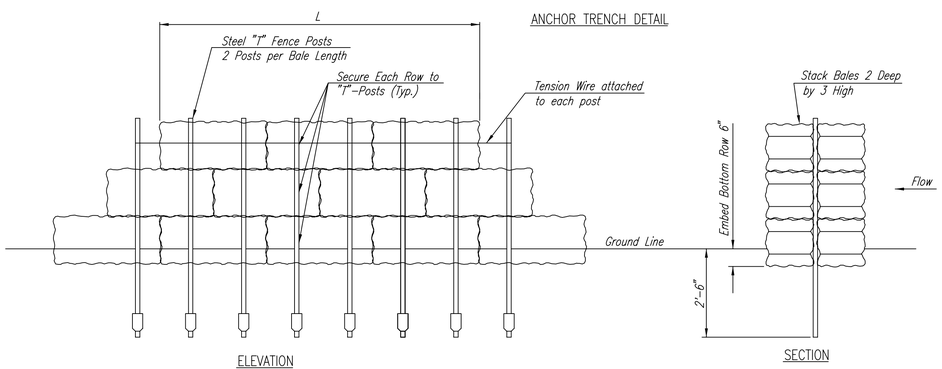
SEDIMENT BARRIER DETAILS
FENCE OPTION



SEDIMENT CONTROL
TYPICAL CROSS ROAD PIPE LOCATION

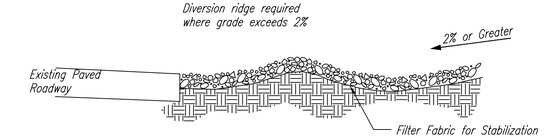
② "a" Dimension = Ditch bottom width +10'
"b" Dimension = End Section or Headwall width +10'

ANCHOR TRENCH DETAIL

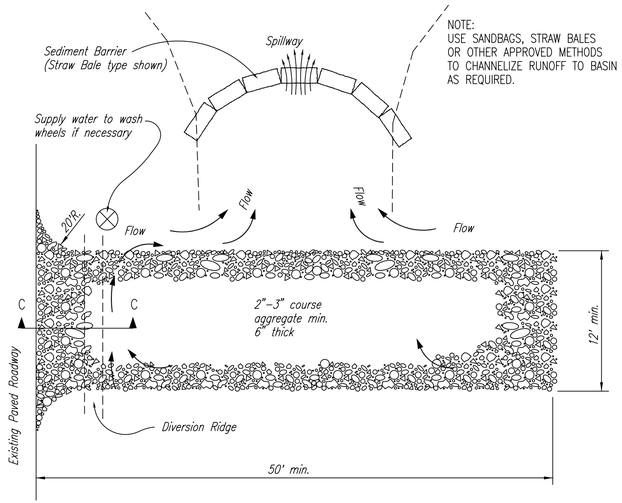


ELEVATION SECTION

SEDIMENT BARRIER DETAILS
HAY/STRAW BALE OPTION



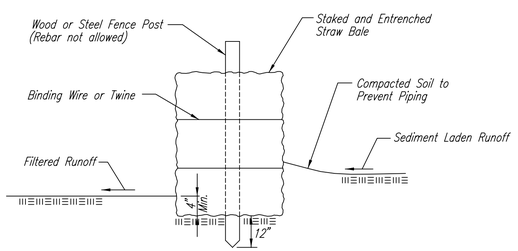
SECTION C–C



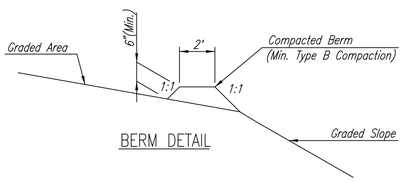
STABILIZED CONSTRUCTION ENTRANCE

NOTES:

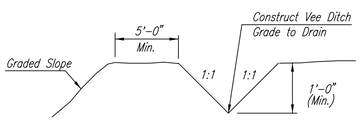
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT–OF–WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN, AS SHOWN ABOVE.
4. DRIVE ENTRANCES ONTO RESIDENTIAL LOTS WILL NOT BE REQUIRED TO HAVE THE SEDIMENT BARRIER SHOWN, BUT WHEEL WASHING MAY BE REQUIRED IF STABILIZED ENTRANCE IS NOT SUFFICIENT TO KEEP MUD FROM BEING TRACKED ONTO ADJACENT STREET. ENTRANCE SHALL EXTEND FROM BACK OF CURB TO DWELLING.



LINEAR SEDIMENT BARRIER



BERM DETAIL



INTERCEPT DITCH DETAIL

TEMPORARY EROSION CONTROL DETAILS FOR SLOPE PROTECTION

The Engineer may determine that the height of Berm or depth of Ditch should be increased over that shown if Drainage conditions are producing Slope Erosion.

1. SEDIMENT BARRIERS SHALL BE INSTALLED AT LOCATIONS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. ADDITIONAL SEDIMENT BARRIERS WILL BE INSTALLED AT LOCATIONS AS DIRECTED BY THE ENGINEER WITH NO ADJUSTMENT IN UNIT PRICE.
2. SEDIMENT BARRIERS SHALL BE ERECTED PRIOR TO THE COMMENCEMENT OF EARTHWORK OPERATIONS IN A GIVEN BASIN. REMOVAL AND DISPOSAL OF ACCUMULATED SILT AND DEBRIS AND/OR REMOVAL AND RECONSTRUCTION OF SEDIMENT BARRIERS WILL BE PERFORMED THROUGHOUT THE PROJECT LIFE WHEN DEBRIS REACHES ONE–THIRD THE FENCE HEIGHT OR AS DEEMED NECESSARY BY THE ENGINEER. SEDIMENT BARRIERS AND ACCUMULATED DEBRIS SHALL BE REMOVED AND DISPOSED OF BY THE CONTRACTOR AFTER TURF COVER HAS BEEN ESTABLISHED, UNLESS OTHER ARRANGEMENTS HAVE BEEN AGREED TO.
3. FILTER FABRIC FOR FENCE OPTION SEDIMENT BARRIERS SHALL BE RESISTANT TO ULTRAVIOLET LIGHT. MATERIALS MAY BE SUPPLIED BY THE FOLLOWING MANUFACTURERS:

MIRAFI, INC.	–	100X
HOECHST FIBERS INDUSTRIES	–	TREVIRA 1115
EXXON	–	TYPAR 3301 W

   MATERIALS SUPPLIED BY THE ABOVE NAMED MANUFACTURERS SHALL BE ACCEPTED UPON VISUAL INSPECTION BY THE ENGINEER. OTHER COMPARABLE MATERIALS MAY BE USED IF APPROVED BY THE ENGINEER.

   FILTER FABRIC SHALL BE ATTACHED TO FENCE FABRIC BY MEANS OF TIE WIRES OR HOG RINGS PRIOR TO ATTACHMENT OF FENCE/FABRIC COMBINATION ONTO THE POSTS.
4. BALES USED FOR SEDIMENT BARRIERS MAY BE EITHER HAY OR STRAW, PROVIDED THEY ARE SOUND AND INTACT.
5. TEMPORARY EROSION CONTROL BERMS AND/OR INTERCEPT DITCHES SHALL BE CONSTRUCTED AT LOCATIONS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. ADDITIONAL BERMS AND/OR DITCHES MAY BE REQUIRED AT NO ADJUSTMENT IN UNIT PRICE(S).

   WHERE TEMPORARY EROSION CONTROL BERMS AND/OR INTERCEPT DITCHES ARE USED, ALL AREAS WHERE FLOW IS CONCENTRATED SHALL BE PROTECTED BY SILTATION BARRIERS PRIOR TO DISCHARGING INTO ANY DITCH, STORM SEWER, OR WATERCOURSE.
6. ALL ITEMS ASSOCIATED WITH EROSION CONTROL SHALL BE CONSIDERED SUBSIDIARY TO THE LUMP SUM PRICE BID FOR "SITE CLEARING AND RESTORATION".

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

EROSION CONTROL AND SEDIMENT BARRIER DETAILS

Designed by	---	Job No.	FIGURE II–8
Drawn by	---	Date December 2006	

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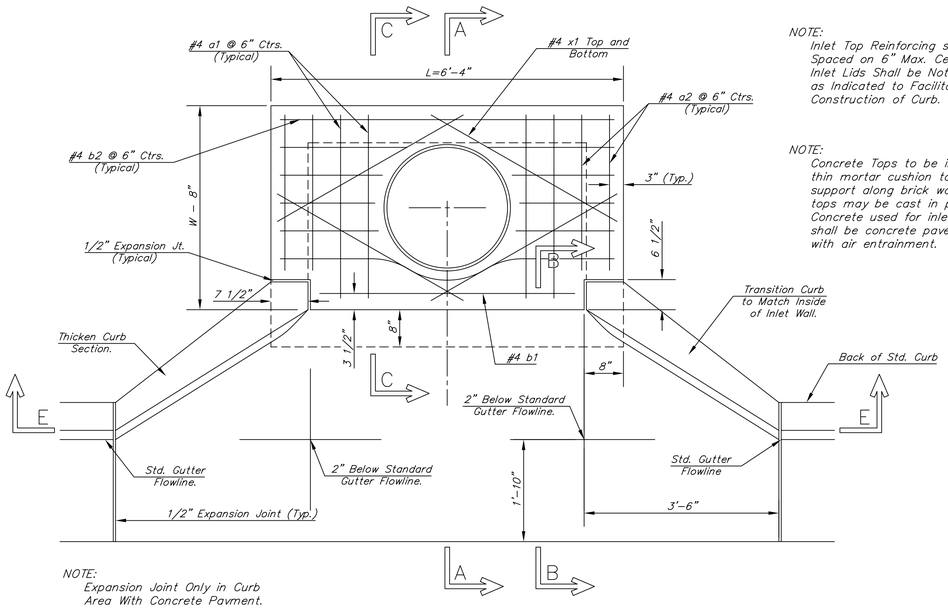
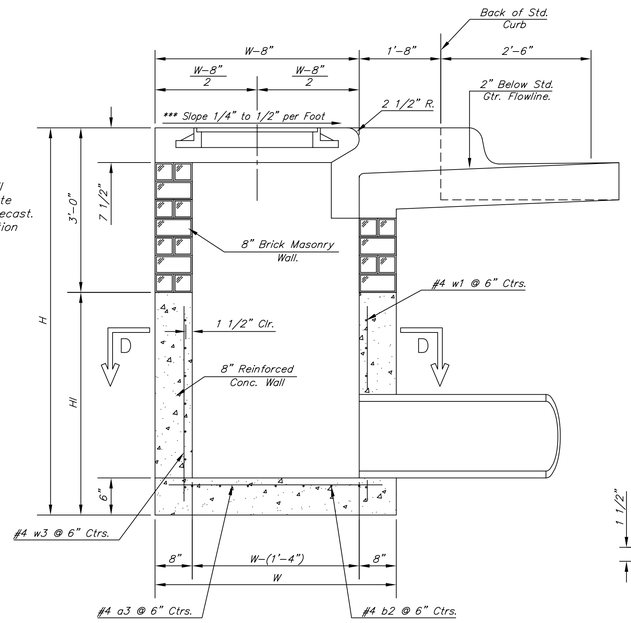


NOTE:
Expansion Joint Only in Curb Area With Concrete Pavment.

PLAN

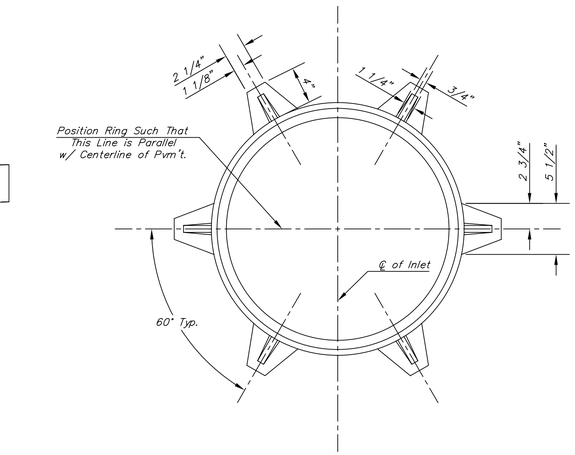
NOTE:
Inlet Top Reinforcing shall be Spaced on 6" Max. Centers. Inlet Lids Shall be Notched Out as Indicated to Facilitate Construction of Curb.

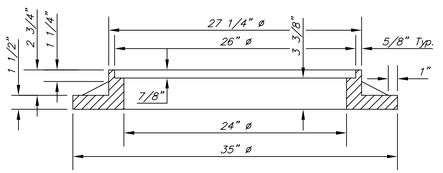
NOTE:
Concrete Tops to be installed on thin mortar cushion to insure full support along brick walls. Concrete tops may be cast in place or precast. Concrete used for inlet construction shall be concrete pavement mix with air entrainment.



SECTION A-A

***NOTE: Slope of Inlet tops to Match Sidewalk or Parking Slopes within Limits Indicated.

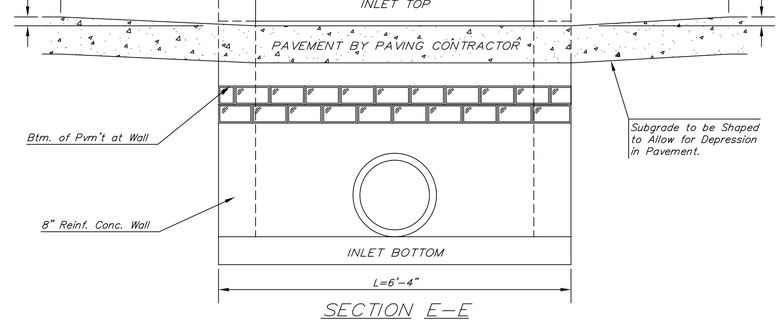




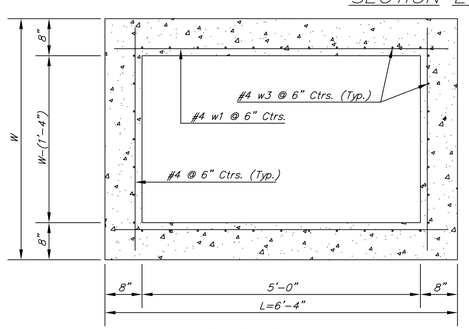
MANHOLE RING AND COVER

Weight = 180 Lbs.

*See Standard Manhole Ring and Cover Detail Sheet for Cover Details to be Used with Inlet Frame.



SECTION E-E



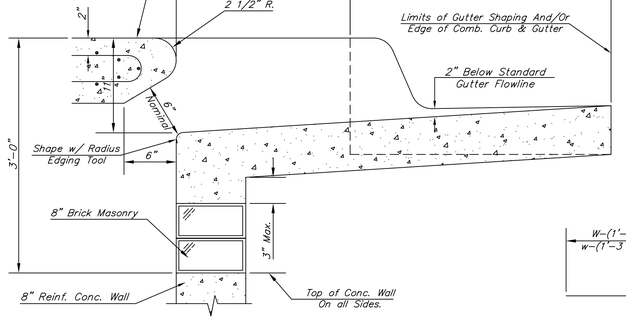
SECTION D-D

NOTE: Contractor shall have the option of constructing 8" brick masonry walls between the concrete inlet base and top on this inlet when W=6'-4" and H=7'-0" or less.

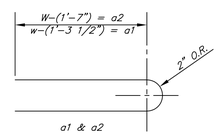
Additional curb and gutter construction necessary to connect set-back inlet to pavement will be paid for at the unit price bid for each inlet hookup.

Inlet invert shall be shaped with 8 sack sand mix concrete to create flow channels and to increase hydraulic efficiency such that the inlet will be self-cleaning between all inlet and/or outlet pipes.

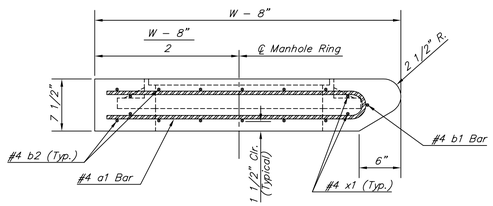
The ends of all pipes installed in inlets shall be cut off flush with the inside face of the inlet wall



SECTION B-B



BENDING DIAGRAM



SECTION C-C

PRECAST SLAB AND FLOOR REINFORCING											
		W = 4'-4"		W = 5'-4"		W = 6'-4"		W = 7'-4"		W = 8'-4"	
MARK	SIZE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
* a1	#4	6	6'-7"	6	8'-7"	6	10'-7"	6	12'-7"	6	14'-7"
a2	#4	4	6'-0"	4	8'-0"	4	10'-0"	4	12'-0"	4	14'-0"
a3	#4	13	4'-1"	13	5'-1"	13	6'-1"	13	7'-1	13	8'-1"
b1	#4	1	4'-9"	1	4'-9"	1	4'-9"	1	4'-9"	1	4'-9"
* b2	#4	23	6'-1"	29	6'-1"	35	6'-1"	41	6'-1"	47	6'-1"
x1	#4	8	3'-10"	8	4'-2"	8	4'-6"	8	4'-10"	8	5'-2"
WALL REINFORCING											
		W = 4'-4"		W = 5'-4"		W = 6'-4"		W = 7'-4"		W = 8'-4"	
MARK	SIZE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
w1	#4	①	6'-1"	①	6'-1"	①	6'-1"	①	6'-1"	①	6'-1"
w2	#4	①	4'-1"	①	5'-1"	①	6'-1"	①	7'-1"	①	8'-1"
w3	#4	32	②	36	②	40	②	44	②	48	②

* Field Bend or Cut Reinforcing as Required for Clearance.
① 4 (HI - 12") (HI - 21") Rounded down to nearest 0.5'
② HI - 3"

STANDARD CURB INLET PRECAST TOPS			
W	PRE-CAST TOP SIZE	PIPE SIZE	CU. YD. CONC.
4'-4"	3'-8" x 6'-4" x 7 1/2"	21" & SMALLER	0.38±
5'-4"	4'-8" x 6'-4" x 7 1/2"	24" & 30"	0.51±
6'-4"	5'-8" x 6'-4" x 7 1/2"	36" & 42"	0.64±
7'-4"	6'-8" x 6'-4" x 7 1/2"	48" & 54"	0.77±
8'-4"	7'-8" x 6'-4" x 7 1/2"	60" & 66"	0.90±

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

STANDARD TYPE 1-A CURB INLET OPENING = 6" x 5'-0", L=6'-4"

Designed by	---	Job No.	FIGURE III-1
Drawn by	---	Date December 2006	

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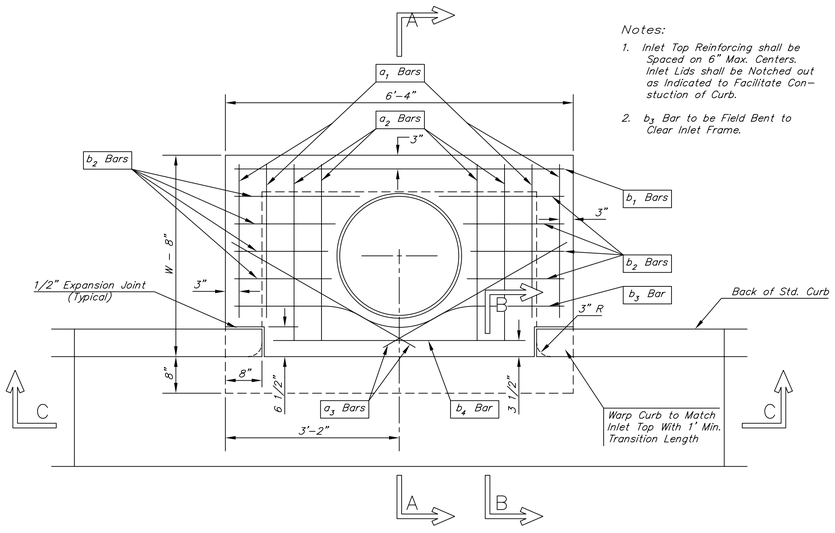
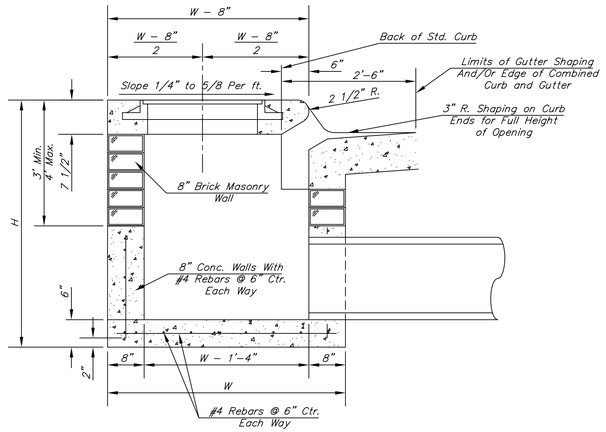


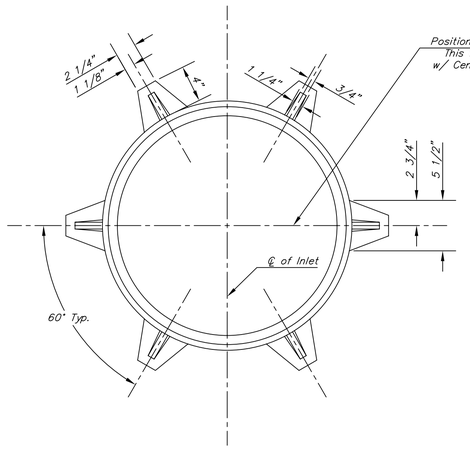
PLAN

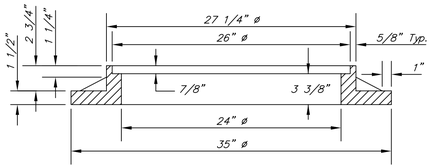
Notes:

1. Inlet Top Reinforcing shall be Spaced on 6" Max. Centers. Inlet Lids shall be Notched out as Indicated to Facilitate Construction of Curb.
2. b_3 Bar to be Field Bent to Clear Inlet Frame.



SECTION A—A

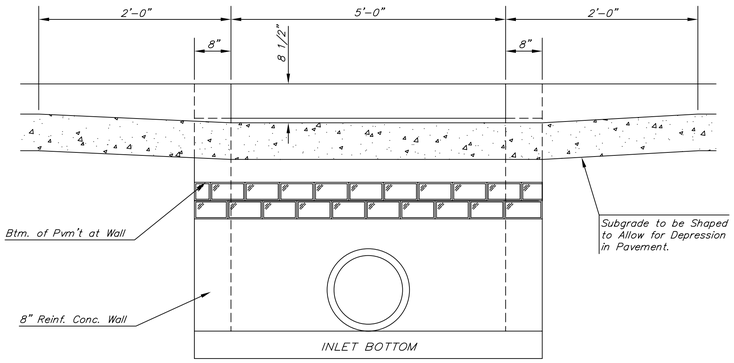




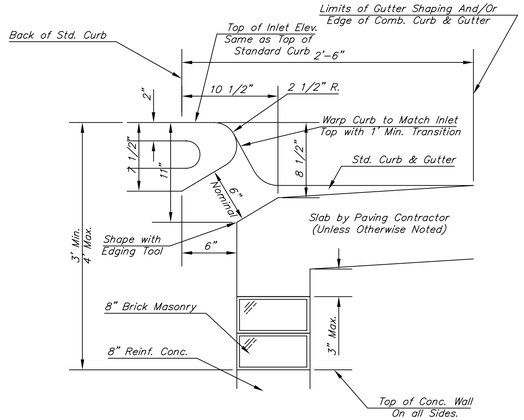
WT. = 180 lbs.

MANHOLE RING AND COVER

*See Standard Manhole Ring and Cover Detail Sheet for Cover Details to be Used with Inlet Frame.



SECTION C—C



SECTION B—B

STEEL SCHEDULE

BAR		a_1	a_2	a_3	b_1 W=4'-4"	b_1 W=5'-4"	b_1 W=6'-4"	b_1 W=7'-4"	b_1 W=8'-4"	b_2	b_3	b_4	Wt. Lbs.
NUMBER		4	4	2	1	3	5	7	9	6	1	1	
SIZE		#4	#4	#4	#4	#4	#4	#4	#4	#4	#4	#6	
LENGTH	W=4'-4"	5'-7"	6'-7"	4'-0"	6'-1"	–	–	–	–	1'-9"	6'-2"	4'-8"	60±
	W=5'-4"	7'-7"	8'-7"	5'-0"	–	6'-1"	–	–	–	1'-9"	6'-2"	4'-8"	81±
	W=6'-4"	9'-7"	10'-7"	6'-0"	–	–	6'-1"	–	–	1'-9"	6'-2"	4'-8"	101±
	W=7'-4"	11'-7"	12'-7"	7'-0"	–	–	–	6'-1"	–	1'-9"	6'-2"	4'-8"	121±
	W=8'-4"	13'-7"	14'-7"	8'-0"	–	–	–	–	6'-1"	1'-9"	6'-2"	4'-8"	141±

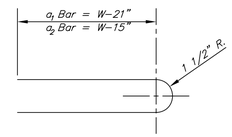
Note: a_3 Bars to be Placed Approx. 2" Below Top of Inlet Cover.

STANDARD CURB INLET PRECAST TOPS

W	PRE-CAST TOP SIZE	PIPE SIZE	CU. YD. CONC.
4'-4"	3'-8" 6'-4" 7 1/2"	21" & SMALLER	0.38±
5'-4"	4'-8" 6'-4" 7 1/2"	24" & 30"	0.51±
6'-4"	5'-8" 6'-4" 7 1/2"	36" & 42"	0.64±
7'-4"	6'-8" 6'-4" 7 1/2"	48" & 54"	0.77±
8'-4"	7'-8" 6'-4" 7 1/2"	60" & 66"	0.90±

GENERAL NOTES

1. Concrete tops to be installed on thin mortar cushion to insure full support along brick walls. Concrete tops may be cast in place or precast. Concrete used for inlet construction shall be concrete pavement mix.
2. Contractor shall have the option of constructing 8" brick masonry walls between the concrete inlet base and top on this inlet when W=6'-4" and H=7'-0" or less.
3. Inlet invert shall be shaped with 8 sack sand mix concrete to create flow channels and to increase hydraulic efficiency such that the inlet will be self cleaning between all inlet and/or outlet pipes.
4. The ends of all pipes installed in inlets shall be cut off flush with the inside face of the inlet wall.



BENDING DIAGRAM

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

STANDARD TYPE 1 CURB INLET OPENING = 6" x 5'-0"

Designed by	---	Job No.	FIGURE III-2
Drawn by	---	Date December 2006	

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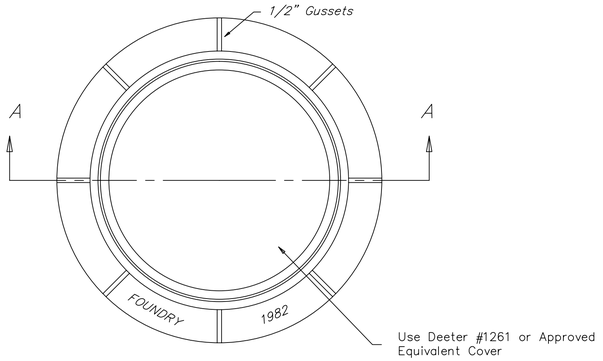
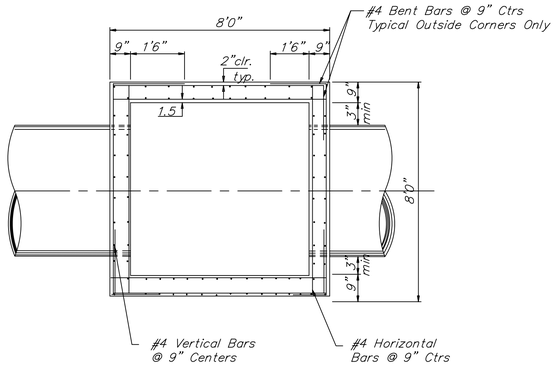
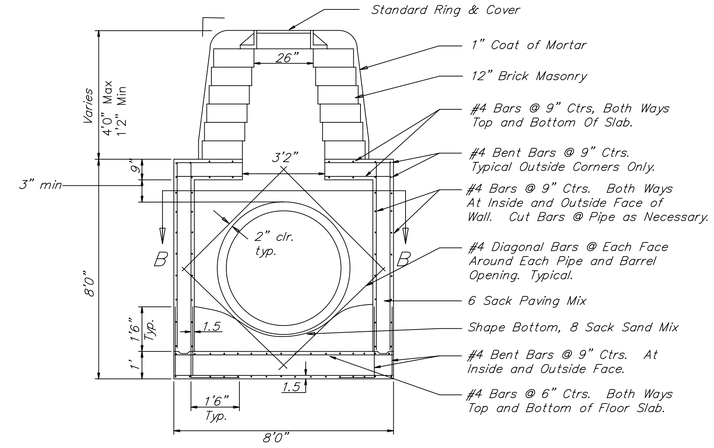


TOP VIEW

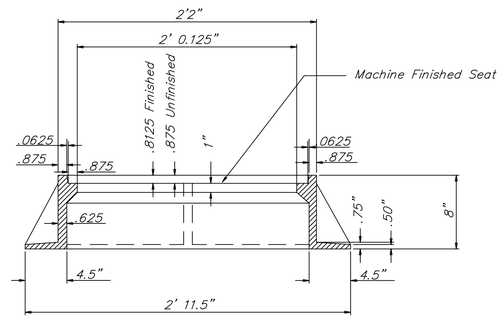


NOTE:
Bend Bars Not More Than 8" to Clear Pipes, or Cut Bars 2" Clear of Pipe, as Necessary.

SECTION B–B

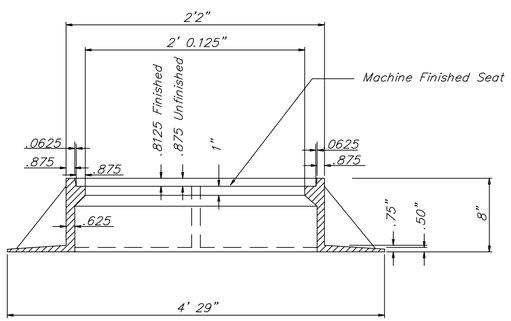


REINFORCED CONCRETE MANHOLE
STACK 2.33' TO 4'0"



SECTION A–A

MANHOLE FRAME
Weight: 240 Lbs.



WIDE FLANGE RING
Weight: 705 Lbs.

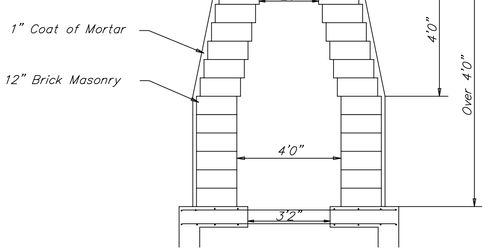
GENERAL NOTES:

1. MORTAR USED IN MASONRY CONSTRUCTION SHALL CONTAIN 8 SACKS OF CEMENT PER CUBIC YARD. CONCRETE USED IN MANHOLE WALLS AND BASES SHALL CONFORM TO THE REQUIREMENTS FOR CONCRETE PAVEMENT CONSTRUCTION AS SPECIFIED IN THE CITY STANDARD PAVING SPECIFICATIONS, USING CITY CONCRETE PAVEMENT MIX WITHOUT AIR ENTRAINING ADMIXTURE. MORTAR SHALL BE PLACED AROUND THE MANHOLE RING AS SHOWN ON THE DRAWINGS WHEN MANHOLES ARE CONSTRUCTED IN UNPAVED AREAS. COMPLETED MANHOLE SHALL BE WITHOUT LEAKS AND WATER TIGHT.

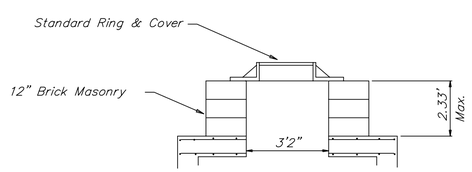
2. THE FLOORS OF ALL MANHOLES SHALL BE SHAPED WITH FLOW CHANNELS SUCH THAT THE MANHOLES WILL BE SELF CLEANING. USING 8–SACK SAND MIX CONCRETE. FLOW CHANNELS SHALL BE FORMED TO MATCH THE BOTTOM HALVES OF THE INFLOWING PIPES AND THE OUTFLOWING PIPE. MANHOLE FLOORS SHALL HAVE SLOPES OF 3 INCHES PER FOOT IN THE AREAS OUTSIDE OF THE FLOW CHANNELS SLOPED TOWARD THE FLOW CHANNELS.

3. MANHOLE COVER CASTINGS AND MANHOLE FRAME CASTINGS SHALL CONFORM TO THE RE–QUIREMENTS AS INDICATED IN THE STANDARD SPECIFICATIONS AND AS SHOWN IN THE STANDARD DETAIL DRAWING.

4. THE ENDS OF ALL PIPES IN MANHOLES SHALL BE CUT OFF FLUSH WITH THE INSIDE FACE OF MANHOLE WALL.



MANHOLE STACK OVER 4'0"



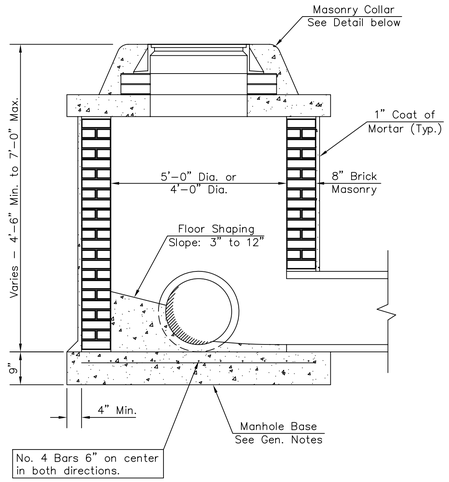
MANHOLE STACK LESS THAN 2.33'

No.	Revision	By	Date

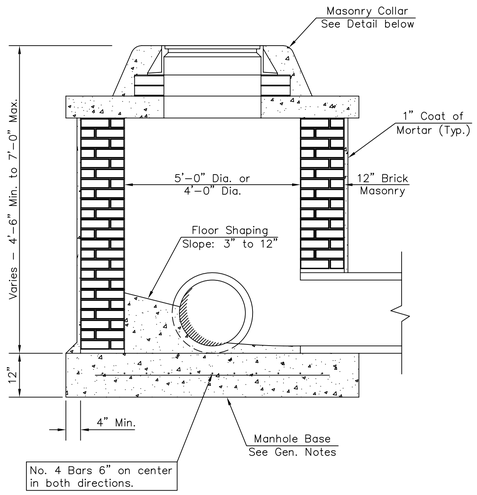
CITY OF NEWTON
HARVEY COUNTY, KANSAS

REINFORCED CONCRETE MANHOLE

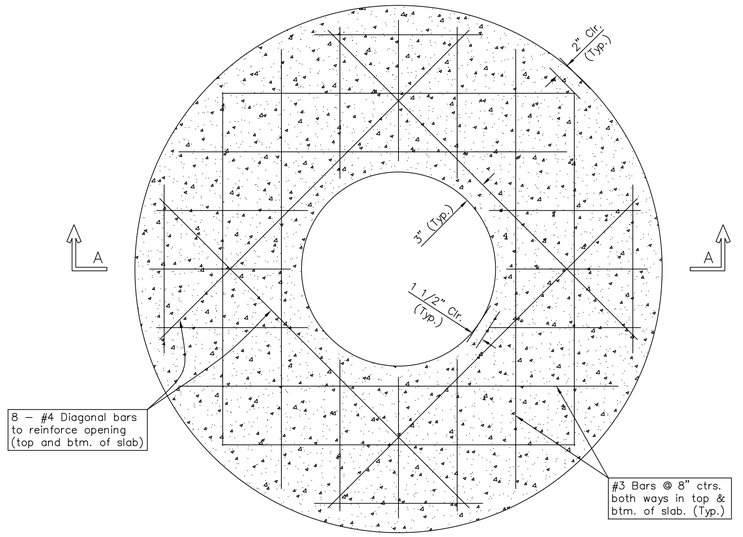
Designed by	---	Job No.	FIGURE III–3
Drawn by	---	Date December 2006	



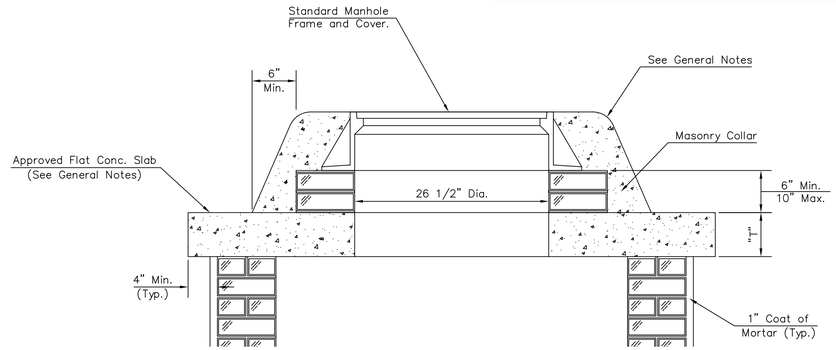
SHALLOW TYPE "A" MANHOLE



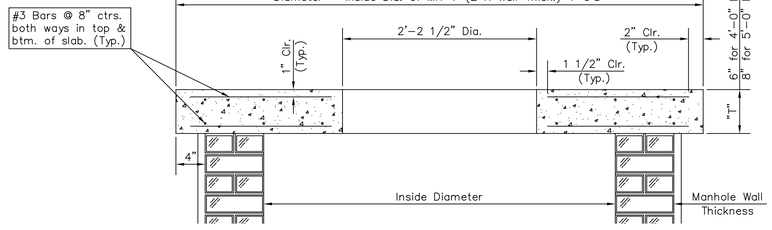
SHALLOW TYPE "B" MANHOLE



PLAN



MASONRY COLLAR DETAIL

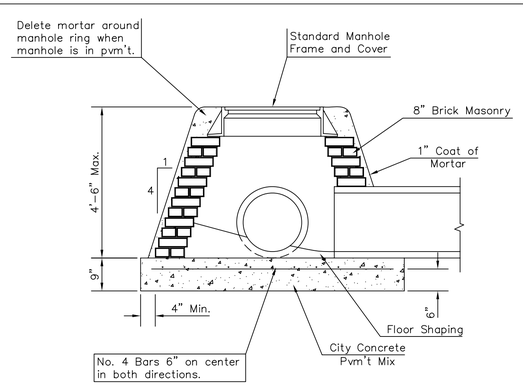


SECTION A–A

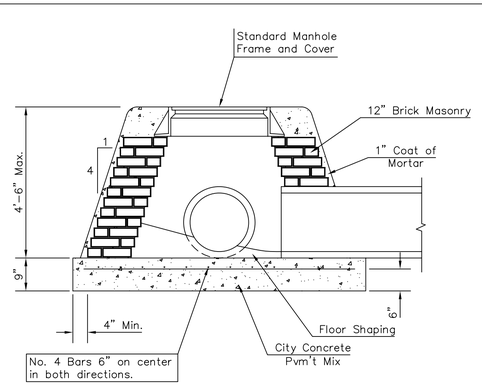
FLAT CONCRETE SLAB DETAILS

GENERAL NOTES

1. Mortar used in masonry construction shall contain 8 sacks of cement per cubic yard. Concrete used in manhole bases shall conform to the requirements of concrete for concrete pavement construction as specified in the city standard paving specifications using city concrete cement mix without air entraining admixture. Mortar shall be placed around the manhole ring as shown on the drawings when manholes are constructed in unpaved areas. Type "A" shallow manholes can be used on sewers when the manhole is not located within public street pavement. Manholes constructed where pipe sizes are smaller than 24" shall have an inside diameter of 4'. Manholes constructed where pipe sizes are 24" or larger shall have an inside diameter of 5'. Completed manhole shall be without leaks and water tight.
2. Reinforcing steel shall be installed in the manhole bases and shall consist of no. 4 bars placed on 6" centers in both directions. The manhole base reinforcement shall be placed 6" above the bottom of the manhole base. All costs for furnishing and installing reinforcing steel shall be included in the unit price bid for the manhole.
3. The floors of all manholes shall be shaped with flow channels such that the manholes will be self cleaning and free of areas where solids could be deposited as sewage flows through the manhole from all inlet pipes to the outlet pipe. Flow channels shall be formed to match the bottom halves of the inflowing pipes and the outflowing pipe as shown by the drawings. Manhole floors shall have slopes of 3 inches per foot in the areas outside of the flow channels sloped toward the flow channels. Pipes laid through manholes shall have the top half removed to neat lines for the full inside diameter of the manhole. Manhole floors shall then be shaped around the bottom half of the pipe which forms the flow channel.
4. Pipes installed within the excavation made for the manhole shall be cradled with concrete to the limits of the manhole excavation. When clay pipe is used, the cradle shall extend to the first joint outside the manhole. The cradle shall be terminated at the clay pipe joint in a manner which will maintain the flexibility of the joint. Cost of cradle within manhole excavation or to clay pipe joints adjacent to manhole shall be included in the unit price bid for the manhole.
5. Manhole cover castings and manhole frame castings shall conform to the requirements as indicated in the standard specifications and as shown in the standard detail drawings.
6. The crowns of inflowing pipes shall never be set lower than the crown of the outflowing pipe.
7. Standard shallow manholes type "A" and "B" shall be paid for at the unit price bid per each for the type and diameter indicated. Standard special shallow manholes type "A" and "B" shall be paid for at the unit price bid per each for the type indicated. All standard shallow manhole diameters will be 4' unless indicated otherwise.
8. All brick used in manhole construction shall meet Grade SW of ASTM C652 or C62–87.



SPECIAL SHALLOW TYPE "A" MANHOLE



SPECIAL SHALLOW TYPE "B" MANHOLE

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

STANDARD / SPECIAL SHALLOW MANHOLES TYPE "A" & "B"

Designed by	---	Job No.	FIGURE III–4
Drawn by	---	Date December 2006	

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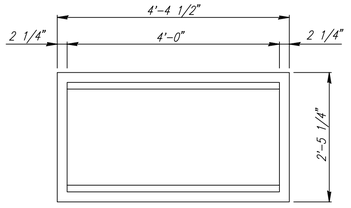
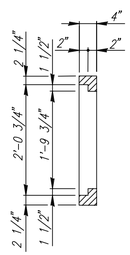
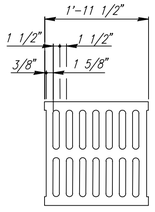
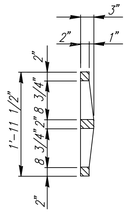


FRAME DETAIL
(Wt.=460 lbs.)





GRATE DETAIL
(Wt.=180 lbs.)



GENERAL NOTES

CONCRETE SHALL BE STANDARD PAVING MIX PER CITY SPECIFICATIONS. ALL EXPOSED EDGES SHALL BE FINISHED WITH AN APPROVED EDGING TOOL.

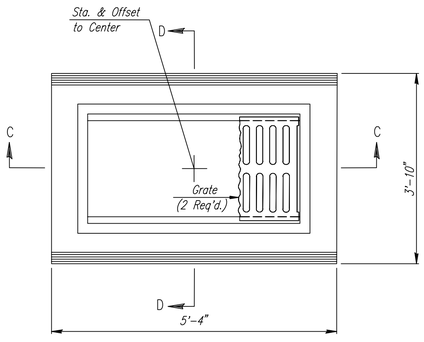
REINFORCING STEEL SHALL BE A MINIMUM GRADE 40, A.S.T.M. A615. ALL DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO THE CENTERLINE OF BARS UNLESS OTHERWISE NOTED.

INLET CASTINGS SHALL BE MANUFACTURED USING GOOD QUALITY GRAY IRON CONFORMING TO CLASS 30 OF A.S.T.M. DESIGNATION A-48. DIMENSIONS AND WEIGHTS SHOWN ON THE DETAILED DRAWINGS SHALL BE CONSIDERED AS MINIMUM REQUIREMENTS AND ANY DEVIATIONS FROM THE DIMENSIONS SHOWN MUST BE SPECIFICALLY APPROVED. THE FINISHED CASTINGS SHALL BE OF UNIFORM QUALITY, FREE FROM BLOWHOLES, POROSITY, HARD SPOTS, SHRINKAGE DISTORTIONS OR OTHER DEFECTS.

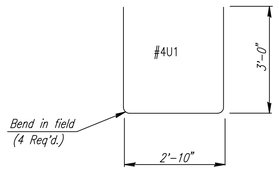
CONSTRUCTION REQUIREMENTS AND MATERIALS FOR MASONRY WALLS SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.

INLET FLOOR SHALL BE SHAPED WITH UNREINFORCED CONCRETE (8 SACK SAND MIX) TO CREATE FLOW CHANNELS AND TO INCREASE HYDRAULIC EFFICIENCY SUCH THAT THE INLET WILL BE SELF CLEANING BETWEEN ALL INLET AND/OR OUTLET PIPES.

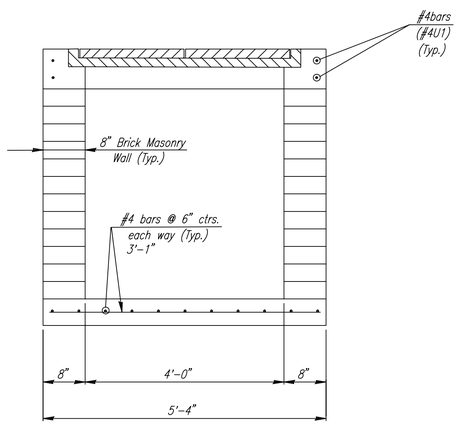
AREA INLETS SHALL BE MEASURED AND PAID FOR AT THE CONTRACT UNIT PRICE BID PER EACH. THIS SHALL BE CONSIDERED FULL COMPENSATION FOR ALL EXCAVATION, BACKFILLING, MATERIALS, LABOR, CONNECTION TO EXISTING STRUCTURES, (IF REQUIRED), EQUIPMENT, TOOLS, AND INCIDENTALS NECESSARY TO COMPLETE THE WORK.



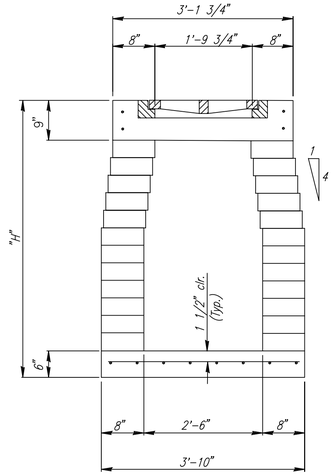
PLAN



BENDING DIAGRAM

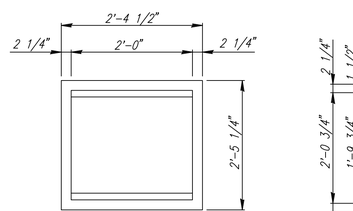


SECTION C-C

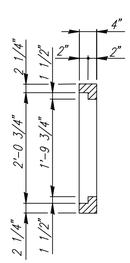


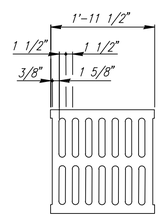
SECTION D-D

AREA INLET

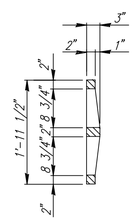


FRAME DETAIL
(Wt.=460 lbs.)





GRATE DETAIL
(Wt.=180 lbs.)



GENERAL NOTES

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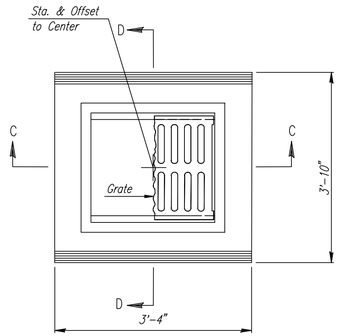
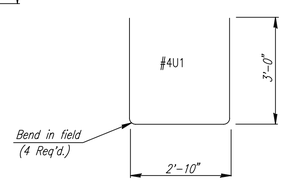
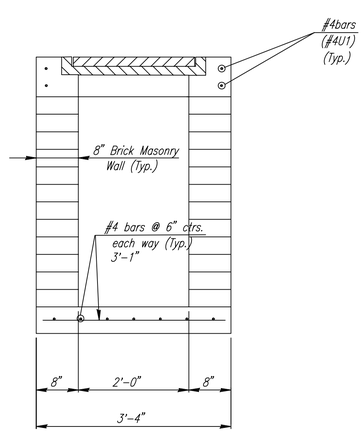


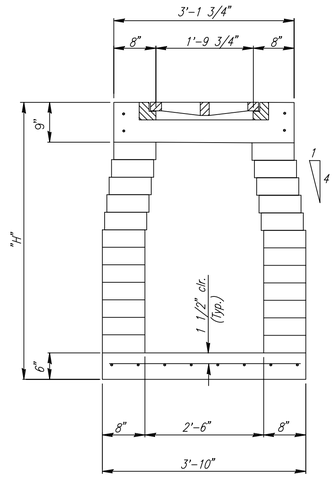
PLAN



BENDING DIAGRAM



SECTION C-C



SECTION D-D

AREA INLET

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

STANDARD AREA INLET DETAILS

Designed by ---	Job No.		FIGURE III-5
Drawn by ---	Date December 2006		

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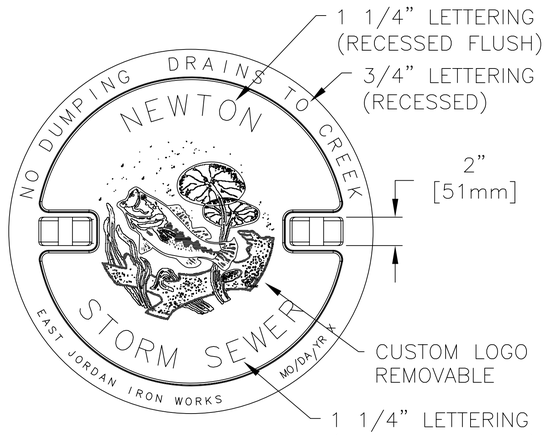
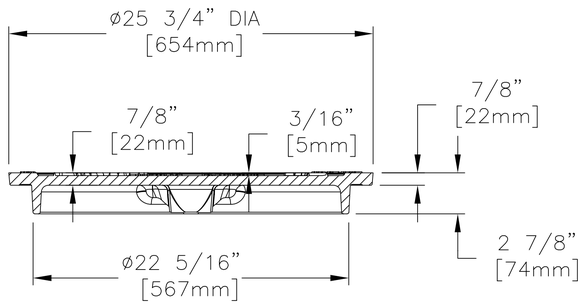
Q:\1999\99129\Newton Standards\Storm\III-05

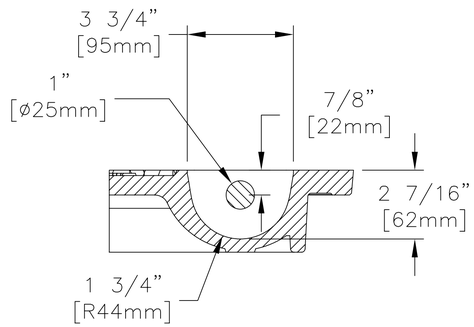


PLAN VIEW

BOTTOM VIEW



SECTION VIEW



PICKBAR DETAIL

EJIW EAST JORDAN IRON WORKS EST.1883
800-626-4653
www.ejiw.com
MADE IN USA

PRODUCT NUMBER
NCR07-0030A

CATALOG NUMBER
1936A3

COVER

LOAD RATING
HEAVY DUTY

COATING
UNDIPPED

ESTIMATED WEIGHT
COVER: 131 LBS 60kg

MATERIAL SPECIFICATION
COVER – GRAY IRON
ASTM A48 CL35B

OPEN AREA
N/A

√ DESIGNATES MACHINED SURFACE

DRAWN	DATE
SMH	01/08/07
LAST REVISED	DATE

REFERENCE INFORMATION
00193651 LOGO COPE
00193621.1DRAG

GENERAL NOTES

1. MANHOLE CASTINGS SHALL BE MANUFACTURED USING GOOD QUALITY GRAY IRON CONFORMING TO CLASS 35 B OF A.S.T.M. DESIGNATION A-48. DIMENSIONS AND WEIGHTS SHOWN ON THE DETAILED DRAWINGS SHALL BE CONSIDERED AS MINIMUM REQUIREMENTS AND ANY DEVIATIONS FROM THE DIMENSIONS SHOWN MUST BE SPECIFICALLY APPROVED. THE FINISHED CASTINGS SHALL BE OF UNIFORM QUALITY, FREE FROM BLOWHOLES, POROSITY, HARD SPOTS, SHRINKAGE DISTORTIONS OR OTHER DEFECTS. DIMENSIONS AS DETAILED ON THE PLAN SHALL NOT DEVIATE BY MORE THAN ±1/16". CASTINGS WEIGHING LESS THAN THE MINIMUM SPECIFICATIONS WILL NOT BE ACCEPTED.
2. MANHOLE CASTINGS SHALL BE MANUFACTURED SUCH THAT A COVER MANUFACTURED BY ANY ONE FOUNDRY WILL FIT INTERCHANGEABLY INTO A FRAME MANUFACTURED BY ANOTHER FOUNDRY AND STILL MEET ALLOWABLE CLEARANCES AND NON-ROCKING REQUIREMENTS. THIS WILL REQUIRE MANUFACTURING OF THE MATCHING FACES ON THE COVER AND THE FRAME TO CLOSE TOLERANCES.
3. THE OUTSIDE CIRCUMFERENCE OF THE VERTICAL FACE OF THE COVER AND THE INSIDE CIRCUMFERENCE OF THE VERTICAL FACE IN THE FRAME RECESS SHALL BE MANUFACTURED TO TOLERANCES SUCH THAT THE CLEARANCE BETWEEN THE COVER AND FRAME WILL NOT EXCEED 1/8" AT ANY POINT AROUND THE CIRCUMFERENCE OF THE COVER. THE SEATING SURFACES BETWEEN THE COVER AND FRAME SHALL BE MACHINED SUCH THAT THESE SEATING SURFACES SHALL MAKE FULL CONTACT FOR THEIR FULL CIRCUMFERENCE TO PRECLUDE THE COVER FROM ROCKING IN THE FRAME.
4. THE MANHOLE COVER SHALL BE MARKED WITH LETTERING INDICATING THE NAME OF THE MANUFACTURER AND THE YEAR WHEN THE COVER OR FRAME WAS CAST. THE TEXTURE OF THE TOP SURFACE OF THE COVER SHALL BE MANUFACTURED IN A CHECKERED PATTERN DESIGN AS INDICATED ON THE DRAWINGS. SMOOTH BLOCKOUTS SHALL BE UTILIZED TO HIGHLIGHT THE LETTERING ON THE COVER SURFACE. THE TOTAL AREA OF SMOOTH SURFACE BLOCKOUT SHALL NOT EXCEED THE AREA AS INDICATED ON THE DRAWING.
5. NO OTHER LETTERING OR MARKINGS OTHER THAN THOSE DETAILED ON PLAN WILL BE PERMITTED ON CASTINGS.
6. CASTINGS MUST BE DOMESTICALLY MANUFACTURED IN THE UNITED STATES OF AMERICA.
7. MANHOLE CASTINGS SHALL BE EAST JORDAN IRON WORKS NO. 1936A3 OR APPROVED EQUAL, UNLESS OTHERWISE SPECIFIED IN THE SPECIAL CONDITIONS. ALL MANHOLE CASTINGS SHALL BE CONSIDERED SUBSIDIARY TO THE UNIT PRICES BID FOR THE VARIOUS MANHOLE TYPES.
8. THE MANUFACTURER SHALL SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL PRIOR TO MANUFACTURE. THE ENGINEER SHALL RETAIN THE RIGHT TO REJECT CASTINGS NOT CONFORMING TO THE SPECIFICATIONS OR THE APPROVED SHOP DRAWINGS.
9. GASKETS SHALL NOT BE PROVIDED FOR STORM SEWER INLETS/MANHOLES.

No.	Revision	By	Date

CITY OF NEWTON
HARVEY COUNTY, KANSAS

MANHOLE FRAME AND COVER DETAILS
(STORM SEWER)

Designed by ---	Job No.	FIGURE III-6	
Drawn by ---	Date December 2006		

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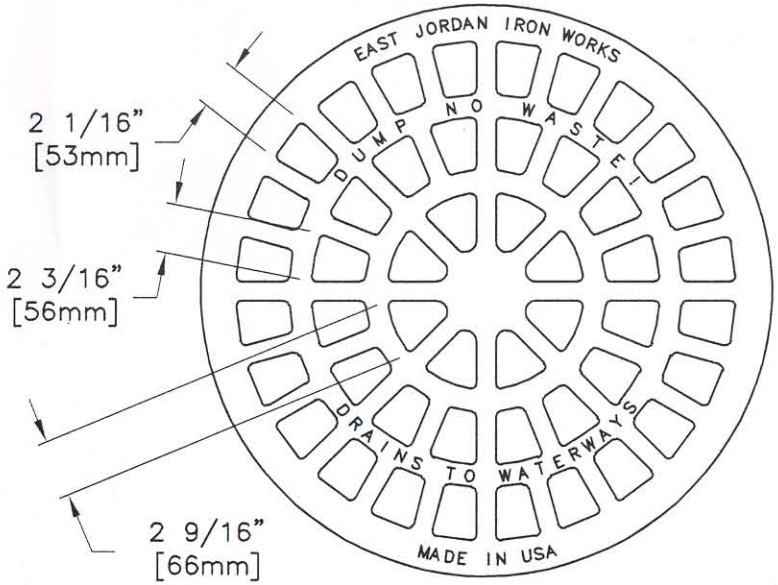
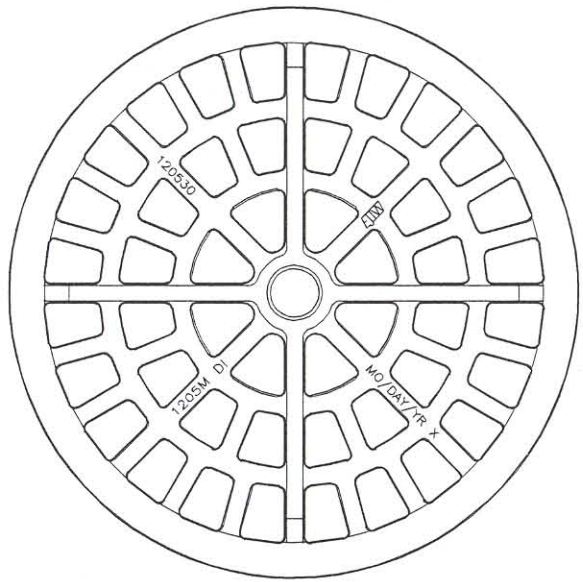
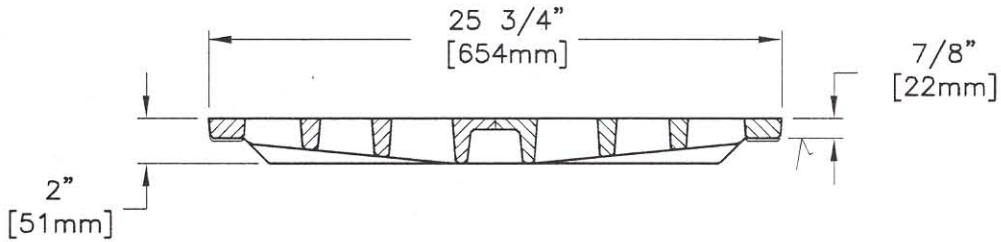




BOTTOM VIEW
OF GRATE



GRATE SECTION

√ MACHINED SURFACE

EAST JORDAN
IRON WORKS, INC.
P.O. BOX 439
EAST JORDAN, MI. 49727
1-800-874-4100
FAX 231-536-4458

DRAWN	DATE
SBB	09/08/04
APPROVED	DATE

MANHOLE GRATE

PRODUCT NO.
00120530

CATALOG NO.
1205MDI

REF. PRODUCT DRAWING
120530

EST. WT.
GRATE: 105 LBS 48kg

OPEN AREA
200 SQ. IN.
1290 SQ. CM.

MAT'L SPEC.
GRATE – DUCTILE IRON
ASTM A536

LOAD RATING
HEAVY DUTY

Figure III-7