CITY OF HIGHLAND HEIGHTS, KENTUCKY
SUBDIVISION REGULATIONS

Prepared By:
Highland Heights
Planning Commission

Highland Heights Planning Commission . . . . . Adopted: December 11, 2018

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STATUS OF AMENDMENTS

Article Number	Section	Description	Adoption Date

HIGHLAND HEIGHTS SUBDIVISION REGULATIONS

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Article 1 Purpose and Authority

1.1 Title

These regulations shall be known as the Highland Heights Subdivision Regulations and once adopted by the Highland Heights Planning Commission shall remain in effect for the City of Highland Heights located in Campbell County, Kentucky.

1.2 Provisions Declared to be Minimum Standards

In their interpretation and application, the provisions of these regulations shall be held to be minimum acceptable standards or requirements, adopted for the promotion of the public health, safety, and general welfare. Whenever the requirements of these regulations conflict with the requirement of any other lawfully adopted rules, regulations, ordinances, orders or resolutions, the most restrictive, or that imposing the higher standards shall govern.

1.3 Severability Clause

Should any section, subsection, clause, part, or provision of these regulations be declared by a court of competent jurisdiction to be unconstitutional or invalid, such invalidity shall not affect any other section, subsection, clause, part of provision of these regulations as they are severable and shall continue to have full force and effect.

1.4 Repeal of Conflicting Regulations or Ordinances, Effective Date

All regulations or ordinances, or parts of regulations or ordinances in conflict with or inconsistent with the provisions of their regulations, specifically including the Highland Heights Subdivision Regulations dated 1984 are hereby repealed to the extent necessary to give these regulations full force and effect. These regulations shall become effective from and after the date of their approval and adoption as provided by law.

1.5 Purpose and Authority

These Subdivision Regulations as herein set forth, have been prepared in accordance with the adopted Highland Heights Comprehensive Plan to promote the public health, safety, and general welfare of the county; to provide for the proper arrangement of streets in relation to existing or proposed streets; to provide for adequate and convenient open spaces for vehicular and pedestrian traffic, utilities, access of police and fire fighting apparatus, recreation, light and air, and the avoidance of congestion of the population, and to facilitate the orderly and efficient layout and appropriate use of the land. These regulations are adopted in accordance with the Kentucky Revised Statutes - Chapter 100.

1.6 Planning Commission Approval Required for Subdivision of Land

The Highland Heights Subdivision Regulations sets forth a procedure for Planning Commission approval for the subdivision of land. This procedure is stated in K.R.S. 100.277.

(A) All subdivision of land shall receive planning commission approval.

(B) No person or his agent shall subdivide any land before securing the approval of the planning commission of a plat designating the areas to be subdivided, and no plat of a subdivision of land within the planning unit jurisdiction shall be recorded by the county clerk until the plat has been approved by the planning commission and the approval entered thereon in writing by the chairman, secretary, or other duly authorized officer of the planning commission.

(C) No person owning land composing a subdivision or his agent shall transfer or sell any lot or parcel of land located within a subdivision by reference to, or by exhibition, or by any other use of a plat of such subdivision, before such plat has received final approval of the planning commission and has been recorded. Any such instrument of transfer or sale shall be void and shall not be subject to be recorded unless the subdivision plat subsequently receives final approval of the planning commission, but all rights of such purchaser to damages are hereby preserved. The description of such lot or parcel by metes and bounds in any contract or instrument of transfer or other document used in the process of selling or transferring same shall not exempt the person attempting to transfer from penalties provided or deprive the purchaser of any rights of remedies he may otherwise have. Provided, however, any person or his agent, may agree to sell any lot or parcel of land located within a subdivision by reference to an unapproved or unrecorded plat or by reference to a metes and bounds description of such lot and any such executory contract of sale or option to purchase may be recorded and shall be valid and enforceable so long as the subdivision of land contemplated therein is lawful and the subdivision plat subsequently receives final approval of the planning commission.

(D) Any street or other public ground which has been dedicated shall not be accepted for maintenance by the legislative body until it has received final plat approval by the planning commission. Any street that has been built in accordance with specific standards set forth in subdivision regulations or by ordinance shall be, by operation of law, automatically accepted for maintenance by a legislative body forty-five (45) days after inspection and final approval.

(E) Any instrument of tranfer, sale or contract that would otherwise have been void under this section and under any of its subsections previously, is deemed not to have been void, but merely not subject to be recorded unless the subdivision plat subsequently receives final approval of the planning commission.

1.7 Administration

The Planning Commission may designate authority and responsibilities to a Zoning Administrator or other staff to administer the Highland Heights Subdivision Regulations:

(A) Upon finding that any of the provisions of this order are being violated, notify in writing the person responsible for such violations(s), ordering the action(s) necessary to correct such violation.

(B) Order, in writing, discontinuance of any illegal work being done, and take any other action authorized by law to ensure compliance with or to prevent violation(s) of these regulations.

(C) Interpret the Highland Heights Subdivision Regulations, including the determination of review processes, plat requirements, and the applicability and substance of design standards, based on interpretation of the stated and implied requirements of the subdivision regulations.

The Planning Commission's authority and responsibilities generally include the following with respect to governing the Highland Heights Subdivision Regulations.

(D) Review, process, and act on all plans or plats as described in these regulations.

(E) Receive and distribute fees collected as a result of subdivision review of various plats and plans and inspection services.

(F) Distribute copies of approved plans and plats as needed to various governmental bodies, agencies such as public works or public service departments, building department, water and sewer districts, property valuation administrator's office, county clerk's office, and utility companies.

(G) Delegate any tasks as specified in these regulations relative to its administration.

The City of Highland Heights authority and responsibilities generally include the following with respect to governing the Highland Heights Subdivision Regulations.

(A) Perform on-site construction inspections of public improvements in accordance with the approved plans, plats, or drawings.

(B) Assure that all public improvements inspected are complete and have been constructed in accordance with the approved plans, plats, or drawings.

(C) Receive or hold guarantees and bonds for proper installation of public improvements as described in Article 3 of these regulations.

(D) Take action on acceptance for maintenance of public improvements as delineated on final plats approved by the Highland Heights Planning Commission and formally requested by the subdivider, developer or owner of the proposed subdivision.

1.8 Waiver of Subdivision Regulations

Upon request to the Administrative Official, an applicant, developer or property owner may seek a waiver of any subdivision regulation in this document based upon a written request (including a completed application and related fees). The Administrative Official shall review the individual request and may grant a waiver under unusual or extreme circumstances or refer the request to the Planning Commission for action. An action must make findings of fact to support the granting of the waiver. This findings of fact must include:

1. a) The waiver is not in conflict with the intent and purpose of these Subdivision Regulations, the zoning ordinance and the adopted comprehensive plan; and,

b) The waiver will not be detrimental to the public welfare.

AND at least one of the following:

2. a) Unusual topographic or exceptional physical conditions exist on the proposed site that are or were not created by actions of the subdivider or anyone on his/her behalf; OR

b) Strict compliance with these Subdivision Regulations would deprive the subdivider of reasonable use of the land; OR,

c) The waiver will provide for an innovative design layout of the subdivision.

The Administrative Official shall also inform the Planning Commission, on a regular basis, of the results of all waiver requests.

1.9 Appeals

Any person or entity claiming to be injured or aggrieved by an official action, order, requirement, interpretation, grant, refusal, or decision by the Administrative Official relative to the administration of these subdivision regulations may appeal such decision to the Planning Commission within thirty (30) consecutive calendar days. Such appeal shall follow the procedures and notice requirements for an appeal as stated in Article 17 of the Highland Heights Zoning Ordinance.

In accordance with KRS.347, Any person or entity claiming to be injured or aggrieved by any final action of the Planning Commission may appeal from the final action to the Campbell County Circuit Court. Such appeal shall be taken within thirty (30) consecutive calendar days after such action. For purposes of this section, final action shall be deemed to have occurred on the calendar date when the vote is taken to approve or disapprove the matter pending before the body.

Article 2 Procedure For Subdivision Approval

2.1 Summary of the Subdivision Review Procedure

The following articles apply to subdivisions or the divisions of land which are used for commercial, industrial, residential, or other types of uses. The subdivision of land can occur in two forms.

The first form involves a minor division of land (Conveyance Plat). A minor division of land involves the division of five (5) buildable lots or less from the parent tract, including any remainder or residual tract(s), and is located along an existing public street.

The minor division of land involves no widening or extension of a public or private street, and no public utility improvements. A Conveyance Plat may also be used to record routine sales or the transfer of property from one owner to another. Often, lending institutions require a plat to be prepared for a sale to occur. Many older parcels, including those in "baby farms" or extremely narrow parcels in older subdivisions dating from the early to mid twentieth century are non-buildable parcels under the current zoning. In circrumstances like these, the Convenance Plat can be used to combine existing parcels into one larger parcel. Conveyance Plats can provide a less formal procedure in these instances. A property owner may use an unlimited amount of conveyance plats if the subdivided parcels are non-buildable lots and do not meet the current zoning requirements. If an applicant or property owner originally used the Conveyance Plat or minor division of land procedure, but then decided to create more than five buildable lots from the parent tract, then the applicant shall be required to follow the major division of land procedure.

The second form involves a major division of land or six (6) or more buildable lots from the parent tract (including any remainder or residual tracts), and/or subdivisions which include public utilities and/or public or private streets. The review procedure for a major division of land involves a Preliminary Plat, Improvement Plan, and a Final Plat. If, however, the division of land of six (6) or more buildable lots does not require any public utility or public street improvements, the developer will only be required to submit a Preliminary Plat and a Final Plat for review and approval. The major division of land procedure shall also be followed if five cumulative prior conveyances have already occurred from the parent tract under the current ownership.

(A) Minor Division of Land - The subdivider or applicant submits a Conveyance Plat to the Highland Heights Planning Commission for review and approval based upon the requirements in Section 2.15 of this document. Once approved, the subdivider or applicant may then proceed to record the Conveyance Plat in the Campbell County Clerk's office. If the new owner of the property intends to build a structure, then he or she may then proceed to obtain zoning and building permits for each tract in the subdivision.

(B) Major Division of Land - The subdivider or applicant submits a Preliminary Plat to the Highland Heights Planning Commission for review and recommendation. The Planning Commission shall review and take action either to approve or disapprove a Preliminary Plat within ninety (90) days unless the time limitation is waived by agreement between the Planning Commission and the developer. The Preliminary Plat shall also be provided to other public utilities, including the fire district for assistance in reviewing the plans.

MINOR DIVISION OF LAND	MAJOR DIVISION OF LAND
5 buildable lots or less from the parent tract no street improvements or extensions no public utility improvements	6 buildable lots or more from the parent tract street improvements or extensions to public or private streets public utility improvements
	Preliminary Plat
	Improvement Plan (not required when private streets are the only subdivision improvement involved or when no public street or utility improvements are involved)
Conveyance Plat	Final Plat

After the Preliminary Plat is approved, the subdivider submits an Improvement Plan to the Highland Heights Planning Commission for review. The Planning Commission shall review and take action either to approve or disapprove the Improvement Plan within two consecutive commission meetings unless the time limitation is waived by agreement between the developer and the Planning Commission. Once the Preliminary Plat and Improvement Plan are approved by the Planning Commission, the subdivider or applicant may commence grading of the site and construct utilities and streets, subject to review, inspection and approval of federal, state and local government agencies for such public utilities.

Once construction work has commenced in a subdivision or proposed subdivision and the public improvements (e.g. streets, sanitary sewer lines, storm sewer lines and water lines, etc.) are completely installed or near completion and inspected, a Final Plat shall be submitted to the Planning Commission for review and action. Such public

(B) Continued:

improvements shall be completed and inspected prior to Final Plat approval. Consequently, no lot in an existing or proposed subdivision can be sold or transferred until a Final Plat has been reviewed and approved by the Planning Commission and signed by an officer of the Highland Heights Planning Commission (Chairman, Vice-Chairman, Secretary/Treasurer or the Temporary Presiding Officer), and recorded in the Campbell County Clerk's office.

Final Plat approval or disapproval shall occur within a thirty (30) day time period, and can occur simultaneously with Improvement Plan review. The developer or applicant can then proceed to obtain zoning and building permits for each structure in the subdivision.

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As previously stated, if a subdivider or applicant proposes to develop a major subdivision with private roads and no public utilities (e.g. sanitary sewer, storm sewer and water mains) are either planned in the near future and are not located in the general vicinity, then the applicant will be required to submit a Preliminary Plat and Final Plat to the Highland Heights Planning Commission for review and approval. In addition, the applicant shall be required to submit detailed street and grading plans with the Preliminary Plat for the private street construction. Any proposed private streets shall be one hundred (100%) percent completed (per section or phase), inspected for compliance with the approved Preliminary Plat and the requirements of Section 4.1-23, Private Streets and Roads, and approved by the Highland Heights Planning Commission prior to approval of a Final Plat; no bonds or other such guarantees shall be accepted to allow the filing of a Final Plat prior to the completion of any private road. If a proposed subdivision already has frontage on a publicly dedicated street and no new street will be constructed or extended, then the applicant is only required to show the elevation of the public road, the location of right-of-way, and the pavement width.

(C) Resubdivision of a Previously Recorded Lot - If a subdivider or applicant wishes to resubdivide a previously recorded lot that is currently recorded on a Final Plat into two (2) or more buildable lots, then the applicant shall submit an amended Final Plat and if the resubdivision is for a non-buildable lot from an existing lot, then the applicant shall submit a conveyance plat for review and approval by the Planning Commission. If a subdivider or applicant wishes to resubdivide a previously recorded lot that is not recorded on a Final Plat, and the proposed resubdivision does not require the Major Division of Land procedure described herein, then the subdivider or applicant shall submit a Conveyance Plat for review and approval by the Planning Commission.

(D) Remainder or Residual Tracts or Lots - The creation of a remainder or residual tract is a subdivision pursuant to these regulations and KRS 100.111, except when the land involved is for an agricultural use as defined by said statute. Remainder or residual tracts are not required to be platted and given a new legal description when the parent tract is subdivided, however, sufficient evidence must be provided to demonstrate that any remainder or residual tract is a buildable lot per the applicable zoning regulations and subdivision regulations when the plat for the subdivision of the parent tract is submitted to the Planning Commission for review. Otherwise, the remainder or residual tract must be platted as a non-buildable lot on the same plat document as the other lot(s) which is (are) being subdivided from the parent tract. One remainder or residual tract may be created per record plat, in addition to any future subdivision phases which are shown on an approved Preliminary Plat.

2.2 Advisory Meeting with Planning Commission

Prior to application for Major Division of Land review and approval before the Planning Commission, each applicant, property owner, or developer is required to have a pre-application meeting or discussion with City and/or Planning Commission staff. This meeting is intended to familiarize the subdivider with the current regulations and to ascertain the location of any planned projects which may affect the property being considered for subdivision. This would also include a review of the topography of the area to determine where potential street connections to adjoining property should occur as well as to estimate the number of businesses or dwelling units that would be supported by the proposed subdivision.

At this stage the subdivider and Planning Commission staff should discuss all suitable development options. This pre-application step does not require a formal application or filing of a plat with the Planning Commission. The subdivider or applicant is encouraged, however, to prepare a plat or plan so that the Planning Commission will have the maximum amount of information available for review purposes.

2.3 Revision of Previously Approved Preliminary Plats and Improvement Plans

In certain cases, a developer or applicant may find it necessary to make changes to the arrangement, size, number, or location of individual lots, streets, or utilities. These changes are usually recognized by the Planning Commission in the subdivision review process. In general, the Preliminary Plat, Improvement Plan, and Final Plat shall be similar in design and shall follow the same general development concepts. Depending on whether the changes are major or minor in nature, the Planning Commission may request that a developer or applicant submit a revised Preliminary Plat and/or Improvement Plan for Planning Commission action or for its files. It is the responsibility of the developer or property owner of the subdivision to submit any revised Preliminary Plat or Improvement Plan to the Planning Commission and to the affected utility company/organization or legislative body. For changes proposed to an approved Preliminary Plat and/or Improvement Plan, the Planning Commission will determine if the proposed changes are major or minor in nature in terms of overall impact of the subdivision phase on the adjoining properties and community facilities. The changes will include, but not be limited to, number of lots, lot and street configurations, grading and drainage design, utilities and street construction. Minor changes may be reviewed and approved by the Planning Commission's staff without an additional formal review procedure. Major changes shall be reviewed through the normal application procedures.

2.4 Revocation of Subdivision Plat

Revocation of a previously approved Subdivision Plat shall be permitted only in accordance with KRS 100.285.

2.5 Preliminary Plat Review Procedure

(A) After meeting informally with the Planning Commission's Staff as recommended in Section 2.2, the subdivider shall, prior to the making of any improvements, prepare a Preliminary Plat for review and approval by the Highland Heights Planning Commission.

(B) A subdivider or applicant shall file an application and submit seven (7) copies of a Preliminary Plat of the proposed subdivision to the Highland Heights Planning Commission. IN ADDITION, COPIES OF THE PRELIMINARY PLAT ARE RECOMMENDED TO BE SUBMITTED TO THE FOLLOWING APPROPRIATE ORGANIZATIONS OR AGENCIES:

1) The City of Highland Heights or their representative;
2) public/private utilities (water, sewer, electric, telephone, gas, cable, etc.);
3) state highway department or county/city public works department;
4) fire department or district;
5) soil conservation service; and,
6) local or state health board.

Action or comments received by the legislative bodies, the public/private utilities, or other agencies is not required for Planning Commission action. The purpose of this recommendation is to begin coordination of reviews and to seek input from the various organizations or agencies in order to keep revisions to the Preliminary Plat and subsequent reviews at a minimum. Any comment from an outside agency shall be received within a two-week period.

(C) The Planning Commission shall review and take action to approve or deny the submitted application based upon the requirements stated in these Subdivision Regulations.

2.6 Preliminary Plat Requirements

The Preliminary Plat shall meet the minimum acceptable design standards and the general applicable regulations for the construction of public improvements as set forth in this document and shall contain the following information:

(A) The proposed subdivision plat shall be drawn to scale of not less than one (1) inch equals one hundred (100) feet. A graphic or written scale shall be noted on the plat along with the date of the plat and north arrow.

(B) The proposed subdivision name and the names and addresses of the owner, developer and the name, address, and seal of a Kentucky licensed Professional Engineer, and/or licensed Professional Land Surveyor responsible for designing the plat. A Preliminary Plat must be designed by both a Kentucky licensed Professional Engineer and a licensed Professional Land Surveyor if the subdivision proposal involves public infrastructure improvements. If no infrastructure improvements are involved, a Preliminary Plat must be designed by a licensed Professional Land Surveyor.

(C) A vicinity map showing the proposed location of the subdivision in relation to major or minor roads in the area. The vicinity map shall have an approximate scale.

(D) All proposed uses including the type of housing (e.g. single-family attached or detached, townhouses, duplexes, patio homes, etc.) or other uses in the subdivision and any public dedication or reservation of land.

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(E) Acreage of land to be subdivided, the total number of lots, and if applicable, the approximate number of acres in open space or other public uses.

(F) Existing contours with intervals of not more than two (2) feet to reflect the current topography of the proposed subdivision with elevations based on mean sea level (U.S.G.S. Datum). Also, the current elevations on adjoining streets or roads shall be indicated to determine proper access management.

(G) Identify all landscaped areas within a public street right-of-way along with maintenance of such features. If landscaped islands are proposed, drainage facilities are required. Proposed street trees shall be shown or noted.

(H) Boundary lines of the land to be subdivided in heavy solid lines, including lengths and bearings. The following existing features within 100 feet of the subdivision boundary shall be indicated: all existing buildings, cemeteries, (see Article 4 Standards for Subdivision Review), historical landmarks or features, railroads, bridges, all private/public utility facilities and easements, the present zoning classification, both on the land to be subdivided and on the adjoining land, and the names of adjacent subdivisions and all street rights-of-way. All existing topography and water courses (creeks, rivers, swales, drainage ditches, etc.) within 200 feet of the subdivision boundary shall be indicated. The names of the property owners of all adjoining unsubdivided properties shall be noted. If the proposed subdivision is an additional section of an existing subdivision, the plat shall show the numbering of all adjoining sections and lots.

(I) Information pertaining to the proposed and existing public/private utility layouts (e.g. storm and sanitary sewer, water, gas, telephone, electric, cable, etc.) based upon existing and proposed service lines. If applicable, location of all detention/retention areas. The preliminary utility layout for the subdivision shall define the location and direction of flow of each stormwater and sanitary sewer, and the location of each water line. Telephone, electrical, and cable service should be noted as being installed underground or overhead.

(J) An overall conceptual plan for sanitary sewer, storm sewer, and water service.

(K) Names, locations, and widths of proposed streets according to the standards of this document. The applicant shall state whether the proposed streets will be public or private. Also, any existing easements shall be shown along with other open spaces or reservation of land. Lots shall be numbered and the lot sizes shall be noted on the plat. For all subdivisions that involve private roads and no public improvements (public streets, storm or sanitary sewers, water mains, etc.), detailed street and grading plans shall be provided.

(L) Approximate boundaries of 100 year flood plain using the National Flood Insurance Program (FEMA) maps. The plat shall show all flood-prone areas. Also, a map using the current U.S. Geological Survey data shall be included to demonstrate the drainage basins upstream and downstream from the development.

(M) Kope Geologic formation Reference to the existing soil types of the site or proposed subdivision. The location and identification of soil types can be found in the Soil Survey of Boone, Kenton, and Campbell Counties, Kentucky. If other data is used, it shall be certified by a professional geotechnical engineer The soil types shall be listed on the Preliminary Plat in order to determine any potential environmental impact as a result of building or public improvement construction on each soil type.

(N) A digital copy of the Preliminary Plat if the plat was computer generated (CAD format).

2.7 Preliminary Plat Approval

(A) The subdivider shall file the completed Preliminary Plat application with the City offices during normal business hours. The Planning Commission shall indicate its approval or disapproval within ninety (90) days from the date of filing, unless such time is extended by agreement between the Planning Commission and the subdivider. If a request is denied, the reasons for denial shall be provided to the subdivider in writing. The basis for action shall be in conformance with the applicable requirements of the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations.

(B) Approval of the Preliminary Plat by the Planning Commission shall not constitute acceptance of the Improvement Plan or Final Plat.

(C) The approval of the Preliminary Plat shall be in effect for two (2) years from the approval date unless an Improvement Plan for at least one (1) section of the subdivision is submitted for review and approval. As each section of a subdivision is approved and developed, the approval of the Preliminary Plat will be extended for a two year period beyond each approved section or phase. A two (2) year extension of approval of a Preliminary Plat is possible through an application to and action by the Zoning Administrator. Any deviation from or changes made to the approved Preliminary Plat shall be submitted to the Planning Commission for review and approval by the Staff. The Planning Commission shall distribute the approved copies to the appropriate organizations.

2.8 Improvement Plan Review Procedure

A) The applicant is encouraged to have a pre-application meeting with the Planning Commission's Staff. After meeting informally with the Planning Commission's Staff, the subdivider or applicant shall, prior to the construction and installation of any utilities or

roads or grading of any parcel, prepare and submit an Improvement Plan for review and action by the Planning Commission. In general, the Improvement Plan shall be consistent with the approved Preliminary Plat.

B) The property owner, developer, or applicant may file an application and submit an Improvement Plan at any time during normal business hours. The staff will review each plan, and the Planning Commission shall indicate its approval or disapproval within two consectutive commission meetings unless the time limitation is waived by agreement between the developer and the Planning Commission. If the Planning Commission approves the plan then the applicant may proceed with construction.

(C) The applicant shall submit seven (7) copies of an Improvement Plan of the proposed subdivision to the City offices. Copies of the submitted Improvement Plan may then be forwarded by the Planning Commission's Staff to the appropriate public/private utility companies, legislative bodies, state, county, or city road department, soil conservation service or other pertinent body in order to seek input and coordinate reviews. Action or comments received from the above organizations is not required for Planning Commission approval.

2.9 Improvement Plan Requirements

The Improvement Plan shall provide the minimum acceptable design and improvement standards which are required as a precondition to development or in conjunction with development for lots, streets, utilities, and other physical elements in the subdivision. Based upon the information and design plans of the subdivision, the Planning Commission may request additional information on any of the following requirements in order to clarify design issues. The Improvement Plan shall be designed by a Kentucky licensed Professional Engineer and installed in accord with these and other applicable regulations, and shall contain the following information:

(A) The proposed name of the subdivision or development. In no case shall the name of a proposed subdivision duplicate or be similar to an existing subdivision in Campbell County unless it is an extension or expansion of existing subdivision.

(B) Names and addresses of owner or developer of the subdivision and the Kentucky licensed Professional Engineer responsible for the design of all improvements. The plan shall be certified with the seal of the engineer.

(C) A vicinity map showing the proposed location of the subdivision in relation to roads in the area, and the boundaries of the phase or phases under review relative to the entire subdivision. The vicinity map shall have an approximate scale.

(D) The plan shall be to a scale of one inch (1") is equal to fifty (50) feet and the submitted drawing shall be a 24" X 36" sheet size unless another scale is approved by Staff. On large lots, this scale may be used to show just the graded portion of the lots and improvements. A graphic or a written scale shall be on each sheet of the plan.

(E) The date shall be on the cover or first sheet of the plan, and a north arrow shall be on all sheets of the plan.

(F) The boundary of the subdivision or section of subdivision under review shall be indicated by a heavy, solid line on one sheet of the plan at a standard scale to show the location of section under review with other sections of the subdivision. All subdivision boundary lines shall be labeled with the bearing and distance.

(G) Location, right-of-way width, and name of all existing and recorded streets, railroads, public and private utility rights-of-way or easements (including drainage easements); water courses (creeks, rivers, swales, drainage ditches, etc.); public parks and open spaces; buildings (labeled as "to remain" or "to be removed"); corporation, county and state lines; cemeteries (see Article 9) and other historical landmarks or features. Drainage easements not planned to be piped shall be labeled "surface drainage easement."

(H) Location and sizes of all existing utility facilities (public and private) within or adjacent to the subdivision or development area. Location and width of all public or private sidewalks, including ownership and maintenance of private sidewalks and pathway systems.

(I) Location and identification of all existing zoning districts within or adjoining the subdivision or project area. If used for residential purposes, the type of housing shall be stated on the Improvement Plan.

(J) Existing contours with intervals of not more than two feet (2') shall be clearly marked with elevation based on mean sea level (U.S.G.S. Datum) and location and description of the benchmark used.

(K) Location, right-of-way and pavement width, and name of all proposed streets and other public utility right-of-ways or easements. Show striping of street lanes on roads with more than two lanes. Also, show location of street lights and submit detail of a typical light fixture. A typical detail drawing, which depicts the classification of the proposed street shall be shown on the Improvement Plan. Where divided entrances are proposed, detail plans shall be submitted for review and approval. Note signage located at the temporary dead end of streets that are planned to continue through a development and connect with an adjoining property or another roadway to inform the public of a future street connection. Proposed street names shall not duplicate or too closely approximate phonetically, the name of any other street in Campbell County. Street stations and PVI's shall be labeled on the centerline of proposed streets and correspond to profiles of said street. (See Article 4)

For full width portland cement concrete streets, the Engineer shall submit a project specific detailed method for prevention of street creep. The design for prevention shall be included within the drawing/details of the specific application submitted. Each submittal will be reviewed by the future street owner to assure that the method is acceptable to prevent creep.

The Engineer can include strategies within the street, driveways, or both. If, however, the driveway construction becomes part of the strategy, assurances will be required to insure compliance by future builders; or driveway prevention techniques included with street construction (construct portions of drives in advance).

(L) Proposed location and identification number of all lots with the distances of all proposed lot lines noted and the areas in terms of square feet. The proposed drainage of individual lots will be indicated by arrows showing the water flow off the lot.

(M) Profile of each proposed street with finish grades (including adequate extensions, where necessary, beyond the proposed subdivision or development or section) including all existing and proposed underground public utility crossings with catch basins, junction boxes, and manholes and existing private utility crossings including gas, electricity, and telephone. Horizontal scale shall be same as the plan scale, and vertical scale not less than one inch (1") equal to ten feet (10') unless approved by the Planning Commission's Engineer. Stationing shall be labeled and correspond to the plan view.

(N) Location of proposed sanitary, storm water, and water resource systems, including all facilities relating thereto such as manholes, pump stations, sewerage plants, catch basins, junction boxes, headwalls, water valves, fire hydrants. Detention/retention areas or ponds shall be clearly identified with the 100 year storm elevation labeled. Detailed drawings of all overflow facilities shall be shown. All stormwater and sanitary sewer facilities (catch basins, junction boxes, headwalls, manholes) shall be numbered and correspond to those facilities on profiles as described in paragraph "o" of this section. Connection to existing facilities shall be shown and labeled. Responsibility of maintenance of any detention/retention areas shall be noted on the Improvement Plan. If applicable, a copy of a Kentucky Division of Water Stormwater General Permit shall be submitted.

(O) Show boundaries of Buffer Zones along designated creeks.

(P) Location and identification of any drainage facility (i.e. man made dams) or natural feature (i.e. lake or pond) on the site or within one hundred feet (100') of the subdivision or development boundary which has or could have a significant impact on drainage or siltation control.

(Q) Profiles of all proposed stormwater and sanitary sewer pipelines, and facilities including percent grade, pipe diameters, material of pipe, pipe lengths, and invert elevations. Profiles shall also show all existing and proposed public utility (water, storm and sanitary sewer) crossings, and all existing private utility (gas, electric, telephone) crossings. The facilities (catch basins, junction boxes, headwalls, manholes) shall be numbered and correspond to those facilities as described in paragraph "n" of this section. The 25 year hydraulic grade lines shall be shown for all storm water systems. Detail drawings of all detention/retention overflow and controlling facilities including valves shall be shown. Connections to existing pipelines or facilities shall be shown and labeled.

(R) Design calculations for all drainage facilities including detention/ retention basins, sediment basins, storm water pipelines and drainage channels. Calculations must include flows, 25 year hydraulic grade elevations, mean velocities, etc., and be approved and signed by a Kentucky licensed Professional Engineer. (See Design Standards Section).

(S) Proposed finished contours with intervals of not more than two feet (2'), shall be clearly labeled and be related to the existing contours. Maximum grade for any excavated (cut or fill) slopes shall be 2 ½:1 (2 ½ feet horizontal for each 1 foot vertical), and the design slope shall be labeled on the plan. Engineered slopes may be steeper upon report by a geotechnical engineer approved by the Planning

Commission or City Engineer. For all residential subdivisions, the top of foundation at the first floor elevation and drainage arrows indicating the final drainage pattern of the proposed lots shall be provided. Disturbed limits shall be clearly identified on the submitted plan and in the field.

If a grading plan of the proposed subdivision or section thereof was approved under Section 290 of the Regulations, then a copy of that approved plan shall be submitted with the proposed Improvement Plan.

(T) The names of adjacent subdivisions and all street rights-of-way within two hundred (200) feet of the subdivision boundary and the names of the property owners of all adjoining unsubdivided properties. If the proposed subdivision is an additional section of an existing subdivision, the plan shall show the numbering of all adjoining sections and lots.

(U) Reference to the type of street and a typical cross-section detail as noted in the current City or County or State Street Specifications.

(V) The minimum building setback lines as stated in the current Highland Heights Zoning Regulations shall be shown on each lot.

(W) Label lots in the proposed subdivision or development that are intended to be dedicated or temporarily reserved for public use, or to be reserved by deed covenant for use of all property owners in the subdivision, and the conditions (if any) of such dedication or reservation. The applicant shall provide information regarding any dedication of public lands, restrictive covenants on non-development areas, or conservation easements.

Identify all landscaped areas within a proposed public street right-of-way along with an easement and maintenance responsibility of such features. If landscaped islands are proposed, drainage facilities are required, and a detail of the island shown and labeled. Fencing or landscape treatment shall be shown with explanatory notes or details provided. Any street trees shall be shown or noted.

(X) Location of ALL erosion and sediment control facilities shall be shown on the plan, with detail drawings of each type of facility being used. The detailed soil erosion techniques or features may be referenced on the plan in accordance with the Street, Storm, and Sidewalk Specifications and submitted Best Management Practice document. All excavated slopes shall be seeded and mulched immediately upon completion of grading of that particular slope, and right-of-ways shall be seeded and mulched within sixty (60) days of the Planning Commission's approval of the final plat of that section.

(Y) A statement regarding the intent to create a Homeowners Association and intended maintenance for HOA owned or controlled improvements.

(Z) Additional documentation or information such as geotechnical studies may be required by the Planning Commission if an applicant is proposing to make improvements on property located near or in areas classified as hillsides by Hillside Development Guidelines of the Highland Heights Zoning Regulations or along roads that have known landslides. Areas which are classified as hillsides are subject to the requirements of Section 3162 through the Preliminary Plat and Improvement Plan procedures, and Grading Plan procedure if applicable.

(AA) For subdivisions planned with individual sanitary septic systems, it is recommended that the applicant contact local and state health officials regarding the permit process and preliminary soil testing.

(BB) A digital copy of the Improvement Plan if the plan was computer generated (CAD format).

2.10 Improvement Plan Approval

(A) The subdivider shall file the completed Improvement Plan application with the Planning Commission's Staff during normal business hours. The Planning Commission shall indicate its approval or disapproval of the Improvement Plan within two consecutive commission meetings from the date of filing unless time is extended by agreement between the Planning Commission and the subdivider. If a request is denied, the reasons for denial shall be provided to the subdivider in writing. The basis for action shall be conformance with the applicable requirements of the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations.

(B) Approval of the Improvement Plan by the Planning Commission shall not constitute acceptance of the Final Plat. Approval of the Improvement Plan also shall not be construed as acceptance or agreement to accept any proposed improvement intended to be dedicated to public use.

(C) The Improvement Plan shall become null and void after two (2) years from the date of approval, unless a substantial amount of construction of significant improvements in the subdivision are made and include the following: utility installation, road construction, or extensive excavation. In addition, acceptance of a bond or guarantee will be interpreted by the Planning Commission as having met the requirements of construction of significant improvements. A two (2) year extension of approval of an Improvement Plan is possible through an application to and action by the Zoning Administrator. Any deviation from or changes made to the approved Improvement Plan shall be submitted to the Planning Commission for review and approval by the Staff. The Planning Commission shall distribute the approved copies to the appropriate organizations.

2.11 Final Plat Review Procedure

(A) The Final Plat shall, in general, conform to the approved Preliminary Plat and Improvement Plan, and if desired by the developer, it may constitute only that portion of the approved Improvement Plan which the applicant proposes to record and develop at the time, provided however, that such portion conforms to all requirements of these regulations. If an applicant or property owner originally used the conveyance plat or minor division of land procedure, but then decided to create more than five buildable lots from the parent tract and no public improvements are planned or required, then he shall be required to submit a Preliminary Plat and a Final Plat.

(B) The Planning Commission staff or designee will review the Final Plat application. The subdivider or applicant

shall submit three (3) copies of the original plat or drawing, three (copies) of the record drawing, and file an application form. Seven (7) paper copies and the original mylar plat or drawing of the revisions shall

be submitted to the Planning Commission for signature. The Chairman, Vice-Chairman, Secretary-Treasurer, Temporary Presiding Officer, or designated employee of the Planning Commission will sign the plat. The application and Final Plat shall be submitted during the regular business hours of the Planning Commission.

2.12 Final Plat Requirements

The Final Plat shall conform to the requirements as follows, and to the current minimum standards as stated by the Kentucky Revised Statutes (KRS 322) and Kentucky Administrative Regulations (201 KAR 18).

(A) The proposed name of the subdivision or development, as established by the Improvement Plan. Also, names of adjacent property owners and recorded subdivisions with section or phase number. All Final Plats shall be drawn on a 18" X 24" fixed line mylar.

(B) Location of the proposed subdivision or development.

(C) Group Number as established and published by the Campbell County Clerk's Office.

(D) Name(s) and address(es) of the owner or developer of the subdivision and the Kentucky licensed Professional Land Surveyor or surveying firm responsible for survey and lot design of the subdivision.

(E) Date, north arrow, and graphic or written scale. The scale shall not be less than one inch (1") equal to fifty feet (50'), except subdivision or developments with lots having a minimum area of eighty thousand (80,000) square feet which shall not be less than one inch (1") equal to one hundred feet (100).

(F) Boundary of the subdivision or section thereof, with bearings and distances based on the field traverse that has an accuracy in accordance with 201 KAR 18.150.

(G) Area in acres of the subdivision or section of the subdivision and area in acres of each lot that is over one (1) acre.

(H) Location and right-of-way width of all streets and easements which are to be dedicated or reserved for public or private use. All proposed easements shall clearly state the purpose of the easement and the party to which it is being conveyed. All private easements shall be labeled "private." In instances where the party responsible for the easement changes over its' course, and/or the public or private nature changes, a defined boundary shall be indicated. The recording reference for existing easements which are already of record shall be noted. Drainage or similar easements do not permit a property owner to perform grading or site work on adjoining lots under different ownership unless the easements are specifically worded to allow such work.

(I) Names of streets within or adjacent to the subdivision, and private streets shall be labeled.

(J) Centerline curve data for the right-of-way of the streets and easements with the data to include: central angle and radius, arc, length, long chord and tangent distances.

(K) Numbered lots whose boundaries are described by bearing and distance for each tangent course, and proper curve data (as given above) for curve courses. Lot corners that are within curved street sections, shall have a reference tie to the tangent line of that centerline curve. Also, if any lots were subject to a conveyance plat, those lots shall be noted with dashed lines and referenced by deed book and page number.

(L) All corners of the lots within the subdivision or section thereof shall be monumented and shown, including notation as whether were found or set, and the type of monument used in accordance with 201 KAR 18.150 (See Article 2).

(M) Location of areas to be dedicated for public use and with the planned use clearly indicated. Areas intended to be reserved for common use but not dedicated to public use shall be identified by a lot number and treated as a private lot. Lots to be conveyed to the proper legislative body for detention purposes shall be labeled and the deed of transfer shall be executed. A statement shall appear on the Final Plat that clearly describes the ownership and maintenance responsibilities for any public or non-public common areas.

(N) The following statement shall appear on the Final Plat unless noted in the form of a deed restriction by the developer of a subdivision.

"Building setbacks will be determined by current applicable zoning regulations or districts."

(O) For any patio home development or zero-lot line style of development, the developer shall provide information on design items such as landscaping, roof styles, porches, size and placement of housing units, orientation of entryways, location and orientation of garages, and the location of any off-street public parking spaces.

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(P) Certificate and seal of the Kentucky licensed Professional Land Surveyor, who is responsible for the survey that the plat represents (Article 10).

(Q) A signed and notarized certificate of the owner(s) indicating adoption of the plat and dedication of the streets, easements, and any other public areas (Appendix B). This certificate shall be signed prior to the plat being signed by an officer of the Planning Commission or at a minimum the application form for Final Plat review shall bear the signature of the property owner. When a parcel adjoins either an existing or proposed arterial, collector, subcollector or local public street, one half the right-of-way shall be dedicated and shown on the plat. This right-of-way is measured from the centerline.

(R) Reference to the current Deed Book(s) and Page Number(s) as to the transfer to the current owner(s) of all property that is a part of the subdivision or section thereof. If the reference is of more than one tract, the tract line with current deed references shall be shown on the plat.

(S) Certificate of approval of the Highland Heights Planning Commission (Article 10).

(T) Reserved blank space for the Campbell County Clerk's recording stamp (Article 10).

(U) Certificate of the approval of public streets, storm sewer line(s), public water and sanitary sewer lines(s) by the appropriate agency or legislative body, if applicable (Article 10). This also includes executing a written agreement or guarantee to cover the cost of properly installing the proposed improvements.

(V) A final copy of any Homeowners Agreement document which deals with the future maintenance of sidewalks, streets, open areas, recreational lands, street lighting, private utilities, and other items. At a minimum, the Homeowners Agreement document should include membership names, fee or dues structure, estimated cost for future maintenance items, a detailed list of maintenance items, a budget description and a description of ownership boundaries

(W) If any subdivision involves on-site individual septic tank sewage disposal systems, this statement shall appear on the Final Plat:

"Plat approval for building development and/or alteration of existing systems on each lot is contingent upon the issuance of a sewage construction permit and inspection by the local and/or state health board or district."

(X) For subdivisions which involve private on-site sanitary sewage treatment plants, the following statement shall be placed on the Final Plat:

"The sanitary sewer lines and the sewage treated at the _____ plant will be owned and operated by _____. The sanitary sewer lines will be maintained by _____ and the sewage treatment plant will be maintained by _____."

(Y) Show the location and dimensions of a cemetery if it exists on the site.

(Z) The following statement shall appear on the plat:

"This plat shall be void if not filed with the Campbell County Clerk for recording purposes within two (2) years of Planning Commission approval."

(AA) A record drawing of all public storm water and sanitary sewer improvements, including: the location, surface elevation, and invert elevations of all accessible structures; the size, slope, and material of all pipes; the as-built topography (maximum 2' contour interval) of all detention/ retention ponds; the maximum storage capacity of all detention/retention ponds; and the size and elevation of all detention/retention pond control structures.

(BB) A digital copy of the Final Plat and record drawing of public improvements if the plat and record drawing were computer generated (CAD format).

2.13 Final Plat Approval

(A) Approval or disapproval shall occur within thirty (30) days from the date of submittal. Once reviewed and approved by Staff, the Chairman, Vice-Chairman, Secretary/Treasurer, Temporary Presiding Officer, or designated employee of the Highland Heights Planning Commission will sign the approved copies and original drawing. If a request is denied, the reasons for denial shall be provided to the subdivider in writing. The basis for action shall be conformance with the applicable requirements of the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations.

(B) Upon approval and signature, copies of the Final Plat will be forwarded to the Property Valuation Administration (PVA) office, the Building Department, and the applicant. The Campbell County Clerk's office receives the approved original drawing.

(C) Approval of the Final Plat by the Highland Heights Planning Commission shall not constitute the acceptance by the appropriate legislative body of the public dedication or maintenance of any street or other facility nor shall it imply acceptance by the Campbell County Clerk for recording purposes.

(D) A Final Plat shall be recorded in the Campbell County Clerk's office within two (2) years from the date of the Planning Commission's approval or else the Final Plat shall become void.

2.14 Conveyance Plat Review Procedure

(A) The provisions for Conveyance Plat Review and approval are intended to provide a convenient and expeditious process for the conveyance or transfer of land in a minor division of land from the parent tract as described in Section 2.1 of this article.

(B) A Conveyance Plat can be used in situations where there is a minor division of land of five (5) buildable lots or less from the parent tract and when no public street improvements or utility improvements, nor the construction or upgrade of private streets, are required. Each lot intended for building or development purposes must still meet the minimum standards in each zoning district as stated on the Highland Heights Zoning Map and in the

Highland Heights Zoning Regulations. This type of plat is intended to allow the division of a single buildable lot (maximum 5 lots) from a large tract for building purposes and for the casual sales of property, including the sale of property for non-buildable lots, when the imposition of the full subdivision procedure would be unnecessary.

(C) Conveyance Plats may be submitted at any time to the Planning Commission for review and approval by the Chairman, Vice-Chairman, Secretary/Treasurer, Temporary Presiding Officer, or designated employee of the Planning Commission. Three (3) copies shall be required for submittal and an application. The application and Conveyance Plat shall be submitted during the regular business hours of the Planning Commission.

2.15 Conveyance Plat Requirements

Conveyance Plats are intended to graphically represent the information of a boundary survey of property that is to be subdivided and thus reviewed by the Planning Commission. The Plat shall conform to the following requirements and conform to the minimum standards in the Kentucky Revised Statutes (KRS 322) and the Kentucky Administrative Regulations (201 KAR 18).

(A) Date, north arrow, and standard engineering scale: not less than 1"=200' unless approved by the Planning Commission Staff. Plats may not be larger than 8-1/2" x 14".

(B) Name, address and seal of the Kentucky licensed Professional Land Surveyor responsible for the survey plat preparation and the Land Surveyor's Certificate (Appendix A).

(C) Boundary of the parcel and subdivision of that parcel, including bearings and distances of each tangent course, and all necessary data for curve courses. The traverse that the boundary is depended on shall be in accordance with 201 KAR 18.150, and if requested by the Commission, closure documentation shall be submitted in addition to the plat.

(D) Area in acres (accuracy of 0.001 acre) of the parcel; and remainder parcel if entire parent tract was surveyed.

(E) Bearing and distance to a reference tie which may be the intersection of two dedicated right-of-ways, recorded subdivision corner, primary control network monument (i.e. state plane coordinates), or a corner to the parent tract that the parcel is a division from.)

(F) Location and names of public or private right-of-ways that adjoin the boundary. All proposed easements shall clearly state the purpose of the easement and the party to which it is being conveyed. All private easements shall be labeled “private.” In instances where the party responsible for the easement changes over its’ course, and/or the public or private nature changes, a defined boundary shall be indicated. The recording reference for existing easements which are already of record shall be noted. Drainage or similar easements do not permit a property owner to perform grading or site work on adjoining lots under different ownership unless the easements are specifically worded to allow such work.

(G) Encroachments discovered in the course of the survey.

(H) Names and recording information of adjoining property owners and/or recorded subdivisions with section or phase number.

(I) Current, legible vicinity map with an accurate scale.

(J) Group number as established and published by the Campbell County Clerk's Office.

(K) Statement by the applicant on whether the transfer will be used or is being used for building or non-building purposes.

(L) Description of all monumentation, including notation as whether found or set, and the type of monument used in accordance with 201 KAR 18.150 (See Section 281).

(M) When a parcel adjoins either an existing or proposed arterial, collector, subcollector or local public street, one half the right-of-way as prescribed by Section 305 shall be dedicated and shown on the plat. This right-of-way is measured from the centerline. A signed and notarized certificate of the owner(s) indicating dedication of this right-of-way shall be on the plat. A statement of dedication shall be on the plat (Article 10).

(N) Certificate for Planning Commission approval (Article 10).

(O) Show the location and dimensions of a cemetery if it exists on the site.

(P) The following statement shall appear on the plat.

"This plat shall be void if not filed with the Campbell County Clerk for recording purposes within two (2) years of Planning Commission approval."

(Q) A digital copy of the Conveyance Plat if the plat was computer generated (CAD format).

2.16 Conveyance Plat Approval

(A) Approval or disapproval shall occur within ten (10) working days from the date of submittal. Once reviewed and approved by Staff, the Chairman, Vice-Chairman Secretary/Treasurer, Temporary Presiding Officer, or designated employee of the Planning Commission will sign the approved copies. If a request is denied, the reasons for denial shall be provided to the subdivider in writing. The basis for action shall be in conformance with the applicable requirements of the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations.

(B) Upon approval and proper signatures, a copy of the Conveyance Plat will be retained by the Planning Commission. The remaining copies will be returned to the applicant or applicant's surveyor.

(C) Approval of the Conveyance Plat by Planning Commission representatives shall not constitute the acceptance or recording of the plat in the County Clerk's office.

(D) A Conveyance Plat shall be recorded in the Campbell County Clerk's office within two (2) years from the date of the Planning Commission's approval or else the Conveyance Plat shall become void.

2.17 Monumentation

All monumentation for a proposed subdivision or development shall be in accordance with 201 KAR 18.150 with regard to material, size, shape, identification and minimum accuracies. All corners of the lots within the subdivision or section of, including individual lots, shall be monumented and shown, including notation as whether found or set, and the type of monument. Set monuments shall be placed prior to recording of plat. Setting of control within the streets (centerline marks or x-notches, curb notches, etc.) may be used in lieu of lot front corner monuments prior to plat recording, but monuments must be set prior to issuance of "Final Occupancy Permit". All street control must be shown and labeled on plat.

2.18 Condominium Property Regime Plats

In accordance with the Horizontal Property Law (KRS 381.805-381.910), whenever a developer, the sole owner, or the co-owners of a building or buildings constructed or to be constructed, expressly declare, through the recordation of a master deed or lease, a condominium property regime may be established. Once the property is submitted to the condominium property regime, a unit in the building (s) may be individually conveyed and may be the subject of ownership possession or sale and other acts as if it were sole and entirely independent of the other units in the building(s) of which they form a part and the corresponding individual titles and interest shall be recordable. It is the purpose of the condominium property regime plat to provide a process whereby two or more apartments, townhouses, rooms, office spaces, or other units in existing or proposed buildings or structures may be subdivided and offered or proposed to be offered for sale in accordance with requirements as established by these regulations. In order to be processed as a condominium property regime plat, the following requirements must be met in addition to other requirements of the subdivision regulations and applicable sections of KRS 381.805 to 381.910:

(A) The proposed condominium project does not require Preliminary Plat, Improvement Plan and Final Plat Reviews and public utilities are already in place.

(B) The proposed condominium project will not involve the subdivision and conveyance of land with any unit within the condominium property regime for which other processes are available.

(C) If condominiums are being proposed as part of Final Plat Review, the applicable regulations of this section shall apply.

2.19 Submission of Condominium Property Regime Plats

The developer shall submit to the Planning Commission seven (7) copies of the Final Plat drawing prepared in accordance with Article 2 of these subdivision regulations. In addition to other requirements of these regulations, the Final Plat shall show the location of the building or buildings proposed for the condominium project. Simultaneously, with the submission of the Final Plat, there shall be attached seven (7) copies of a set of floor plans of the building or buildings in accord with KRS 381.835 bearing the certification of a registered architect or professional engineer.

At this time, the following information shall be filed with the Planning Commission:

(A) Application for Condominium Property Regime Plat Approval: An application form provided by the Commission, shall be submitted at the time of filing for Condominium Property Regime Plat approval.

(B) Master Deed or Lease: One (1) copy of the master deed or lease, in accord with the requirements of KRS 381.835 to 381.837.

(C) Condominium Property Regime Plat Fees: Plat fees shall be submitted the same as for Final Plats, in accord with Article 1 of these regulations.

(D) A digital copy of the Condominium Property Regime Plat if the plat was computer generated (CAD format).

Prior to the construction of a planned condominium development, the following review procedures shall be followed:

(E) Public improvements associated with a condominium development (public water mains, sanitary sewer mains, etc.) shall be reviewed through the Improvement Plan procedure.

(F) Private improvements associated with a condominium development (placement and height of buildings, parking improvements, etc.) shall be reviewed through the Site Plan procedure as described in the Highland Heights Zoning Regulations. The Site Plan application and any necessary Improvement Plan application shall be submitted for review concurrently. A Preliminary Plat application is not required if the proposal does not involve the creation of tracts of land, construction of public streets, and/or the dedication of right-of-way. With the exception of setback requirements along internal public rights-of-way, the overall development site for multi-building condominium developments (versus individual buildings or lots within the overall development site) shall be evaluated for compliance with the applicable density/ intensity, setback, and parking requirements outlined in the Highland Heights Zoning Regulations.

2.20 Processing of Condominium Property Regime Plats

The Planning Commission shall review the condominium property regime plats for conformance to the applicable requirements of Article 2 of these subdivision regulations and KRS 381.805 to 381.910. If approved and signed by an officer of the Planning Commission, the original condominium property regime plats shall be recorded simultaneously with the master deed or lease in the County Clerk's office.

2.21 Grading Plan Review Procedure

(A) An application for a Grading Plan may be submitted after approval of a Preliminary Plat but before the submittal of an Improvement Plan. The Grading Plan shall be limited in its scope to grading and storm sewer work. The Grading Plan shall not include final engineered drawings for streets, water lines, and sanitary sewer lines.

(B) The subdivider or applicant shall submit seven (7) copies of the completed Grading Plan to the Highland Heights Planning Commission during normal business hours. Grading Plan applications are reviewed and approved by the Planning Commission's staff or engineer.

(C) Once the Grading Plan has been approved by the Planning Commission, the subdivider or applicant has one (1) year from the date of the approved Grading Plan to begin and to complete the work as stated in the Grading Plan or the Plan shall become null and void.

2.22 Grading Plan Requirements

Upon the approval of the Preliminary Plat, the developer of a proposed subdivision or property owner may submit a Grading Plan of the proposed subdivision or section thereof for review by the Commission's Staff. Based upon the submitted grading plan, the Planning Commission may request utility information from other phases of a subdivision if it impacts the site under review. The grading plan shall be designed by a Kentucky licensed Professional Engineer and installed in accord with these and other applicable regulations, and shall contain the following information:

(A) The name of the proposed subdivision or development.

(B) Names and addresses of owner or developer of the subdivision and the Kentucky licensed Professional Engineer, responsible for all of the improvements. The plan shall be certified with the seal of the Engineer.

(C) A vicinity map showing the proposed location of the subdivision in relation to major or minor roads in the area, and the boundaries of the phase or phases under review relative to the entire subdivision. The vicinity map shall have an approximate scale.

(D) The plan shall be to a scale of not less than one inch (1") equal to fifty feet (50'). On large lots, this scale may be used to show just the graded portion of the lots and improvements. A graphic or written scale shall be placed on each sheet of the plan.

(E) The date shall be on the cover or first sheet of the plan, and a north arrow shall be on all sheets of the plan.

(F) The boundary of the subdivision or section of subdivision under review shall be indicated by a heavy, solid line on one sheet of the plan at a standard scale to show the location of section under review with other sections of the subdivision. All subdivision boundary lines shall be labeled with the bearing and distance.

(G) Location, right-of-way width, and name of all existing or recorded streets, railroads, and public and private utility easements (including drainage easements), public parks and open spaces; buildings (labeled "to remain" or "to be removed"); incorporation, county and state lines; cemeteries (see Article 4 design standards) and other historical landmarks or natural features.

(H) Location and size of all existing utilities (public and private) within or adjacent to the subdivision or project area.

(I) Existing contours with intervals of not more than two feet (2') shall be clearly marked with elevations based on mean sea level (U.S.G.S. Datum) and location and description of benchmark used.

(J) A general location of any proposed streets and detailed plans of any storm sewer facilities to be installed at time of grading. (See Subdivision Design Standards Article 4.).

(K) Show boundaries of Buffer Zones along designated creeks.

(L) Proposed finished contours with intervals of not more than two feet (2') shall be clearly labeled, and related to existing contours. Maximum grade for any excavated (cut or fill) slopes shall be 2 ½:1 (2 ½ feet horizontal for each 1 foot vertical), and the design slope shall be labeled on the plan. Engineered slopes may be steeper upon report by a geotechnical engineer (see Article 5 - Definitions Section) approved by the Planning Commission. For all residential subdivisions, the front door floor elevation and drainage arrows shall be labeled for each building lot. For open space subdivisions, a detailed drainage plan shall be included for all building lots. Disturbed limits shall be clearly identified on the submitted plan and in the field.

(M) Location of erosion and sediment control facilities shall be shown on the plan, with detail drawings of each type of facility being used. The detailed soil erosion techniques or features may be referenced on the plan in accordance with the Street And Storm Drainage Construction Specifications and submitted Best Management Practice document. All excavated slopes shall be seeded and mulched immediately upon completion of grading of that particular slope, and right-of-ways shall be seeded and mulched within sixty days (60) of the Planning Commission's approval of the final plat of that section.

(N) Additional documentation or information such as geotechnical studies may be required by the Planning Commission if an applicant is proposing to make improvements on property located near or in areas classified as hillsides in the Highland Heights Zoning Regulations. Areas which are classified as hillsides are subject to the requirements of Section 3162 through the Preliminary Plat and Improvement Plan procedures, and Grading Plan procedure if applicable.

(O) A digital copy of the Grading Plan if the plan was computer generated (CAD format).

2.23 Grading Plan Approval

(A) Approval or disapproval shall occur within ten (10) working days from the date of submittal. If a request is denied, the reasons for denial shall be provided to the subdivider in writing. The basis for action shall be conformance with the applicable requirements of the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations.

(B) The Grading Plan will not serve as a replacement or substitute for the Improvement Plan.

2.24 Soil Erosion and Slope Control

The developer of a proposed subdivision or development shall be required to submit to the Commission a detailed plan for erosion and/or sedimentation control. The plan shall contain proposed methods for slope stabilization, erosion control and water pollution abatement and shall be reviewed by the Commission. The Commission shall require that such a plan or part thereof be submitted with the Improvement Plan and Grading Plan.

(A) Prior Grading or Disturbed Site - No Improvement Plan and/or Grading Plan may be approved where the site has been graded, stripped, excavated, devegetated or otherwise disturbed so that slipping, erosion and/or water pollution has or may reasonably be expected to occur until such conditions are corrected to the satisfaction of the Commission.

(B) Soil Survey - The current "Soil Survey of Boone, Campbell and Kenton Counties, Kentucky" issued by the United States Department of Agriculture, Soil Conservation Service in cooperation with the Kentucky Agricultural Experiment Station is hereby made a part of these regulations and will be used for informational and reference purposes.

(C) Erosion Control Measures - Must be per the current *Kentucky Best Management Practices For Construction Activities*.

Article 3 Procedure For Inspections And Enforcement

3.1 Construction Inspections

Inspections relative to the construction and installation of public improvements such as sanitary sewer, storm sewer, water, streets, driveway aprons and sidewalks shall be made by the appropriate utility company, water and sewer commission or district, public works/service department, building department, legislative body, or other representative. This inspection also includes soil erosion as it relates to public improvement construction and lot grading. Inspectors are authorized to inspect all work done and all materials furnished. Such inspection, including final inspection, may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector shall not be authorized to revoke, alter, or waive any requirements of the approved Improvement Plan drawings and specifications, but is authorized to call the attention of the contractor, any failure of the work or materials to conform to the approved improvement drawings and specifications. Any change in the approved plan and specifications shall be approved by the Planning Commission. The owner or developer of a subdivision and/or general contractor shall contact and meet with the appropriate city inspection officials for the purpose of a pre-construction meeting. The purpose of this meeting is to discuss the projects time table, local specifications and general information relating to the proposed development.

The contractor shall notify the appropriate inspector(s) in advance and in accordance with departmental procedures and prior to the time when the work is to begin on each phase of construction, such as embankments, subgrades, water system, storm and sanitary sewer systems and street paving, sidewalks, including all related testing. The inspector shall begin inspection at the time of construction and maintain inspection as the work progresses on each phase of the project until all construction is complete. Further, and during the time of construction, any work determined by the inspector not to conform to the requirements of the approved improvement plans, drawings, and specifications shall be suspended and corrected, prior to proceeding with that phase of the project.

Any work which cannot be determined to conform with the approved improvement plans, drawings, and specifications, shall be referred to the design engineer for revision and/or modification and decided upon by the Planning Commission.

3.2 Subdivider and/or Contractor Construction Responsibilities

The subdivider and/or contractor shall have available on the project, at all times, a copy of all approved plans and specifications. The subdivider's and/or contractor's superintendent shall be capable of reading and thoroughly understanding the plans and specifications and he or she shall

receive instructions from the inspector. A superintendent shall always be present regardless of the amount of work sublet.

3.3 Final Clean Up of Site

Upon completion of construction work of the subdivision or an individual lot, the subdivider, developer, and/or contractor shall remove all debris or excess fill in connection with the completed work prior to final plat approval.

3.4 Written Agreements and Guarantees

A subdivision developer or subdivider may execute and file a written agreement or guarantee with the City of Highland Heights and/or appropriate water and sewer commission/district in lieu of actual installation or completion of the required public improvements when requesting approval of the final plat in accordance with specific criteria. Such agreements or guarantees shall be an amount for the required public improvements, as estimated by the subdivider's engineer and approved by the appropriate legislative unit or water and sewer commission/district. The cost estimate shall have supporting written data and be based on the amount determined to be reasonably necessary to complete all of the public improvements required to be constructed by the subdivider as specified in the approved Improvement Plan drawings and specifications, including a ten (10) percent contingency.

The written agreement or guarantee shall typically be in the form of sureties (e.g. bond payment or performance bond from an insurance company or a financial institution), a cash deposit (e.g. escrow agreement or certified check from a financial institution), or an instrument of agreement from one or more financial institutions (e.g. letter of credit) and payable to the appropriate legislative body or water and sewer commission/district. The agreement or guarantee shall be pursued by the subdivider and developed by an insurance company or financial institution. The agreement or guarantee shall be an assurance of faithful performance of any and all work and the construction and installation of all public improvements required to be done by the subdivider, as specified in the approved Improvement Plan drawings and specifications.

The agreement or guarantee shall have no expiration date but all work must be completed within one year of the approval of the Final Plat unless approved by the appropriate accepting agency, and contain the condition that should the subdivider fail to complete all construction work and public improvements required, then the legislative unit or appropriate water and sanitary sewer commission/district may elect to complete all required public improvement construction work on its own. Consequently, the City or appropriate water and sewer commission/district shall be authorized, in the event of any default on the part of the subdivider of the performance of any work or construction of any public improvements for which such guarantees have been agreed to, to complete the required work to be done and to withdraw that amount required for payment of all costs. The following examples describe the type of information, which is typical of each type of written agreement or guarantee:

3.5 Types of Written Agreements or Guarantees

(A) Sureties - Two types of sureties are bond payments and performance bonds. The surety shall originate from an insurance company and from a financial institution. With each type of surety, the following information shall be required.

1) Terms of bond.

2) A detailed list of improvements, which the bond will cover and estimated costs.

3) Description of all work performed in relation to the bond amount.

(B) Cash Deposit - One type of cash deposit is an escrow agreement. Escrow agreements include certified checks and a special account from a financial institution. With this type of escrow agreement, the following information shall be required.

1) Terms of escrow agreement.

2) A detailed list of improvements to be made, which the escrow agreement will cover and estimated costs.

3) Description of all work performed in relation to the escrow agreement amount.

(C) Instrument of Credit - One type of an instrument of credit is a letter of credit from one or more lending institutions. With this type of instrument of credit, the following information shall be required.

1) Terms of letter of credit.

2) A detailed list of improvements to be made, which the letter of credit will cover and estimated costs.

3) Description of all work performed in relation to the letter of credit.

3.6 Review Fees

Fees for the review of a Preliminary Plat, Improvement Plan, Final Plat, Conveyance Plat, Grading Plan and other plats shall be required. Fees for the review of a preliminary plat, improvement plan, final plat, conveyance plat, grading plan and other plats shall be payable to the City of Highland Heights in accordance to the approved "Schedule of Fees".

Some utility agencies, such as Sanitation District No. 1, collect their own inspection fees outside of the Planning Commission's subdivision review and approval processes. It is the responsibility of the subdivider to pay all fees and financial guarantees as applicable, and coordinate inspections, for such utilities.

KNOW ALL MEN BY THESE PRESENTS: That _____

_____ , Principal, and _____ Surety, are held and firmly

unto _____ bound, Obligee, in the
(Name of Legislative Body)

sum of _____Dollars ($ _____) for the payment of

which we bind ourselves, our legal representatives, successors and assigns, jointly and severally,

firmly by these presents.

WHEREAS, Principal has entered into a contract with Obligee, dated _____ for Construction of public improvements relating to or arising from Right-of-Way (A) and Right-of-Way (B) in accordance with a plat from a tract of land within _____Kentucky to be known as
(Name of Legislative Body)

Section _____Lots _____and _____ pursuant to a construction contract dated _____between _____and _____Kentucky.
(Name of Legislative Body)

Copy of which contract is by reference made a part hereof.

NOW, THEREFORE, if Principal shall, in accordance with applicable Statutes, promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to Surety being waived, then this obligation to be void; otherwise to remain in full force and effect.

SIGNED, SEALED AND DATED _____

_____(Seal)

by _____
Attorney-in-Fact

Article 4 Subdivision Design Standards

4.1 Streets

4.1-1 Purpose

This section fulfills the infrastructure requirements of Kentucky Revised Statutes (KRS) 100.273 through 100.292. By establishing these Street standards as a factor in the development review process, it assures a necessary component of harmonious, progressive, and aesthetically-pleasing development. It contributes to healthy and dynamic neighborhoods where residents can live, work, shop, and play. Furthermore, it promotes the health, safety, and general welfare of the public in Campbell County. To further these more general purposes, this section:

(A) Establishes the adequacy of existing and proposed transportation elements as a factor to be considered when reviewing proposed Subdivisions;

(B) Sets forth minimum standards for new Streets and the extent to which they shall be provided;

(C) Provides a Street system of suitable location, width, and improvement to accommodate satisfactory access to police, firefighting, emergency medical services, snow removal, and maintenance equipment; and

(D) Ensures an effective traffic circulation system by requiring that new Streets extend into adjoining areas and that existing Streets interconnect from adjoining areas.

4.1-2 Street Names

The following shall apply to the naming of proposed Streets:

(A) The name of a new Street shall not duplicate existing or platted Street names within the County, or approximate such names in spelling, sound, or pronunciation.

(B) The use of existing Street names differentiated by alternate prefixes (i.e., "North," "South," etc.), or suffixes (i.e., "Lane," "Way," etc.) is prohibited.

(C) Street names shall not be objectionable or offensive.

(D) Street names shall be limited to no more than three words including any prefix or suffix, and shall not contain more than 20 characters including spaces.

(E) Punctuation, such as apostrophes or hyphens, etc., or numerals including fractions, are prohibited.

(F) Streets in direct alignment that cross an intersecting Street should bear the same name.

(G) Street names shall be approved and/or reserved by Staff prior to approval of Improvement Drawings.

4.1-3 Street Name Signs

The following shall apply to the installation of Street Name Signs:

(A) The Developer shall be responsible for the installation of Street Name Signs in conformance with standards established by the city.

(B) Street Name Signs shall be installed prior to approval of a Final Plat. Temporary Street Name Signs are permitted during construction until the permanent signs are erected.

4.1-4 Traffic Control Signs and Devices

Traffic Control signs and devices shall be the responsibility of the City of Highland Heights or KYTC.

4.1-5 Pavement Signing and Marking

(A) Pavement marking and signing shall be provided on all arterial and collector streets in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

(B) Marking and signing shall include centerline, edgeline, and lane use markings and all necessary regulatory signing.

4.1-6 Addressing

(A) Addresses shall conform to a uniform County system and be assigned by Staff prior to approval of an identification or Final Plat.

(B) Addresses shall be shown for each Lot or unit on the Plats prior to recording.

4.1-7 Public Rights-of-Way

The following shall apply to public rights-of-way:

(A) The minimum public Right-of-way width for Streets shall comply with Table 4.1-1 of these regulations.

(B) The required Right-of-way widths are based on development type and Functional Classification.

(C) Subdivisions platted along existing Streets shall dedicate additional Right-of-way, if necessary, to meet the minimum Right-of-way requirements identified in Table 4.1-1. Such dedication shall be in accord with the following:

(1) The minimum total Right-of-way width shall be dedicated where the proposed Subdivision is on both sides of an existing Street.

(2) When the Subdivision is located on only one side of an existing Street, one-half (1/2) of the required Right-of-way width, measured from the centerline of the Right-of-way, shall be dedicated.

(D) Proposed Streets shall be constructed dimensionally within the Right-of-way widths identified in Table 4.1-1. The pavement shall be located centrally within the Right-of Way width.

(E) For developments containing only Multi-Family Residential Dwellings, the Right-of-way width may be less than the minimum required width in Table 4.1-1 provided:

(1) The Right-of-way width is coupled with an ingress/egress and street maintenance easement that when totaled, equals or exceeds the minimum Right-of-way width indicated in Table 4.1-1; and

(2) That the use of the narrowed Right-of-way width coupled with the ingress/egress and street maintenance easement is approved by the authority designated by the applicable Legislative Body in writing.

4.1-8 Pavement Widths

The following shall apply to the pavement width of Streets.

(A) The minimum pavement widths shall comply with Table 4.1-1.

(B) The required pavement widths are based on development type and Functional Classification.

(C) Pavement widths shall be measured from back of Curb to back of Curb. If no Curbs are required, then pavement width shall include the entire paved surface of the wearing course. See Figure 4.1-A.

(D) Subdivisions located along existing Streets that contain pavement widths less than identified in Table 4.1-1, may be required by Staff to construct additional pavement to comply with the minimum widths contained in Table 4.1-1.

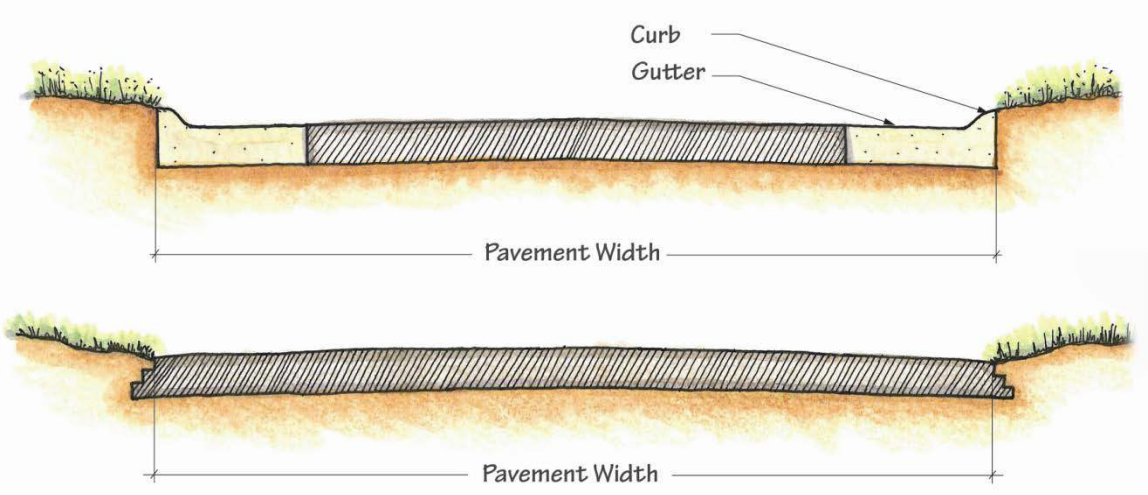


Figure 4.1-A: Illustration of pavement width measurements

4.1-9 **Street Grades** - Grades of both public and private streets in proposed subdivisions or developments shall not be greater than as follows: (See Definitions Section for type of street.) Grades shall not be less than one and one-half percent (1.5%) on any street.

1.	Major Arterial Streets.	7 percent
2.	Minor Arterial Streets.	7 percent
3.	Collector Streets.	10 percent
3.a.	Limited Access Collector Street. . . .	10 percent
4.	Sub-Collector Streets.	10 percent
4.a.	Limited Access Sub-Collector Street	10 percent
5.	Local Streets.	12 percent
6.	Residential Condominium Street	12 percent
7.	Cul-de Sacs.	12 percent
8.	Alley..	12 percent

These maximum grades may be modified by the Commission where extreme topographic conditions exist or in the interest of good site planning.

4.1-10 **Land Adjoining Arterial and Collector Streets**

(A) The subdivision of new lots on land with a minimum lot size of less than 80,000 square feet, which adjoin arterial and collector streets shall be platted in a manner which necessitates vehicular access to be provided from a secondary street, alley, or private access driveway and not arterial or collector streets. A plat note shall be provided on the record plat which states that vehicular access is prohibited from the arterial or collector street in question.

(B) The subdivision of new lots which adjoin arterial and collector streets shall be platted in a manner which necessitates vehicular access to be provided from a secondary street, alley, or private access driveway and not arterial or collector streets. A plat note shall be provided on the record plat which states that vehicular access is prohibited from the arterial or collector street in question.

(C) When a proposed residential subdivision abuts a major or minor arterial or collector road, landscape buffering shall be located along the rear and corner side yard property lines which adjoin said road. The

landscape buffer area shall include earthen berming, consistent decorative fencing, hedging, limestone wall as reqiured along U.S. 27 in the zoning regulations, evergreen or deciduous plant materials or combination thereof which are high enough at maturity to screen the adjoining lot areas at a height of at least six (6) feet.

TABLE 4.1-1: INFRASTRUCTURE AND DESIGN STANDARDS FOR STREETS										
DEVELOPMENT TYPE	FUNCTIONAL CLASSIFICATION	PAVEMENT WIDTH [1] (FEET)	CURB	PARKING	SIDEWALK/MULTI-USE FACILITIES	TREELAWN	TYPE OF BICYCLE FACILITIES	MEDIAN WIDTH	ROW WIDTH (FEET)	CROSS-SECTION FIGURE #
SUBURBAN RESIDENTIAL	Local (Serving under 200 lots)	22	Yes	None	4 feet wide	4 feet wide	None	None	40	
		25	Yes	One Side	4 feet wide	4 feet wide	None	None	50	
	Subcollector (Serving 200 to 500 lots)	35	Yes	Both	4 feet wide	4 feet wide	None	None	60	Figure 4.1-G
		22	Yes	None	4 feet wide	4 feet wide	None	None	40	
		28	Yes	One Side	4 feet wide	4 feet wide	None	None	50	
	Collector (Serving over 500 lots)	22	Yes	None	10 feet wide [2]	4 feet wide	Multi-use path	None	60	Figure 4.1-C
		30	Yes	One Side	10 feet wide [2]	4 feet wide	Multi-use path	None	60	
	Arterial	28	Yes	None	12 feet wide [2]	10 feet wide	Multi-use path	None	60	Figure 4.1-D
URBAN RESIDENTIAL	Local (Serving under 200 lots)	22	Yes	One Side	5 feet wide	4 feet wide	None	None	40	
		28	Yes	Both	5 feet wide	4 feet wide	None	None	46	
	Subcollector (Serving 200 to 500 lots)	25	Yes	One Side	5 feet wide	4 feet wide	None	None	43	Figure 4.1-H
		30	Yes	Both	5 feet wide	4 feet wide	None	None	48	Figure 4.1-I
	Collector (Serving over 500 lots)	30	Yes	None	5 feet wide	5 feet wide	Dedicated Bike Lane	None	50	
		44	Yes	Both	5 feet wide	5 feet wide	Dedicated Bike Lane	None	64	
	Arterial	32	Yes	None	5 feet wide	5 feet wide	Dedicated Bike Lane	None	52	Figure 4.1-E
		46	Yes	Both	5 feet wide	5 feet wide	Dedicated Bike Lane	None	66	
Infill Residential	Local (Serving under 200 lots)	22	Yes	One Side	5 feet wide	4 feet wide	None	None	40	
		28	Yes	Both	5 feet wide	4 feet wide	None	None	46	

TABLE 4.1-1: INFRASTRUCTURE AND DESIGN STANDARDS FOR STREETS										
DEVELOPMENT TYPE	FUNCTIONAL CLASSIFICATION	PAVEMENT WIDTH [1] (FEET)	CURB	PARKING	SIDEWALK/MULTI-USE FACILITIES	TREELAWN	TYPE OF BICYCLE FACILITIES	MEDIAN WIDTH	ROW WIDTH (FEET)	CROSS-SECTION FIGURE #
RESIDENTIAL	Subcollector (Serving 200 to 500 lots)	25	Yes	One Side	5 feet wide	4 feet wide	None	None	43	
		30	Yes	Both	5 feet wide	4 feet wide	None	None	48	
	Collector (Serving over 500 lots)	40	Yes	None	5 feet wide	5 feet wide	Dedicated Bike Lane	10 feet wide	60	
		54	Yes	Both	5 feet wide	5 feet wide	Dedicated Bike Lane	10 feet wide	74	
	Arterial	44	Yes	None	5 feet wide	5 feet wide	Dedicated Bike Lane	12 feet wide	64	
		58	Yes	Both	5 feet wide	5 feet wide	Dedicated Bike Lane	12 feet wide	78	Figure 4.1-F
COMMERCIAL / INDUSTRIAL	All Classifications	28	6" Barrier Curb Only	None	5 feet wide	Optional	None	None	60	
Urban Mixed Use	See Article 8									

NOTES:

[1] Total pavement width including amenities such as Medians, Bicycle Facilities and parking
[2] Sidewalk is required along only one side of the Street, preferred on the water main side when on-street parking is permitted.
[3] Development type determined by lot sizes and widths as indicated in Table 4.1-2; not by geographic area.

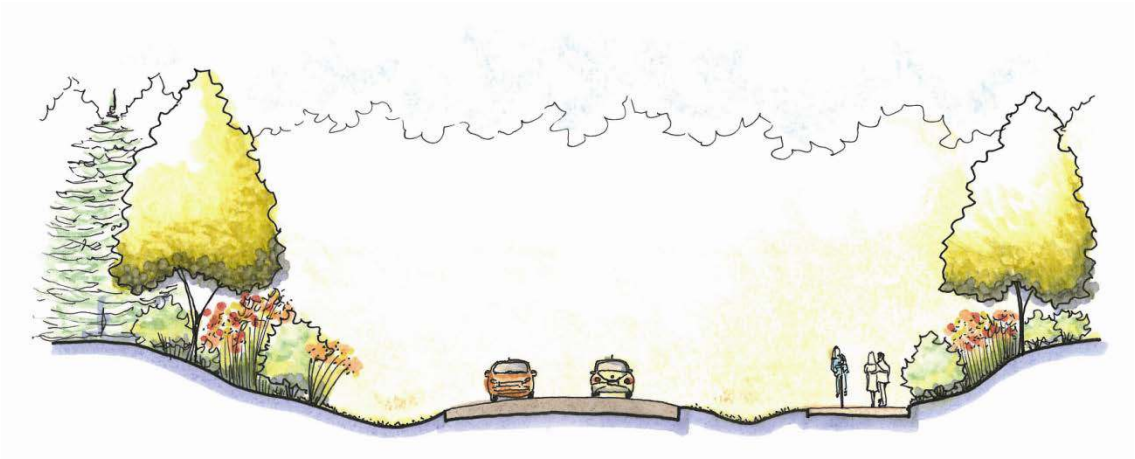


Figure 4.1-B: Typical cross-section of an existing arterial street without parking

Figure 4.1-C: Typical cross-section of a suburban development collector street without parking

Figure 4.1-D: Typical cross-section of a suburban development arterial street without parking

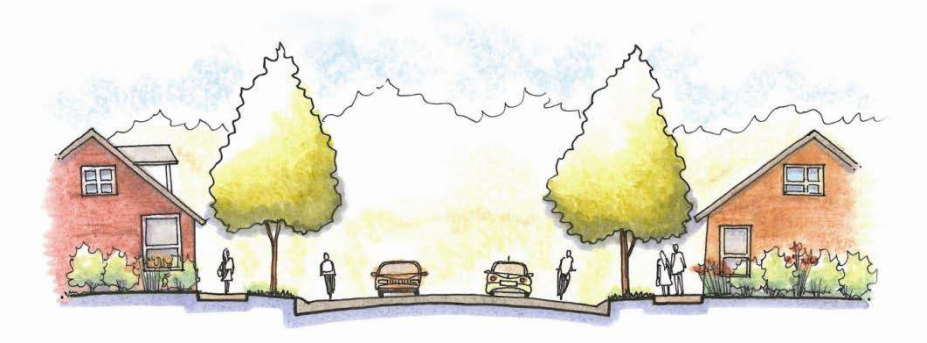


Figure 4.1-E: Typical cross-section of an urban development arterial street without parking

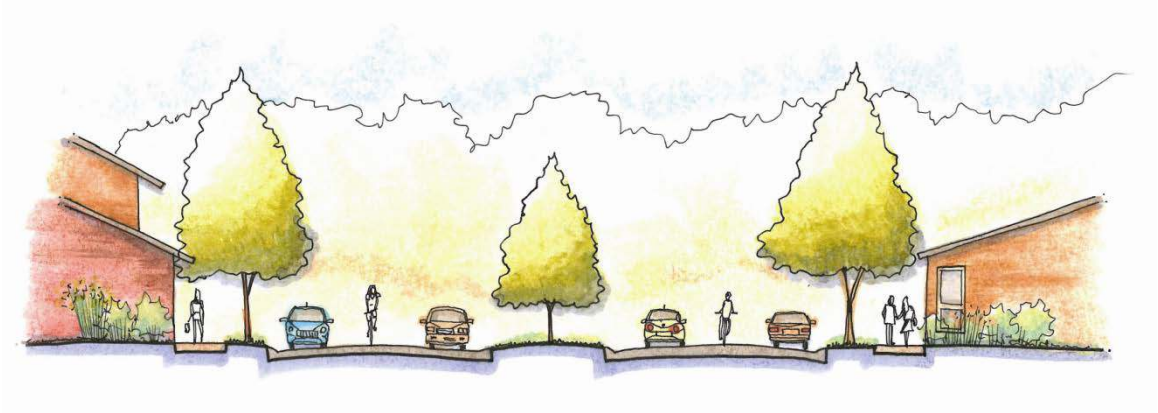


Figure 4.1-F: Typical cross-section of a traditional neighborhood development arterial street with parking on both sides of the street

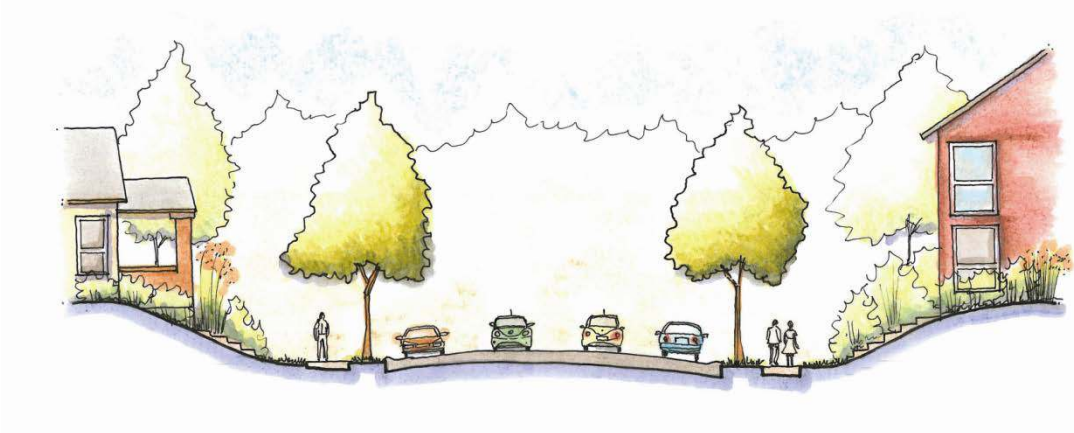


Figure 4.1-G: Typical cross-section of a suburban development subcollector street with parking on both sides of the street

Figure 4.1-H: Typical cross-section of an urban development subcollector street with parking on one side of the street

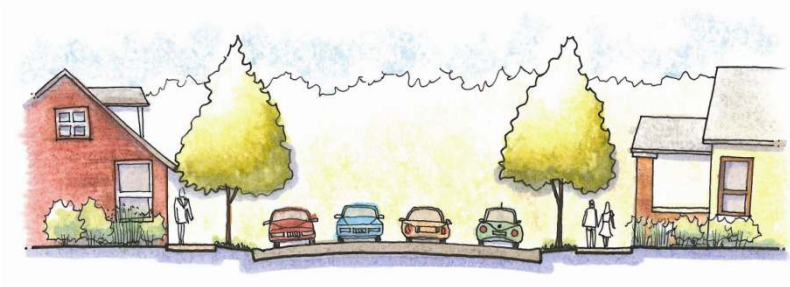


Figure 4.1-I: Typical cross-section of an urban development subcollector street with parking on both sides of the street

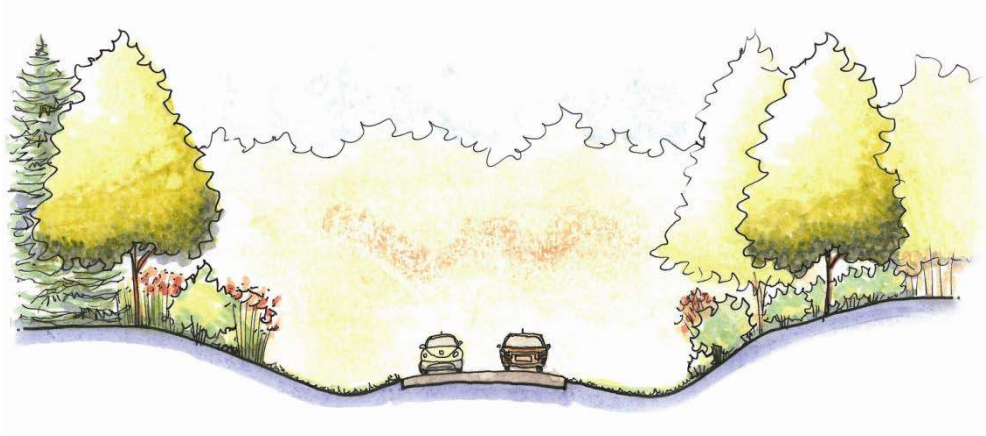


Figure 4.1-J: Typical cross-section of an existing local street without parking

4.1-11 Sidewalks

The following shall apply to the installation of Sidewalks.

(A) Sidewalks shall be provided as indicated in Table 4.1-1, except as provided in this subsection.

(B) Sidewalks may be provided along one side of new Streets under the following circumstances:

(1) When residences are proposed only along one side of the entirety of the Street;

(2) When the development contains alternative Pedestrian Walkways (Subject to Subsection 4.1-12: Alternative Pedestrian Walkways.) that constitute a pedestrian circulation system equal to or exceeding Sidewalk on both sides of the Street; or

(3) When the Street serves as an entrance to a development and contains no residences or contains residences along one side of the Street.

(C) Sidewalks shall be provided along existing Streets that abut the limits of a Subdivision shown on a Preliminary Plat.

(D) Where Sidewalks are present, Curb ramps shall be installed at all Street intersections containing Curb and gutter in accord with Appendix A: Standard Construction Drawings.

(1) Curb ramps shall be required at the intersection of the sidewalk and curb when sidewalk dead-ends into a t-type or hammerhead type turnaround.

(E) Sidewalks constructed closer than two feet from the edge of Street pavement, or back of Curb, shall require the use of a barrier Curb along the Street.

(1) Sidewalks shall be permitted closer than two feet from the back of sloped Curb within multi-family developments only.

(F) Concrete Sidewalks shall have a minimum thickness of four inches. See Figure 4.1-K.

(1) The thickness of concrete Sidewalks shall be increased to five inches when part of a Driveway. See Figure 4.1-K.

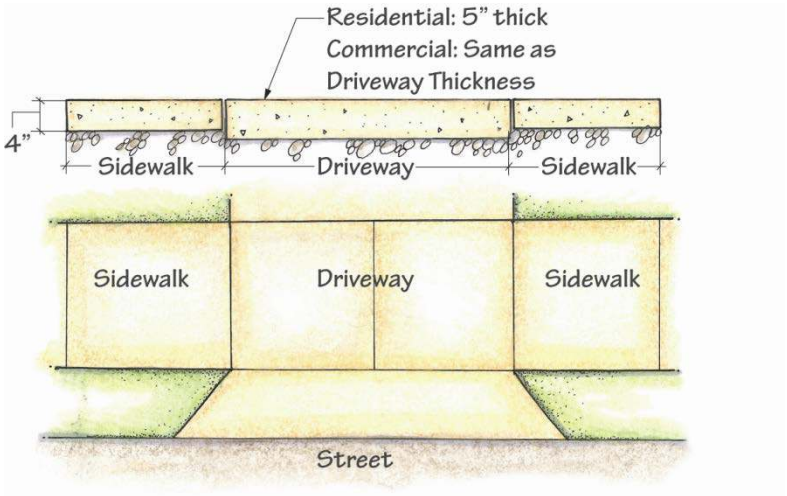


Figure 4.1-K: Illustration of Sidewalk thickness for Sidewalks

(2) In commercial and industrial areas, Sidewalks within the Driveway apron shall have a minimum thickness equal to the thickness required for the commercial or industrial Driveway apron.

(G) In the case where Sidewalk Improvements have not been completed, a conditional Certificate of Occupancy may be given provided it does not exceed six months.

(H) In the case where Sidewalks have not been installed fronting platted, but vacant Lots, such sidewalks shall be installed by the owner of the Lot(s) in question within six months from the date when 75 percent of the Lots have been issued certificates of occupancy.

4.1-12 Alternative Pedestrian Walkways

Alternative Pedestrian Walkways may be permitted in developments by choice of the Applicant and/or as an alternative to sidewalks identified in Subsection 4.1-11: Sidewalks.

(A) Pedestrian Walkways within the public Right-of-way shall be constructed of Portland cement concrete.

(1) Multi-use paths (hiker-biker paths) referenced in Table 4.1-1 may be constructed of asphalt.

(B) Pedestrian Walkways located outside of the public Right-of-way that are intended to meet, in an alternate way, the requirement of Table 4.1-1 may be constructed of asphalt.

(1) Asphalt walkways shall have a minimum width of five feet and a minimum thickness of five inches consisting of a modified base mixture.

(2) The Subgrade for asphalt walkways shall be proofrolled prior to placement of the Sidewalk.

(3) Walkways constructed outside the public Right-of-way (See Figure 4.1-L.) shall only be permitted within developments that contain a homeowners' association with specific maintenance and Easement agreements for the walk recorded at the County Clerk's office.

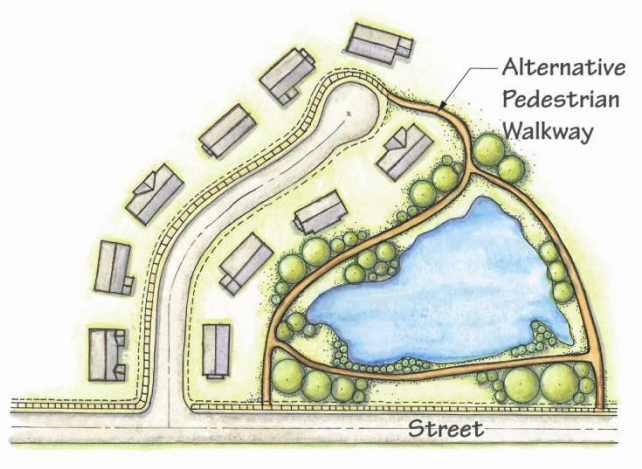


Figure 4.1-L: Illustration of an alternative Pedestrian Walkway

(4) The recording of the maintenance and Easement agreements for the walkways shall occur concurrently with the first Final Plat containing the walk.

(C) If the requirement for sidewalks in Table 4.1-1 have been met, either through the provision of: a) Concrete sidewalks within the Right-of-way; b) a combination of Concrete sidewalks within the Right-of-way and Asphalt sidewalks outside the Right-of-way; or c) Asphalt sidewalks outside the Right-of-way, then any other sidewalk construction is not regulated in terms of materials used.

(1) Sidewalk construction where materials are not regulated by these regulations is still required to comply with the Americans with Disabilities Act of 1990.

4.1-13 Roadside Swales

The following shall apply to the installation of roadside swales.

(A) Curbs shall be provided along both sides of all new Streets except where a private street is approved.

(B) Roadside swales may be provided in new development if properly designed according to Green Infrastructure provisions in these regulations and the long term maintenance responsibilities of swales are defined.

4.1-14 Americans with Disabilities Act (ADA) Curb Ramps

Where Sidewalks along Streets are required, Curb ramps shall comply with the U.S. Department of Justice's regulations for the Americans with Disabilities Act of 1990.

(A) Curb ramp installation shall prohibit stormwater from flowing onto the ramps.

(B) Curb ramps shall be installed at all new Street intersections in conjunction with construction of the concrete Curbs and gutters.

(C) Curb ramps shall be required at the intersection of the Sidewalk and curb when Sidewalk dead-ends into a t-type or hammerhead type turnaround.

4.1-15 Bicycle Facilities

Multi-purpose paths serving both bicycle and pedestrian traffic can substitute for sidewalks in re-development areas if they meet AASHTO requirements.

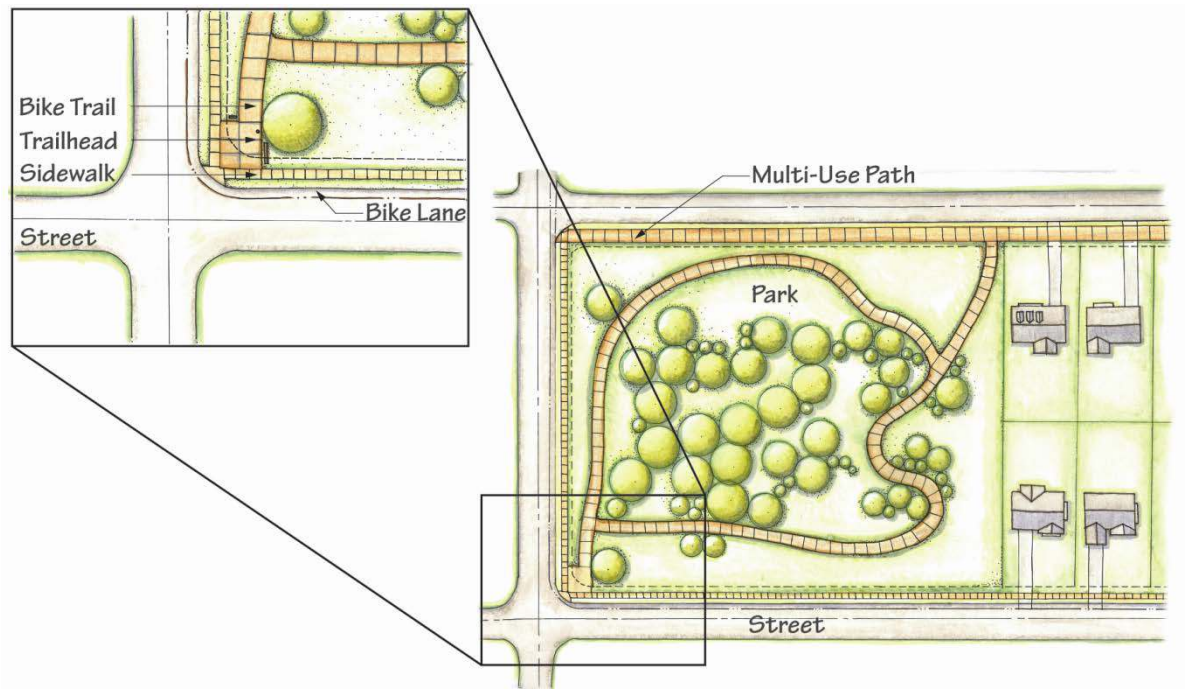


Figure 4.1-M: Illustration of a bicycle facility network

(C) All Bicycle Facilities shall be developed in accordance with the American Association of State Highway Officials (AASHTO) Guide for the Development of Bicycle Facilities.

4.1-16 On-Street Parking

The following shall apply to on-Street parking:

(A) On-Street parking may be provided as identified in Table 4.1-1 of these regulations.

(B) Lots that abut Streets which prohibit on-street parking in residential developments shall contain twice the off-Street parking that is required by the applicable zoning ordinance.

(C) Unless the water main changes to the opposite side of the street mid-street, on-street parking lanes shall not be shifted from one side of the Street to the other mid-Street, but can be shifted from block to block as a traffic calming measure.

(D) Except for Streets that allow parking on both sides of the street, the on-street parking lane shall be located on the opposite side of the street from fire hydrants. See Figure 4.1-N.

(E) In new proposed developments that are accessed by existing public streets that are not built to standards in this Article, on-street parking on the new street shall be as approved by the Planning Commission in consultation with the Central Campbell County Fire District.

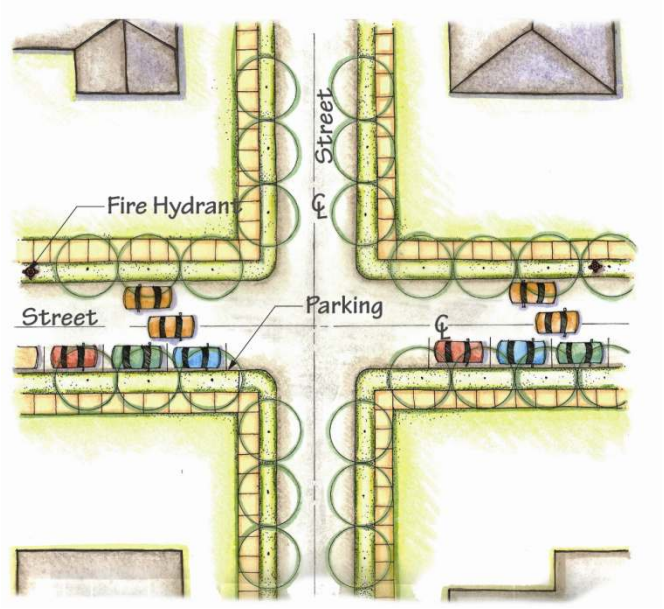


Figure 4.1-N: Illustration of on-Street parking

4.1-17 Off-Street Parking Areas

Off-street Parking Areas shall be constructed in accordance with the requirements of the applicable zoning ordinance.

4.1-18 Geometric Design of Streets

The horizontal and vertical alignment of Streets shall be designed in compliance with the guidelines established by the American Association of State Highway Transportation Officials (AASHTO) manual "A Policy of the Geometric Design of Highway and Streets, "(The Green Book) as summarized in Table 4.1-3. The following issues shall also apply:

(A) When there is a change in the horizontal alignment of a Street along the centerline, a curve with a minimum radius appropriate to the Design Speed of the Street as defined in Table 4.1-3 shall be constructed.

(B) A tangent of at least 200 feet for new Collector Streets shall be provided between reverse horizontal curves.

(C) At intersections, the algebraic difference in cross slopes at the crown line of the intersected Street, shall not exceed six percent. This standard shall apply to the centerline of all through travel lanes at the intersection. See Figure 4.1-O.

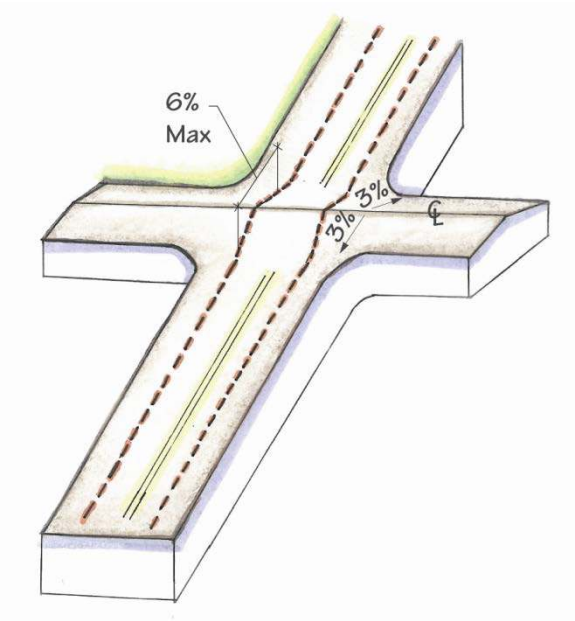


Figure 4.1-O: Illustration of cross slopes at an intersection

(D) The maximum grade of the centerline of the side Streets intersecting with the gutter line of the through Street shall not exceed four percent for a distance of not less than 75 feet for Local Streets and 150 feet for collector and arterial streets. See Figure 4.1-P.

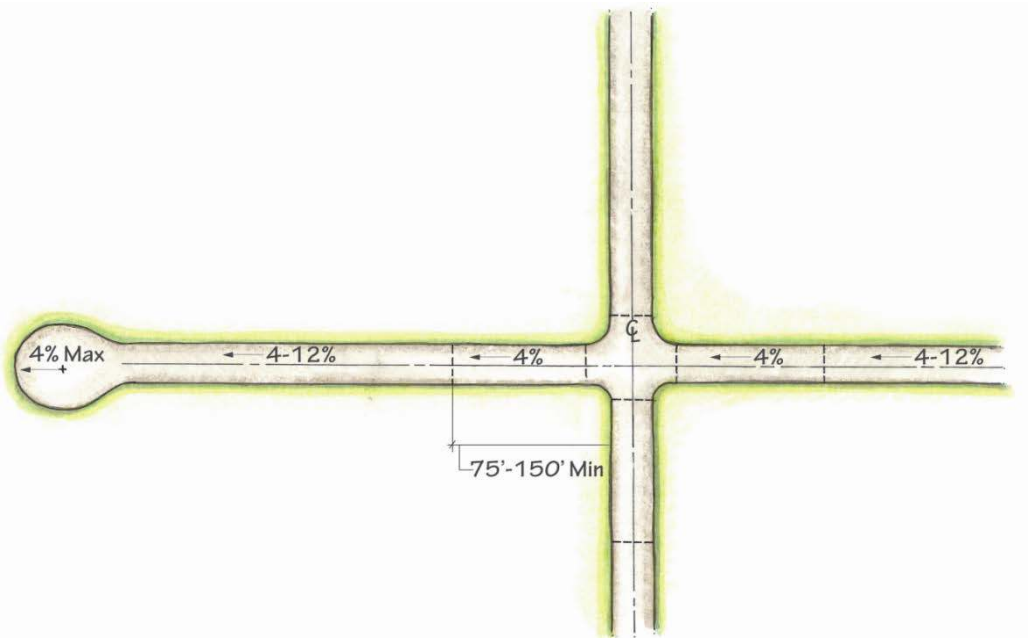


Figure 4.1-P: Illustration of the maximum grades permissible along a Street

(E) Descending centerline grades approaching the terminus of a Cul-de-sac shall be reduced within a vertical curve to a maximum of four percent unless determination is made by City Engineer that a steeper grade will provide adequate clearance for vehicles entering ascending Driveways. See Figure 4.1-P and Figure 4.1-Q.

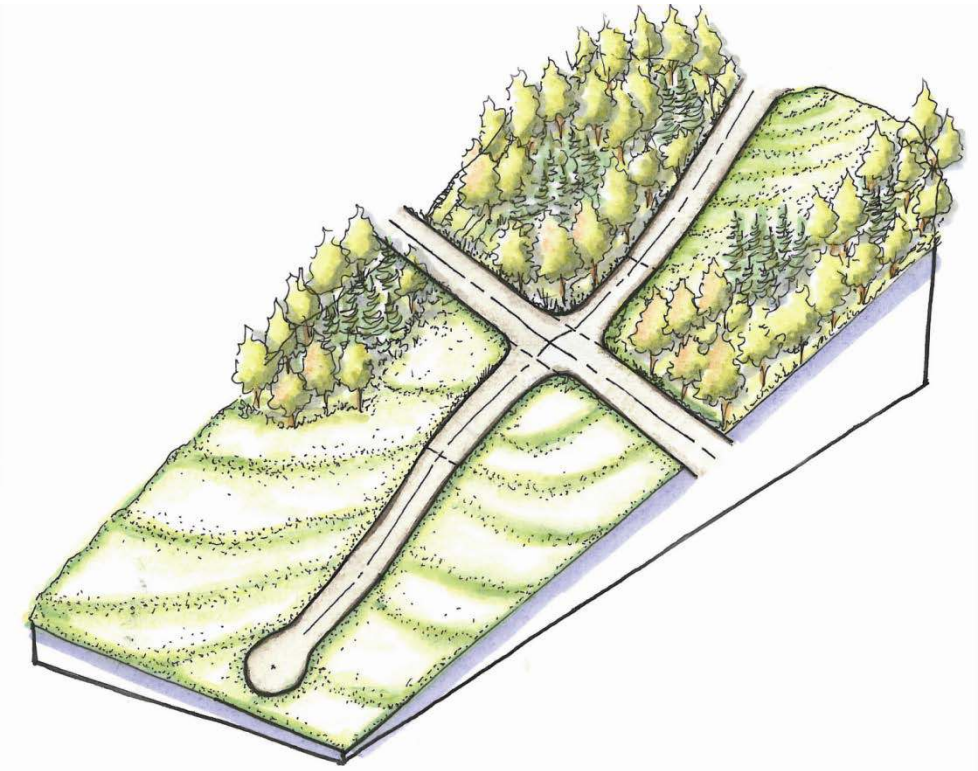


Figure 4.1-Q: Illustration of a descending centerline approaching the terminus of a Cul-de-sac

TABLE 4.1-3: GEOMETRIC DESIGN STANDARDS

FUNCTIONAL CLASSIFICATION	DESIGN SPEED	HORIZONTAL	VERTICAL		GRADES (%)	
			CREST	SAG		
		MINIMUM RADIUS (FEET)	K FACTOR MINIMUM	K FACTOR MINIMUM	MAX	MIN
Local and Subcollector	25	100	15	15	12 (8)	1
Collector	35	400	30	35	10	1
Arterial	45	900[1]	61	79	7[1]	1

NOTES:
Numbers in parenthesis indicate values required for commercial/nonresidential uses.
[1] Under proposed standards, the Design Speed on arterial streets is 45 miles per hour.

4.1-19 Street Connectivity

(A) **Temporary Dead-End Streets and Street Connections to Adjoining Tracts or Areas** -Future street connections provide the opportunity for reasonable access alternatives to adjoining tracts, the necessity of providing through connections between collector or arterial streets, distribution of traffic patterns by providing alternative routes, and convenient and efficient access for emergency vehicles, street maintencance, school buses, postal delivery, and other essential services.

The Commission shall consider the following criteria for evaluating street connections to adjoining property:

1) The adjoining land must be compatible with the subject development as determined by the current zoning and/or the Future Land Use Map as specified in the current Comprehensive Plan.

2) Street connections to adjoining properties will not be required if significant grading (as determined by the City Engineer) and/or the construction of a bridge would be necessary to make such connections.

3) Subdivisions required to provide subcollector or collector streets (as described in the street classification table in Article 4) shall be required to provide for future connection of such streets to other collector or arterial streets or connection to adjoining lands, if feasible.

4) The Planning Commission may require the connection of local streets to adjoining tracts or areas in order to prevent the local street from becoming a cul-de-sac street which exceeds the maximum length permitted for a cul-de-sac street.

5) In instances where a street connection can not be constructed all the way to a shared property line due to grading or other construction feasibility issues until development occurs on an adjoining tract, the connection shall be constructed as far as practical toward the property line. The developer shall deposit the cash amount plus contingency with the applicable legislative body for the estimated costs of the remaining street construction to the property line. The developer shall be responsible for constructing the remaining street segment when the adjoining tract develops, or for making arrangements to cause the construction to occur at that time.

(B) Extension of Existing Streets on Existing Right-of-Way

The City of Highland Heights contains older residential development, particularly dating from the middle part of the twentieth century. Much of the relatively level land within the city is already developed, and left-over parcels are often difficult to access for new infill development. Many existing "unfinished" streets currently dead-end within public rights-of-way without cul-de-sacs and without enough space where a cul-de-sac or suitable turnaround could be constructed. In some cases, the pavement ends, however, public right-of-way continues to remaining undeveloped or lightly-developed property.
These are often known as "paper streets." Where there is developable land beyond one of these locations and other requirements of the zoning and subdivision regulations are met, development beyond these existing street ends can occur by constructing a public street to access the site according to the following Public Connection Street standards.

When the proposed residential units in a new development are on pre-existing, non-conforming "baby farm" lots, then the builder can either extend the public street according to these regulations or provide a private street according to the requirements in subsection "O."

(C) Public Connection Streets in Residential Zones

Where topographic constraints exist or the existing public roadway is more narrow than current standards, a publicly-dedicated Connection Street can be approved by the Planning Commision upon consultation with utility companies and the Central Campbell County Fire District. Such street could meet the following standards:

1) a twenty-two (22) foot wide street with no sidewalks in extreme constraints and where there are no existing sidewalks in the neighboring and connecting residential areas.

2) a twenty (20) foot wide street with a four (4) foot wide sidewalk on one side when sidewalks are present in the neighboring and connecting residential areas. If sidewalks are present on both sides of the existing street that provides access to the site, then the new street construction shall provide for a street crossing in accordance to AASHTO requirements.

3) The minimum right-of-way shall be forty-two (42) feet.

4) Box curbs, not roll curbs shall be used, and no driveway access shall occur on the connection portion. Catch basins or other storm facilities shall be provided. Sidewalks if required can be attached to the box curb.

5) Speed limit is to be based on visibility and setbacks present, and the default should be considered to be twenty (20) mph.

D) Existing Residential Street Conditions Leading to the Site

When a proposed residential development can develop under the current zoning and subdivsion regulations, the existing street section can remain. When the zoning of the subject property does not support the proposed land uses and/or density, then the condition and dimensions of the existing street should be evaluated during the normal zoning map amendment application process through the Planning Commission and City Council. If a zone change is proposed, the developer can approach the City and the Central Campbell County Fire District to attempt to eliminate on-street parking on the existing narrow public street that provides access to the development parcel. If implemented, this can serve as a partial solution to safety and emergency access concerns to the proposed new development.

(E) Street Connectivity to Adjoining Areas Beyond the Development Site

The arrangement of Streets in new Subdivisions shall provide for reasonable access to adjoining tracts, through connections between Streets, logical distribution of traffic patterns, and convenient and efficient access for emergency vehicles, street maintenance, school buses, postal delivery, and other essential services.

The public Right-of-way for a Street connection to adjoining property shall be platted when the contributing street in the Subdivision is within 100 feet of the connection to the adjoining property. A guarantee may be filed with the Planning Commission in lieu of the completion of the required street connection.

(F) Public Street rights-of-way not intended to dead-end permanently through the use of a Cul-de-sac are required to extend to the abutting property line. Spite strips of land, defined as a piece of land that limits or denies access to another right-of-way for no legitimate reason, are prohibited by these regulations.

(G) When the abutting property differs in elevation from the proposed Right-of-way the street shall be constructed as close as practical, as determined by Staff, to the abutting property line.

1) The distance between the end of the street and the elevation of the abutting property line shall not result in a slope that exceeds 3 horizontal to 1 vertical.

2) In those areas where the street was not able to be constructed to the abutting property line, the section of unconstructed street shall not be required to be bonded.

3) The Engineer shall be required to provide on the Final Plat any grading easements outside the right-of-way necessary to accomplish constructing the unconstructed section of street referenced above to the abutting property line when the adjacent property develops.

4.1-20 Street Connectivity within a Subdivision

(A) The Street system shall be in compliance with the maximum intersection spacing identified in Table 4.1-4. See Figure 4.1-R and Figure 4.1-S.

(B) Permanent Cul-de-sacs and dead end Streets may be provided in accordance with Table 4.1-4 of these regulations unless topographic or other physical conditions render these provisions impracticable as determined by Staff. See Figure 4.1-T.

TABLE 4.1-4: INTERNAL CONNECTIVITY STANDARDS BY DEVELOPMENT TYPE

DEVELOPMENT TYPE	CUL-DE-SAC PERMITTED	MAXIMUM CUL-DE-SAC LENGTH	MAXIMUM INTERSECTION SPACING
Traditional Neighborhood	NO	N/A	600 Feet
Urban	NO	N/A	600 Feet
Suburban	YES	1,200 Feet	1,200 Feet

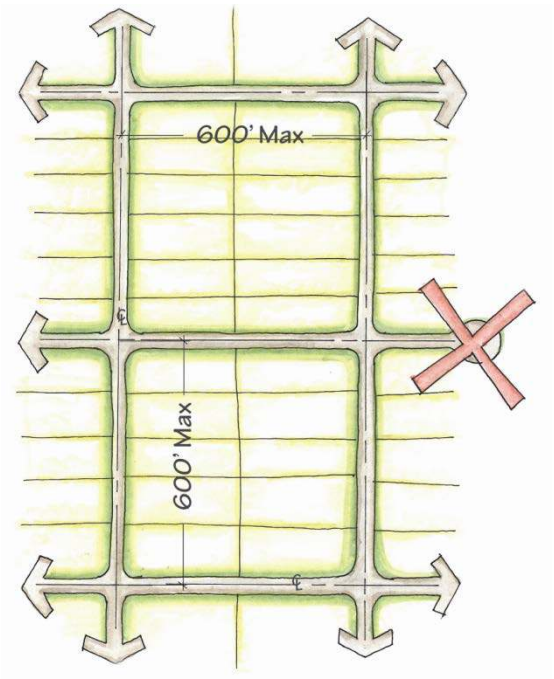


Figure 4.1-R: Illustration of connectivity within urban residential and/or commerical development

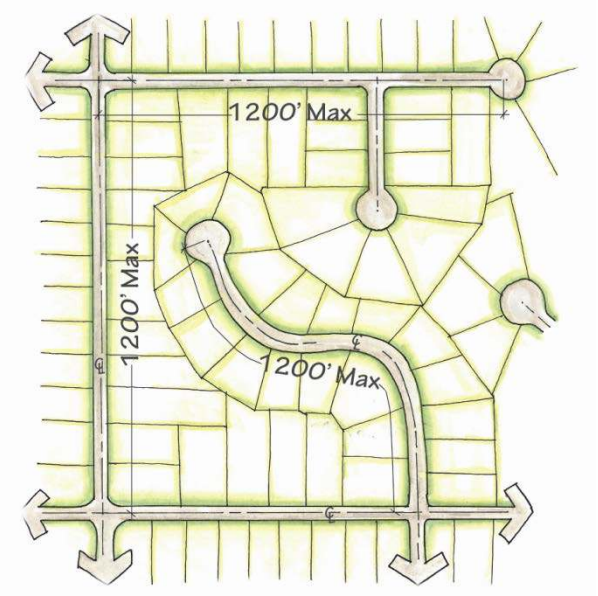


Figure 4.1-S: Illustration of connectivity within a residential or industrial subdivision

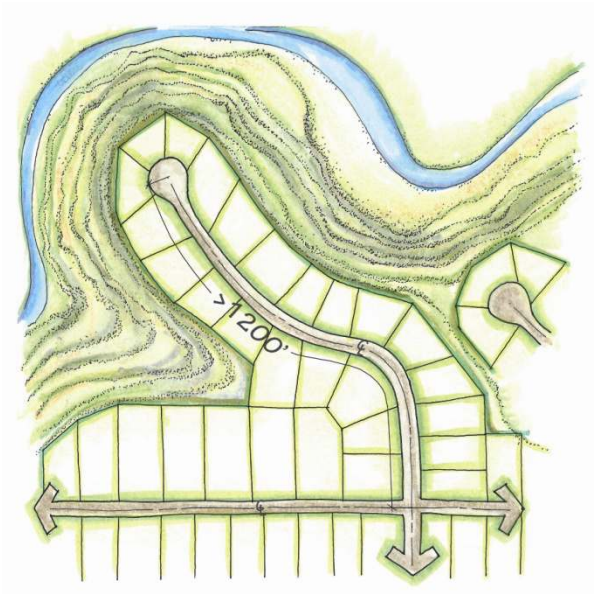


Figure 4.1-T: Illustration of where Cul-de-sacs may be appropriate due to topographic conditions

4.1-21 Intersection Design and Access Points

The design and spacing of intersections and Access Points shall comply with the access control regulations contained in Article 8: Access Control Regulations.

(A) Centerlines of all intersecting Streets shall intersect at a 90 degree angle where possible and in no case shall the angle of intersection be less than 75 degrees or greater than 105 degrees.

(B) Where 'T' type intersections are used, a minimum centerline offset of 150 feet for Access Points along opposite sides of the Street shall be maintained on Local Streets. On collector and arterial streets, a minimum centerline offset capable of accommodating required left and right turn lanes shall be maintained. When no auxiliary turn lanes are required, a minimum centerline offset of 200 feet for Access Points along opposite sides of the Street on collector and arterial streets shall be maintained.

(C) A Curb radius shall be constructed at intersections as shown in Table 4.1-5. The minimum radius to be used shall comply with the standards for the Street with highest functional class at the intersection and the adjacent land use. See Figure 4.1-U.

TABLE 4.1-5: CURB RADIUS (FEET)

FUNCTIONAL CLASSIFICATION	LAND USE		
	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
Local	25	30	40
Collector	30	40	50
Arterial	40	40	50

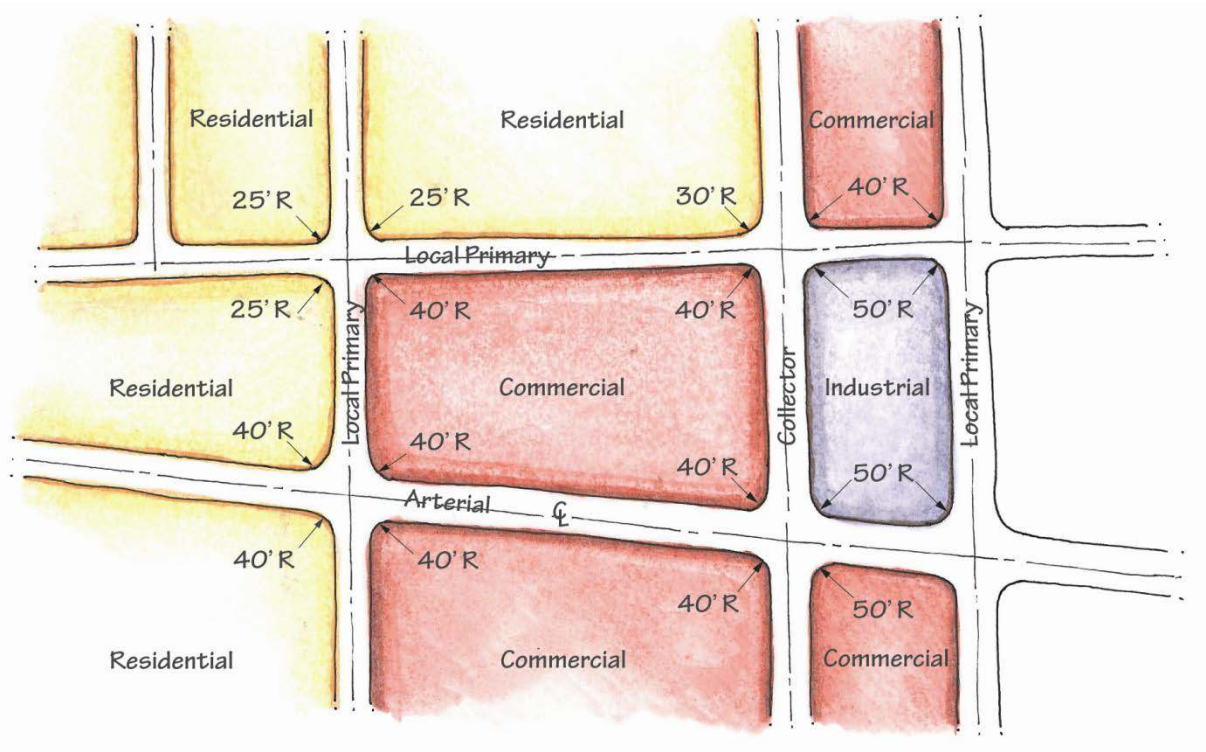


Figure 4.1-U: Illustration of applicable Curb radii based on land use and the Functional Classification of Streets

4.1-22 Sight Distance Requirements for New Streets

(A) Minimum Sight Distances for vehicles entering and exiting an intersection shall be designed in compliance with the guidelines established by the American Association of State Highway Officials (AASHTO) manual "A Policy of the Geometric Design of Highway and Streets," as summarized in Table 4.1-6 and Table 4.1-7. See Figure 4.1-V and Figure 4.1-W. These requirements are for proposed new street construction. The Highland Heights Zoning Regulations in Article 11 contain requirements for sight distance considerations for proposed driveways in new developments.

(B) Sight Distance calculations and profiles shall utilize a driver's eye height of 3.5 feet and an object height of 2.0 feet.

TABLE 4.1-6: SIGHT DISTANCE REQUIREMENTS FOR EXITING VEHICLES (FEET)

NO. OF LANES	POSTED SPEED LIMIT (MILES PER HOUR)							
	20	25	30	35	40	45	50	55
2-Lane	230	285	340	400	455	510	570	625
4-Lane	245	305	365	425	485	545	605	665

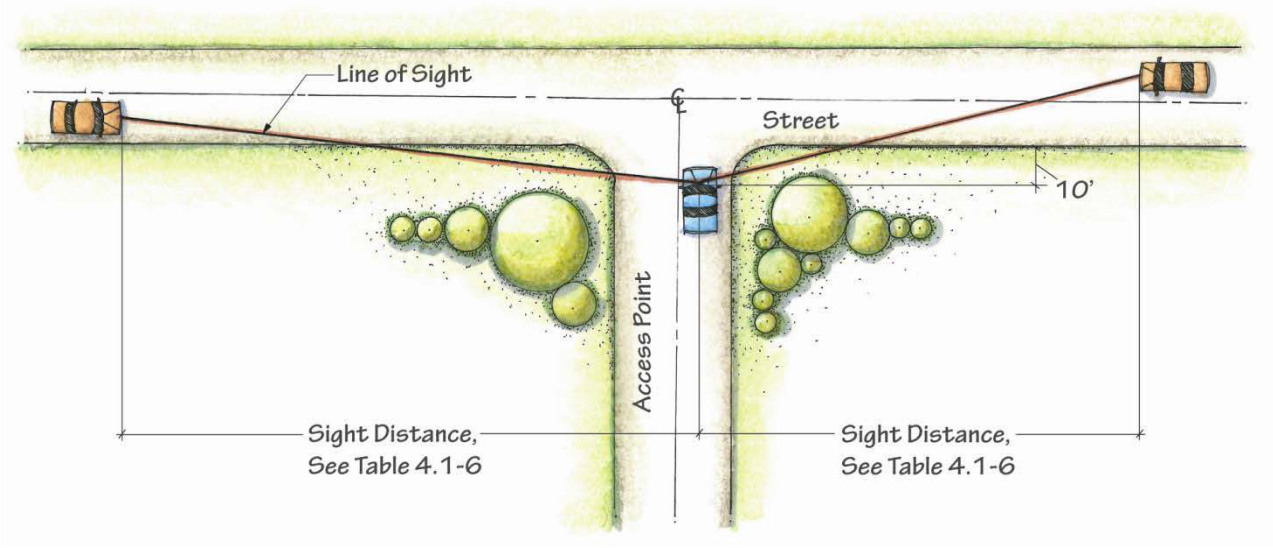


Figure 4.1-V: Illustration of Sight Distance requirements for exiting vehicles

TABLE 4.1-7: SIGHT DISTANCE REQUIREMENTS FOR APPROACHING VEHICLES (FEET)

NO. OF LANES	POSTED SPEED LIMIT (MILES PER HOUR)							
	20	**25**	**30**	**35**	**40**	**45**	**50**	**55**
2-Lane	165	205	245	285	325	365	405	445
4-Lane	180	220	265	310	355	400	440	485
6-Lane	195	240	290	335	385	430	480	525

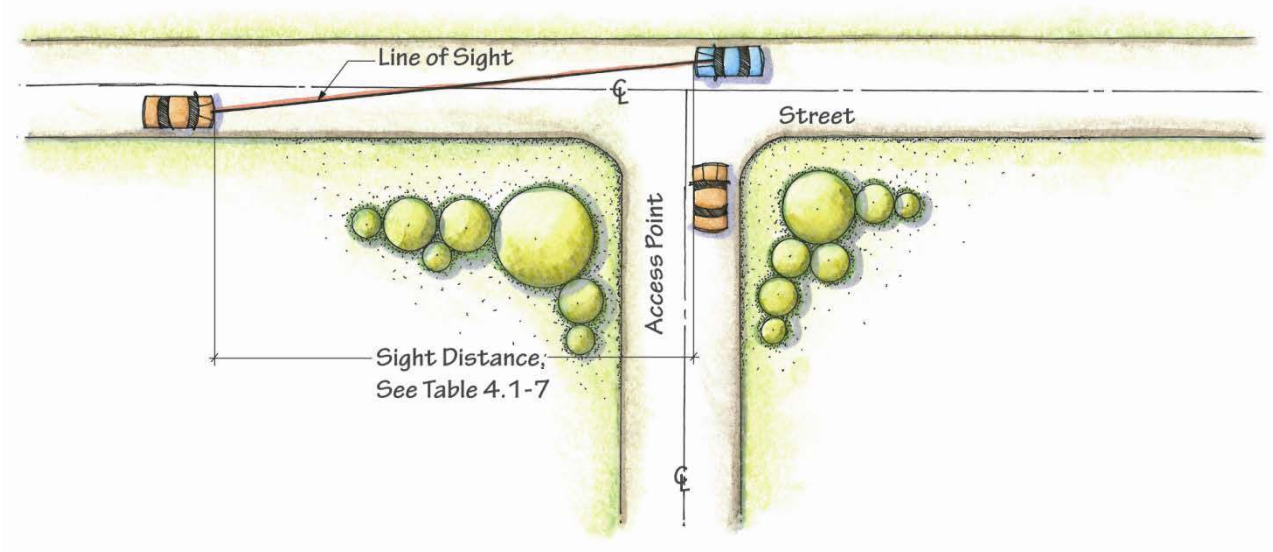


Figure 4.1-W: Illustration of Sight Distance requirements for approaching vehicles

4.1-23 Privately-Maintained, Single-Family Residential Streets

In extreme circumstances and in order to provide access to otherwise undevelopable parcel(s) a subdivider can propose to the Planning Commission that a private street be approved. These private streets apply only to situations where a public street and right-of-way would not be feasible because of space limitations, and where flag lots and shared driveways are not feasible because of topography and similar features. Private streets can provide a narrower pavement and narrower private right-of-way in order to access developable parcels for more than two lots. A private street can serve a maximum of six lots. The intention is for the lot owners served by the private street to maintain the street through a formal maintenance agreement or Homeowner's Association (HOA) in perpetuity with no municipal support. Private streets are not permitted in commercial or industrial development.

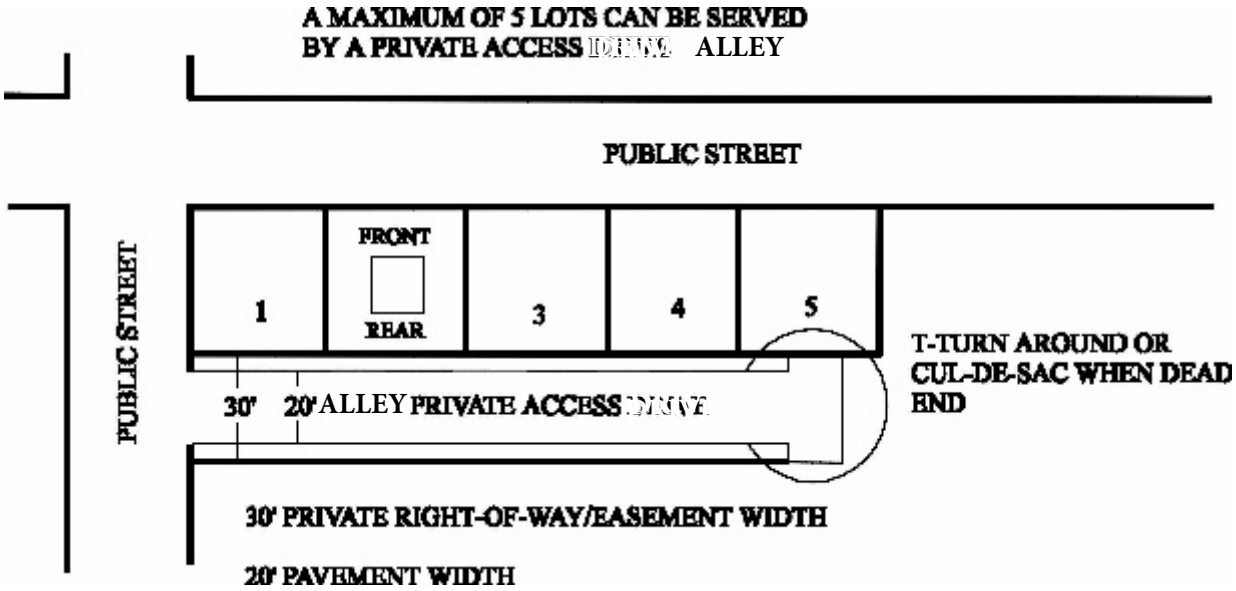
Private Streets shall terminate in a cul-de-sac or t-turnaround or similar with no potential for a through-connection. The use of private streets in Highland Heights is intended to serve limited new development on leftover, undeveloped parcels to be accessed through existing development or at the end of an existing street, and must be approved by the Planning Commission as part of a Preliminary Plat. All private streets must be centered within a private right-of-way; this private right-of-way must be at least the width of the public right-of-way of the public roadway that provides access to the parcel. The right-of-way shall consist of a deeded access easement and maintenance agreement tied to each lot and to each deed. A maintenance association or HOA shall be set up as the owner of the private right-of-way and shall contain a financial instrument for the future viability and repairs to the private street, and have a cost increase index built in for future economic inflation. There must also be a suitable liability or legal defense fund built into the maintanance or HOA agreement. Maintenance agreements must provide for routine repairs, snow removal, utilility easements, trash removal, as well as major future rehabilitation in reponse to the expected design life. The sudivider must address emergency service access, as well as 911 location services sufficient off-street parking, and mailbox locations. The right-of-way shall be a minumum of thirty-eight (38) feet wide. These items are required as part of Preliminary Plat Review for Planning Commission approval.

Newly proposed private streets in Highland Heights may serve no more than six (6) buildable single-family detached lots. The surfacing for a newly proposed private street shall consist minimally of asphalt or concrete pavement, and the minimum pavement width shall be at least eighteen (18) feet with no parking permitted on either side. Street grades shall meet the requirements for public streets. Street names for private streets shall be proposed and approved through the Preliminary Plat process. Signage for private streets shall be installed in accordance with the policies of the applicable legislative body prior to Final Plat approval. Sidewalks, constructed to the specifications in these regulations, shall be provided along private streets that are accessed by public streets containing sidewalks. If the private street is to be located at the end of an existing residential local street with no sidewalks, no sidewalks are required.

Multi-family and condomium development may have privately-maintained parking stalls and parking aisles in accordance with the Highland Heights Zoning Regulations and other sections of these Subdivision Regulations.

4.1-24 Private Residential Alley

Private access alleys shall conform to the same pavement width, right-of-way width, and construction standards as set forth in these regulations for publicly-dedicated alleys. They are to be used only where buidling lots cannot or should not have direct driveway access to the public street where the lot frontage resides. A private access alley that dead ends shall terminate with a T turn-around or a cul-de-sac. Such alley shall be owned and maintained by one or more private property owners and shall only serve a maximum of five lots. The easement or right-of-way for a private access alley shall be indicated on the Final Plat. A copy of a Homeowners Association Agreement to maintain the drive shall be submitted at Final Plat Review.



4.1-25 Private, Commercial Access Drives

(A) Access drives may be used to provide direct vehicular access to buildings and Parking Areas from the side or rear of the property. See Figure 4.1-X.

(B) Access Drives may serve as the primary means of access for a maximum of four commercial Lots.

(C) Access drives may serve as the secondary means of access for an unlimited number of commercial lots when the primary means of access is provided by a public street system accepted for maintenance by the city.

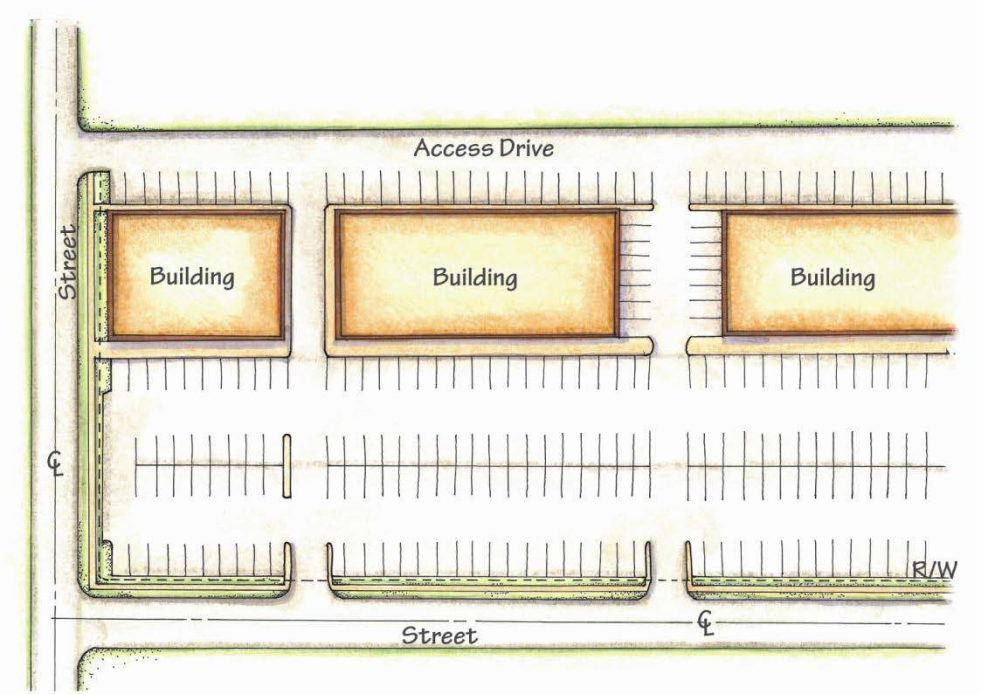


Figure 4.1-X: Illustration of an Access Drive

4.1-26 Driveway Widths

Driveways for residential areas shall be provided with a minimum width as identified in Table 4.1-8. See Figure 4.1-Y.

TABLE 4.1-8: MINIMUM REQUIRED DRIVEWAY WIDTHS

NO. OF RESIDENCES	DRIVEWAY WIDTH
1	9 [1]
2	12
3 - 4	16

NOTE:
[1] Driveways longer than 150 feet shall have a minimum width of 12 feet.

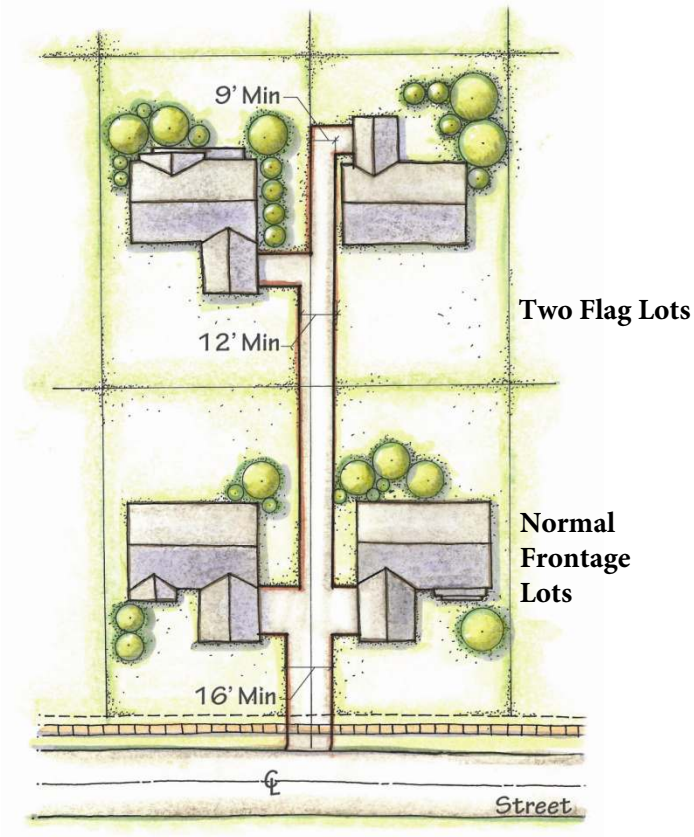


Figure 4.1-Y: Illustration of required Driveway widths based on number of residences served

4.1-27 Driveway Aprons

The following shall apply to Driveway aprons:

(A) Driveway aprons in residential areas shall have a minimum thickness of five inches.

(B) Driveway aprons in commercial and industrial areas shall have a minimum thickness equal to the thickness required for the commercial or industrial entrance.

(C) Driveway aprons shall be constructed in accordance with Figure A.1-U: Detail #19 and Figure A.1-V: Detail #20.

4.1-28 Additional Street Improvements

Improvements to the existing transportation network may be required to ensure adequate safety and mobility of users on the Street system. The improvements shall be limited to the study area established in a required traffic impact study and shall be consistent with the recommendations of the traffic impact study that were identified to be necessary to maintain the pre-build level of service within the defined study area.

4.1-29 Construction Details and Specifications

All infrastructure contained in this chapter shall conform to the standard construction drawings contained in Appendix A: Standard Construction Drawings.

4.2 Lot Layout

4.2-1 Purpose

This section fulfills the infrastructure requirements of Kentucky Revised Statutes (KRS) 100.273 through 100.292. These Lot layout standards assure a necessary component of harmonious, progressive, and aesthetically-pleasing development. They contribute to healthy and dynamic neighborhoods where residents can live, work, shop, and play, and promote the health, safety, and general welfare of the public in Campbell County. To further these more general purposes, this section:

Lot Frontage - All new lots in a subdivision shall have the minimum frontage on a public or private street as stated for their respective zone under the current Highland Heights Zoning Regulations.

(A) Creates standards that result in the logical arrangement of Lots that are accessible and capable of being built upon;

(B) Sets forth minimum standards for utility and Watercourse Easements that will accommodate their future maintenance needs; and

(C) Provides for the reservation of desirable recreational areas, school sites or other public grounds for the potential purchase of such areas by the appropriate public body.

4.2-2 Easements

(A) The minimum width of Public utility Easements shall be as required by the applicable public utility agency. The utilities shall be centrally located within the width of the Easement.

(B) Additional Easement width shall be required by Staff if Staff determines that such additional width is necessary due to the depth the utilities must be buried or due to the proposed size and use of the utilities.

4.2-3 Watercourses

(A) The Subdivider shall provide Easements for storm Drainage purposes that conform to the lines of any existing or proposed Watercourses which traverse the Subdivision.

(B) The Easement width shall be sufficient to provide for the maintenance of the Watercourse as determined by Staff.

4.2-4 Natural Land Use

Subdivisions shall be encouraged to be designed to take advantage of the natural topography of the land, to economize the construction of Drainage facilities, to minimize destruction of trees and topsoil, and to preserve such natural features as Watercourses, unusual rock formations, large trees, sites for historical significance, and other natural assets. See Figure 4.2-A.

Figure 4.2-A: Illustration of Subdivision design taking advantage of the natural topography

4.2-5 Flood Protection

The following shall apply to Flood protection:

(A) All Subdivision development shall comply with the Flood protection development controls contained in the applicable zoning ordinance.

(B) All Streets and utilities constructed to serve a Subdivision shall be either Flood protected, or constructed to a level of not less than two feet above the elevation of the 100-year Flood.

4.2-6 Lot Size

All proposed Lots shall conform to the minimum size requirements of the applicable zoning ordinance.

4.2-7 Lot Frontage

(A) All proposed Lots for building purposes shall front onto a Public Street system accepted for maintenance by the applicable Legislative Body.

(B) The minimum Frontage for a single proposed building lot along a Public Street system shall be 25 feet. (see Current zoning requirements section 9.10 (E)).

(C) The minimum frontage for two contiguous Flag Lots along a Public Street system is 15 feet per flag.

(D) Current zoning requirements for flag lot frontage prevail if more restrictive (Section 9.10 (E)).

4.2-8 Double and Triple Frontage Lots

(A) Lots shall not have Frontage onto more than one Street except:

(1) When a Lot is a Corner Lot;

(2) When the rear of a Double Frontage Lot abuts an arterial, Freeway, Access Drive, or collector street; or

(3) When the rear of a Triple Frontage Lot abuts a Freeway, or Access Drive.

(B) Double frontage and Triple Frontage Lots shall be restricted to one Driveway on the Street with the lowest Functional Classification.

(1) More than one Driveway may be provided for double and triple frontage lots that abut local streets if permitted by the applicable zoning ordinance.

4.2-9 Flag Lots

The following shall apply to Flag Lots:

(A) Flag Lots shall only be used in those locations where due to geometric, topographic, or other physical features, or the lack of economic feasibility in proportion to the size of the development, it would be impractical to extend a publicly dedicated Street.

(B) Single flag lots shall have twenty-five feet (25') of frontage on a publicly dedicated street. In the case of two contiguous flag lots, there shall be thirty feet (30') of frontage on a publicly dedicated street with a common driveway. With two contiguous flag lots, a deeded 15 foot (15') strip of land for each lot is required with a common unobstructed access easement for a shared driveway to the public street.

(C) Access to the Lot(s) shall only be provided from within the limits of the contiguous Flag Stem portion of the Lot(s) or from an existing, shared driveway.

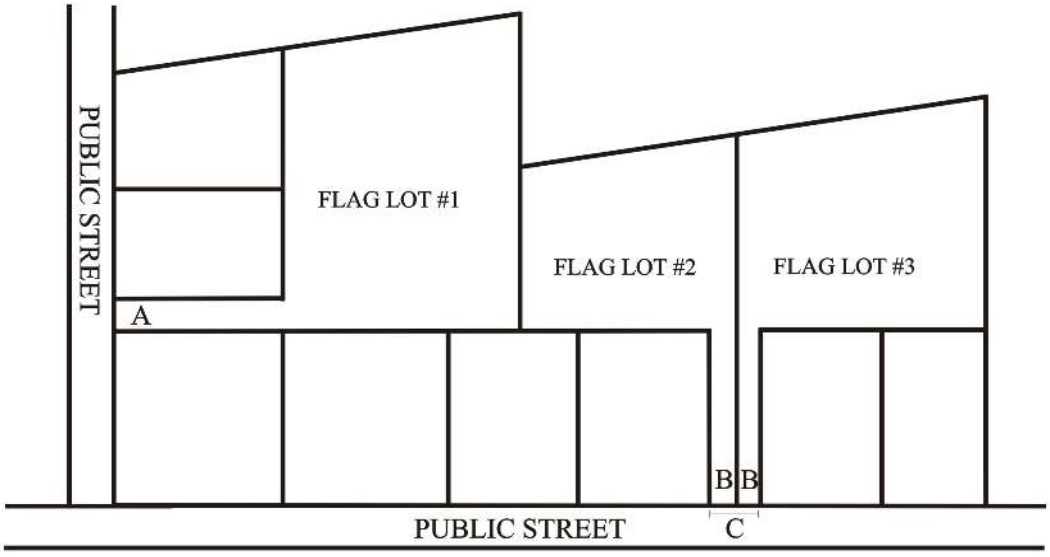
(D) In the case of new developments containing new Street only, no more than four Flag Lots are permitted to be contiguous to each other at the street. Otherwise no more than two Flag Lots are permitted to be contiguous to each other at the Street. See Figure 4.2-B.

(E) No more than 15 percent of Lots contained on a Preliminary Plat shall be Flag Lots.

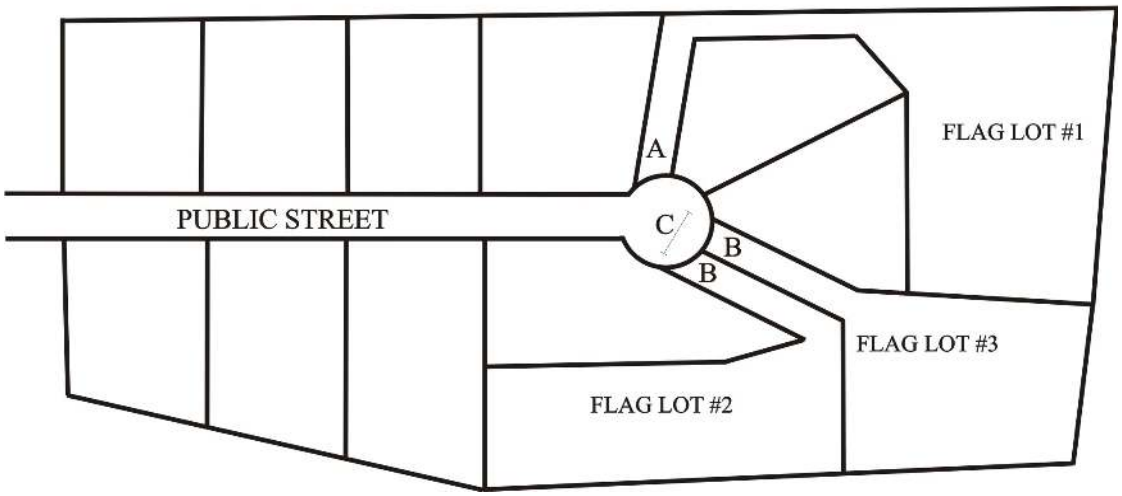
PROPER USE OF FLAG LOTS

TYPE OF SUBDIVISION	A	B	C
AGRICULTURAL/RESIDENTIAL	25'	15'	30'
COMMERCIAL/INDUSTRIAL	30' MIN 50' MAX	15' MIN 25' MAX	30' MIN 50' MAX

EXAMPLE 1



EXAMPLE 2



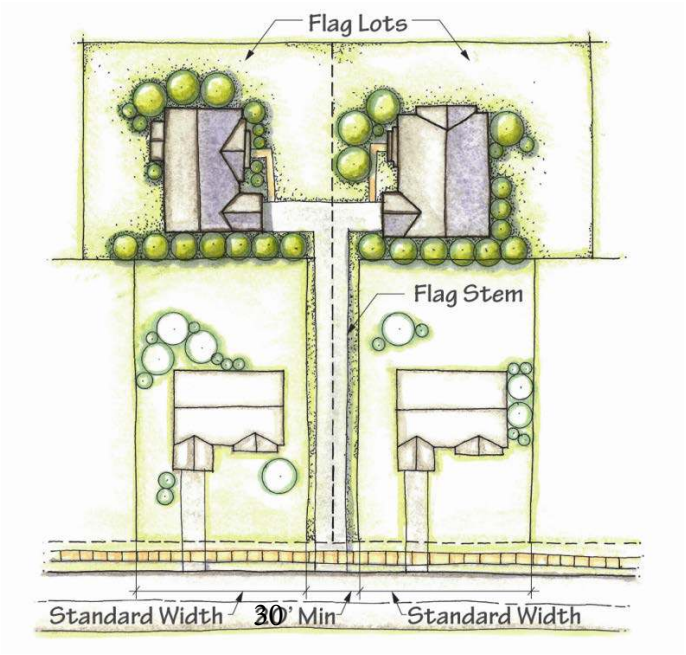


Figure 4.2-B: Illustration of Flag Lot requirements

4.2-10 Maximum Lot Depth

(A) The maximum depth of a new lot shall not be greater than four times the width of the Lot, except for Flag Lots and Lots which contain over five acres of Lot Area. See Figure 4.2-C.

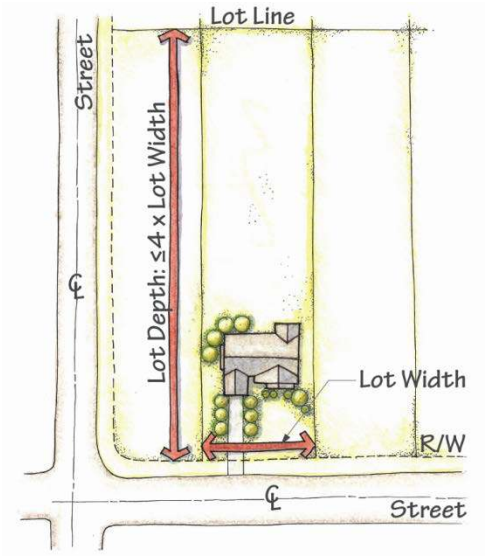


Figure 4.2-C: Illustration of maximum lot depth

(B) Individual site conditions and/or the proposed Lot layout and arrangement may require variation from these requirements, as determined by Staff.

4.2-11 Driveway Access

(A) The minimum width of a Driveway serving a single Lot shall conform to the Zoning Ordinance.

(B) The minimum width of a Driveway serving two Lots shall be 12 feet, and when an existing driveway will serve a new additional lot, the driveway shall be upgraded to 12 feet minimum.

(C) The minimum width of a Driveway serving three to four Lots shall be 16 feet.

(D) Driveways shall serve no more than four lots and/or residential dwellings.

4.2-12 Residual Parcels

No Residual Parcels shall be created which:

(A) Do not conform to the minimum lot size requirements of the zoning district in which the Parcel is located;

(B) Are not required for a private or public utility purpose; or

(C) Are not accepted by the applicable Legislative Body or any other appropriate public body.

4.2-13 Side Lot Lines

(A) Side Lot Lines shall be as close to right angles with the Street centerline as possible, or radial to curve Street centerlines. See Figure 4.2-D.

(B) Lot Lines not at right angles with the Street centerline, and Lot Lines intersecting with curved Right-of-ways shall have a reference tie to the tangent line of that centerline curve. See Figure 4.2-D.

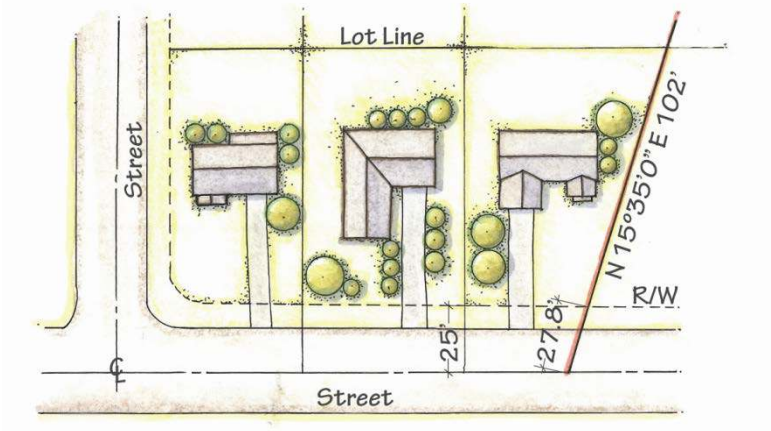


Figure 4.2-D: Illustration of Side Lot Lines

4.2-14 Property Lines at Street Intersections

Property lines at Street intersections shall be provided from the same radius point necessary to establish the pavement radius. See Figure 4.2-E.

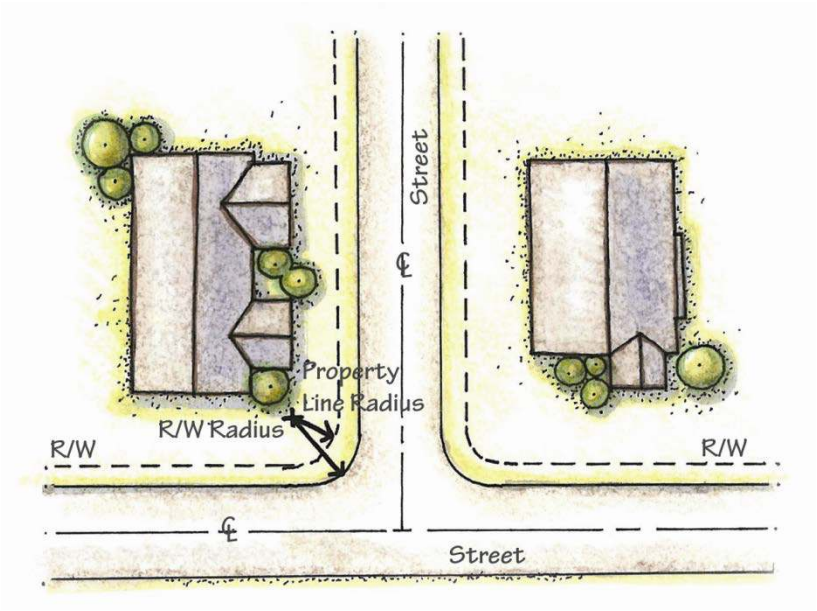


Figure 4.2-E: Illustration of property line location at Street intersections

4.2-15 Public Sites

Where a proposed park, recreational area, open space, school site, or other public uses identified in the Comprehensive Plan is located in whole or in part within a proposed Subdivision, Staff may require a reservation for the purchase of such ground by an applicable public body not to exceed two years as a condition precedent to Preliminary Plat approval.

4.3 Public Utilities

4.3-1 Purpose

This chapter fulfills the infrastructure requirements of Kentucky Revised Statutes (KRS) 100.273 through 100.292. These public utility standards assure a necessary component of harmonious, progressive, and aesthetically-pleasing development is addressed. They contribute to healthy and dynamic neighborhoods where residents can live, work, shop, and play. Furthermore, they promote the health, safety, and general welfare of the public in Campbell County. To further these more general purposes, this section:

(A) Establishes the adequacy of existing and proposed stormwater, wastewater and water supply facilities as a factor to be considered when reviewing proposed Subdivisions;

(B) Sets forth minimum standards for stormwater drainage systems, sanitary sewer and water systems, and the extent to which they shall be provided;

(C) Ensures that new Lots are provided access to essential public utilities when they are available;

(D) Promotes the ability of fire departments to fight fires by requiring minimum fire flows and adequate provision of fire hydrants.

4.3-2 Storm Water Drainage Systems

All storm water Drainage systems shall comply with the Northern Kentucky Regional Storm Water Management Program Rules and Regulations of Sanitation District No. 1 (SD 1's Storm Water Regulations).

(A) Sanitation District No. 1 shall perform the plan review of the storm water Drainage system(s) and issue the appropriate permit(s) for any development that disturbs one acre of land or greater, or for disturbances of less than one acre when that disturbance is part of a larger overall development.

(B) Development that does not disturb one acre of land or greater will be subject to the requirement of plan reviews and/or permits through these regulations and/or the applicable zoning ordinance.

(C) Any proposed Subdivision that requires submission of a grading plan or improvement drawing to Staff shall receive grading plan or improvement drawing approval prior to the commencement of any earth moving operations.

4.3-3 Inlet Grates

Except for inlets serving temporary silt basins, detention and/or retention basins, Inlet Grates shall not allow a sphere with a diameter of six inches to pass through.

4.3-4 On-Street Inlet Location

Inlet spacing along Streets shall be based upon gutter and inlet capacity, Street slope, and contributing Drainage area. In addition, inlet spacing shall not exceed the following spacing requirements unless hydraulic calculations are submitted that indicate acceptable capacity:

(A) Along continuous grades less than two percent - 400 feet maximum;

(B) Along continuous grades two percent and over - 600 feet maximum;

(C) At sag locations less than two percent - 400 feet maximum between inlets or from a high point;

(D) At sag locations two percent and over - 600 feet maximum between inlets or from a high point;

(E) Inlets shall be placed immediately upstream of Pedestrian Walkways and designed to intercept 100 percent of the flow at the gutter line;

(F) Inlets placed at locations other than in Clause 4.3-4(E) above shall be designed to conform to SD1's Storm Water Regulations; and

(G) Roll type grate inlets shall be used in any location where a driveway will intersect the street.

4.3-5 Cul-de-sac Inlet Location

Special consideration should be given to storm Drainage entering Cul-de-sacs. In addition to an inlet provided at the low point within the Cul-de-sac, two additional inlets shall be required along each Curb prior to the entrance of the Cul-de-sac:

(A) For Street slopes eight percent and less draining more than 400 feet of pavement; and

(B) For all Street slopes more than eight percent and draining more than 300 feet of pavement.

4.3-6 Culverts and Pipe Types

Culverts and pipe types shall be designed in accord with SD 1's Storm Water Regulations

(A) All pipe installations greater than 30 inches in diameter require full-time on-site inspections under the direction of a Qualified Geotechnical Engineer of Firm.

4.3-7 Lot Grading and Drainage

The following shall apply to Lot grading and Drainage:

(A) Surface Drainage swales to accommodate individual Lot Drainage shall be constructed as part of the final Lot grading and seeded and mulched.

(B) Surface Drainage swales shall have a minimum grade of two percent and shall be constructed so that the surface water will drain onto a Street, storm inlet, natural Drainage area, or other Drainage feature. See Figure 4.3-A.

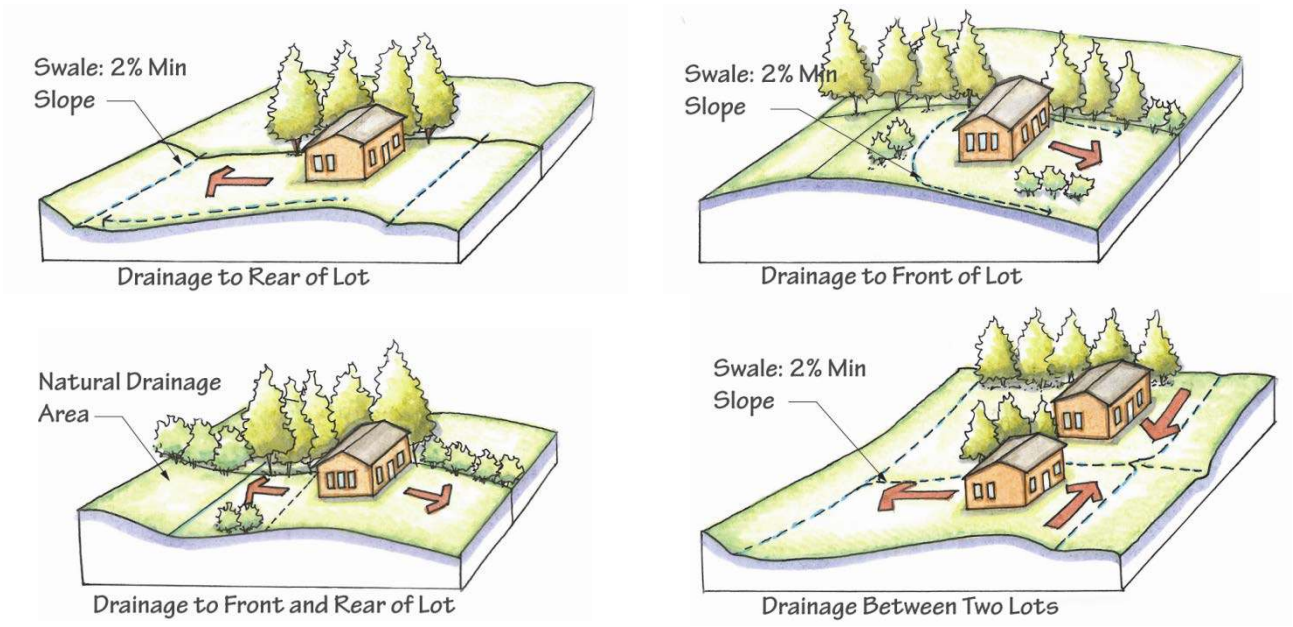


Figure 4.3-A: Illustrations of Lot Drainage and Swales

(C) Roof downspouts, footing, foundation drains, and sump pumps that are discharged above ground shall be discharged onto the same Parcel of land from which the water is generated, as far from the property line as practical and at least five feet from the residence.

(D) Roof downspouts, footing, foundation drains, and sump pumps discharging toward the Street shall be discharged onto a pervious area no closer than 20 feet from the edge of pavement or back of Curb. See Figure 4.3-B.

(1) The discharge of roof downspouts, footing, foundation drains and sumps directly onto an impervious area that drains to the street is prohibited.

Figure 4.3-B: Illustration of Drainage on Lot

(E) The connection of roof downspouts, footing, foundation drains, or sump pumps to the public storm sewer system shall be prohibited unless approved by Sanitation District No. 1 in writing.

4.3-8 Waivers for Storm Water Runoff Control Facilities

A waiver (See Section 3.9: Waivers to the Regulations.) of stormwater management control facilities may be granted by Staff when the following criteria are present:

(A) Less than one acre of land is disturbed and the area is not part of a larger overall development;

(B) Less than ½ acre will be impervious area; and

(C) Drainage calculations indicate that the downstream Drainage facilities are adequately sized to accommodate the additional stormwater runoff and that no pre-existing stormwater Drainage problems in this watershed exist immediately downstream.

4.3-9 Sanitary Sewer System

The following shall apply to a sanitary sewage system:

(A) The sanitary sewage system shall comply with the Rules and Regulations of Sanitation District No. 1.

(B) In those areas identified in the Comprehensive Plan within the "Urban/Suburban Focus Area", a sanitary sewage system shall be provided to adequately serve all Lots in the Subdivision.

(C) The sanitary sewer system easements shall be required to be provided to adjacent property not presently served by a sanitary sewer system.

(D) Where package sewage treatment plants are proposed, the sewage collection system shall be designed for ultimate connection to the public system.

(E) Sanitary sewage treatment plants for any Subdivision shall be set back a minimum of 200 feet from any existing residence.

4.3-10 Individual On-Site Sewage Disposal Systems

Individual on-site sewage disposal systems are required to be constructed in accordance with the current standards and specifications of the state and local health department.

4.3-11 Water System

The following shall apply to a domestic water system:

(A) The water system shall comply with the applicable water district's rules and regulations.

(B) A water system shall be provided to adequately serve all Lots in the Subdivision.

(C) The water system easements shall be required to be provided to adjacent property not presently served by a water system.

(D) The water system shall be required to interconnect with an existing water system where practical.

4.3-12 Fire Flow Requirements for Residential Development

The following shall apply to minimum fire hydrant flows within residential developments:

(A) The minimum fire hydrant flows shall be provided in accord with Table 4.3-1.

(B) The minimum fire hydrant flow is the quantity of flow in gpm (gallons per minute) at 20 psi (pounds per square inch) residual pressure.

(C) In areas served by the Northern Kentucky Water District, minimum fire hydrant flows shall be determined by the Design Engineer using Fire Flow Testing conforming to the standard procedures contained in the National Fire Protection Association, (NFPA) Handbook and/or by hydraulic modeling data provided by the Northern Kentucky Water District.

(D) In areas outside the jurisdiction of the Northern Kentucky Water District, minimum fire hydrant flows shall be determined by a Fire Flow Test performed by the applicable water service district or fire department and shall conform to the standard procedures contained in the National Fire Protection Association (NFPA) Handbook.

TABLE 4.3-1: MINIMUM FIRE FLOW REQUIREMENTS FOR RESIDENTIAL DEVELOPMENT

EXPOSURE DISTANCES [1]	MINIMUM FIRE FLOW
Over 100 feet	None
100 feet or less	500 gpm

NOTE:
[1] Exposure distances are measured using the minimum allowable side yards identified in the applicable zoning ordinance.

4.3-13 Fire Hydrant Locations for Residential Development

The following shall apply to the location and spacing of fire hydrants for residential development:

(A) Water mains and fire hydrants shall be extended along any proposed Street where the existing water system can support the extension and meet all of the Northern Kentucky Water District Regulations.

(B) The maximum spacing of fire hydrants shall be provided in accordance with Table 4.3-2. See also Figure 4.3-C.

(C) Fire hydrant spacing shall be measured along the centerline of the Street and placed at proposed Lot Lines where practical.

(D) A fire hydrant shall be located a maximum of 500 feet from the face of any building within developments where a new Street is involved.

(1) Other Northern Kentucky Water District Regulations

TABLE 4.3-2: MAXIMUM SPACING OF FIRE HYDRANTS

DEVELOPMENT TYPE	SPACING
Single-Family	500 feet
Multi-Family	300 feet

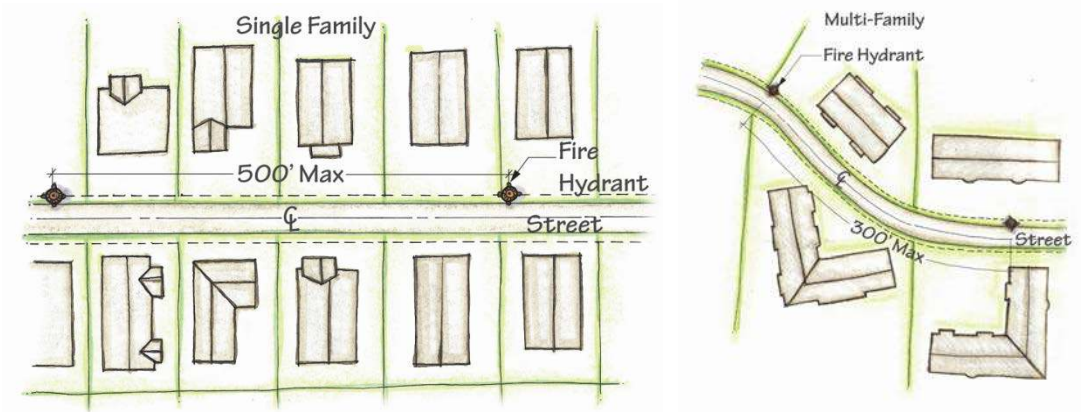


Figure 4.3-C: Illustrations of fire hydrant locations for single-family and multi-family developments

4.3-14 Fire Hydrant Locations and Fire Flow Requirements for Nonresidential Development

Minimum fire hydrant locations and fire flows for nonresidential developments shall be as approved by the applicable fire department in writing.

4.3-15 Telephone, Cable and Electric Utility Lines

All new telephone, cable and electrical utility lines shall be installed underground and be in conformance with the appropriate utility company's policy and requirements.

4.4 Pavement Design Method and Required Thicknesses

4.4-1 Pavement Design Method

AASHTO Guide for Design of Pavement Structures (1986 and 1993), published by The American Association of State Highway and Transportation Officials is the design method used herein and is specified as the design method to be used for any alternate pavement designs that are allowed or required in this regulation. Table 4.4-1: Subdivision Pavement Design Parameters Using AASHTO Method sets out the design parameters used herein for Cambell County Subdivision pavements. For definition and explanation of the parameters shown here, see the above mentioned AASHTO guides, Section 4.8: Pavement Performance and Design herein. Project specific pavement designs are required for residential streets serving over 1,000 residences or commercial/industrial streets serving more than 3,500,000 ESALs or alternative pavement designs proposed under Section 4.4-2: Required Thicknesses. Any project specific pavement designs are required to use the design parameters identified in Table 4.4-1: Subdivision Pavement Design Parameters Using AASHTO Method.

TABLE 4.4-1: SUBDIVISION PAVEMENT DESIGN PARAMETERS USING AASHTO METHOD

PARAMETER	DESIGN VALUES	
	CONCRETE	ASPHALT
Design Life	20 years	20 years
Life Cycle Analysis	50 years	50 years
Drainage Coefficient	1.0	--
Reliability	80%	80%
Deviation	0.35	0.45
Initial Serviceability	4.2	4.5
Terminal Serviceability	2.5	2.5
Modulus of Rupture	600 psi	--
Modulus of Elasticity	3,600,000 psi	--
CBR, Minimum	2 (K=50 pci)	3 (MR=2700 psi)
Load Transfer	4.4 (no dowels)	--
Load Transfer	3.2 (dowels)	--
20 Year ESAL, Residential Local Street, ≤ 199 lots served	81,000	81,000
20 Year ESAL, Residential Subcollector Street, 200-500 lots served	203,000	203,000
20 Year ESAL, Residential Collector Street, 501-1000 lots served	406,000[2]	406,000[2]
20 Year ESAL, Commercial/Industrial Street	3,500,000[1]	3,500,000[1]
Year 17 to Year 34 and Year 34 to Year 50 ESAL, Residential Local Street, ≤ 199 lots served	53,000	53,000
Year 17 to Year 34 and Year 34 to Year 50 ESAL, Residential Subcollector Street, 200-500 lots served	133,000	133,000
Year 17 to Year 34 and Year 34 to Year 50 ESAL, Residential Collector Street, 501-1000 lots served	265,000[2]	265,000[2]
ESAL, Arterial	Per KYTC Specification	
Asphalt Surface Layer Coefficient		0.44
Asphalt Base Layer Coefficient		0.40
Crushed Stone Base Layer Coefficient		0.14
Crushed Stone Base with Tensar TX5 Geogrid Layer Coefficient		0.25 for CBR ≥ 3
		0.21 for 2≤ CBR < 3
Thickness conversion factor, 17 year old asphalt		0.7
Thickness conversation factor, 34 year old asphalt		0.6

NOTES:
[1] Engineer shall submit a Traffic Impact Study (TIS) documenting project-specific design ESALs for each commercial/industrial Subdivision generating more than 100 vehicle trips per hour during the AM or PM peak period. If project-specific ESAL loading is greater than 3,500,000, a project-specific pavement design is required.
[2] Project specific pavement design required for residential streets serving more than 1,000 lots

4.4-2 Required Thicknesses

(A) Table 4.4-2: Required Subdivision Street Thicknesses shows the required pavement thicknesses for various Street classifications for Asphalt and Concrete Streets where in situ Subgrade soils can meet the minimum required Subgrade CBR equal to 2 or greater for Concrete pavements or CBR of 3 or greater for Asphalt pavements. These thicknesses were determined using the AASHTO Guide for Design of Pavement Structures (1986 and 1993) and the design parameters identified in Table 4.4-1: Subdivision Pavement Design Parameters Using AASHTO Method. These values meet requirements for a 50 year life cycle without replacement, assuming resurfacing at 17 and 34 years as shown in the example calculation in Figure C.1-A: Exhibit A.

TABLE 4.4-2: REQUIRED SUBDIVISION STREET THICKNESSES

STREET CLASSIFICATION WITH NUMBER OF LOTS SERVED[5]	CONCRETE	CONCRETE OVER 4" CRUSHED STONE BASE	FULL-DEPTH ASPHALT		ASPHALT OVER CRUSHED STONE BASE (CSB)			ASPHALT OVER CRUSHED STONE BASE (CSB) + GEOGRID[6]		
			SURFACE	BASE[1]	SURFACE	BASE	CSB[1]	SURFACE	BASE	CSB[1]
Residential Local ≤199 Lots	7"[2]	NA	1.25"	8"	1.5"	5"	7"[4]	1.5"	3"	7"[4]
Residential Subcollector 200 – 500 Lots	8"[2]	NA	1.25"	8.75"	1.5"	6"	7"[4]	1.5"	4"	7"[4]
Residential Collector 501 – 1,000 Lots	9"[2]	NA	1.25"	10.5"	1.5"	7.75"	7"[4]	1.5"	5.75"	7"[4]
Commercial/ Industrial	Not Permitted	10"[3]	Not Permitted	Not Permitted	1.5"	14"	7"[4]	1.5"	12"	7"[4]
Arterial	Per KYTC Specifications									

[1] Average thickness. Varies from 1 inch less at centerline to 1 inch greater at gutter apron

[2] Plain Concrete, tooled skewed transverse Contraction Joints without dowels (see Figure A.1-N: Detail #12 and Figure A.1-O: Detail #13).

[3] Plain Concrete, with doweled and sawed (non-skewed) transverse Contraction Joints (see Figure A.1-M: Detail #11).

[4] 6-8 inch KYTC crushed stone base for residential pavements to be installed in one lift (pug milled) and properly compacted (one lift). Any crushed stone base greater in thickness than the above noted 6-8 inches must be installed in two lifts. Asphalt base can be replaced with a structurally equivalent thickness of crushed stone base as long as the following minimum asphalt thicknesses are maintained: minimum total Asphalt thickness equals 4.5 inches local, 5.5 inches subcollector, 6.5 inches residential collector, and 7.5 inches commercial/industrial

[5] Number of lots served for a particular Street is defined as the number of lots which that Street serves as the sole access or, where a number of Lots are served by more than one access, it is an approximation of the number of lots served that is equivalent to one access.

- Example 1: A particular section Street serves as the sole access to less than 200 Lots. That Street would then be a Local Street.
- Example 2: An area of existing and future residential development of 450 Lots is served by more than one access Street. Only those Streets that will carry traffic and ESAL loading higher than a Subdivision Street that provides sole access to more than 200 Lots will be classified as a subcollector Street.

[6] Geogrid shall be Tensar TX5 triaxial geogrid.

(B) Wherever the minimum CBR values for Asphalt or Concrete pavements as defined in Table 4.4-1: Subdivision Pavement Design Parameters Using AASHTO Method cannot be provided by the in situ Subgrade soils, the Engineer shall: 1) submit an engineered Subgrade improvement design that increases the CBR value of the in situ Subgrade soils to the required minimum CBR values for Asphalt and Concrete pavement in Subsection 4.4-1: Pavement Design Method; or 2) submit an engineered alternate pavement design that takes into account the substandard CBR values.

(1) Engineered subgrade improvements may include:

a) Undercutting the substandard Subgrade soils and replacing them with documented soils that provide the minimum CBR values, or greater.

b) Providing a chemically stabilized Subgrade (usually lime stabilization) to effectively provide the minimum CBR values, or greater.

c) Utilizing crushed stone base with geotextile and/or Tensar TX5 triaxial geogrid to effectively provide the minimum CBR values, or greater.

(2) Alternative pavement designs may be proposed for Asphalt pavement on subgrades with a CBR value of 2, provided the pavement structure is shown to meet the structural number requirements identified in Table 4.4-3: Structural Numbers For Alternative Asphalt Pavement Designs (CBR =2). Alternative pavement designs are not permitted for Subgrade soils with a CBR less than 2; rather, the subgrade soils shall be improved to CBR equal to 2 or greater, per Subsection 4.4-2(B)(1).

TABLE 4.4-3: STRUCTURAL NUMBERS FOR ALTERNATIVE ASPHALT PAVEMENT DESIGNS (CBR =2)

STREET CLASSIFICATION	STRUCTURAL NUMBER
Local (<200 Lots)	4.09
Subcollector (200-500 Lots)	4.92
Collector (501-1,000 Lots)	5.60
Commercial/ Industrial	8.40

(3) When chemically stabilized Subgrade demonstrates a documented CBR value greater than 3**,** an alternative asphalt pavement design may be proposed to reduce pavement thickness, provided the pavement structure is shown to meet the structural number requirements identified in Table 4.4-4: Structural Numbers For Alternative Asphalt Pavement Designs**.**

TABLE 4.4-4: STRUCTURAL NUMBERS FOR ALTERNATIVE ASPHALT PAVEMENT DESIGNS

STREET CLASSIFICATION	STRUCTURAL NUMBER			
	CBR 4	CBR 5	CBR 6	CBR 7
Local (≤199 Lots)	2.85	2.50	2.24	2.04
Subcollector (200-500 Lots)	3.52	3.14	2.84	2.60
Collector (501-1,000 Lots)	4.09	3.65	3.34	3.07
Commercial/ Industrial	6.47	5.92	5.47	5.12

a) For full depth asphalt pavements, the maximum allowable reduction in asphalt thickness over that identified in Table 4.4-2: Required Subdivision Street Thicknesses shall be 2 inches. Asphalt base shall be a minimum of 4" thick under the curb; if the

CBR of the subgrade is improved to 5 or higher, a 3" minimum thickness may be used under the curb.

b) For Asphalt over Crushed Stone Base pavements, the crushed stone base may not be reduced below the thicknesses shown in Table 4.4-2: Required Subdivision Street Thicknesses, and minimum total Asphalt thicknesses of 4.5 inches (local streets), 5.5 inches (subcollector streets), 6.5 inches (residential collector streets), and 7.5 inches (commercial/industrial streets) shall be maintained.

c) There shall be no reduction in thickness for Concrete pavements below those shown in Table 4.4-2: Required Subdivision Street Thicknesses

d) Alternative pavement designs shall not be permitted for:

i) in situ soils with CBR values greater than 3;

ii) undercut and replaced subgrade soils; or

iii) crushed stone base and geotextile/geogrid subgrade improvements.

4.4-3 Pavement and Pavement Drainage Construction Details

Appendix A: Standard Construction Drawings contains important construction details that are a part of these specifications for the pavement, pavement Drainage system, and other utility construction within the Right of Way that can impact pavement performance. Proper construction execution of the details in Appendix A: Standard Construction Drawings is important to good pavement performance.

4.5 Use of Aggregates Within the Right-of-way

4.5-1 Aggregate Specifications

Table 4.5-1 indicates the specifications for the various aggregate types and their uses in improvement construction within the Street Right-of-way. All aggregates must pass all KYTC aggregate requirements for their intended use as set out in Section 800 of the KYTC Road and Bridge Manual, latest edition.

TABLE 4.5-1: AGGREGATE SPECIFICATION TABLE

KYTC SPECIFICATION	USE WITHIN RIGHT-OF-WAY
Pipe Bedding Sand	Bed and cover for deep sanitary sewer and storm sewer
Concrete Sand	Concrete mix and bed and cover for waterline and power and communication utilities
DGA	Backfill for waterline and power and communication utilities under the Street
No. 57 Crushed Limestone	Concrete pavement aggregate and catch basins crossover construction
No. 57 Gravel	Allowable aggregate for all Concrete not used in Concrete pavement and Concrete Curb and gutter
No. 8 Gravel	Allowable aggregate for all Concrete
No. 467 Crushed Limestone	Required aggregate for Concrete pavements
Crushed Stone Base	Base material for Asphalt pavements with stone base
Asphalt Aggregates See Table 4.7-1	Asphalt pavement aggregate must meet requirements in Section 400 of the KYTC Road and Bridge Manual, latest edition, except where noted otherwise in this specification.

All aggregates must pass all KYTC aggregate requirements for their intended use as set out in Section 800 of the KYTC Road and Bridge Manual, latest edition.

4.6 Portland Cement Concrete (Concrete) Infrastructure

4.6-1 General Requirement

(A) Materials

Portland cement, water, aggregates, air entraining agents, and admixtures to reduce water, retard set, etc. shall satisfy the material specifications of, and be proportioned, batched, delivered, and cured in accordance with, the Portland Cement Association (PCA), Design and Control of Concrete Mixtures, latest edition, except as noted otherwise in these regulations.

(B) Mix Design

Concrete mix design will vary depending on the intended use, as spelled out in Subsections 4.6-2(A), 4.6-3(A), and 4.6-4(A).

(C) Fly Ash

No fly ash is allowed in the Concrete mix.

(D) Strength

Finished Concrete shall attain a minimum compressive strength at 28 days of 4,000 pounds per square inch.

(E) Ready Mix Suppliers

All Concrete Ready Mix must be provided by Ready Mix plants listed on the KYTC List of Approved Materials (LAM) as a qualified producer. In the alternative, the Ready Mix supplier must supply to the staff an executed original of KTC Form TC-64-764/09 2011 "Certification of Compliance for Freeze Thaw Resistant Concrete Aggregate" for the aggregate used in Concrete mixes prior to commencement of construction. All Ready Mix Concrete suppliers shall submit to the Staff in January of each year mix design verifications for all Concrete mixes that will be supplied during that year for use in Subdivision improvements.

(F) Delivery and Discharge

Concrete shall be delivered and discharged from a truck mixer or agitator truck within the periods specified in Table 4.6-1. Delivery tickets shall have this time clearly shown and be checked for conformance by the Staff. Delivery tickets shall also show the date of the delivery, the Concrete mix supplied, and the design compressive strength. All delivery tickets shall be delivered to Staff. Any Concrete which is not plastic and workable when placed shall be rejected.

TABLE 4.6-1: MAXIMUM CONCRETE DISCHARGE TIME

AIR TEMPERATURE	MAXIMUM DISCHARGE TIME
Up to 85 degrees Fahrenheit	1.5 hours
More than 85 degrees Fahrenheit	1 hour

(G) Curing

Concrete shall be cured in accordance with Section 601.03.17 of the KYTC specification.

(H) Expansion and Isolation Joints

Expansion and Isolation Joint material used herein shall be preformed one inch thick material, the full depth of the Concrete, and shall conform to KYTC specifications for use in Concrete pavements.

4.6-2 Street Pavement Requirements

(A) Concrete Mix Design Requirements

(1) Aggregates for Concrete Street pavement shall be a blend of No. 467 crushed limestone, No. 8 gravel and concrete sand.

(2) The No. 467 crushed limestone aggregate shall meet the gradation limits shown in Table 4.6-2.

TABLE 4.6-2: NO. 467 GRADATION LIMITS

SIEVE SIZE	PERCENT PASSING
2"	100
1½"	93-98*
1"	----
¾"	35-70
½"	----
⅜"	10-30
#4	0-5
#8	----
*Note that the specified percent passing the 1½" sieve	

differs from Section 800 of the KYTC Road and Bridge Manual, latest edition, for No. 467 gradation. The No. 467 crushed limestone for Street pavement in the Regulation must have 2% to 7% retained on the 1½" sieve.

(3) Gradation of the No. 8 gravel and the concrete sand shall meet the requirements of Section 800 of the KYTC Road and Bridge Manual, latest edition.

(4) Minimum cement factor shall be 564 pounds per cubic yard.

(5) Minimum compressive strength at 28 days shall be 4,000 psi.

(6) Maximum water / cement ratio shall be 0.45.

(7) Air entrainment shall be 6% ± 2%.

(8) Maximum slump without mid-range water reducer shall be 4-inches.

(9) Maximum slump with mid-range water reducer shall be 7-inches.

(10) Workability factor shall be between 38 high to 33 low.

(11) Coarseness factor shall be between 73 high to 68 low.

(B) Thickness Requirements

Pavement thicknesses for various classifications of Streets shall be as shown in Table 4.4-2: Required Subdivision Street Thicknesses. Various critical Concrete pavement design and construction details that shall be used in Concrete Subdivision pavements are shown in Appendix A: Standard Construction Drawings.

(C) Testing Requirements

(1) One set of three test cylinders shall be made for each day's placement of Street. An additional set of three test cylinders shall be made for each additional 100 cubic yards of placement. One slump, air entrainment and temperature test shall be performed for each set of Concrete test cylinders.

(2) One cylinder shall be tested for compressive strength at no later than seven days and two cylinders at 28 days.

(3) Part of the plastic Concrete sample used for the test cylinders shall be washed to visually confirm that crushed limestone coarse aggregate was used in the Concrete mix.

(4) All Concrete testing shall be performed by a Qualified Materials Testing firm in accord with applicable ASTM specifications, latest editions. The results of all Concrete testing are required to be provided to Staff by the Developer prior to the approval of a Final Plat.

(D) Reinforcing Steel

The use of continuous reinforced concrete pavements is not required but can be considered for streets serving commercial/industrial uses.

(1) Bent bars are not considered reinforcing steel in the contents of this section.

(2) The use of wire mesh in concrete pavements is prohibited.

(E) Placement

(1) Formwork

a) Fixed forms shall have a depth equal to or greater than the thickness of the pavement.

b) Forms shall be of such cross-sections and strength and so secured as to resist the pressure of the Concrete when placed, and the impact and vibration of any equipment which they support, without springing or settlement.

(2) Setting

The Subgrade under the forms shall be compacted and shaped so that the form set shall provide the specified elevation.

(3) Grade and Alignment

The alignment and grade elevation of the forms shall be checked by the Contractor immediately ahead of Concrete placement and corrections made when necessary.

(4) Placement Method

a) All Concrete placement shall conform to ACI Specifications, latest edition.

b) The Concrete shall be mixed in quantities required for immediate use and shall be deposited on the Subgrade to the required depth and width of the construction lane in successive batches and in a continuous operation. The terminus of a continuous pour shall be a Construction Joint per Figure A.1-N: Detail #12.

c) The Concrete shall be placed as uniformly as possible in order to minimize the amount of additional spreading necessary.

d) The Concrete shall be vibrated and consolidated with suitable tools while being placed so that the formation of voids or honeycomb pockets is prevented.

e) Concrete shall not be placed around manholes or other structures until they have been brought to the required grade and alignment.

f) Additional tamping and compaction of surrounding fill material may be required after raising manholes.

(5) Consolidating and Finishing

a) Concrete pavement shall be struck off and consolidated with a mechanical finishing machine, vibrating screed, slipform paver, or by hand-finishing methods such that, after consolidation and final finishing, it shall be at the elevation shown on the approved plans.

b) The finishing method shall incorporate a screed, which will consolidate the Concrete by pressure, vibration, or both.

c) The Concrete shall be brought to a true and even surface, free from rock pockets.

d) Hand-finishing tools shall be kept available for use in case the mechanical finishing machine breaks down.

e) When hand finishing, the pavement shall be struck off and consolidated by a vibrating screed to the elevation as shown on the plans. When the forward motion of the vibrating screen is stopped, the vibrator shall be shut off and not be allowed to idle on the Concrete.

(6) Scraping and Straight Edging

a) The Inspector may require that the pavement be scraped with a straightedge with a minimum width of six feet, equipped with handles long enough to permit it to be operated from the edge of the pavement.

b) When irregularities with the surface elevation are discovered, they shall be corrected by adding or removing Concrete. All disturbed areas shall be floated with a wooden or metal float not less than four feet long and not less than six inches wide and straight edged.

(7) Edging

Before final finishing is completed and before the Concrete has taken its initial set, the edges of the slab and Curb shall be carefully finished with an edger.

(8) Final Surface Finish

a) The final surface of the Concrete pavement and Curb shall have a uniform gritty texture at the grades and cross-sections shown on the plans.

b) A burlap drag or medium broom shall be used as the final finishing method for Concrete pavement.

c) A burlap drag finish shall have a minimum width of at least three feet and have a length that is long enough to cover the entire pavement width.

d) The burlap drag shall be pulled forward across the pavement in the direction in which the pavement is being placed.

e) A broom finish shall be drawn transversely across the pavement using overlapping strokes to produce surface corrugations of uniform appearance approximately $^{1}/_{16}^{th}$ inch in depth.

f) Curbs shall be finished using the same method as the pavement.

(9) Integral Curb

a) Curbs shall be constructed monolithically with pavement extrusion equipment or hand formed prior to the finishing operation.

b) The integral barrier and sloped Curb shall be constructed with or prior to the finished paving operation. Special care shall be taken so that the Curb construction does not create a "cold joint."

c) Curbs placed immediately following the paving operation shall be sufficiently consolidated with the paving slab and shall not contain voids within or along the back face of the Curb.

d) Integral barrier Curbs along the edges of Street pavement shall contain depressed Curbs not less than 1-3/4 inches above the gutter line at all Driveway entrances and at such other locations as designed on the approved plans.

e) When barrier Curb is used, the Curb may be sawed horizontally to facilitate residential Driveways, approaches, and Sidewalks.

(F) Concrete Street Pavement Joints

(1) Contraction Joints

a) All Contraction Joints shall be placed a maximum of 15 feet on center. Commercial/ industrial Subdivision pavements shall have sawed transverse Contraction Joints with steel dowels that are cut perpendicular across the pavement. All residential pavements shall have tooled or sawed Contraction Joints without dowels. Residential pavement transverse Contraction Joints shall be skewed (except at intersections, paired catch basins and in Cul-de-sacs). See Figure A.1-O: Detail #13.

b) Sawed joints shall be equal to a depth of one-fourth (1/4) of the pavement thickness continuous across the slab.

c) The timing of the installation of joints shall conform to ACI specifications, latest edition.

d) Contraction Joints cut into fresh Concrete with a jointing tool shall be a minimum 1½ inches deep.

(2) Expansion Joints

There shall be no Expansion Joints in any pavements except at bridge abutments and where required by construction details in Figure A.1-R: Detail #16, Figure A.1-S: Detail #17, Figure A.1-T: Detail #18, Figure A.1-U: Detail #19, and Figure A.1-V: Detail #20.

(3) Longitudinal Joints

a) All pavements wider than 15 feet require Longitudinal Joints. Longitudinal Joints may be Construction Joints or tooled/sawed joints.

b) Longitudinal Construction Joints will require 18 inches long #4 deformed bars embedded into each slab at the mid-slab height, no more than four feet on center and no closer than 18 inches to each Contraction Joint.

c) Bent bars may be inserted into fresh Concrete before its initial set.

d) Bent bars shall not be straightened until the Concrete has cured sufficiently to enable bending without fracture of the Concrete slab.

(4) Other Pavement Joints

Other Contraction Joints and Isolation Joints shall be constructed per Figure A.1-N: Detail #12.

(G) Manholes and On-Street Inlets

Manholes, on-Street inlets, and water valves encountered in the areas to be paved shall be raised or lowered to the surface of the new pavement. On-Street inlets may be separated from the pavement and Curb by boxing out around the inlet. Details for Joint construction at manholes and catch basins are in Figure A.1-P: Detail #14, Figure A.1-Q: Detail #15, and Figure A.1-R: Detail #16.

(H) Protection and Opening to Traffic

(1) Traffic shall be prohibited from the pavement until the Concrete has attained a compressive strength of 3,500 pounds per square inch.

(2) Prohibited traffic shall include Contractor's vehicles.

(3) Prior to opening to public traffic, the Developer is responsible for completing, curing and sealing the pavement, including box outs, backfilling the Street, sealing the joints and cleaning the pavement of all debris.

(I) Concrete Pavement Lugs

The purpose of pavement lugs in Subdivision pavements is to provide some additional resistance to Contraction Joints separating during repeated expansion and contraction cycles over the life of the pavement in certain open ended and relatively steep downhill pavement conditions. In these open ended and downhill conditions, resistance to pavement lengthening at contraction joints is substantially reduced as compared to Contraction Joints in long stretches relatively straight pavement. In the long, relatively straight streets, the repetitive adjacent slabs help keep the contraction joints from separating during repeated expansion and contraction cycles. Those conditions which shall require lugs are related to the geometry of the Streets and are as follows (see Figure A.1-J: Detail #8, Figure A.1-K: Detail #9, and Figure A.1-L: Detail #10).

(1) The ends of Cul-de-sacs where the Street grade approaching the Cul-de-sac decreases more than 20 feet vertically, at an average grade of more than six percent, before there is a change in direction of Street Drainage. In this condition, install a lug near the end of the Cul-de-sac across the extension of the two lanes of pavement.

(2) At T-intersections, place a lug on the intersecting street near the intersection, where grade on the intersecting Street is going up from the intersection more than 20 feet vertically, at an average grade of more than six percent, before there is a change in the Drainage direction.

(3) On the main line of a Street pavement where the pavement is going straight and downhill more than 20 feet vertically, at an average grade of more than six percent and the direction of centerline deflects horizontally by more than 30 degrees, place a lug just uphill of the start of the horizontal curve.

a) Lugs shall be placed at least 20 feet uphill from any shallow utility excavation transverse to the pavement.

(4) The Design Engineer may add other lugs in conditions he considers critical to Contraction Joint integrity.

(5) Lug locations are to be shown on construction design and as-built drawings.

(J) Joint Sealing Compound

(1) Joint sealing compound shall conform to the following standard designations:

a) Hot-poured elastic type, as specified by AASHTO, latest edition; or

b) Silicone rubber sealant type (non-sag, self-leveling, or rapid cure) conforming to the KYTC Department of Highways Standard Specifications for Road and Bridge Construction, latest edition; or

c) An approved equal, as determined and approved by Staff.

(2) The application of joint sealant is prohibited at temperatures below 40 degrees Fahrenheit.

4.6-3 Concrete Curb and Gutter Requirements for Asphalt Streets

(A) Concrete Mix Design Requirements

(1) Aggregates for Concrete Curb and Gutter shall be a blend of No. 57 crushed limestone, No. 8 gravel and concrete sand .

(2) Gradation of the No. 57 crushed limestone, the No. 8 gravel and the concrete sand shall meet the requirements of Section 800 of the KYTC Road and Bridge Manual, latest edition.

(3) Minimum cement factor shall be 564 pounds per cubic yard.

(4) Minimum compressive strength at 28 days shall be 4,000 psi.

(5) Maximum water / cement ratio shall be 0.45.

(6) Air entrainment shall be 6% ± 2%.

(7) Maximum slump without mid-range water reducer shall be 4-inches.

(8) Maximum slump with mid-range water reducer shall be 7-inches.

(9) Workability factor shall be between 40 high to 35 low.

(10) Coarseness factor shall be between 63 high to 58 low.

(B) Curb Design

(1) 24-inch wide Concrete Curb and gutter shall be used for all Streets Types with Asphalt pavements.

(2) The Developer may choose between using the sloped Curb or the six inch barrier Curb profile shown in Figure A.1-H: Detail #7.

(3) All Streets serving industrial/commercial developments shall use the six inch barrier Curb.

(C) Concrete Curb over Asphalt Base

Concrete Curb over Asphalt base shall be a minimum of six inches thick at the Curb apron. Concrete Curb over crushed stone base shall be a minimum of seven inches thick at the Curb apron.

(D) Expansion Joints

(1) Expansion Joints shall be placed in Concrete Curbs at each side of Curb inlet catch basins.

(2) Two ¾-inch diameter, 18-inch long smooth dowels with expansion caps shall be placed in each Expansion Joint location.

(3) Expansion material must go completely through the Curb cross section, preventing Concrete to Concrete contact. See Figure A.1-R: Detail #16.

(E) Contraction Joints

Contraction Joints shall be installed in the Curb at a spacing of no more than 10 feet on center.

(F) Standard Details

Details for Concrete Curb and gutter are shown in the exhibits in Figure A.1-H: Detail #7 and Figure A.1-I: Detail #7A.

(G) Testing Requirements

(1) One set of three test cylinders shall be made for each day's placement of Street. An additional set of three test cylinders shall be made for each additional 100 cubic yards of placement. One slump, air entrainment and temperature test shall be performed for each set of Concrete test cylinders.

(2) One cylinder shall be tested for compressive strength at no later than seven days and two cylinders at 28 days.

(3) Part of the plastic Concrete sample used for the test cylinders shall be washed to visually confirm that crushed limestone coarse aggregate was used in the Concrete mix.

(4) All Concrete testing shall be performed by a Qualified Materials Testing firm in accord with applicable ASTM specifications, latest editions. The results of all Concrete testing are required to be provided to Staff by the materials testing firm prior to the approval of a Final Plat.

4.6-4 Concrete Public Sidewalks, Pathways, Driveway Aprons and Other Infrastructure Uses Not Specified Elsewhere in These Regulations

(A) Concrete Mix Design Requirements

(1) Aggregates shall be a blend of No. 57 gravel or crushed limestone, No. 8 gravel and concrete sand .

(2) Gradation of the No. 57 gravel or crushed limestone, the No. 8 gravel and the concrete sand shall meet the requirements of Section 800 of the KYTC Road and Bridge Manual, latest edition.

(3) Minimum cement factor shall be 564 pounds per cubic yard.

(4) Minimum compressive strength at 28 days shall be 4,000 psi.

(5) Maximum water / cement ratio shall be 0.45.

(6) Air entrainment shall be 6% ± 2%.

(7) Maximum slump without mid-range water reducer shall be 4-inches.

(8) Maximum slump with mid-range water reducer shall be 7-inches.

(9) Workability factor shall be between 40 high to 35 low.

(10) Coarseness factor shall be between 63 high to 58 low.

(B) Subgrade

(1) Subgrade for Sidewalks, pathways, and Driveway aprons shall be non-organic and consist of natural clay or sand soils.

(2) Clay soils must be knit together without any loose clay soils. Any material used to finish grade Subgrade shall be bank run sand, KYTC crushed limestone DGA, or crushed recycled Concrete.

(3) Any granular material in excess of two inches thick shall be compacted with a vibrating plate compactor or equivalent.

(4) No gravel and no other crushed limestone gradation will be used for finish grade fill material.

(C) Thickness Requirements

(1) Concrete for public Sidewalks and pathways shall be a minimum of four inches thick.

(2) Residential Driveway aprons shall be a minimum of five inches thick.

(3) Commercial and industrial Driveway aprons shall be a minimum of seven inches thick.

(D) Drive/Apron Requirements

Required Driveway apron layouts and construction details, including required Expansion Joint thickness and location, are shown in Appendix A: Standard Construction Drawings. Special care must be taken during construction to make sure there is no Concrete-to-Concrete contact under all Expansion Joints.

(E) Edge Drain Installation

When installing Driveway aprons, special care must be taken not to damage the edge drain installed on the outside of the Curb. If the edge drain is damaged, the damaged section must be properly replaced to assure water flow through the edge drain.

(F) Contraction Joint Spacing

For Sidewalks, the maximum spacing of Contraction Joints shall not exceed five feet, except when the Sidewalk or pathway is wider than five feet when the spacing shall not exceed the width of the slab.

4.7 Asphalt & Concrete Paving Mixture, Construction Specifications

4.7-1 General

(A) All Subdivision Streets in new Highland Heights Subdivisions shall be constructed in accordance with the latest edition of the KYTC Roadway Manual, Division 400, except where noted otherwise in this specification.

(B) All Contractors must be prequalified by KYTC or demonstrate experience and success on similar projects in order to perform this work.

(C) All construction materials incorporated into the work shall conform to the requirements set forth in the KYTC Roadway Manual.

(D) The Contractor shall notify Staff of the intent to start the project within 24 hours of beginning production.

4.7-2 Mixture Designation and Design

(A) Volumetric Mix Design

The Contractor shall perform the volumetric mix design according to AASHTO R35 and conforming to AASHTO M323 and utilize 50 gyrations.

(B) Mix Design Submittal

At least 72 hours prior to the start of production, the Contractor shall submit the mix design to the Staff and the Applicant's Qualified Material Testing Lab for review.

(C) Aggregate Gradation

Aggregate gradations for base, intermediate and surface mixtures shall conform to KYTC Roadway Manual Division 400 and Table 4.7-1.

TABLE 4.7-1: AGGREGATE GRADATIONS			
SIEVE SIZE	1.0 BASE MIXTURE	0.75 INTERMEDIATE MIXTURE	SURFACE MIXTURE
1½"	100	--	--
1"	90-100	100	--
¾"	<90	90-100	--
½"	--	<90	100
⅜"	--	--	90-100
#4	--	--	<70
#8	19-45	23-49	25-55
#16	--	--	--
#200	1-7	2-8	2-10

(D) Voids in Mineral Aggregate (VMA), Asphalt Content (AC) and Air Voids (AV)

VMA, AC and AV for residential streets shall be as specified in Table 4.7-2 and for commercial / industrial streets as specified in Table 4.7-3.

TABLE 4.7-2: VMA, AC AND AV FOR RESIDENTIAL STREETS			
	MINIMUM VMA	MINIMUM AC	AV
Base Mixture	12%	4%	4%
Intermediate Mixture	13%	4.3%	4%
Surface Mixture	14%	5.4%	3%

TABLE 4.7-3: VMA, AC AND AV FOR COMMERCIAL / INDUSTRIAL STREETS			
	MINIMUM VMA	MINIMUM AC	AV
Base Mixture	12%	4%	4%
Intermediate Mixture	13%	4.3%	4%
Surface Mixture	14%	5.4%	4%

(E) Remaining Mix Design

The remaining mix design shall conform to the applicable KYTC mix designations Class 2 BASE 0.75D PG64-22 or Class 2 BASE 1.0D PG64-22 "Base and Intermediate Mixture" and Class 2 SURF 0.38D PG64-22 "Surface Mixture".

(F) Recycled Asphalt Pavement and Recycled Asphalt Shingles

Recycled Asphalt Pavement (RAP) may be used but is limited to 25 percent of the mixture by weight in the surface and 30 percent of the mixture by weight in the base. Recycled Asphalt Shingles (RAS) may be used but is limited to 3.0 percent of the mixture by weight. However, when combined, the total amount of RAP and RAS may not exceed 25 percent in the surface and 30 percent in the base with no more than three percent RAS. Warm mix Asphalt technology is allowed on a permissive base similar to the KYTC Standard Specifications. See Table 4.7-4.

TABLE 4.7-4: MAXIMUM RECYCLED RAP AND RAS IN ASPHALT PAVEMENT			
	MAXIMUM RAP	MAXIMUM RAS	MAXIMUM RAP AND RAS
Base Mixture	30%	3%	30%
Intermediate Mixture	30%	3%	30%
Surface Mixture	25%	3%	25%

4.7-3 Plant Mix Operation

(A) Plant Requirements

(1) All Asphalt mixing plants shall conform to KYTC standards.

(2) Maximum asphalt temperature during plant operations is 330° F.

(3) Minimum asphalt temperature in the truck at the plant is 220° F.

(B) Plant Testing Requirements

(1) The Contractor shall monitor the plant production and perform quality control testing at the Asphalt mixing plant.

(2) Staff shall be provided access to the facility during production and may be present to observe sampling and testing by the Contractor personnel.

(3) A minimum of one test shall be performed per day of paving and additional tests shall be performed for each 1,000 tons produced.

a) The Contractor may perform additional testing as desired to control mix properties.

b) When multiple test samples are obtained, the average value of those results shall be used for acceptance.

c) At the start of production on the project, the first sample shall be obtained after a minimum of 50 tons have been loaded.

d) Samples shall be tested for conformance to gradation and Asphalt content requirements (AASHTO T164 & AASHTO T30).

e) Testing results from any offsite laboratory testing shall be reported to Staff, the applicant and the Qualified Material Testing Lab within 24 hours.

4.7-4 Minimum and Maximum Lift Thicknesses

Minimum and maximum thicknesses for asphalt lifts are indicated in Table 4.7-5.

TABLE 4.7-5: MINIMUM AND MAXIMUM LIFT THICKNESSES		
	MINIMUM LIFT	MAXIMUM LIFT
Base	3”	5”
Intermediate	2¼”	4½”
Surface	1¼”	1¾”

4.7-5 Placement Procedures

(A) General

(1) All Contractors must be prequalified by KYTC or demonstrate experience and success on similar projects in order to perform this work.

(2) Immediately before placing Asphalt materials, remove loose and deleterious materials using a power broom or street sweeping equipment.

(B) Subgrade

(1) Asphalt placement is prohibited on subgrade with free water on the surface.

(2) Pavement Subgrade cross slopes shall vary from 3.7 percent to 5 percent depending on the applicable Street cross section.

(C) Overlay

(1) A tack coat shall be evenly applied across the width of the lane at a rate of 0.05 gallons per square yard. Adjust spray bars as necessary to avoid streaks.

(2) A tack coat is not required when placing Asphalt base mixtures on granular base layers.

(3) When Asphalt surface abuts a barrier Curb or similar vertical surface, the abutting surface shall be tack coated prior to construction of the Asphalt course.

(D) Equipment

(1) The Contractor shall furnish dump trucks with clean, smooth metal beds to transport materials and shall use approved and environmentally friendly release agents.

(2) Use of diesel fuel is strictly prohibited in truck beds.

(3) Sufficient trucks should be scheduled to allow for a continuous paving operation without significant delays between trucks.

(4) The Contractor shall furnish a self-propelled paver with the capacity of spreading and finishing all courses to the indicated widths, depths, line, grade and cross section, with a smooth finish, uniform in density and texture.

(5) Rollers must also be self-propelled and capable of reversing smoothly. Steel wheel rollers must be equipped with adjustable scrapers, spray bars, and/or wetting pads to keep wheels clean at all times.

(6) Hand tampers may also be used in tight areas inaccessible by rollers.

(E) Temperatures for Asphalt, Ambient Air and Subgrade

(1) Do not place Asphalt mixtures when the ambient air temperature and existing surface temperatures on the project are less than those specified below or when weather conditions otherwise prevent the proper handling or finishing of the Asphalt mixtures.

a) Minimum ambient air and existing surface temperature shall be 35^{o} F (and rising) prior to placement of Asphalt Base Mixture.

b) Minimum ambient air and surface temperature shall be 40^{o} F (and rising) prior to placement of Asphalt Surface Mixture:

(2) The maximum temperature of the mixture shall not exceed 330° F at any time, and the minimum temperature (measured in the truck at the project site) shall not fall below 200° F for all mixtures.

(3) Compaction efforts shall be completed before the Roadway mix temperature falls below 150° F.

(F) Application of Asphalt Mixes

(1) All courses shall be placed and spread as continuously as possible, keeping the number of joints to a minimum.

(2) The longitudinal joint in the final surface course shall be placed along the dividing line between the lanes.

(3) Best paving practices shall be utilized to ensure the proper amount of material at the joint and to make the same number of passes over the joint as the middle of the mat.

(4) The finished Joint shall be smooth and tight and free from voids or coarse material.

(G) Surface Course Application

(1) The surface course application shall be provided no later than 12 months from the date the base Asphalt was placed.

(2) Prior to the surface course application, Staff shall inspect the Asphalt base course. Damage to the Asphalt base course that will affect the structural integrity or future maintainability of the pavement section shall be repaired prior to placement of the surface course.

(3) Damage to Curb and gutter sections identified by Staff that will affect the structural integrity and/or future maintainability of the Curb and gutter shall be removed and replaced prior to the placement of surface Asphalt course.

(4) The surface course shall be compacted to between ⅛" and ½" above adjacent Concrete Curb apron.

(5) The pavement surface cross slope shall be three percent.

(6) The joint between Curb and gutter and Asphalt pavements shall be sealed in accord with Subsection 4.7-7: Joint Sealing.

4.7-6 Density Testing Requirements

(A) Sampling

All base and surface Asphalt and aggregate materials shall be sampled, tested, and reported by a Qualified Material Testing Lab in accordance with the KYTC Roadway Manual Division 400.

(B) Testing Frequency and Results

(1) Density tests shall be performed at least every 150 feet along each lane of asphalt placed.

(2) At the discretion of Staff, a quality assurance check (including cores) of the sampling and testing may be required if deficiencies are suspected.

(3) Asphalt base and surface courses shall be compacted to an average density of between 90 and 97 percent of solid volume.

(4) Density testing shall be per ASTM D2950 "Density of Bituminous Concrete In Place by Nuclear Density Methods" or ASTM D7113 "Density of Bituminous Mixtures In Place by Electromagnetic Surface Contact Methods".

4.7-7 Joint Sealing

(A) Compound Material

The Joint Sealing Compound shall conform to the following standard designations:

(1) Hot-Poured Elastic Type, as specified by AASHTO, latest edition; or

(2) Silicone Rubber Sealant Type (Non-Sag, Self-Leveling, or Rapid Cure) conforming to the KYTC Roadway Manual, latest edition; or

(3) An approved equal, as determined and approved by Staff.

(4) The use of AC-20 as joint sealant is prohibited.

(B) Air Temperature

The application of joint sealant is prohibited at air temperatures below 40^{o} F.

(C) Application

(1) Joint Sealant shall be applied to all Joints abutting the Asphalt, which includes the Joint between the base Asphalt and the Curb if the surface course is not going to be applied immediately.

(2) Joint sealant shall be applied to the Curb line immediately upon placement of the surface Asphalt.

4.7-8 Acceptance

(A) All Asphalt pavement materials shall be evaluated by the Staff, per the requirements set forth in this specification and the KYTC Roadway Manual. Asphalt mixtures will be considered acceptable if the test results determine the materials are within the acceptable limits, as shown in Table 4.7-6 and Table 4.7-7. Any materials deemed to be outside of these ranges shall be re-tested for compliance.

TABLE 4.7-6: ACCEPTABLE RANGES FOR AC AND DENSITY

ASPHALT CONTENT	DENSITY
±0.6%	90% - 97%

TABLE 4.7-7: ACCEPTABLE GRADATION RANGES			
SIEVE SIZE	ACCEPTANCE RANGES PERCENT PASSING		
	1.0 BASE MIXTURE	0.75 INTERMEDIATE MIXTURE	0.38 SURFACE MIXTURE
1½“	94-100	--	--
1”	84-100	94-100	--
¾“	<90	84-100	--
½“	--	<90	94-100
⅜”	--	--	84-100
#4	--	--	<90
#8	14-50	18-54	32-73
#16	--	--	--
#200	1-10	1-10	1-10

(B) When test results are in the “Acceptable Ranges,” the material will be accepted. Staff shall require the Applicant to “Remove and Replace” the materials when the test results indicate they are outside the limits of the “Acceptable Ranges”.

(C) The surface of each course shall be inspected for uniformity and adequate thickness. Base courses shall be placed within a ½ inch tolerance and surface courses within ¼ inch tolerance. All irregularities exceeding the allowable tolerances must be repaired as directed by the Staff.

Article 5 Access Control Regulations

5.1 Purpose

The location and design of Access Points shall be in accordance with the access control regulations in this article in order to:

Promote greater safety of passage between Streets, Sidewalks, and land; Improve the convenience and ease of movement of travelers and pedestrians on Streets and Sidewalks; and

Permit reasonable speeds and economy of travel, and increase and protect the capacity of Streets.

5.2 Applicability

These regulations shall apply to all Street classifications as outlined in the adopted Comprehensive Plan, or in the case of new or proposed Streets, as identified on the submitted Application.

5.3 Conditions for the Provision of Access Points

5.3-1 Access Spacing

(A) All proposed Access Points shall meet the minimum spacing standards in Table 5.3-1.

TABLE 5.3-1: ACCESS SPACING STANDARDS

FUNCTIONAL CLASSIFICATION	SIGNALIZED INTERSECTION SPACING	NONRESIDENTIAL (FULL ACCESS)	NONRESIDENTIAL (PARTIAL ACCESS)	RESIDENTIAL ACCESS
Arterial [2]	2,400	2,400/1,200 [1]	1,200/600 [1]	600
Collector [2]	1,200	600	300	300
Local (not applicable to residential Driveways) [2]	1,200	150	N/A	N/A

NOTE:
[1] For Streets with speed limits greater than or equal to 45 miles per hour (mph), use the larger values. For Streets with speed limits of less than 45 mph, use the lower values.
[2] For existing streets the functional classification shall be based upon the classification indicated in the Kenton County Comprehensive Plan. For proposed streets the functional classification shall be based upon Table 4.1-1.

(B) Spacing standards shall be determined as measured from centerline of the Access Point to centerline of the Access Point as shown in Figure 5.3-A.

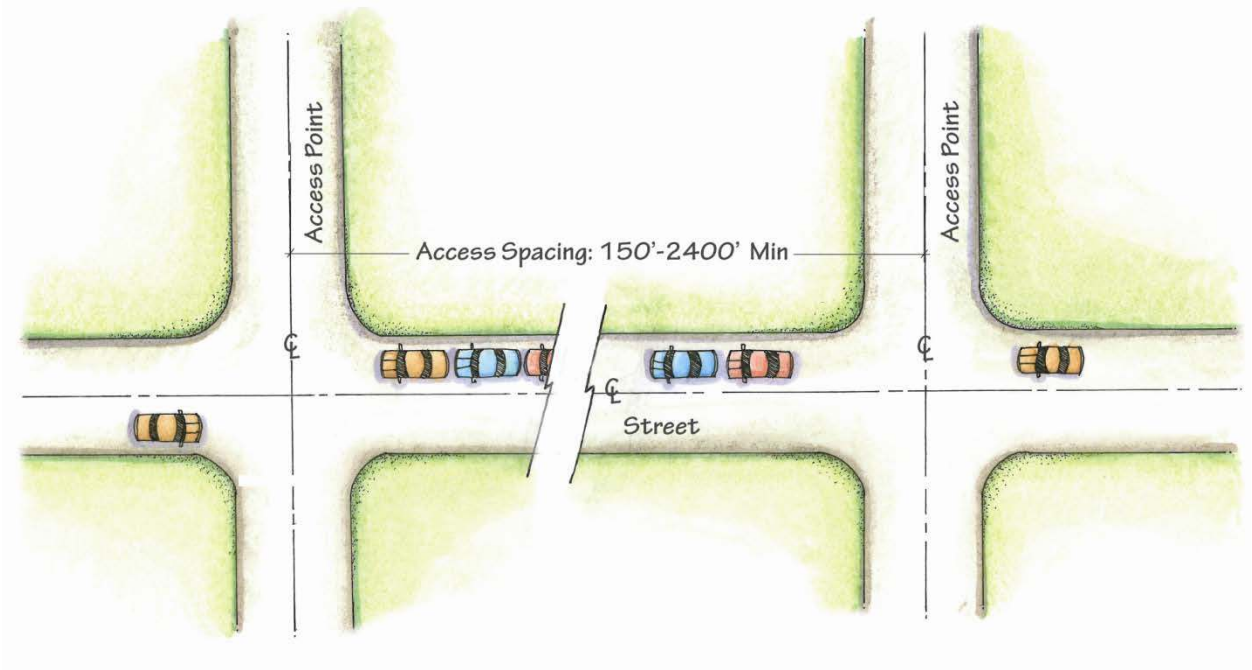


Figure 5.3-A: Illustration of access spacing management

(C) No Access Point shall be permitted within 300 feet from the edge of pavement of an arterial Street nor within the limits of auxiliary left or right turn lanes at intersections as shown in Figure 5.3-B.

Figure 5.3-B: Illustration of access spacing from Arterial Streets

(D) If a Tract of land has no means of access that would meet the requirements of this section, a Restricted Access Point shall be permitted. The Restricted Access Point shall be placed so as to maximize spacing from adjacent Access Points.

5.3-2 Coordination of Access Points

Access points shall be designed, located, and constructed in a manner to provide and make possible the coordination of access with, and between, adjacent properties to maximize the efficient utilization of Access Points. Coordination of Access Points shall be regulated as follows:

(A) With the exception of residential Driveways, Access Points on opposite sides of a Street shall be located directly opposite each other. Where 'T' type intersections are used, a minimum centerline offset of 150 feet shall be maintained on Local Streets. On collector and arterial Streets, a minimum centerline offset capable of accommodating required left and right turn lanes shall be maintained. When no auxiliary turn lanes are required, a minimum centerline offset of 200 feet on collector and arterial streets shall be maintained. See Figure 5.3-C, Figure 5.3-D, and Figure 5.3-E.

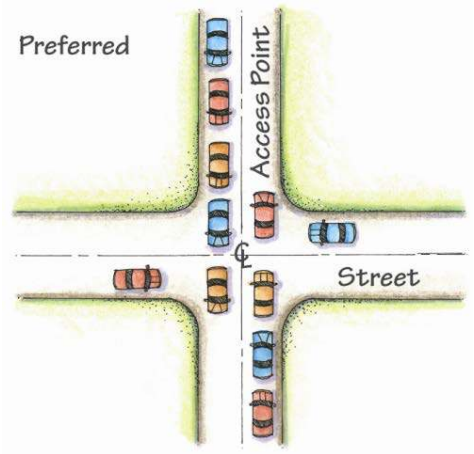


Figure 5.3-C: Illustration of preferred coordination of Access Points

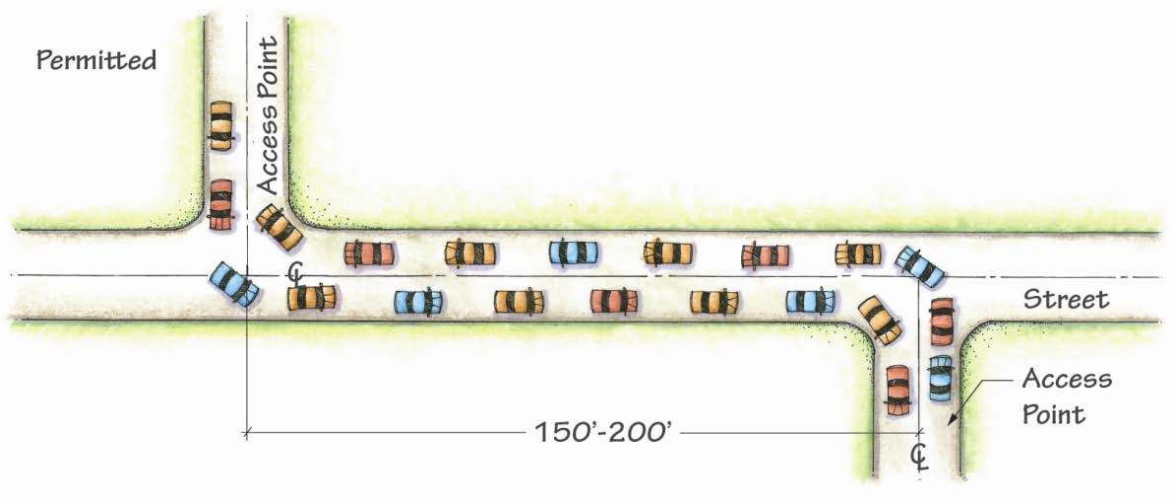


Figure 5.3-D: Illustration of permitted coordination of Access Points

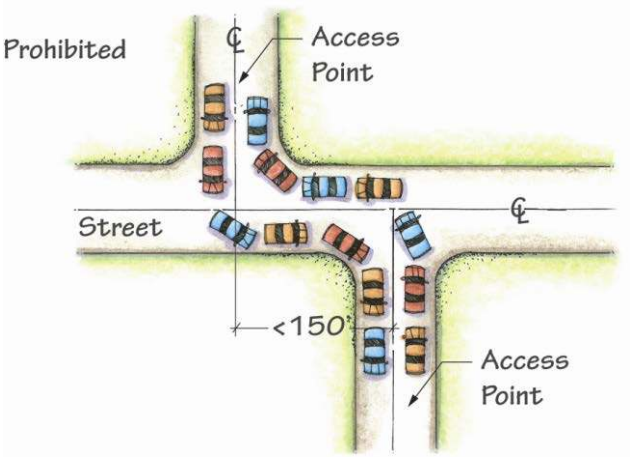


Figure 5.3-E: Illustration of prohibited coordination of Access Points

(B) In cases where access spacing greater than the minimum would prohibit future access to adjacent Parcels, Access Points may not exceed the minimum spacing requirements, except where topographical or exceptional physical conditions exist.

(C) In cases where access coordination is not possible, turning movement restrictions may be imposed by Staff.

5.3-3 Access Width

(A) Driveways intended for residential uses shall meet the access width requirements identified in Subsection 4.1-24: Access Drives. All other Access Points shall not be less than 12 feet nor more than 48 feet in width.

(B) Access width shall be measured from the edge of pavement to edge of pavement, excluding the Curb radius as shown in Figure 5.3-F.

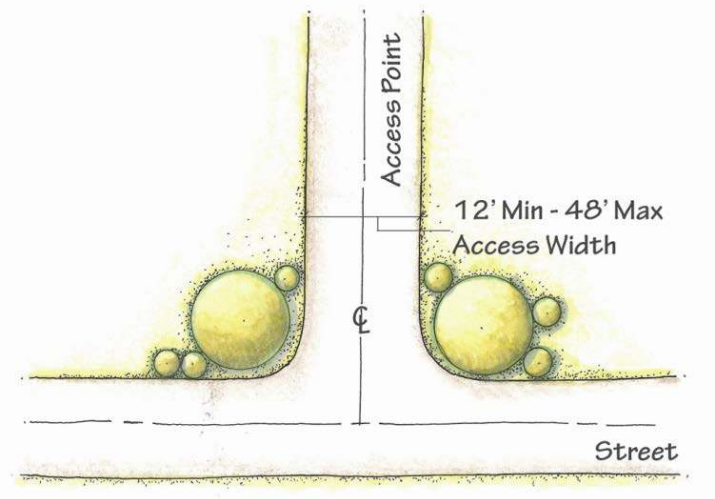


Figure 5.3-F: Illustration of the access width measurement

5.3-4 Access Throat Length

(A) The Access Throat length shall be maintained to avoid the overlapping of Driveway entrance and parking lot circulation conflicts. The Access Throat length shall be measured from the edge of the intersecting Street to the edge of pavement on the parking lot access or adjacent drive as shown in Figure 5.3-G.

(B) Minimum Access Throat lengths shall not be required for residential Driveways or for Access Points on Local Streets, Private Streets, or Access Drives.

(C) A minimum throat length of 50 feet shall be required for Access Points which intersect a Public Street, or as otherwise required to accommodate exiting queue lengths as determined by a TIS.

(D) The Access Throat length shall be separated from vehicular and pedestrian movements adjacent to parking facilities and drives through the construction of a raised Median, landscaping, or other non-traversable feature.

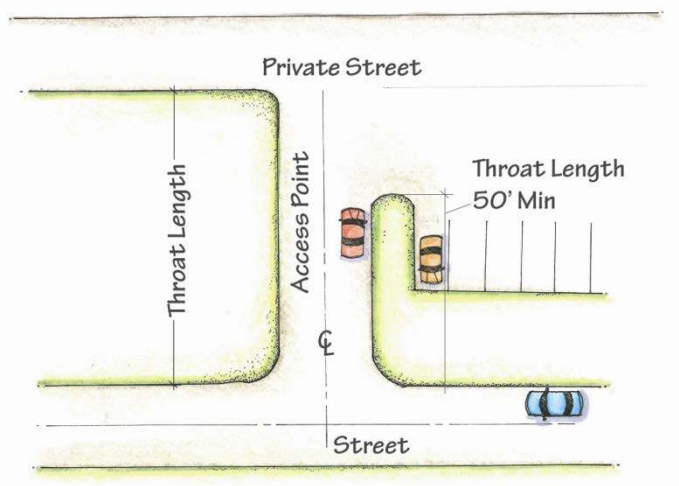


Figure 5.3-G: Illustration of Access Throat length measurement

5.4 Traffic Control

Installation of any Traffic Control measures on an existing Public Street shall not be permitted unless otherwise approved by Staff after completion of a TIS.

5.4-1 Except as herein provided, turning movements prohibited at Partial Access Points or Restricted Access Points shall be controlled through the use of proper Channelization. Channelization shall be constructed in the form of a raised non-traversable Median in the center of the primary Street, sufficiently designed to obstruct the prohibited movement. See Figure 5.4-A.

5.4-2 When the construction of a Median on the primary Street is not possible, the prohibited movements shall be controlled through the use of a raised non-traversable channelizing island constructed on the Access Point approach. The channelizing island shall be of sufficient size and design so as to obstruct the prohibited movement. See Figure 5.4-A.

5.4-3 Median islands not designed to function as a channelizing island (i.e. an entrance landscape island) shall be designed and constructed in accordance with Figure A.1-DD: Detail #28.

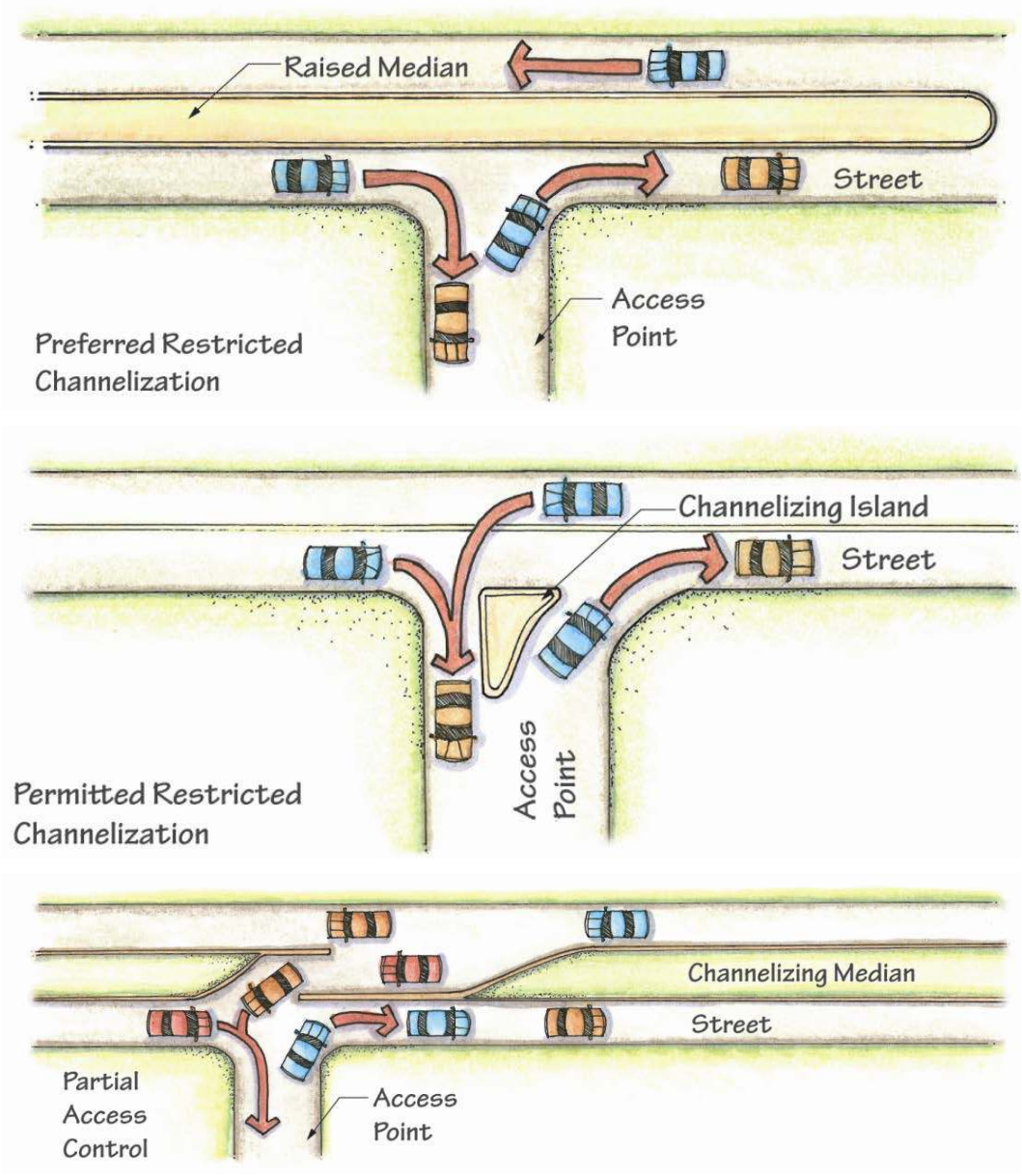


Figure 5.4-A: Illustrations of Channelization techniques

5.5 Provision of Auxiliary Turn Lanes

The need for and design of auxiliary turn lanes shall be determined by auxiliary turn lanes warrants and design standards defined or identified by the Kentucky Transportation Cabinet. See Figure 5.5-A and Figure 5.5-B.

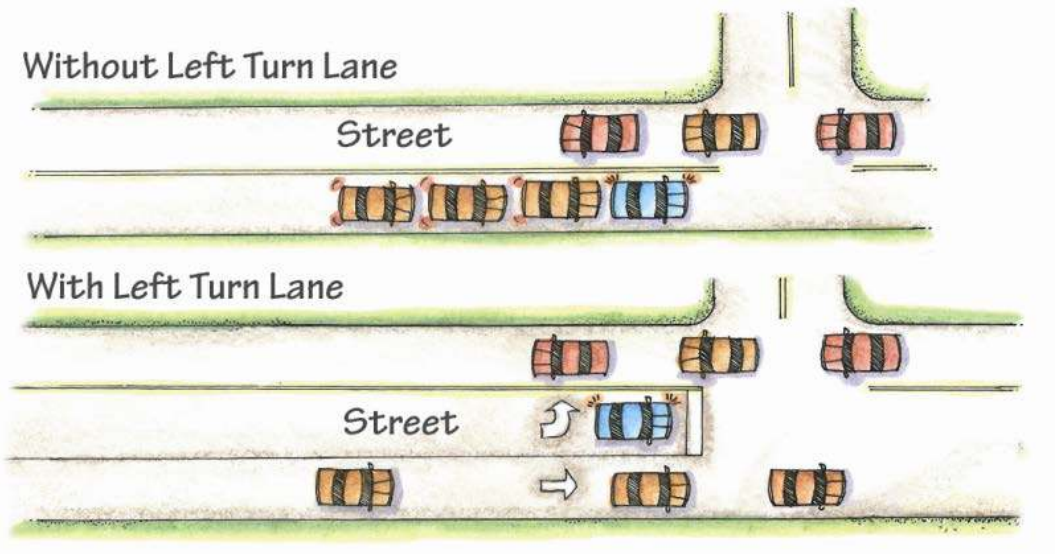


Figure 5.5-A: Illustration of a left turn requirement

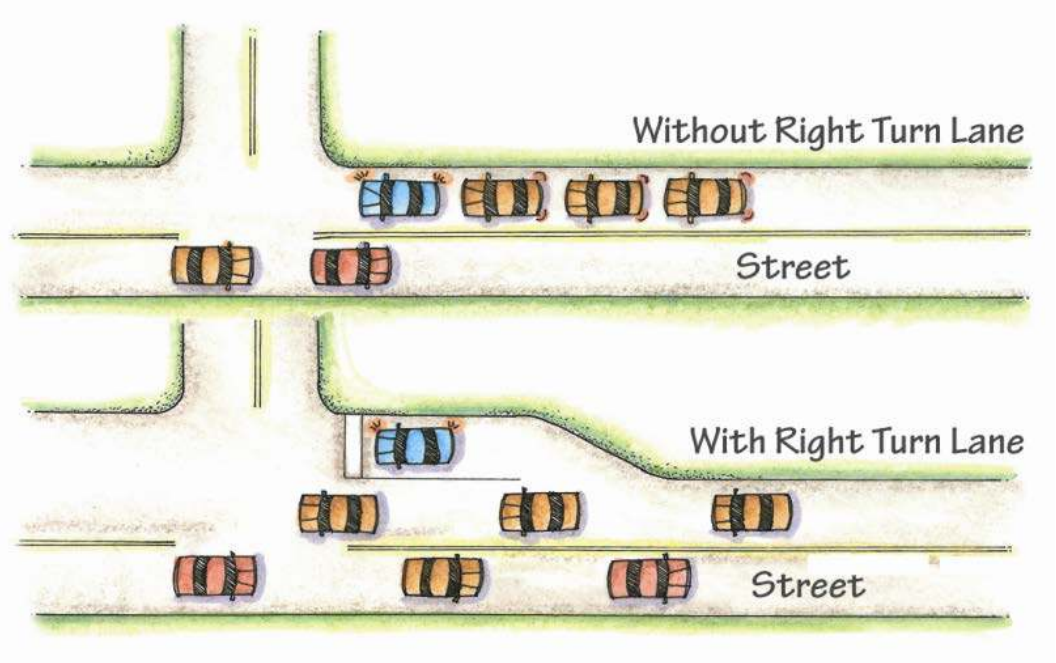


Figure 5.5-B: Illustration of a right turn requirement

5.6 Provision of Access Easement and Access Drives for Nonresidential Uses

5.6-1 Except as herein provided, each Parcel located directly adjacent to or abutting a Street classified as either an arterial or collector in the Comprehensive Plan, shall provide an Easement and shared Driveway or Private Street connecting to adjacent properties.

5.6-2 The access Easement shall be unobstructed from physical features constructed on the Parcel.

5.6-3 When adjacent Parcels with existing Easements and/or Access Drives exist, the access Easement shall be provided in coordination with existing interconnected access provision on the adjacent Parcels.

5.6-4 When adjacent Parcels are not developed, the Easement shall be provided at a location capable of:

(A) Providing cross access to adjacent Parcels; and

(B) Meeting all applicable access spacing standards specified in these Subdivision regulations.

5.7 Pedestrian Access Points

5.7-1 Development along Arterial or Collector Streets shall provide pedestrian Access Points that shall connect to any adjacent public Sidewalk and transit stops.

5.7-2 If no public Sidewalk exists along the adjacent arterial or Collector Street at the time a new development is proposed, a Sidewalk shall be provided, along with the required pedestrian Access Points.

5.7-3 Any expansion or improvement of an existing Parking Area shall be required to be in compliance with this section if the following applies:

(A) The new Parking Area is directly adjacent to the Arterial or Collector Street;

(B) A public Sidewalk or transit stop already exists along the Arterial or Collector Street; and

(C) The expansion will add 10 or more off-Street parking spaces that are to be located adjacent to an Arterial or Collector Street. If a public Sidewalk already exists, then pedestrian Access Points shall be provided.

5.7-4 The requirements of this section may be waived if sufficient proof is presented that there is not adequate room and/or adequate need for pedestrian Access Points.

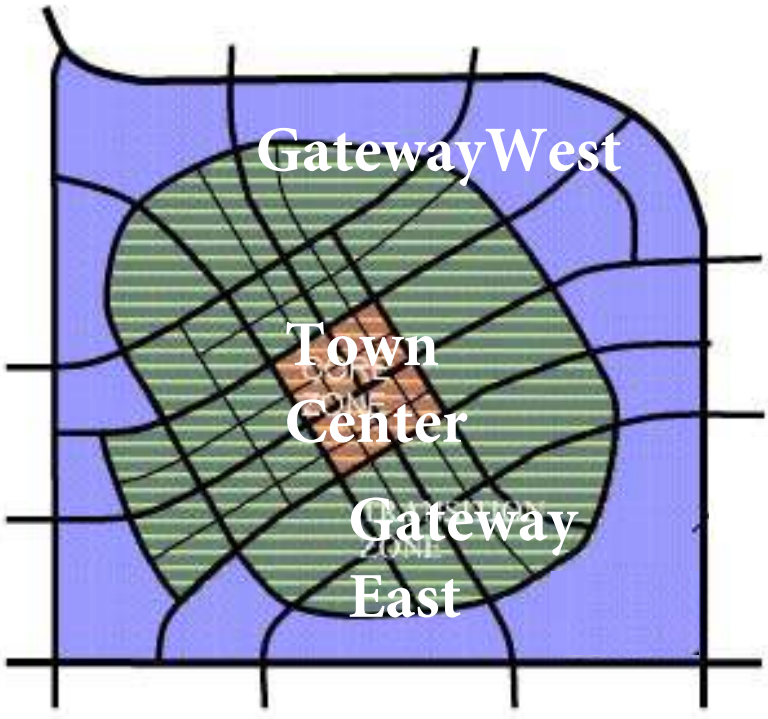
Article 6 Town Center and Redevelopment Area Street Guidelines

6.1 Purpose

These guidelines provide an alternative, safe, comfortable, pleasant and pedestrian-friendly multi-modal travel environment that helps the creation of vibrant civic places and economic vitality in the Highland Heights Town Center area as outlined in the Highland Heights Comprehensive Plan. This urban design style is typically not specified in subdivision regulations, however is presented here as an option in Highland Heights.The Comprehensive Plan also supports the use of these concepts in the Gateway East and Gateway West districts of the city. These guidelines are intended to also coordinate with the Highland Heights Tax Increment Financing District (TIF). The Highland Heights Zoning Regulations specifically address mixed-use urban redevelopment in the MLU, ROD, and the PUD zoning districts. These guidelines provide an alternative to the typical suburban street standards and provide for urban streets and public infrastructure in accordance with the Highland Heights TIF.

6.2 Street Layout

Conceptual example of an urban redevelopment area, including the Highland Heights Town Center:



6.3 Urban Standards

(A) All Urban streets shall be designed and constructed to be consistent with the City of Highland Heights street design and construction specifications contained in and attached to these subdivision regulations (Appendix A).

Appropriate street design parameters, such as cross-sections, pedestrian amenities, levels of access control and design speed shall be designed into the urban development. Design speed is the selected speed used in determining the various geometric design features of a street, such as curvature, sight distance, grades and lane width. Access control is a way of regulating street access rights to and from properties abutting a street. The highest design speeds and levels of access control should occur on the edges of the town center or redevelopment area, and the lowest design speeds and level of access control should occur in the core of the redevelopment area. Similarly, the highest level of pedestrian amenities, such as wider sidewalks, shorter block length and shorter crossing distances should occur in the center of the redevelopment area when compared with the edge or neighboring areas.

(B) Street Network

Street network characteristics impact developments. To encourage compact and mixed-use developments and to provide more route choices and direct access for pedestrians and bicyclists, an inter-connected

street network is required. Specifically, a grid or modified grid system should be designed when feasible. Since Highland Heights is dependent largely on redevelopment, the grid system should connect into the existing, surrounding street fabric as outlined in the Comprehensive Plan. The following **maximum** intersection spacing or block size is suggested for the city fabric:

1) Town Center – 300 feet between intersections
2) Gateway East – 400 feet between intersections
3) Gateway West – 600 feet between intersections

(C) Street Cross-section Elements

The following describes the three key cross-section elements: context, roadside zone and traveled way. These elements should be carefully analyzed and designed to promote a more pedestrian friendly environment and meet city emergency response standards:

(D) Context

The key shaping elements of the context for street cross-sections include the characteristics and physical form of the predominant adjacent land uses and ground floor building uses, landscaping, site access, public and semi-public open spaces, vehicular volumes, building forms, pedestrian, bicycle and transit activities and the predominance of certain travel modes.

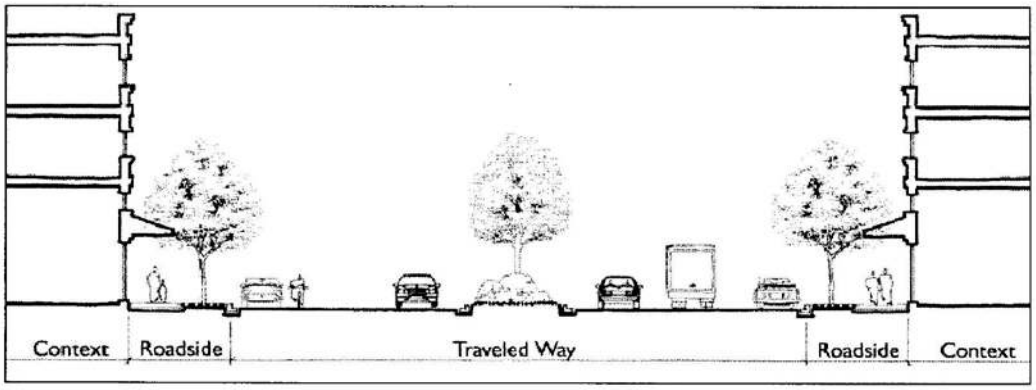
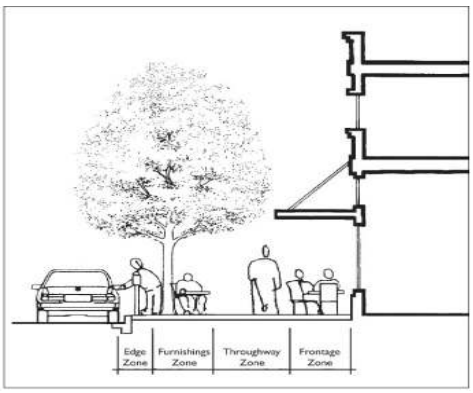


Fig. 6.2 Street Cross-section Elements

(E) Roadside Zone

The roadside zone includes the area between curbs and the front property line of adjoining parcels. It should contain four sub-zones, including curb zone (edge zone), furnishings zone, throughway zone and frontage zone. These zones provide flexibilities along the length of a street for the necessary landscaping, street furnishings, pedestrian through movements and roadside activities.



A minimum of 16 foot attached pedestrian hardscape should be provided in multi-way boulevard, couplet, local urban and all main street cross-sections for the roadside area. Hardscape mainly consists of masonry-work and other decorative paving materials. When the characteristics and physical layout of adjacent land uses and ground floor activities do not justify attached pedestrian hardscape, eight-foot detached sidewalks with eight-foot tree lawns may also be used for main-street cross sections. Detached sidewalks are the pedestrian travel area separated by a tree lawn from the traveled way area.

Development can alternatively provide one tier of parking stalls and one driveway aisle between the building and right-of-way when the development fronts on arterial or collector roadways.

The following discusses the specific functions and minimum dimensions for each sub-zone within the roadside zone:

1) Edge Zone

The edge zone provides an interface between parked vehicles and street furniture. This zone should generally be kept clear of any objects. Parking meters may be placed here with consideration to vehicle door swings. The edge zone should have a minimum width of 1.5 feet and may be widened to a minimum of four feet at transit stops with shelters.

Frontage|Throughway|Furnishing|Curb
Fig. 6.4 Example of Roadside Zone

2) Furnishings Zone

The furnishings zone is the key buffer component between the active pedestrian walking area and the vehicle traveled way area. Street trees, planting strips, street furniture, bollards, signal poles, signals, electrical, telephone and traffic signal cabinets, signs, fire hydrants and bicycle racks should be consolidated in this zone to keep them from becoming obstacles to pedestrians. The furnishings zone should have a minimum width of seven feet.

Curb|Furnishing|Throughway|Frontage
Fig. 6.5 Example of Roadside Zone

3) Throughway Zone

The throughway zone is intended for pedestrian travel only and shall be entirely clear of obstacles and provide a smooth walking surface. The throughway zone should be at a minimum of six feet wide, which is the minimum comfortable passing width for two wheel chairs on a sidewalk.

4) Frontage Zone

The frontage zone is the area adjacent to the property line that may be defined by a building facade, landscaping area, fence, or screened parking area. A minimum width of 1.5-feet should be provided for the frontage zone. The width of the frontage zone may be increased to accommodate a variety of activities associated with adjacent uses, such as outdoor seating or merchant displays.

(F) Traveled Way

Traveled way is the street pavement area between curbs. It includes the following key components:

1) Vehicle Travel Lanes

Vehicle travel lanes range from 10 feet to 12 feet in width.

2) Bicycle Lanes

A minimum bicycle lane width of five feet (not including the gutter pan) shall be provided, including striping and stencils for bicycle lanes.

3) Medians

Medians shall be used as an additional location for landscaping on collector and arterial roadways. Medians may also serve as pedestrian refuge islands within the traveled way when needed.

4) On-Street Parking

Angled parking allows motor vehicles to park with an angle to the driving lanes. Angled parking allows for increased "front door" retail parking and serves to slow vehicular speeds.

Parallel parking is the on-street parking spaces parallel to the driving lanes.

Fig. 6.6 Angled Parking

(G) Other Design Elements

The following elements shall also be considered in street cross-section designs:

1) Emergency Access

To accommodate the set-up requirements of large emergency response vehicles, a minimum width of **25** feet of paved surface shall be provided every **150** feet along all streets. This paved surface area may be provided by means of driveways or "No On-Street Parking" areas or other unobstructed design features.

2) Design Speed and Posted Speed

The greater the level of pedestrian activity, the lower the design and posted speed should be for vehicular traffic due to pedestrian safety concerns. The overall characteristic of street cross-sections should create an environment that is appropriate to the design speed of the street. Relevant design elements in the vehicular travel realm include lane widths, pavement markings, materials and color, curb design, bike lanes and on-street parking. Relevant design elements and treatments within the pedestrian realm include building setbacks, street trees, sidewalks and furnishings. Generally, posted speeds should be 5 to 10 miles per hour lower than design speeds.

3) Building Heights and Location

Buildings should be utilized to define the street edge and reinforce the character of the redevelopment area. A ratio of 1:4 or higher

between the building height and the distance between buildings across the street should be generally maintained.

(H) Cross-Section Descriptions

The following describes each street cross-section for TODs and urban centers:

BOULEVARD (4 or 6 lanes)

Location

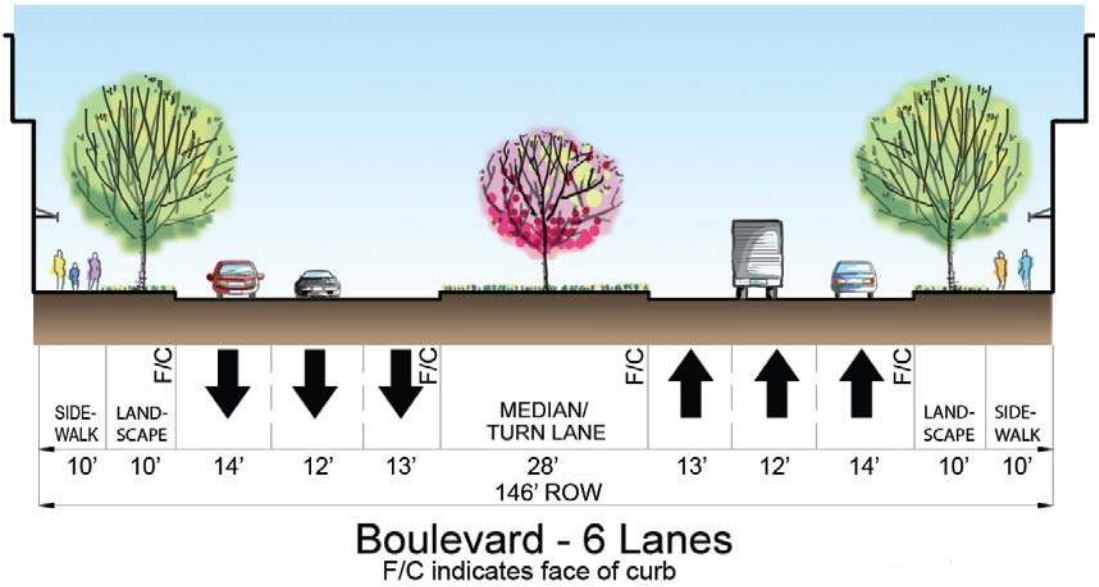
- Gateway East, Gateway West

Primary Functions and Purposes

- Serves as edge streets and provides mobility to and around TODs and urban centers
- Creates an initial image and sense of place for TODs and urban centers through enhanced landscaping and street trees

Defining Elements

- Travel Lanes – four or six
- Pedestrian Travel – detached sidewalk
- Landscapes – wider medians and tree lawns
- Median – yes
- Bicycle Lanes – no
- On-street Parking – no
- Design Speed – 50 MPH
- Posted Speed – 40 MPH
- Access Control – maximum



NEW CROSS-SECTION ABOVE

MULTI-WAY BOULEVARD (4 or 6 through lanes)

Location

- Gateway East and Gateway West

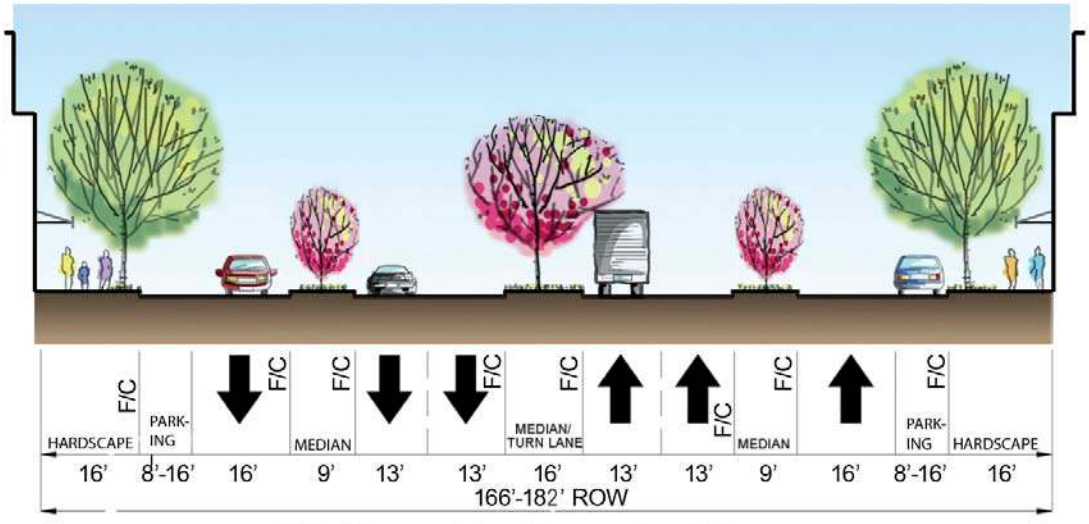
Primary Functions and Purposes

- Serves as edge streets and provides mobility to and around TODs and urban centers
- Balances mobility and access – local access lanes and parallel or angled parking aisles on the periphery of the section provide local access while the center four or six lanes provide mobility for through traffic

Defining Elements

- Travel Lanes – four or six for through traffic and one lane each direction for local access
- Pedestrian Travel – attached hardscape
- Landscapes – three medians and two hardscape areas
- Median – yes
- Bicycle Lanes – shared with local access lanes
- On-street Parking – only on local access lanes (parallel or angled)
- Design Speed – 50 MPH for through lanes and 30 MPH for local access lanes

- Posted Speed - 40 MPH for through lanes and 25 MPH for local access lanes
- Access Control – low to moderate for local access lanes and maximum for through lanes



Multiway Boulevard - 4 Lanes

F/C indicates face of curb

NEW CROSS-SECTION ABOVE

MAIN STREET – MEDIAN – 4 LANES

Location

- Gateway East or Gateway West

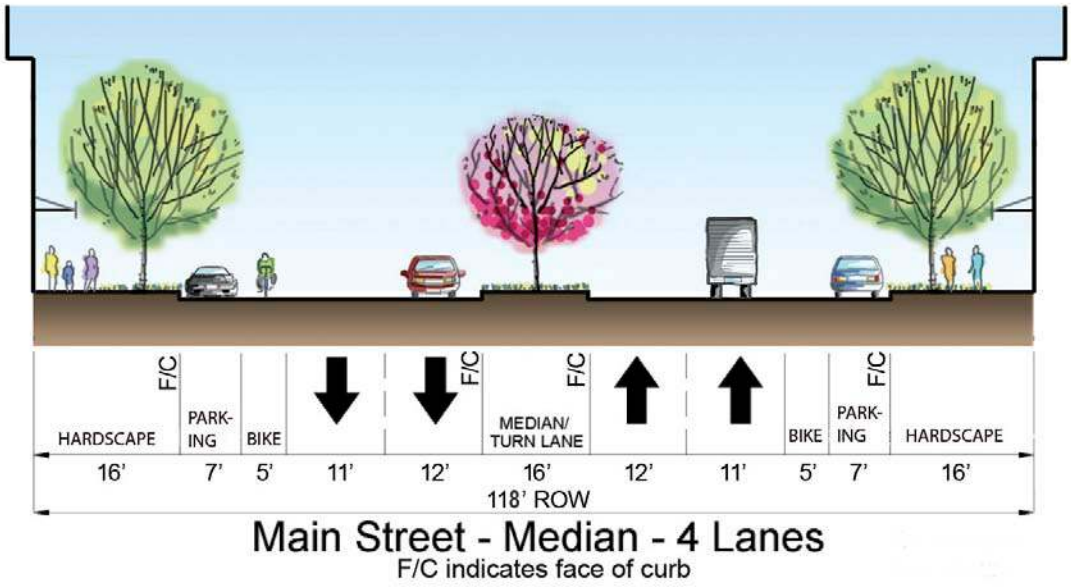
Primary Functions and Purposes

- Provides both mobility and access within TODs and urban centers
- Provides access within transition and edge zones
- Connects core zone to edge streets

Defining Elements

- Travel Lanes – four
- Pedestrian Travel – attached hardscape
- Landscapes – median and hardscape areas
- Median - yes
- Bicycle Lanes – yes
- On-street Parking – yes

- Design Speed – 35 to 40 MPH
- Posted Speed – 25 to 30 MPH
- Access Control – high



Main Street - Median - 4 Lanes
F/C indicates face of curb

NEW CROSS-SECTION ABOVE MAIN

STREET – TWO LANES WITH MEDIAN/ CENTER TURN LANE

Location:

- Town Center, Gateway East ,or Gateway West

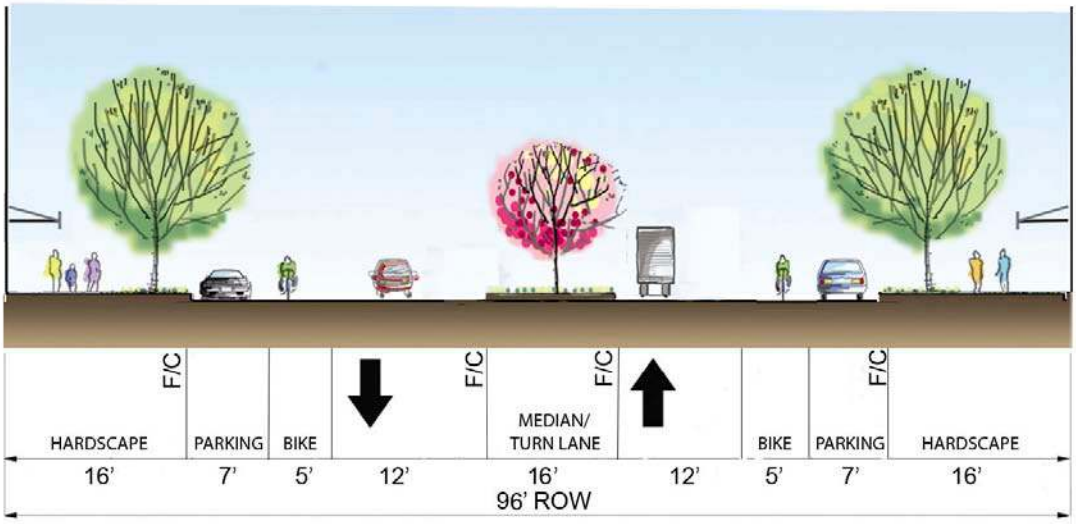
Primary Functions and Purposes

- Provides both mobility and access within urban centers
- Provides access within transition and edge
- Connects core to edge streets
- Provides flexibility for a center turn lane when needed

Defining Elements

- Travel Lanes – two
- Pedestrian Travel – attached hardscape
- Landscapes – median and hardscape areas
- Median – yes
- Bicycle Lanes – yes

- On-street Parking – yes
- Design Speed – 30 to 35 MPH
- Posted Speed – 25 to 30 MPH
- Access Control – low to moderate



Main-Street Two Lanes With Median/Center Turn Lane

F/C indicates face of curb.

NEW CROSS-SECTION ABOVE MAIN

STREET – TWO LANES WITH PARALLEL PARKING

Location

- Town Center, Gateway East or Gateway West

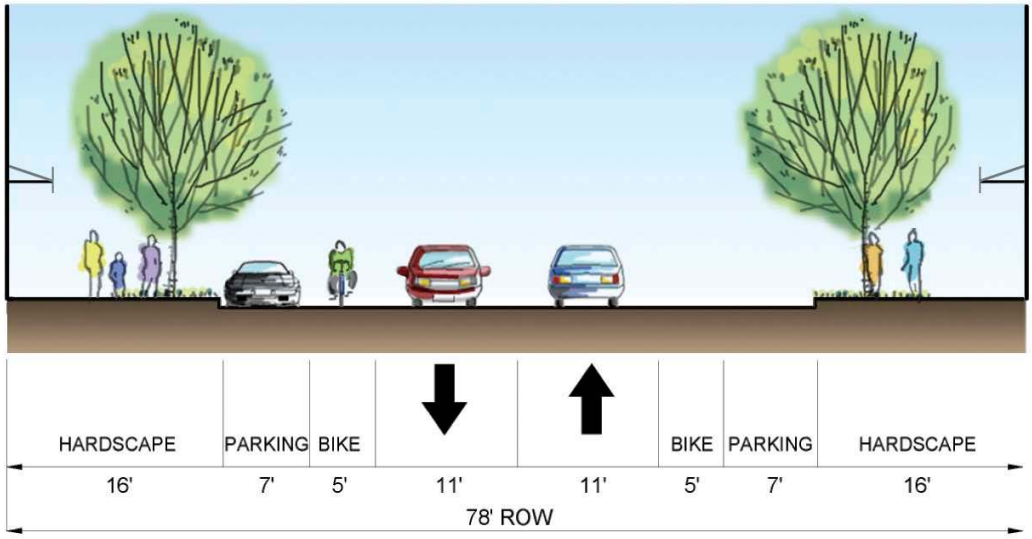
Primary Functions and Purposes

- Provides both mobility and access within urban centers
- Provides access within transition and core
- Connects core to edge streets

Defining Elements

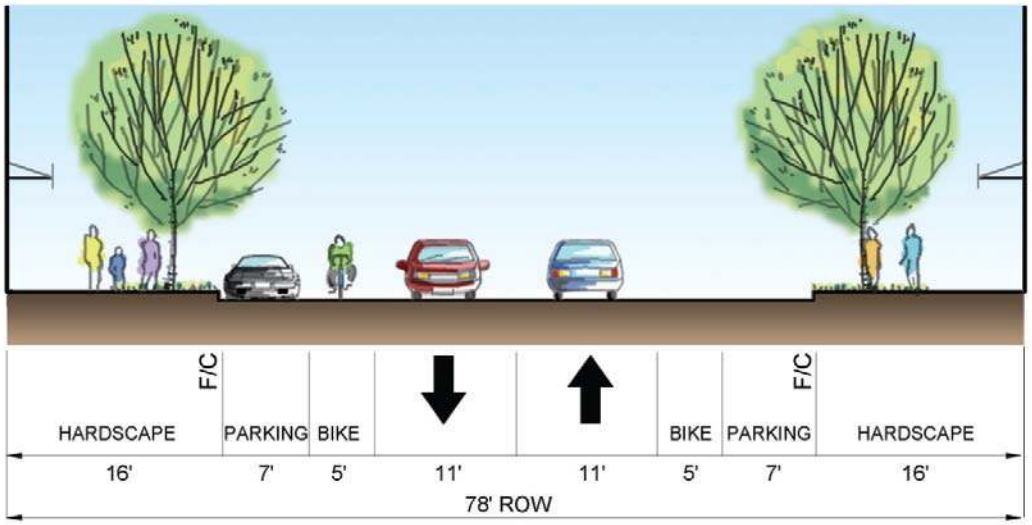
- Travel Lanes – two
- Pedestrian Travel – attached hardscape
- Landscapes – within attached hardscape area
- Median – no
- Bicycle Lanes – yes
- On-street Parking – yes
- Design Speed – 30 MPH

- Posted Speed – 25 MPH
- Access Control – low to moderate



Main Street - Parallel - 2 Lanes

NEW CROSS-SECTION ABOVE



Main-Street Two Lanes with Parallel Parking

F/C indicates face of curb.

NEW CROSS-SECTION ABOVE

MAIN STREET – ANGLED

PARKING *Location*

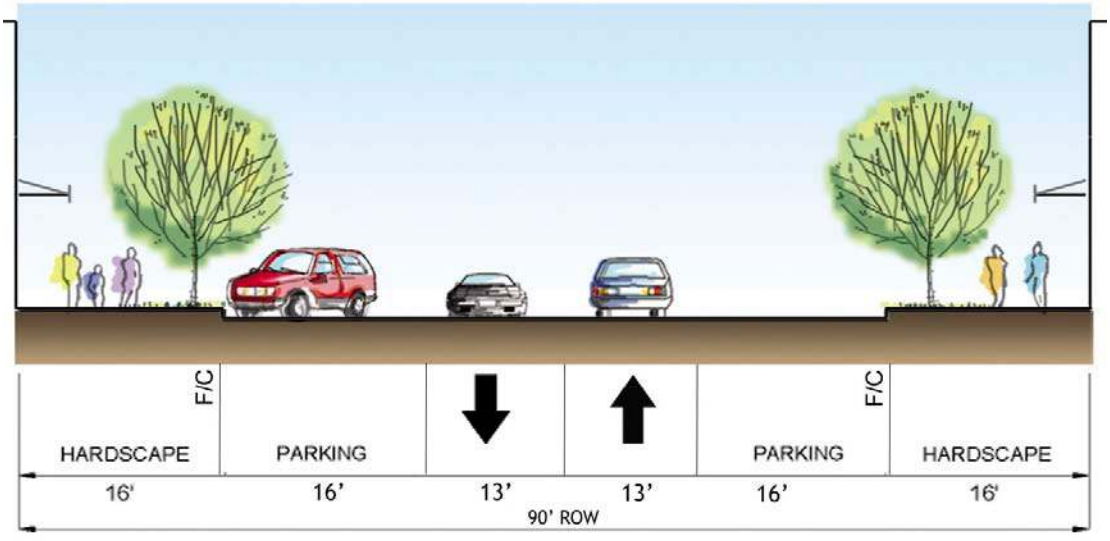
- Town Center

Primary Functions and Purposes

- Provides both mobility and access within and urban centers
- Provides access within transition and core
- Connects core to edge streets
- Provides increased "front door" retail parking spaces
- Slows vehicular traffic speeds

Defining Elements

- Travel Lanes – two
- Pedestrian Travel – attached hardscape
- Landscapes – within attached hardscape area
- Median – no
- Bicycle Lanes – no
- On-street Parking – yes (angled)
- Design Speed – 30 MPH
- Posted Speed – 25 MPH
- Access Control – low to moderate



Main-Street - Angled - 2 Lanes

F/C indicates face of curb.

NEW CROSS-SECTION ABOVE

COUPLET

Location

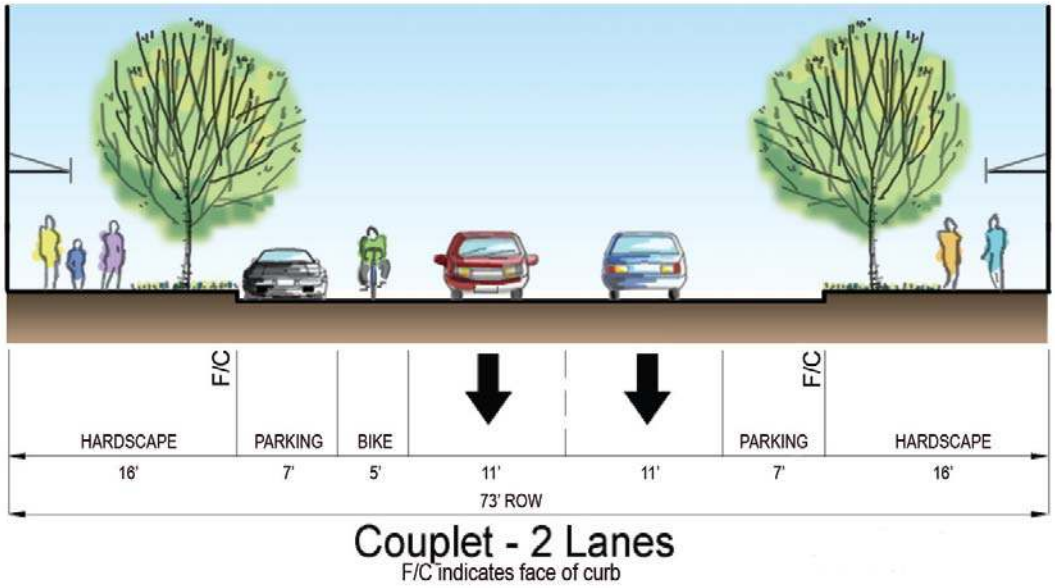
- Gateway East or Gateway West

Primary Functions and Purposes

- Provides both mobility and access within urban centers
- Connects core to edge streets
- Provides one-way travel as an option

Defining Elements

- Travel Lanes – two
- Pedestrian Travel – attached hardscape
- Landscapes – within attached hardscape area
- Median – no
- Bicycle Lanes – yes
- On-street Parking – parallel on one or both sides
- Design Speed – 30 to 35 MPH
- Posted Speed – 25 to 30 MPH
- Access Control – low to moderate



Couplet - 2 Lanes
F/C indicates face of curb

NEW CROSS-SECTION ABOVE

LOCAL URBAN

Location

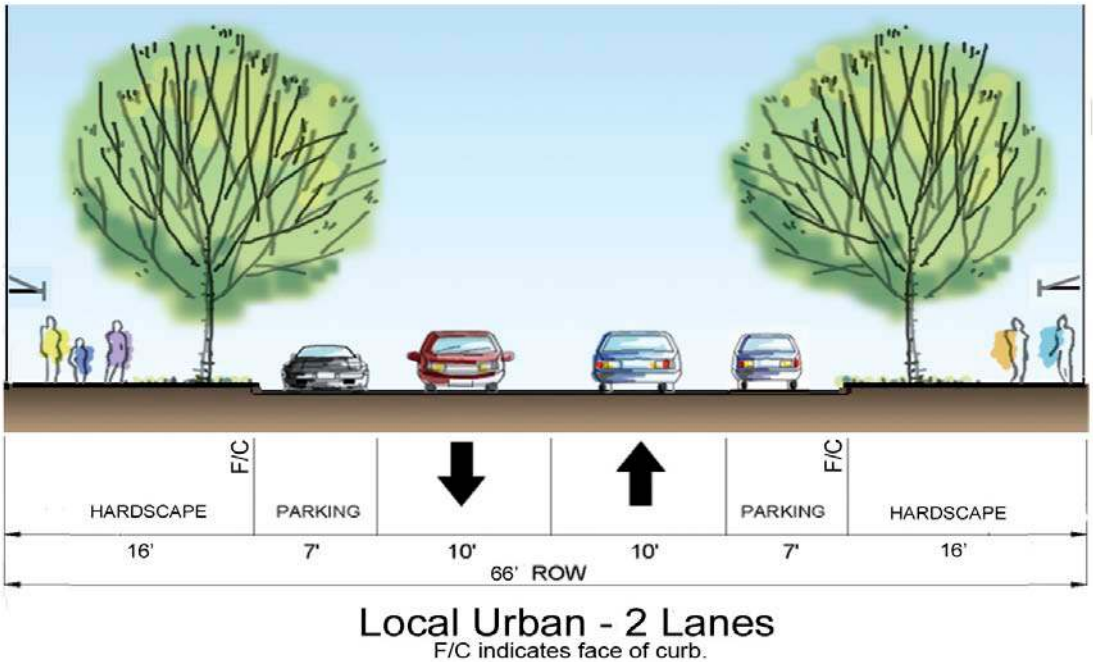
- Town Center

Primary Functions and Purposes

- Provides local access within core or transition zone

Defining Elements

- Travel Lanes – narrowed two lanes
- Pedestrian Travel – attached hardscape
- Landscapes – within attached hardscape area
- Median – no
- Bicycle Lanes – shared
- On-street Parking – yes
- Design Speed – 30 MPH
- Posted Speed – 25 MPH
- Access Control – low



Local Urban - 2 Lanes
F/C indicates face of curb.

NEW CROSS-SECTION ABOVE

RESIDENTIAL PARKWAY

Location

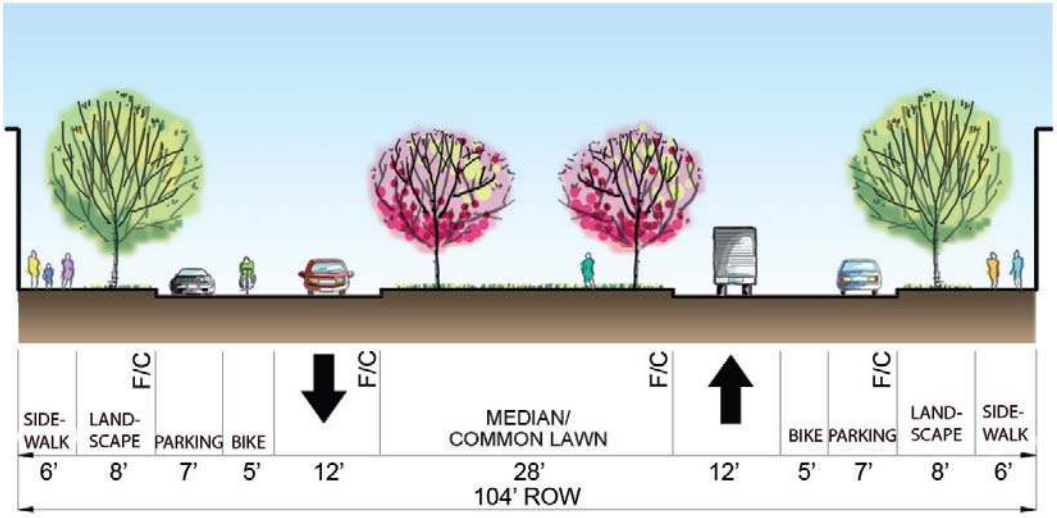
- Gateway East or Gateway West

Primary Functions and Purposes

- Provides mobility and local access
- Provides a common lawn/open space area for adjacent residences

Defining Elements

- Travel Lanes – two lanes
- Pedestrian Travel – detached sidewalks
- Landscapes – median and tree lawns
- Median – wide median for common lawn or open spaces
- Bicycle Lanes – yes
- On-street Parking – parallel
- Design Speed – 30 MPH
- Posted Speed – 25 MPH
- Access Control – low to moderate



Residential Parkway - 2 Lanes
F/C indicates face of curb.

NEW CROSS-SECTION ABOVE

NEIGHBORHOOD STREET

Location

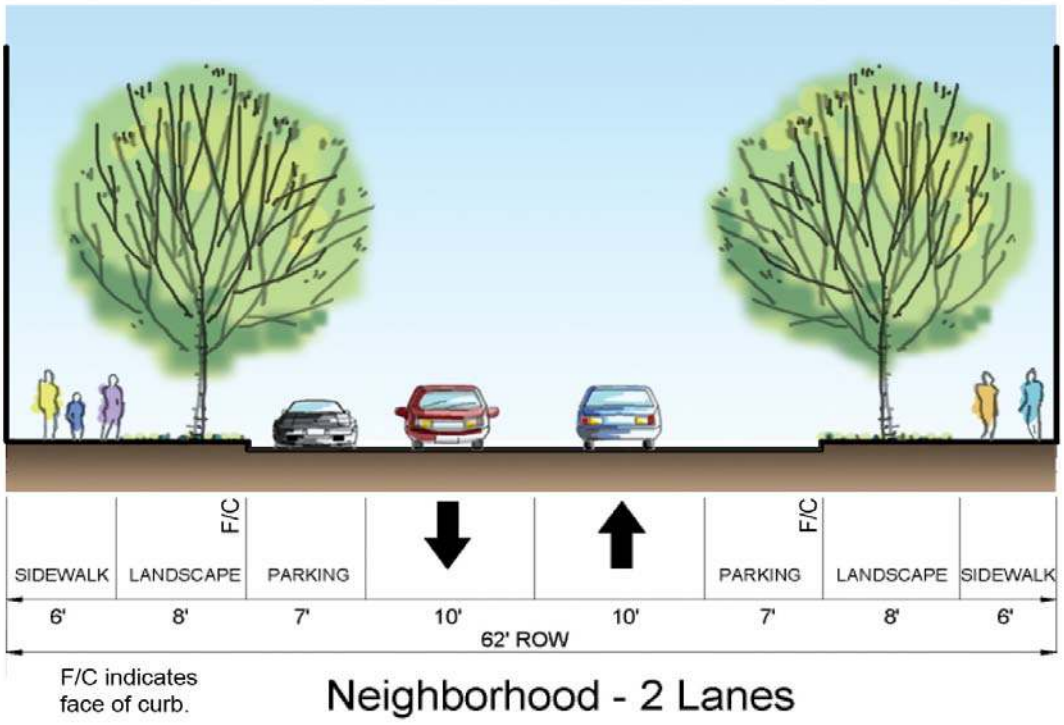
- Town Center, Gateway East, or Gateway West

Primary Functions and Purposes

- Provides local access

Defining Elements

- Travel Lanes – narrowed two lanes
- Pedestrian Travel – detached sidewalks
- Landscapes – tree lawns
- Median – no
- Bicycle Lanes – shared
- On-street Parking – yes
- Design Speed – 30 MPH
- Posted Speed – 25 MPH
- Access Control – low



NEW CROSS-SECTION ABOVE

(I) Land Use Categories

The compatibility between street cross-sections and the characteristics and physical forms of adjacent land uses is an important factor affecting urban forms and street functions in the town center and redevelopment areas. The following land use categories should be considered when selecting street cross-sections. These urban uses are described in more detail in the MLU, ROD, and PUD zoning districts in the Highland Heights Zoning Regulations. Table 1 – Cross Section/Land Use Matrix depicts the appropriate relationship between cross sections and land uses:

Residential Use: The predominant surrounding land use is multi-family residential units, such as apartments and condominiums. These residences typically have a few combined access points for pedestrian and vehicular access along the street.

Civic Use: The predominant surrounding land uses are institutions, plazas and parks complemented with retail and office uses. They typically front onto the street with service businesses located in the same building. The buildings are typically built up to the sidewalk and pedestrian areas along the street.

Mixed Use: The surrounding land uses contain a mix of retail, office and residential. These uses can be located in the same building or in different buildings along the street. Retail uses can be located at the street level with residential and other uses on the upper floors.

Commercial: The surrounding land uses are typically office and retail. The buildings are usually set back from streets. On-site parking and access driveways are usually provided to groups of businesses.

Table 6.1 - Cross Section/ Land Use Matrix						
			Land Use and Frontage Type			
Cross Section	ROW Width	Curb to Curb Width	Residential	Civic	Mixed Use	Commercial
Boulevard	146'	106'		X	X	X
Multi-way Boulevard	166' – 182'	134' – 150'	X	X	X	X
Main Street 4 Lanes with Median	118'	86'	X	X	X	X
Main Street - 2 Lane with Median/Center Turn Lane	96'	64'	X	X	X	X
Main Street - 2 Lanes with Parallel Parking	78'	46'	X	X	X	X
Main Street – 2 Lanes with Angled Parking	90'	58'	X	X	X	X
Couplet	73'	41'	X	X	X	X
Local Urban	66'	34'	X	X	X	
Residential Parkway	104'	76'	X			
Neighborhood	62'	34'	X			

(J) Intersections

Intersection designs in the town center and redevelopment areas should consider the needs of all travel modes. While vehicular traffic flow should be carefully considered, creating safe crossings and accommodating pedestrians and bicycles as much as possible in the available right-of-way take precedence. Reasonable reduction of vehicular traffic capacities and level of service at intersections are justified when high volumes of pedestrians and bicyclists are present.

1) Design Principles

The following principles should be applied in intersection designs.

a) Pedestrian Safety - Pedestrian safety and convenience measures should be considered as key parameters in preparing traffic impact studies. For the safety of pedestrians and bicyclists, especially in the core and transition zones, various pedestrian safety enhancement measures, such as curb extensions, non-exclusive turning lanes or no right-turns on red signals, are pre-determined in Table 2 -Intersection and Mid-Block Approach Design Matrix and should not be changed by a traffic impact study. Instead, these measures should be considered as key parameters in the traffic

impact study when developing assumptions for trip generation, trip distribution, modal split and trip assignment.

b) System-wide Level of Service - A system-wide analysis should be conducted to maintain acceptable vehicular circulation and the accessibility of large vehicles. As certain key streets and intersections within core and transition zones may experience reduced vehicular capacity due to certain pre-determined pedestrian safety measures, an acceptable system-wide level of service should be maintained through careful network design and analysis. Street designs should be reviewed closely on a case by case basis, in conjunction with the entire street network, surrounding uses and the overall city transportation network. In addition, freight routes shall be identified in the street network for freight access.

c) Emergency Vehicle Access - It is required that adequate emergency vehicle access be provided to all areas. All street intersections shall be designed to allow fire trucks to complete a turn without running over curbs. Fire trucks may occasionally encroach into the opposing or adjacent lanes when making a turn. A minimum of 28 feet of drivable road surface (face of curb to face of curb) on one cross street and a minimum of 26 feet of drivable road surface (face of curb to face of curb) on the other cross street shall be provided for all intersections. The dimension of a large school bus, S-BUS 40 as defined by AASHTO (the American Association of State Highway and Transportation Officials), shall be used for conducting additional intersection turning movement analyses of fire trucks when required by Central Campbell County Fire Department.

d) Bus Access - It is required that bus routes and appropriate bus stop locations in the street network be identified in coordination with the Transit Authority of Northern Kentucky (TANK). All street intersections on the bus routes should be designed to allow adequate bus access.

2) Design Elements

The following five elements should be considered in intersection designs:

Fig. 7 Diagonal Curb Ramp

a) Curb Ramps

Diagonal curb ramps should not be used at intersections. Instead, directional curb ramps should be utilized for all intersections.

Fig. 8 Directional Ramp

b) Street Trees and Stop Signs

Street trees should be planted and maintained to provide the required sight stopping distance for drivers of approaching vehicles to observe stop signs. Specifically, a sight line between a stop sign and an approaching vehicle shall be established using the appropriate street cross-section and intersection designs, and AASHTO-recommended stopping sight distance . A ten foot diameter of tree canopy shall be assumed. A tree shall be located at a minimum of three feet from the curb, not block the sight line and have foliage maintained above eight-feet above the surrounding grade.

c) Intersection Sight Triangles

Sight triangles shall be in conformance with the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations.

d) Curb Extensions And Drainage Requirements

Curb extensions are the sidewalk areas extended beyond the regular curb lines into the traveled way. When on-street parking is provided, curb extensions should be provided at all intersections. They are encouraged at mid-block crossings in limited locations, but, must be approved prior to being used. Curb extensions shall not be constructed beyond bicycle and vehicle travel lanes.

When curb extensions are constructed, special drainage designs are required such as separate drainage inlets on both sides of streets, draining water away from the curb extensions and additional drainage inlets.

Fig. 9 Curb Extension

e) Pedestrian Crossing Treatments

A hierarchy of crossing treatments should be applied to intersection and mid-block crossings based on the presence of pedestrians and bicyclists. When designing pedestrian crossings, appropriate signage and striping measures shall be applied per the MUTCD (Manual on Uniform Traffic Control Devices). The hierarchy and appropriate locations include the following applications:

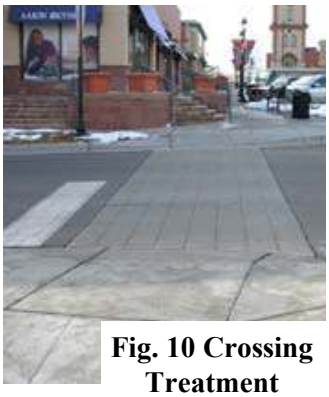


Fig. 10 Crossing Treatment

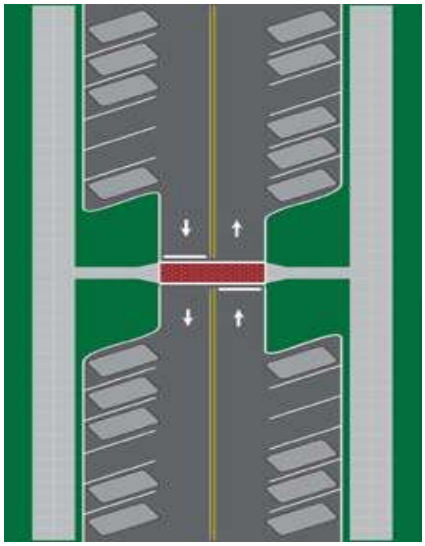
- Standard Markings - All crossings should be identified with ladder striping if no special pavements or color is used and parallel lines with stop bar when special pavements and/or color are used within the cross walk:
- Colored Paving - A dark gray or other appropriate colors may be applied to the paving in crosswalks within core or transition zone;
- Special Pavers - A distinctly patterned paver may be applied to distinguish intersection crosswalks and mid-block crossings in the core or transition zone. License agreements will be required when special pavers are used within public streets.

f) High Visibility Crosswalk Markings

High visibility crosswalk marking is an added feature beyond the use of the standard or enhanced pavement markings, colored pavement, or special pavers. High visibility crosswalk markings may be in the form of signage, special pavement markings, or flashers. High visibility crosswalk markings should be provided at all mid-block crossings and at intersection crossings where no traffic control is provided.

g) Mid-Block Crossing

Mid-block crossings with curb extensions should be considered at locations where a substantial number of pedestrians or bicyclists attempt to cross streets regardless of the presence of protection or identification of the crossing. These circumstances



typically occur in locations with pedestrian attractions on both sides of a roadway, in areas with a combination of street-facing retail shops and on-street parking, and the presence of long blocks (i.e., blocks of 600-feet or greater). Mid-block crossing will only be applied to limited locations and will be analyzed on a case by case basis. Multilane un-signalized controlled mid-block crossings are not permitted.

Fig. 11 Mid-block Crossing

h) Pedestrian Refuge Islands and Medians

Refuge islands should generally be considered for crossings wherever there is a median. Refuge islands in medians should be at least 6 feet wide

i) Roundabout

Intersections with a roundabout design for traffic control may be appropriate in certain locations in the town center or redevelopment areas. Only a one-lane roundabout design shall be considered. No mid-block roundabout designs are appropriate. The specific location and design of roundabouts shall be evaluated and approved by the city engineer.

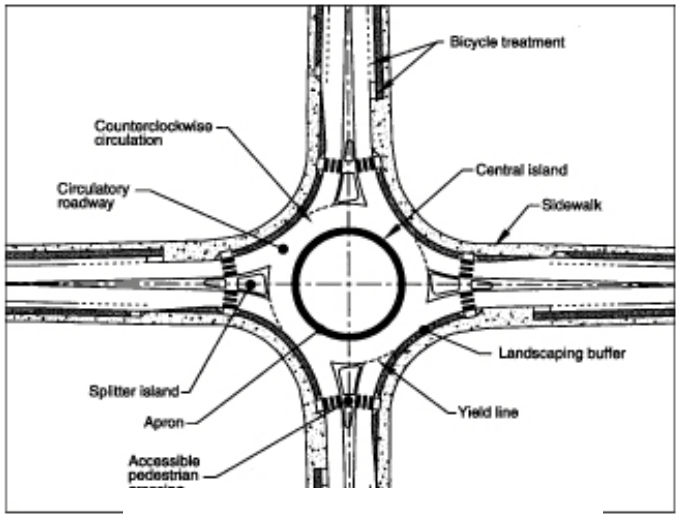


Fig. 12 Roundabout

j) Intersection Approach Designs

The following table depicts various key intersection approach

design elements for all cross-section

Table 2 - Intersection and Mid-Block Approach Design Matrix

	Boulevard	**Multi-Way Boulevard**	**Main Street – Four Lanes with Median**	**Main Street – Two Lanes with Median/Center Turn Lane**	**Main Street – Two Lanes with Median/Center Turn Lane (Mid-Block)**	**Main Street – Two Lanes with Parallel Parking**	**Main Street – Two Lanes with Parallel Parking (Mid-Block)**
Curb Extensions	No	Yes (access street only)	Yes	Yes	Yes	Yes	Yes
Corner Radii	25 Feet	20 Feet	20 Feet	20 Feet	NA	20 Feet	NA
Exclusive Left Turn Lanes Allowed	Yes	Yes (through street only)	Yes (when intersects with boulevards or existing major arterials)	Yes (when intersects with boulevards or existing major arterials)	NA	No	NA
Exclusive Right Turn Lanes Allowed	Yes	No	No	No	NA	No	NA
Standard Markings	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Colored Paving	No	No	Yes	No	No	No	No
Pavers	No	No	No	Yes	Yes	Yes	Yes
High Visibility Markings	No	No	No	No	Yes	No	Yes
Pedestrian Refuge Islands	Yes	Yes	Yes	Yes	Yes	NA	NA

Table 2 - Intersection and Mid-Block Approach Design Matrix (Continued)

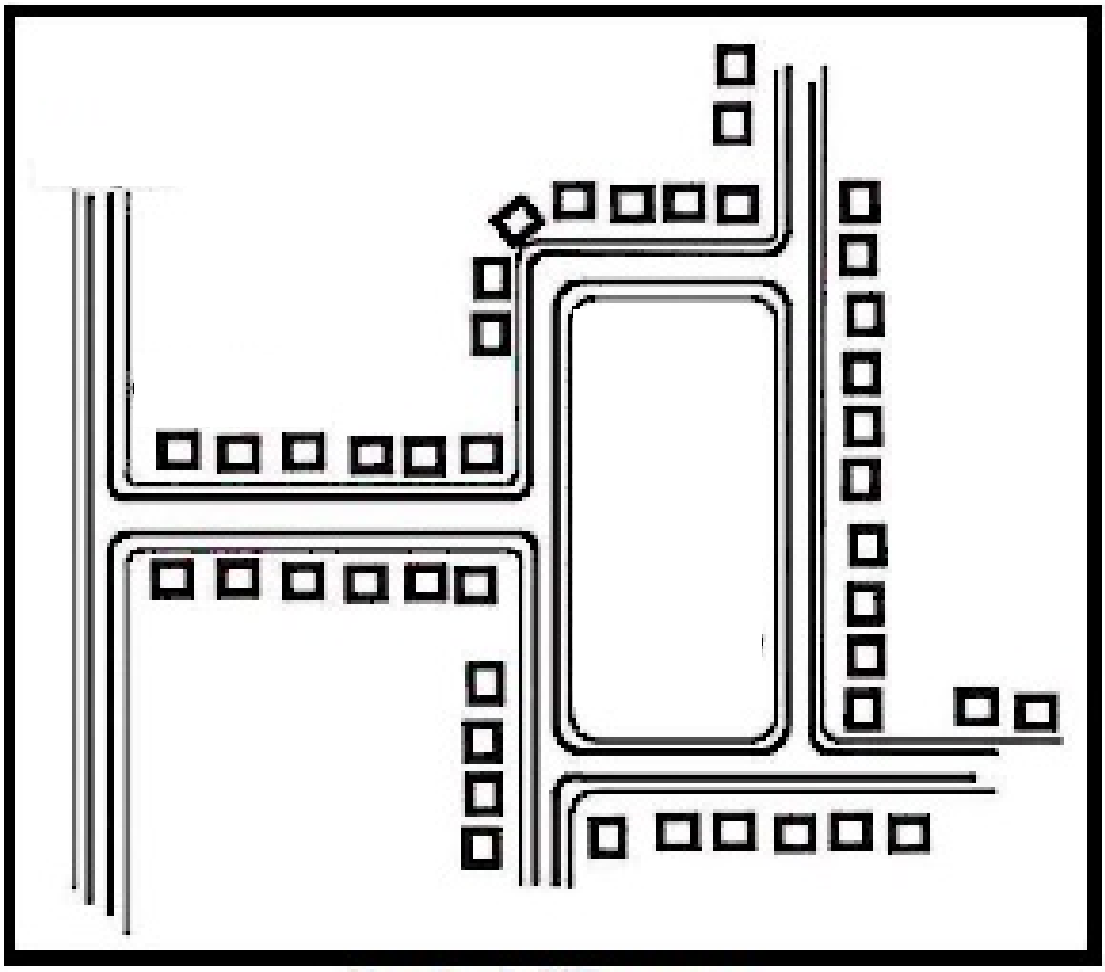
	Main Street – Two Lanes with Angled Parking	**Main Street – Two Lanes with Angled Parking (Mid-block)**	**Couplet – Two Lanes**	**Residential Parkway – Two Lanes**	**Residential Parkway – Two Lanes (Mid-block)**	**Neighborhood/ Local Urban – Two Lanes**
Curb Extensions	Yes	Yes	Yes	Yes	Yes	Partial
Corner Radii	20 Feet	NA	20 Feet	20 Feet	NA	20 Feet
Exclusive Left Turn Lanes Allowed	No	NA	Yes (when intersects with boulevards or existing major arterials)	No	NA	No
Exclusive Right Turn Lanes Allowed	No	NA	No	No	NA	No
Standard Markings	Yes	Yes	Yes	Yes	Yes	Yes
Colored Paving	No	No	No	No	No	No
Pavers	Yes	Yes	Yes	No	Yes	Yes
High Visibility Markings	No	Yes	No	No	Yes	No
Pedestrian Refuge Islands	NA	NA	NA	Yes	Yes	NA

6.4 Planned Development and Infill Redevelopment Subdivision Design

Following are three examples of subdivision design that can help meet the intent of planned developments and Article 7 Green Infrastructure and Stormwater Management for new development within the Residential, PUD and ROD zoning districts in the Highland Heights Zoning Regulations:

(A) Village Green

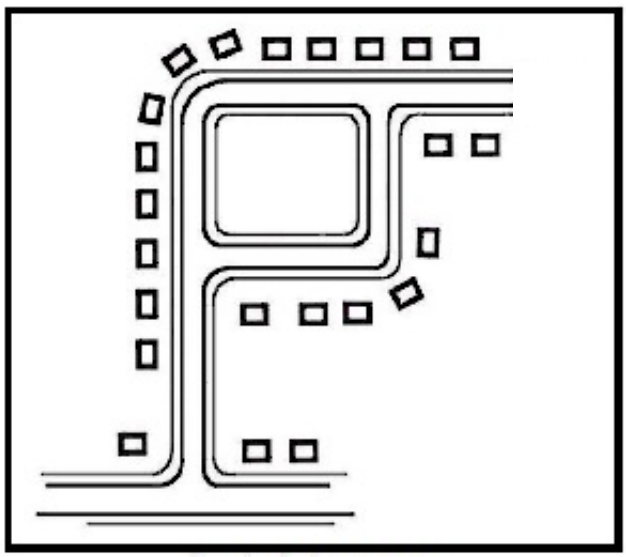
This feature is a formal one-half acre recommended community landscaped island and tree plantings within the center of a street or offset open space within an entrance or major street of the development. It should include: an open shelter type structure such as a gazebo, a fountain or similar focal point, single-loaded street with sidewalk around the perimeter, box curb design, street trees around the perimeter, and appropriate paved pedestrian access to the structure(s). The emphasis should be on a grass commons type of area with shade trees rather than landscaping that is expensive to maintain. Utility boxes, manhole lids or similar that do not serve facilities within the Green should not be located in the Green. One example of a Village Green is attached:



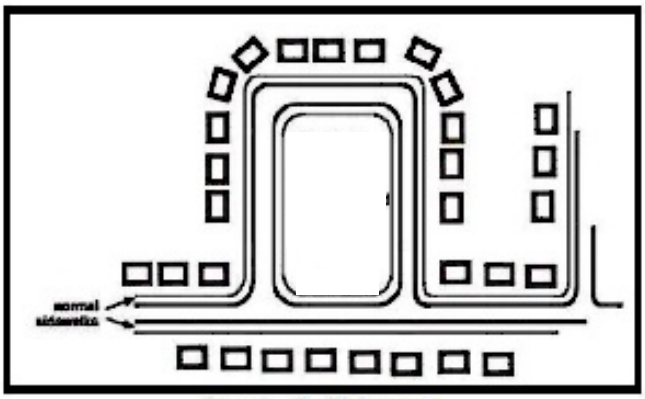
Drawing 1 - Village green

(B) Corner, Side, and Court Greens

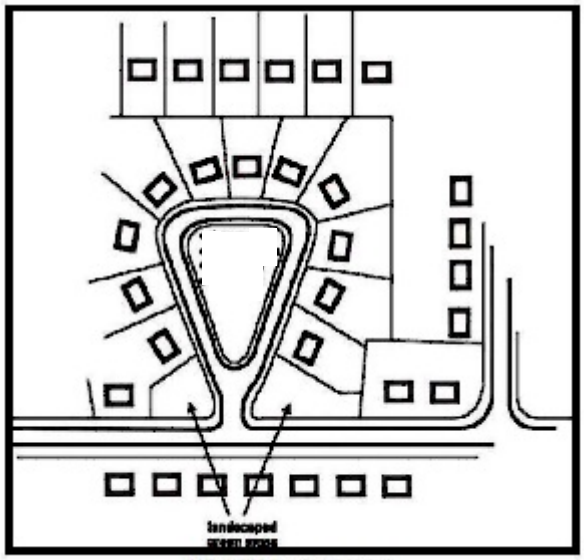
These features can be smaller than the formal Village Green and can occur within the back streets of a development. They include shade trees, benches, paved connecting paths, box curbs at the street. Groundwater recharge can be designed into these features. No utility boxes, manhole lids or similar should be located in these areas.



Drawing 2 - Corner green



Drawing 3 - Side green



Drawing 4 - Side green

(C) Maintenance of neighborhood parks and open spaces

The open space portions of any subdivision shall be clearly designated during subdivision review, and clearly described with use restrictions referenced on a Final Plat filed at the Campbell County Clerk's office. They shall be protected from development by an appropriate restrictive covenant, scenic or conservation easement, public dedication, or homeowner's agreement. The ownership and responsibility for continued maintenance of the open space areas is also required. HOA documents shall be submitted at the Improvement Plan and Final Plat review stages, and shall demonstrate long term financial stability of the proposed HOA.

Article 7 Green Infrastructure And Stormwater Management

7.1 **Purpose**

Green infrastructure uses natural processes to ameliorate the negative effects of urban development, including reducing heat island effects, air pollution, water pollution and excess storm water runoff. Integrated stormwater management is a subset of green infrastructure. The use of integrated stormwater management is encouraged because of its connection to effective development practices and environmental quality. The influence of the natural flow regime (hydrology) of a given watershed on overall stream integrity (chemical, physical, biological) is well established, and as such, maintaining the natural flow regime is a priority for stormwater managers. The proper use of integrated stormwater management practices can achieve this goal and dramatically improve stormwater runoff quality, decrease runoff volume, reduce infrastructure costs, protect the integrity of downstream streams and rivers, and create more interesting places to live. Stormwater management practices include a broader understanding of watershed management and ecosystem function, coupled with overall site design and layout, and implementation of an impervious area reduction strategy. The creation of impervious surfaces on a site can dramatically impact a community's watersheds, wastewater treatment systems, and water supplies by altering the landscape's inherent ability to slow, filter, and absorb stormwater runoff (i.e. alters the natural flow regime). Development or redevelopment of a site can be accomplished while reducing the overall negative impact to receiving streams, by applying carefully considered stormwater management techniques which mimic natural hydrology. To further these more general purposes, this article:

(A) Establishes site design components to promote more effective use of individual stormwater management techniques to prevent negative impacts rather than mitigating them;

(B) Provides the ability to utilize simple, nonstructural methods for stormwater management that are lower cost and lower maintenance than structural controls;

(C) Encourages the management of stormwater as close to the point of origin as possible and minimizes collection and conveyance, establishing a strategy to determine what portions of stormwater are to be filtered into the ground on site and what portions of stormwater are to flow-through the site for management elsewhere;

(D) Provides benefits to the environment as well as to the development community by improving water quality and restoring aquatic habitats while controlling flooding. This approach can increase rainfall infiltration and groundwater recharge with potentially large environmental benefits and potentially lower net costs – both to the environment and to the developer. The integrated stormwater management techniques provide innovative options for developers to rethink overall site design and layout to utilize a site more efficiently while providing better stormwater management opportunities than traditional gray infrastructure;

(E) Uses multiple impervious area reduction techniques within the context of an overall site design to reduce the negative runoff impact created with the development or redevelopment of a site and ideally reduce the amount of underground pipe infrastructure necessary on a site;

(F) Promotes the aesthetic value of integrated stormwater management. In addition to the benefits of maintaining healthy waterways and the multiple environmental benefits supporting healthy communities found in the use of integrated stormwater management, the use of these techniques can provide aesthetic value to a community with the use of added vegetation to the landscape. By integrating natural processes into the built environment, these techniques provide stormwater management, Flood mitigation and control, and air quality management with more aesthetic appeal than standard gray stormwater infrastructure.

7.2 Site Layout Strategies

(A) Overall site layout strategies are encouraged to be incorporated into an integrated stormwater management plan. Site layout strategies are the first step in managing stormwater in a way that mimics natural hydrology. Using land more efficiently for development, preserving critical ecological areas, and reducing runoff through better site design are vital to maintaining a healthy watershed. Stormwater management works most effectively in conjunction with an overall site design strategy which identifies how the stormwater impacts created by the development will be addressed.

(B) A site design strategy should include identification of which portions of expected stormwater will be managed using either infiltration methods, retention methods, or flow-through methods. Shifting the focus toward the utilization of rainwater as a resource that should be managed as close to where it falls as possible and away from addressing rainwater solely as a waste that should be removed from a site will increase the efficiency of stormwater management.

(C) Effective stormwater management will utilize multiple methods aimed at managing runoff through both infiltration into natural systems as well as use of management methods which remove water from the site through piping infrastructure without adding significant impacts to local waterways and watersheds. The elements work collectively to lessen the negative impacts to nearby waterways and watershed systems.

(D) Efficiently designing a site should include conscious efforts to minimize the impervious areas created by new streets, pedestrian pathways, parking lots, and/or buildings.

7.3 Elements of Integrated Stormwater Management

The following elements are examples of integrated stormwater management which, when used in coordination with effective site design strategies, can aid in lowering the negative impact to local waterways and watersheds. Once a strategy has been established to minimize collection and conveyance, these elements can be utilized, in varying combinations, to successfully implement stormwater to be filtered into the ground on site and stormwater to flow-through the site for management elsewhere.

(A) Narrower Right-of-Way Widths

Whether used in conjunction with narrower pavement widths or traditional width pavements, narrowing the right-of-way established within a site is a significant opportunity to reduce the quantity and increase the quality of storm water runoff by allowing structures to be set closer to the street. Because of the topography that is typical for this region, many developments involve land that includes ridge tops, hillside slopes and headwater streams. As such, development plans often include streets and structures constructed along ridge tops with back yards that extend down the hillside slopes and into headwater streams. Placing structures closer to the ridge top lessens the need for earthwork and tree removal along these hillside slopes which keeps more undisturbed land on the slopes and near the headwater streams. In addition to the added benefit of helping to ensure hillside stability, lessening hillside disturbance and tree removal will result in a lesser impact to the natural flow regime, and therefore a lesser impact to water quantity and water quality in these headwater streams as well as the corresponding receiving streams downstream of the site. See Figure 7.3-A.

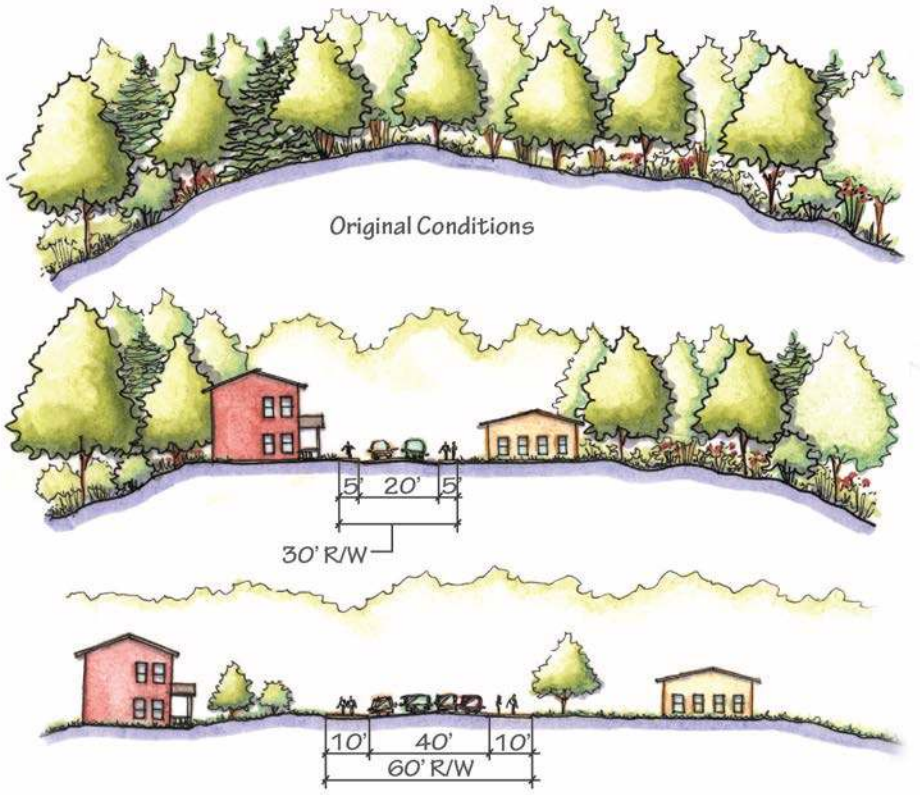
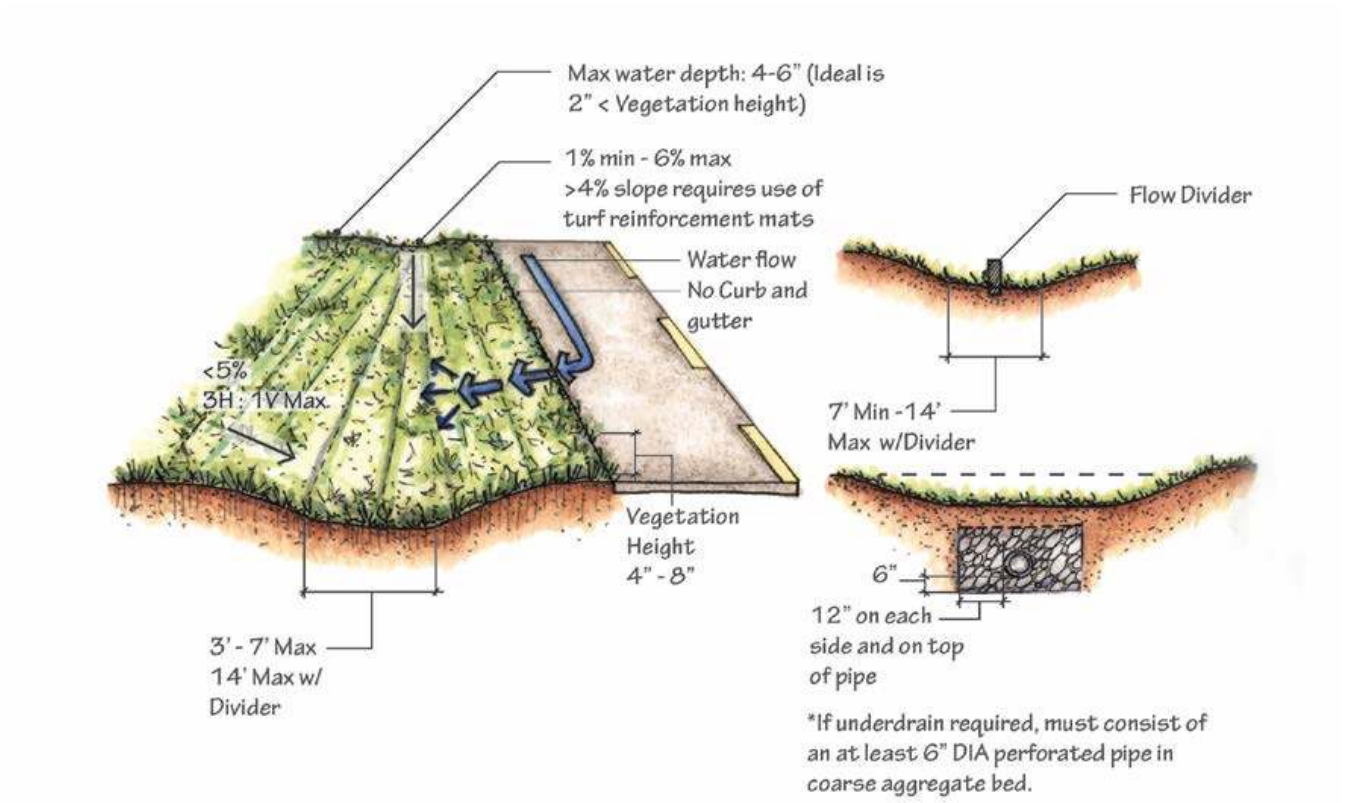


Figure 7.3-A: Illustration of Narrower Right-of-way Widths

(B) Grassy Swales (Bioretention Swales) Without Curb and Gutter and Grassy Swales With Curb and Gutter Containing Cut-outs and Flumes

Swales are long and narrow depressions in the landscape which incorporate vegetation to gradually move stormwater through a site by use of gentle slopes to guide runoff through the system. Swales are primarily used to slow the speed of stormwater runoff as it moves through a site though some infiltration can occur when slopes (less than five percent) and soils are favorable. The vegetation used within swales typically requires lower ongoing maintenance than that of traditional landscaping. When used in combination with curb and gutter containing cutouts and flumes, the swales provide the same benefit as traditional swales without curb and gutter by collecting stormwater outside of traditional gray infrastructure associated with the site and decreasing the impacts of development to the overall man-made stormwater management system. However this system offers the added benefit of providing curb and gutter along the edge of streets to help buttress asphalt pavements, create a well-defined pavement edge and increase the overall pavement edge lifespan. See Figure 7.3-B and Figure 7.3-C.



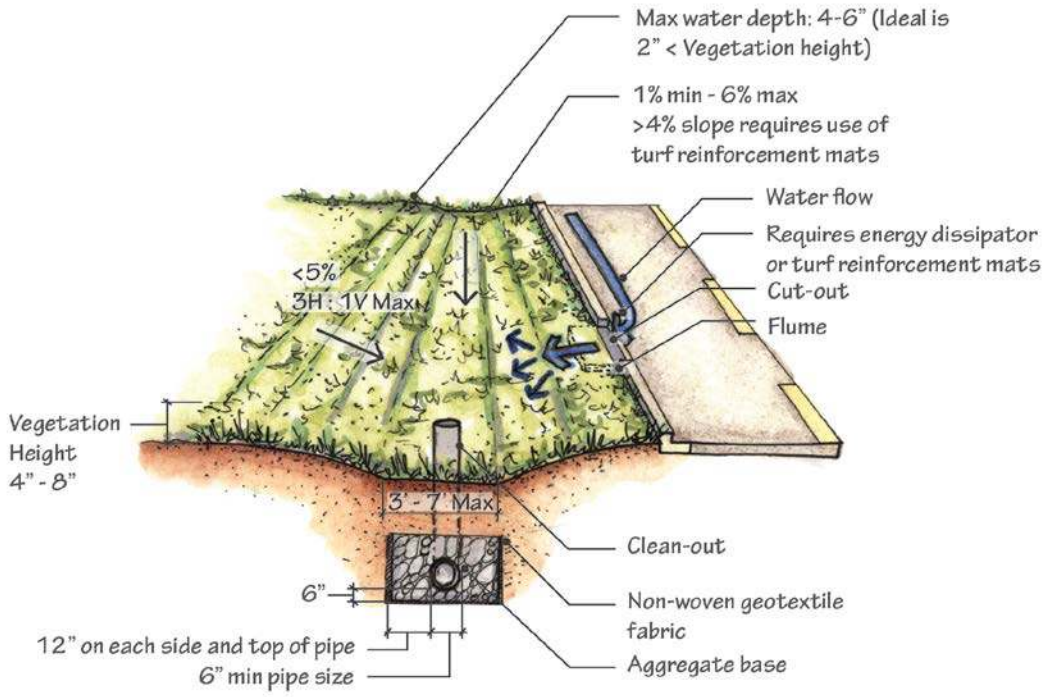


Figure 7.3-C: Illustration of a Grassy Swale with Curb and Gutter

(C) Infiltration Gardens (Biofiltration Swales or Rain Gardens)

Infiltration gardens are shallow depressions in the landscape which provide larger, often unused or left-over areas on a site to filter stormwater into the natural soils and groundwater system. Use of infiltration gardens can significantly lessen the amount of stormwater collected into piping infrastructure. The vegetation used within infiltration gardens typically requires lower ongoing maintenance than that of traditional landscaping. See Figure 7.3-D.

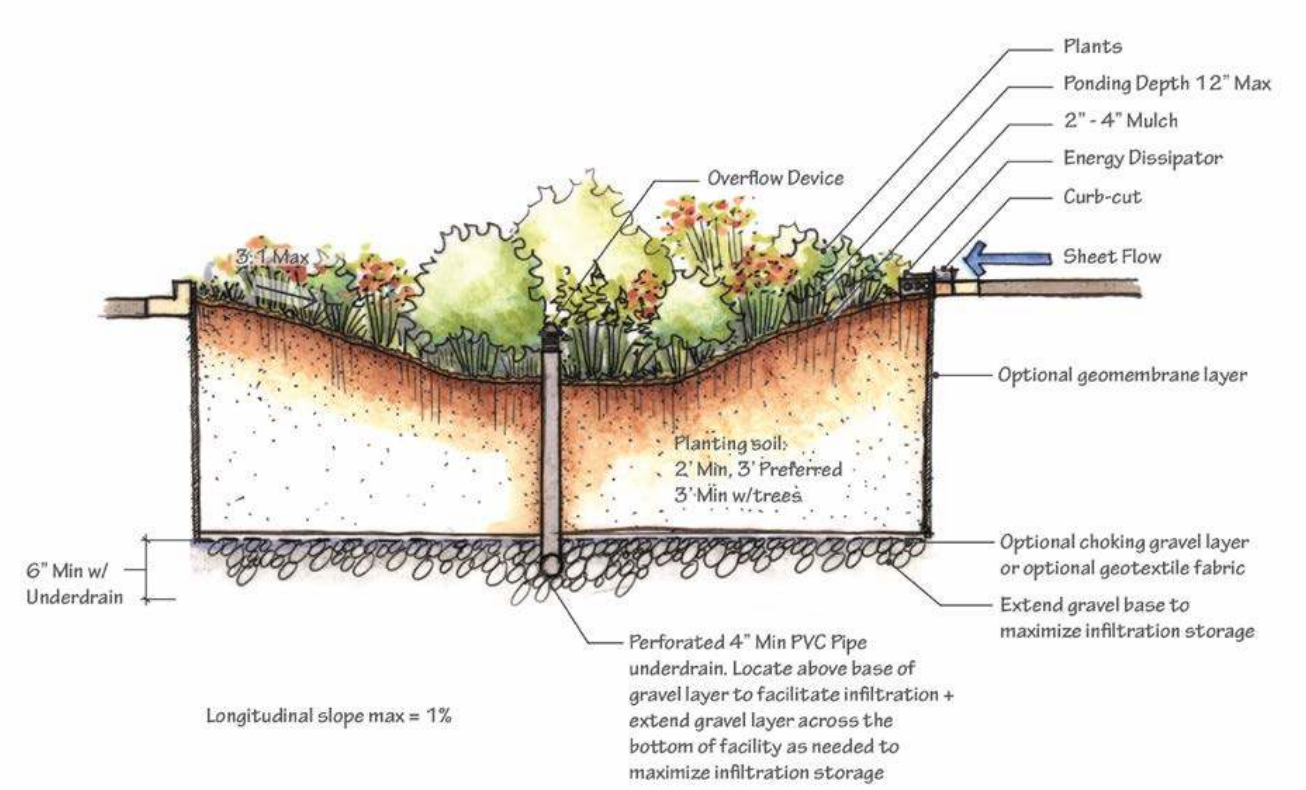


Figure 7.3-D: Illustration of an Infiltration Garden

(D) Pedestrian Walkways as a Design Element

Alternative pedestrian ways which are outside of the requirements set forth in Table 4.1-1 can be created to constitute a pedestrian circulation system equal to the level of effectiveness that traditional sidewalk on one or both sides of the street would provide. Rather than including sidewalks only within the right-of-way along the street, integrating a well thought out pedestrian circulation system throughout a site can reduce impervious surface while potentially lowering the construction cost and raising the stormwater management benefits of the overall site. Incorporating a strategic system of pedestrian walkways linking key destinations within a site (in conjunction with aligning connections for travel outside the site) will increase usability of walkway networks. Additionally, incorporating materials such as mulch, gravel, or other pervious material can further reduce the hard surface runoff. When adding sidewalks to one or both sides of every street, often important pedestrian connections are not made, the sidewalks themselves are under (if-at-all) utilized, and excessive impervious surfaces are created.

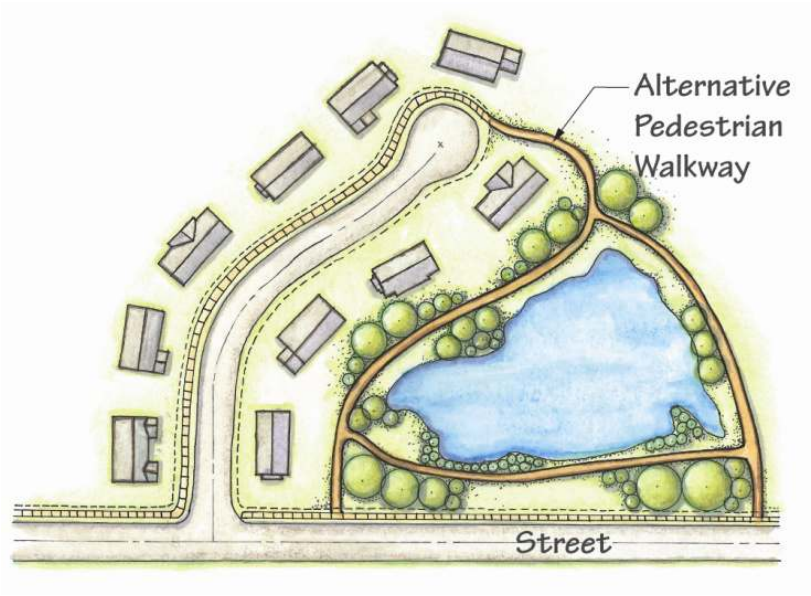


Figure 7.3-E: Illustration of Pedestrian Walkways as a Design Element

(E) Planter Boxes

Planters are long narrow, often rectangular landscaped areas with vertical walls and flat, unsloped bottoms, and are able to store a greater volume of water than swales, because they are typically deeper, and provide more capacity. Water flows into the planter, absorbs into the topsoil and plants, fills to a predetermined overflow elevation, and discharges into the overflow system provided. Two types of planters are used for stormwater management.

1) Flow-through Planters

Flow-through planters have a sealed bottom and sides and absorb only as much water as the soil and plants in the planter can accommodate. They allow water to slowly travel through the soil profile prior to overflowing into a subsurface underdrain system. See Figure 7.3-F.

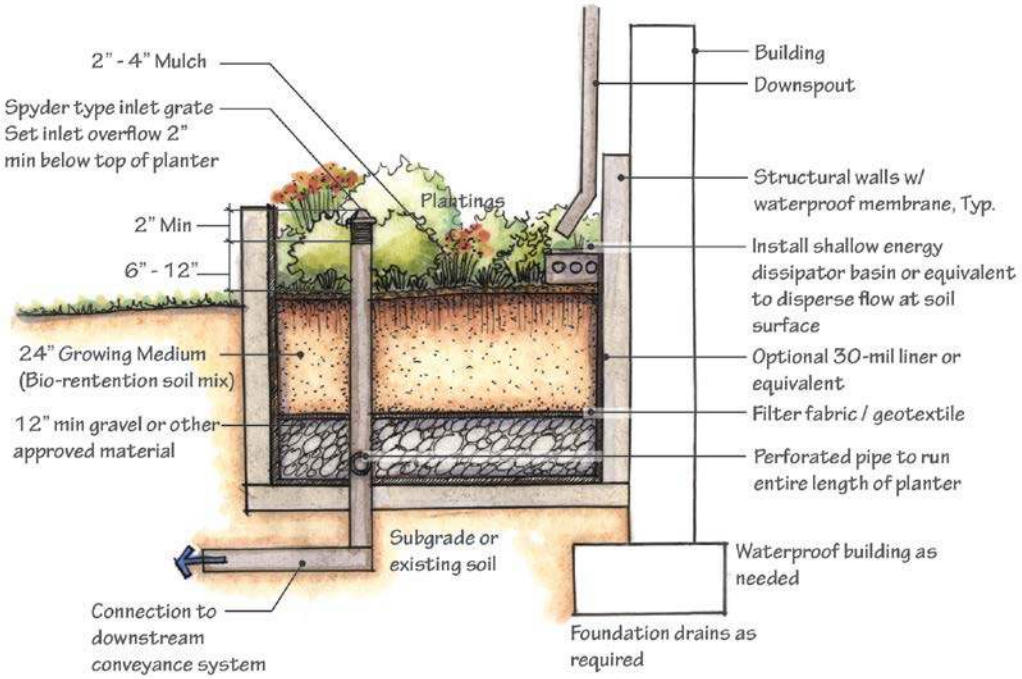


Figure 7.3-F: Illustration of a Flow-Through Planter Box

2) Infiltration Planters

The bottom of an infiltration planter is open to the native soil. Water in the planter is absorbed by topsoil, and infiltrates into native soils below. See Figure 7.3-G.

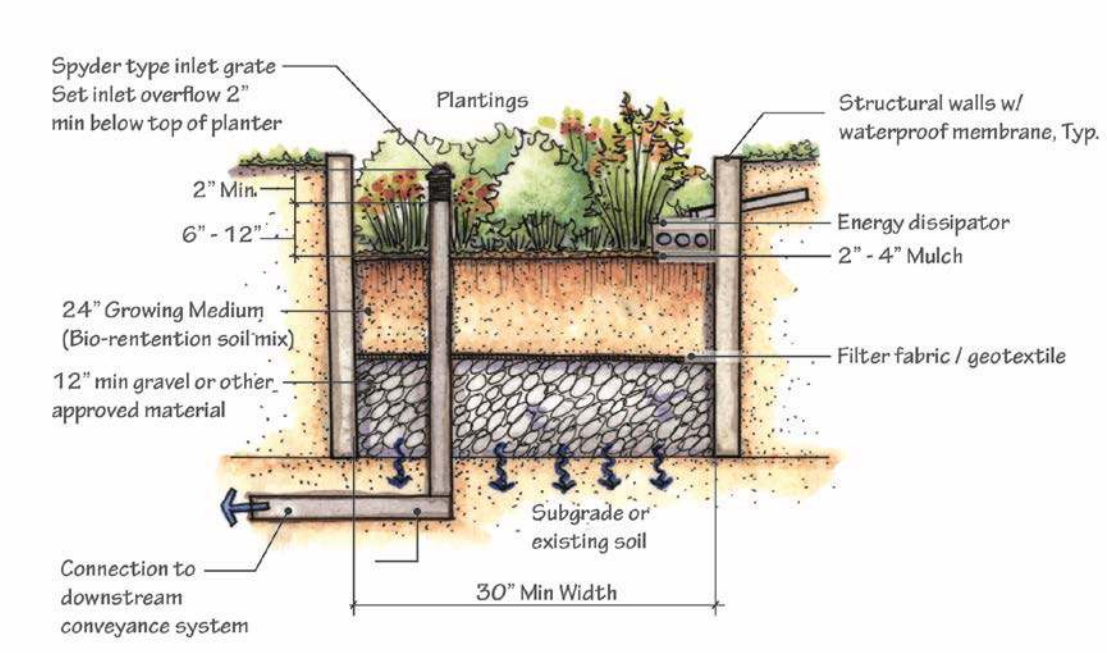


Figure 7.3-G: Illustration of Infiltration Planter Box

(F) Permeable Pavement

If underlying soils allow for the natural infiltration of rain water, constructing pavement using permeable materials can allow for stormwater to filter through the pavement and into the natural ground water system while still providing the structural integrity necessary for the site's automobile and pedestrian traffic. The use of Permeable Pavement can mitigate the overall impact of the development to the piping infrastructure systems while maintaining full functionality of the developed site. See Figure 7.3-H, Figure 7.3-I, and Figure 7.3-J.

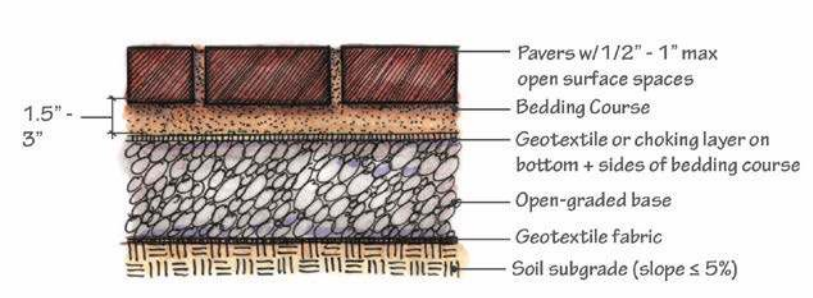


Figure 7.3-H: Illustration of Permeable Pavers

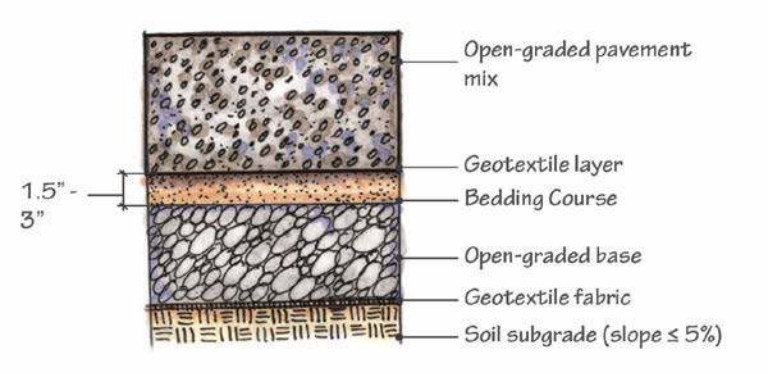


Figure 7.3-I: Illustration of Permeable Pavement

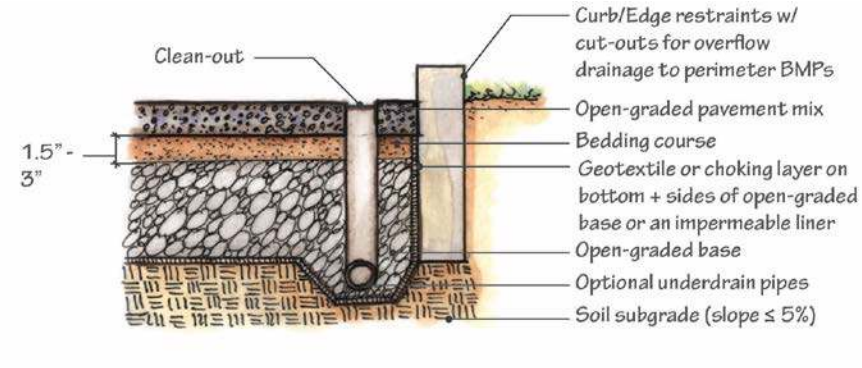


Figure 7.3-J: Illustration of Permeable Pavement with an Underdrain

(G) Preserving Existing Trees and Planting New Trees

Preserving trees and planting new trees on a site adds to the ability to effectively slow, absorb, and filter rainwater. Trees naturally work to physically slow the flow of water through a site by intercepting stormwater on their leaf surfaces as well as through their root structure. Not only do trees collect water for their growth, their physical presence on the landscape intercepts the flow of water downhill and slows its movement. See Figure 7.3-K.

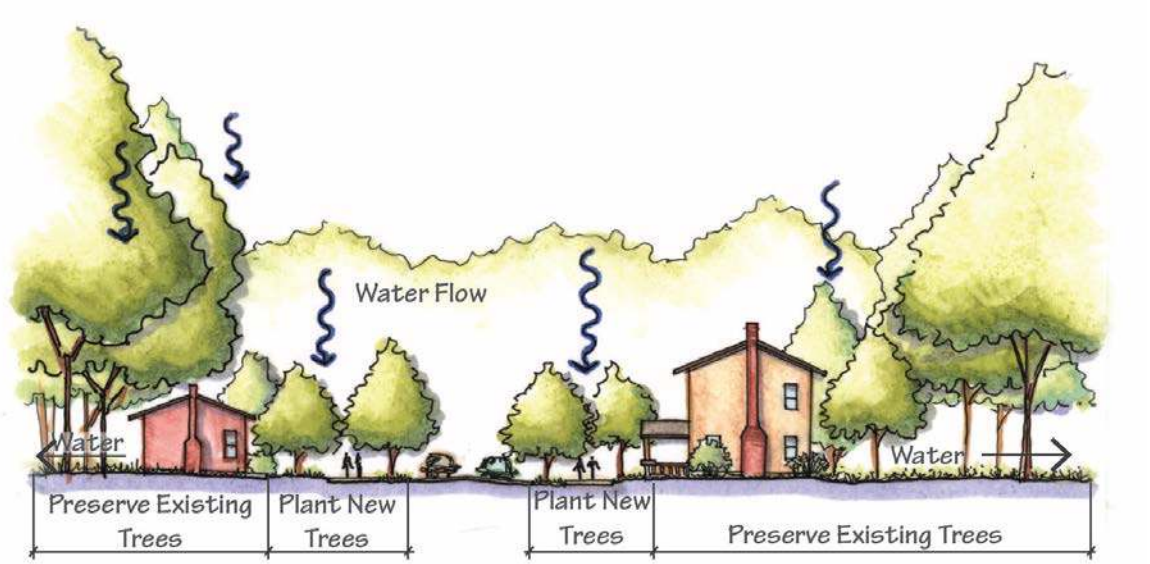


Figure 7.3-K: Illustration of Preserving Existing Trees and Planting New Trees

7.4 Criteria for Integrated Stormwater Management

Staff will approve the use of Integrated Stormwater Management provided the following criteria have been substantiated:

(A) The Integrated Stormwater Management is proposed to utilize the landscape's ability to reduce, slow, filter, and/or absorb stormwater runoff from streets, parking lots, and buildings by maintaining key elements of the natural flow regime and minimizing impacts to receiving streams.

(B) The Integrated Stormwater Management is consistent with Sanitation District No. 1's Stormwater Rules and Regulations.

(C) The Integrated Stormwater Management has been designed by a Professional Engineer.

(D) For Integrated Stormwater Management within the public right-of-way, the element(s) shall be approved by the authority designated by the applicable legislative body in writing.

Article 8 Definitions Used In Subdivision Review

INTERPRETATION OF WORDS AND PHRASES:
For the purpose of these regulations, certain terms, phrases, words, and their derivatives, are herewith defined as follows:

1. The word "person" includes a firm, association, organization, partnership, trust, company, or corporation as well as an individual.

2. Words used in the future tense include the present; words used in the present tense include the future; words used in the singular form include the plural; words used in the plural form include the singular; words used in the masculine include the feminine; words used in the feminine include the masculine.

3. The word "shall" is a mandatory requirement, the word "may" is a permissive requirement, and the word "should" is a preferred requirement.

Access Management
Refers to regulations which promote safe and reasonable access between public and private roads and adjacent land.

Alley
Public right-of-way which affords a secondary means of access to abutting property and which connects between two public streets. An alley is not a street as defined in this article and any lot frontage on an alley may not be used for meeting lot frontage requirements.

Board of Adjustment and Zoning Appeals
An appointed board responsible for hearing appeals of determinations made by the zoning administrator and considers requests for variances and conditional use permits as outlined in the zoning regulations.

Block
A parcel of land within a subdivision that is bounded by streets or bounded by streets and the exterior boundary of the subdivision. For this definition, an alley is not considered a street, but part of the block.

Block Length
The distance between intersections of through streets such as distance being measured parallel to the longest street bounding the block and from right-of-way line to right-of-way line of the two intersecting streets.

Building Inspector
A person employed by the applicable legislative body and registered with the Kentucky Department of Housing, Buildings and Construction per K.R.S. 198B duly authorized representative, whose responsibility it is to inspect items required by these regulations.

Cemetery
A land area used or intended to be used for the purposes of the human or animal burial. A cemetery includes, but is not limited to a burial park for earth interment, mausoleum for entombment, columbarium for inurement, burial ground consisting of one (1) or more marked or unmarked graves, and a burial mound or other burial facility.

Certificate
Refers to the required certificates for Final Plat and Conveyance Plat Review.

Certificate of Occupancy
A certificate which must be obtained prior to occupancy of any premises.

Comprehensive Plan
A plan, or any portion thereof, adopted by the Planning Commission in accordance with Chapter 100 of the Kentucky Revised Statutes which establishes policies for public and private actions and decisions to safeguard the development of public and private property in the most appropriate manner. A comprehensive plan shall contain, as a minimum, a statement of goals and objectives, principles, policies, and standards; a land use plan element; a transportation plan element; a community facilities plan element; and any additional elements.

Conveyance Plat (formerly Deed Plat or Convenience Plat)
A type of plat used in the minor division of land, which is approved by the Campbell County Planning Commission and recorded in the county clerk's office. A conveyance plat is used to transfer a minor division of land in an expeditious manner without subjecting an applicant to the formal subdivision review process or a major division of land procedure. A conveyance plat may be informally called an "identification" or a "ID" plat.

Covenant
A written promise or pledge which is typically a private restriction that applies to land use matters within certain subdivisions.

Culvert
A transverse drain that channels under a bridge, street, or driveway.

Detention Basin
A dry stormwater detention area that is used to detain stormwater runoff a specified length of time to keep the flow of water from the subject area to that of pre-development flow.

Developer
Synonymous with the term "subdivider" or "applicant." Also see definitions of "owner" and "subdivider."

Easement
A right, distinct from the ownership of the land, to cross property with facilities such as, but not limited to, sewer lines, water lines, and transmission lines, or the right, distinct from the ownership of the land, to reserve and hold an area for drainage, access, or other specified purposes.

Engineer
A licensed Professional Engineer (P.E.) in good standing with the Kentucky State Board of Licensure for Professional Engineers and Professional Land Surveyors. The Engineer responsible for designing the public and private improvements on each plan shall be retained by the applicant or property owner to assure that the improvements are made in accordance with the approved plans. Also referred to in these regulations as “Professional Engineer” or “Kentucky Licensed Professional Engineer.”

Final Plat
A subdivision plat prepared in accordance with the provisions herein in which said plat is designated to be placed on record with the county clerk after approval by the planning commission.

Flag Lot
An irregularly shaped lot where access is provided from a public street frontage through a narrow, unobstructed strip (or "panhandle") which is part of the building lot, and that may be shared with one adjoining flag lot. The building site within a flag lot does not immediately abut a public street, but is located at the terminus of the access strip described herein.

Flood
A general and temporary condition of partial or complete inundation of normally dry land areas from: (a) the overflow of inland water; (b) the unusual and rapid accumulation of runoff of surface waters from any source; and, (c) mud slides which are caused or precipitated by accumulations of water on or underground.

Flood - 100 Year Frequency
The highest level of flooding that, on the average, is likely to occur every 100 years.

Flood Plain or Flood Prone Areas
Any normally dry land area that is susceptible to being inundated by water from any source.

Floodway
The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the 100 year flood without cumulatively increasing the water surface elevation more than one foot at any point.

Flowline
The transition point between the gutter and the face of the curb. For a cross or valley pan, it is the center of the pan. Where no curb exists, the flowline will be considered the edge of the outside traveled lane.

Geotechnical Engineer
A qualified individual, who is an engineer licensed in the Commonwealth of Kentucky, and who possesses a masters degree in Civil Engineering with a specialty in Geotechnical Engineering from an ABET accredited Civil Engineering Program, or at least three years of documented experience as a practicing geotechnical engineer, and who has a minimum of one year of local geotechnical engineering work experience.

Upon individual requests made to the Geotechnical Group - Cincinnati Chapter ASCE (American Society of Civil Engineers) c/o its current president, the above criteria and requirements may be used by the Highland Heights Planning Commission for acceptance onto the List of Qualified/Recognized Geotechnical Engineers as a professional employed by a firm. Prior to authorization of performing any geotechnical engineering work required, individual engineers in responsible charge must be included on the List.

Grading Plan
A temporary plan used in certain cases due to construction time limitations, unique soil conditions, and weather conditions, where an applicant or subdivider may begin to grade a site after approval of a Preliminary Plat, but prior to the submittal of an Improvement Plan and which is subject to the conditions stated in this document (see Article 2).

Homeowners Agreement
A legal document involving agreement among property owners for certain rights and privileges for the use of land. Homeowners Agreements usually involve the joint use of open space, common areas, sidewalks, recreational facilities, driveways, etc. Typically, such Agreements address items such as a legal description of the land area, identifying members of the agreement, explanation of rights and privileges, purpose of the agreement (e.g. access), assessments, maintenance, construction material, utility crossovers, etc.

Impervious Surface
An area that has been compacted or covered by a layer of material that is highly resistant to infiltration by stormwater. Impervious surfaces include buildings, parking areas, driveways, sidewalks, and graveled areas.

Improvement Plan
The engineering plans showing types of materials and construction details for the physical structures, facilities, and public improvements to be installed in, or in conjunction with, the proposed subdivision.

Inspector
An individual or group of individuals representing a legislative body, public utility, or other organization whose responsibility is to inspect the construction and installation of public improvements.

Junction Box
A stormwater manhole that connects two or more drainage pipes. Used where there is a change in direction, change in elevation, or change in size of the pipes.

Legislative Body
The elected body of the City or Fiscal Court having territorial jurisdiction over a proposed subdivision, which is responsible for the inspection and acceptance of publicly dedicated subdivision improvements, and which is responsible for the ownership and maintenance of such improvements after dedication pursuant to KRS Chapter 100.

Lot
A portion of a subdivision or other parcel of land intended for transfer of ownership or for building development. "Lots" are the basic unit of a subdivision plan or the smallest division of land owned by someone.

Lot Area
Defined in the Highland Heights Zoning Regulations.

Lot, Corner
A corner lot is a lot situated at the intersection of two streets and has frontage on both streets.

Lot, Double Frontage
A lot having two or more of its non-adjoining property lines abutting upon a street or streets. A corner lot is not a double frontage lot.

Lot Front or Frontage
Defined in the Highland Heights Zoning Regulations.

Lot Line, Rear
The boundary line of a lot which is opposite the front lot line of such lot. In the case of a triangular shaped lot, for measurement purposes only, a line ten (10) feet in length within the lot parallel to the front lot line. In the case of a corner lot, the rear lot line is the line opposite the front lot line which any structure faces.

Lot Line, Side
Any boundary line of a lot, other than a front lot line or rear lot line.

Lot of Record
A lot which is a part of a subdivision according to a specific recorded plat or survey, the plat of which has been officially approved by the planning commission and recorded in the office of the county clerk. Also means a lot which is part of a subdivision according to a specific recorded plat, survey, or written legal description which is recorded in the office of the county clerk, but did not legally require approval of the planning commission at the time of its recording.

Maintenance Acceptance
Maintenance acceptance follows public dedication whereby a legislative unit accepts a public improvement such as an existing or a future road or a utility for maintenance purposes.

Minor Division of Land
A minor division of land is a procedure which involves the division of land in five (5) buildable lots or less from the parent tract, and where there is no need for public street and utility improvements. A conveyance plat is required for this type of procedure.

Major Division of Land
A major division of land is a procedure, which involves the division of land in six (6) buildable lots or more from the parent tract, and/or where there is a need for either public or private street and utility improvements. A Preliminary Plat , Improvement Plan, and Final Plat are required for this type of procedure.

Monuments
Permanent man-made markers used to mark corners of property boundaries or points of change in street alignment. Monuments must be in accordance with 201 KAR 18.150.

Multi-Use Trail
A trail or path that is physically separated from motorized vehicular traffic by an open space or barrier. Sometimes referred to as a combination bicycle/pedestrian path or shared use path, it is designed to be used by a combination of bicyclists, pedestrians, skaters, wheelchair users, joggers, and other non-motorized users.

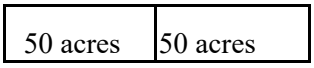
Owner

The person, persons, or other entity having legal title to particular real estate, or such other person, persons, or entity acting on behalf of and with the written permission and authority of the legal title holder, such as a holder of an option or contract to purchase the real estate, or a lessee. In the context of these regulations, "owner" means the person, persons, or entity bearing responsibility for a development review application or proposal, and the term "owner" may be used interchangeably with terms such as applicant, developer, subdivider, owner by option, etc. Also see definitions of "developer" and "subdivider."

Parcel
Synonymous with the term "lot."

Parent Tract
Refers to any existing parcel of land shown as a unit or contiguous units in common ownership. The parent tract may be subdivided in accordance with the requirements of a minor and major division of land.

Example:



PARENT TRACT
100 ACRES

1st division of 50 acres

4 divisions of land remaining for building purposes through Conveyance Plat Procedure

Patio Home
A detached single family dwelling unit, situated on a typically reduced width lot, with a reduced or no side yard setback on one side of the lot to facilitate better overall use of the lot, and to incorporate some aspects of cluster style developments.

Performance Bond or Surety Bond
An agreement by a subdivider or developer with the appropriate city or county government or water and sewer commission/district having jurisdiction for the amount of the estimated construction cost guaranteeing the completion of physical improvements according to plans and specifications within the time prescribed by the subdivider's agreement.

Planned Development
A defined land area to be planned and developed as a single development or an ordered series of developments. A planned development may include a variety of land use types and densities that are characterized by imaginative designs. A planned development's imaginative design shall creatively address architectural design, location of structures, integration of differing land uses, access management, interior vehicular and pedestrian access, stormwater management, landscaping, signage, and the preservation of natural topography, drainage, and vegetation.

Planning Commission
Public agency in the county empowered to prepare a comprehensive plan, zoning regulations, subdivision regulations, special regulations, and corridor or special area studies. The planning commission is responsible for evaluating proposed land use changes and their conformance with any applicable plans or regulations.

Planning Commission's Staff
Individuals employed by the Planning Commission or related Boards under direct employment or by a contractual agreement.

Plat
A map of a tract, parcel, or subdivision of land prepared in accordance with the requirements specified in these regulations.

Preapplication Meeting
Informal discussions between a developer or individual and the planning staff occurring prior to the submission of an application for action by the Planning Commission. The preapplication meeting allows the planning staff to acquaint the applicant with the applicable procedures and regulations, suggest improvements to a proposed design, encourage the applicant to contact appropriate authorities on the provision of public utility service, and provide the applicant with any pertinent information relating to the proposed application.

Preliminary Plat
A plat of a proposed subdivision prepared in accordance with the provisions herein for presentation to the planning commission for its action.

Private Access Driveway
A privately owned driveway at the side or rear of a lot or lots that affords vehicular access to said lot or lots by a means other than a public street. A private access driveway may be used in instances where due to unique topographical conditions or existing layout of a public road, direct access from an individual lot to the public would be dangerous in terms of traffic safety; in such instances, the frontage on a public street may be used to meet the subdivision and zoning requirements only if the proposed structures face the public road. A private access driveway is not a street as defined in this article and any lot frontage on a private access driveway may not be used for meeting lot frontage requirements.

Public Dedication
Public dedication involves a property owner voluntarily transferring land for public use. Public dedication includes the transfer of land ownership to allow the public access to a street, utility or vacant property. Public dedication does not imply public maintenance.

Public Maintenance
Public maintenance involves the maintenance of utilities and roads by legislative bodies and public utilities. Public street and utility maintenance usually involves the following.

1. Developer files a Preliminary Plat and an Improvement Plan with the Planning Commission.

2. Upon approval of the above, the developer may commence construction of project.

3. All public improvements (e.g. street, storm sewer, sanitary sewer and water, et al) must be inspected during the course of construction by the appropriate Inspector in order to demonstrate compliance with approved plats, plans and construction specifications.

continued on next page

4. The streets in a given section shall be accepted for maintenance and dedicated to the appropriate legislative body after a section is completed, provided they, along with the storm sewers, pass the final inspections of the legislative unit. This acceptance shall occur forty-five (45) days from the recording of the final plat if no bond or guarantee is posted.

5. Items requiring repair or completion such as sidewalks, street lights, final grading, crack filling, etc. can be done after the street section final plat is approved, provided a performance bond, escrow pledge or irrevocable letter of credit is posted with the appropriate legislative body.

6. Sidewalks fronting all lots determined to not be buildable nor readily buildable shall be completed prior to acceptance of the street section or a guarantee posted.

7. If, after one (1) year after acceptance of a street, items against which the bond or pledge was posted have not been completed, the developer will be contacted to complete such items within ninety (90) days. Should the developer not complete said items within ninety (90) days, the appropriate legislative body shall contract to have items completed and charged against the posted bond or pledge. However, if during the one (1) year plus the ninety day period mentioned above, the appropriate legislative body determines any of the items covered by the bond or pledge to be required immediately, due to safety or protection of property under emergency situations, said emergency repairs/improvements shall be completed at once at the expense of the developer or his bond/pledge. A one (1) year renewal of the bond or pledge is possible by agreement between the city and the developer.

8. A Final Plat shall be signed by an appropriate official from a City or County or public utility upon recommendation from officials conducting such inspection of a public improvement. If a bond or guarantee is posted and public improvements are completed and inspected, the appropriate official representing the City or County shall release the bond or guarantee and amend the Final Plat.

Record Drawing
A mylar drawing showing field documented as-built conditions of improvements and grades, as specified in Article 2, that were constructed pursuant to an approved Improvement Plan and/or Grading Plan if applicable. A record drawing is a separate sheet(s) that is submitted concurrent with a Final Plat application.

Record Plat
A Conveyance Plat or Final Plat, including a Condominium Property Regime Plat, prepared in accordance with the requirements of these regulations.

Resubdivision
A subdivision which resubdivides a previously recorded subdivision plat, and may include new public improvements.

Retention Basin
A pond or lake that is used to retain stormwater runoff until reaching a level of an overflow device that is designed at a specified elevation.

Right-of-Way
A general term denoting land, property, or interest therein, usually dedicated for such uses as a

street, alley or railroad. In addition to the roadway, it normally incorporates the curbs, lawn strips, sidewalks, lighting, and drainage facilities, and may include special features (required by the topography or treatment) such as grade separation, landscaped areas, viaducts, and bridges.

Roads
See definition of "streets" and following street classifications.

Setback Line
Defined in the Highland Heights Zoning Regulations.

Sidewalk
A portion of the road right-of-way outside the roadway, or a pathway on private property, which is improved for pedestrian traffic.

Streets
Any vehicular ways except alleys or private access driveways. The following shall be used to classify all streets:

Street, Arterial
Public thoroughfares which serve the major movements of traffic within and through the community.

Street, Connection

A short extension of an existing street to provide access to an undeveloped parcel(s) where normal street widths are precluded by topographic or other constraints. These streets may be approved for a decreased width in return for no on-street parking, not driveways, or other considerations.

Street, Collector
Public thoroughfares which serve to collect and distribute traffic primarily from subcollector to arterial streets. Collector streets are designed to serve five hundred (500) or more residential lots or housing units or fifty (50) or more commercial or industrial lots or uses.

Street, Cul-De-Sac
A street having an outlet at one end only and having the other end permanently closed with facilities permitting vehicles to turn around. This type of street serves twenty-five (25) residential lots or units or less (see Section 305).

Street, Expressway
A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at major intersections.

Street, Freeway
A divided multi-line highway for through traffic with all crossroads separated in grades and with full control of access.

Street, Frontage Road (Service or Access Road)
A street adjacent to a freeway, expressway, or arterial street separated therefrom by a dividing strip and providing access to adjoining properties.

Street, Limited Access Residential
A subcollector or collector street with no direct access for individual lots. Such streets are intended to provide direct and safe circulation within and between developing residential areas and the major street network.

Street, Local
Roadways which are designed to be used primarily for direct access to adjoining properties. A type of street designed to serve less than one hundred (100) residential lots or units.

Street, Private
A privately owned and maintained street that provides access to adjoining property for private users of such property. Lot frontage on an approved private street may be used for meeting lot frontage regulations. For the purposes of density calculations, a private street shall constitute the areas of its paved surface and sidewalks or the private right-of-way if designated on the recorded plat.

Street, Public
A public roadway, constructed within the boundaries of an officially dedicated public right-of-way, which affords principal means of access to abutting property. For purposes of density calculations, a public street shall constitute all of the area within the public right-of-way.

Street, Residential Condominium
A publically dedicated local street with a reduced right-of-way width which may be used in residential condominium developments.

Street, Subcollector
A street designed to provide a traffic route from local to collector streets. A type of street designed to serve one hundred (100) to five hundred (500) residential lots or fifty (50) or less commercial or industrial lots or uses.

Street, Urban
A development option available for cul-de-sacs, residential condominium streets, local streets, limited access sub-collector streets, and sub-collector streets which has tighter-knit, urban characteristics by using box curbs, integral sidewalks immediately at the back of the street curb, and narrower pavement width at intersections.

Street Tree
A tree installed in a right-of-way adjacent to a street, or on private property adjacent to a street right-of-way, in accordance with these regulations to improve visual and environmental qualities of a streetscape area.

Subdivider
Any individual, firm, association, syndicate, co-partnership, corporation, trust, governmental agency or any other legal entity commencing proceedings under these regulations, to create a subdivision

of land as defined herein for himself or for another. Where the subdivider is other than the Owner(s) of the property, evidence that the Owner(s) is aware of any proposed subdivision shall be provided to the Commission. Also see definitions of "owner" and "developer."

Subdivision (also referred as development or project)
The division of a parcel of land into two or more lots or parcels or tracts for the purpose, whether immediate or future, of sale, lease, or building development, or if a new street is involved, any division of a parcel of land; providing that a division of land for agricultural purposes into lots or parcels of five acres or more and not involving a new street shall not be deemed a subdivision. The term includes resubdivision and when appropriate to the context shall relate to the process of subdivision or to the land subdivided, and also includes the creation of remainder or residual tracts.

Surveyor
A licensed Professional Land Surveyor (PLS) in good standing with the Kentucky State Board of Licensure for Professional Engineers and Land Surveyors. Also referred to in these regulations as “Land Surveyor” or “Kentucky licensed Land Surveyor.”

Tract
A parcel or lot identified by letter or number, the boundaries of which are shown on the recorded subdivision plat. Also means a parcel or lot defined by a legitimately recorded legal description.

Use
The specific purposes for which land and/or a building is designated, arranged, intended, or for which it is or may be occupied or maintained.

Waiver
An exception to the literal requirements of the subdivision regulations that is reviewed and granted by the Zoning Administrator (also see term "Variance").

Watercourse
A natural or man-made channel through which water flows. Sheet drainage or minor swales across lots shall not, for the purposes of these regulations, be considered as watercourses.

Variance
An exception from the literal enforcement of the zoning regulations. (also see term "Waiver").

Vicinity Map
A drawing located on the plat which sets forth by dimensions or other means, the relationship of the proposed subdivision or use to other nearby developments or landmarks and community facilities and service within the general area in order to better locate and orient the area in question.

Zoning Regulations
The Highland Heights Zoning Regulations determine allowable land uses and dimensions.

Zoning Administrator
The individual who administers, interprets, and enforces the provisions of the subdivision regulations and the zoning regulations.

Article 9 Cemetery And Utility Considerations

9.1 Cemeteries - An applicant, property owner or developer has the option either to (1) preserve an existing private family cemetery and develop around it or (2) relocate an existing cemetery . In relocating a private family cemetery, an applicant, property owner or developer shall be required to follow applicable local and state laws**,** which include KRS 381.720 through KRS 381.750 and KRS 381.750 and coordination with the Kentucky Office of Vital Statistics and Kentucky Heritage Council, as applicable**.** In preserving a cemetery, while at the same time developing a parcel, an applicant, property owner or developer has the following options:

1. Transfer the existing cemetery as part of a buildable lot. Ownership and maintenance of the cemetery would be transferred to the individual lot owner.

2. Make the existing cemetery a separate lot. Ownership and maintenance of the cemetery would be transferred by written agreement to either a subdivision Homeowners Association, the developer of the subdivision, a local legislative unit, or an historical organization.

If a private family cemetery exists on a parcel of land and the exact location of grave sites is not determined, a developer or property owner is advised to contact the Kentucky Heritage Council. If the cemetery is a private family cemetery and not an active cemetery maintained and administered by an existing cemetery board, sexton, church, or other formal organization, the followng standards apply**.** A developer or property owner may seek a waiver of these requirements after consulting with the Heritage Council and providing the results of that consultation to the City.

1. Cemetery boundaries shall be determined by an applicant's professional

archaeologist from the list of archaeologists approved by the Kentucky Heritage Council. The archaeologist shall be responsible for determining the approximate boundaries of the cemetery and providing information on the history of the cemetery. Maps included in the final report must (1) portray the location and orientation of graves within the cemetery and (2) depict the location and orientation of the cemetery relative to the site and at least three nearby recognized landmarks such as public roads or benchmarks visible on a USGS map. The final report must also describe the field and archival methods and results used to document the cemetery, including any genealogical information gathered in the process.

Under KRS 381.755, only Campbell County Fiscal Court has the authority to issue an order or resolution authorizing the relocation of a cemetery located in Campbell County. In some instances, the Kentucky Office of Vital Records may also approve the relocation of graves.

9.2

Water and Sanitary Sewer, Private Utilities and Property Used for Public Purposes

The following shall be the minimum standards for utilities (with the exception of storm water drainage which has its own requirements). These standards are minimum requirements and more stringent local, county, state, or federal regulations may apply. In general, water and sanitary sewer service should be designed to tie into a public system. It is recommended that utility construction doesn't occur until permission has been granted by the appropriate utility company or organization.

(A) Water Systems and Fire Hydrants - Connection into either an existing or planned public water supply system shall be required if the system is sufficient or can be expanded in order to provide an adequate amount of water to a proposed subdivision. Where appropriate water supply lines shall be designed to loop back to existing or proposed systems. Fire hydrants shall be provided in all subdivisions where public water systems are provided. Fire hydrants should be located with a maximum spacing of 500 feet, as measured along the street right-of-way. Fire hydrants should be located no further than 250 feet from any building site, or as determined by the applicable setbacks. Additional hydrants are not required to serve a flag lot if a hydrant is located within 100 feet of the vehicular entrance to the flag lot. Where existing public water mains that have existing fire hydrants are to serve a proposed subdivision and no public water main construction is necessary, no additional fire hydrants are required. In some residential subdivisions, additional fire hydrants may be required by the Planning Commission due to restricted roadway width and density of development, including those that utilize existing public water mains with existing fire hydrants. Fire hydrants shall be designed and constructed in accordance with the Highland Heights Street, Storm and Sidewalk Specifications and the appropriate water district specifications. Public water supply systems shall be designed and constructed in accordance with the Highland Heights Street, Storm and Sidewalk Specifications. Individual on-site water supply systems (wells and cisterns) shall be constructed in accordance with the current Standards and Specifications of the state or local health department/district.

(B) Sanitary Sewer Systems - Connection into either an existing or planned public sanitary sewer system shall be required if the system is sufficient or can be expanded in order to accommodate the additional flow from the proposed subdivision. Sanitary sewer systems shall be designed and constructed in accordance with the Highland Heights Street, Storm and Sidewalk Specifications. Private lateral lines may only occupy the lot it is serving, except where approved by the appropriate utility. Where package sewage treatment plants are proposed, the sewage collection system shall be designed for ultimate connection to the public system. Individual septic tank systems and package treatment plants shall be constructed in accordance with the current standards and specification of the state and local health department/district. No sanitary sewage treatment plant for any subdivision shall be located nearer than two hundred (200') feet to any residence.

(C) Private Utilities - Private utilities such as electric, telephone, natural gas, and cable television shall be placed underground, in the street right-of-way, or within platted easements, and must be constructed per applicable standards and specifications, which includes inspections by the appropriate legislative units, permit requirements and compaction requirements. In addition, a fifteen foot (15') wide utility easement shall be provided along all public street rights-of-way, with the exception of alley rights-of-way.

(D) Property Used for Public Purposes - In the development of large subdivisions, the Boone County Planning Commission or appropriate legislative body may investigate the impact of such development on existing parks, open space, schools, public facilities, streets, and other public uses. If it is determined that the proposed development severely impacts the community, the appropriate legislative body may negotiate with the subdivider, developer, or owner of the proposed subdivision to acquire property for potential public dedication and future public use either through donation, contract purchase, or lease arrangement. The acquired property may then be used for public purposes by serving the subdivision residents only or both the subdivision and neighboring populations.

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Article 10 Certificates Used On Final And Conveyance Plats

Certificates Begin on Next Page

10.1 **LAND SURVEYOR'S CERTIFICATE**

The following certificate shall appear on all Final Plats and Conveyance Plats presented to the Highland Heights Planning Commission for approval. The certificate shall be clearly legible, lettering shall not be less than 3/32 inch in height and shall be dated, signed, and stamped or sealed by a registered land surveyor as defined and regulated by KRS-322.

LAND SURVEYOR'S CERTIFICATE

I hereby certify that the survey depicted by this plat was done by me or by persons under my direct supervision by the method of random traverse with side shots. The unadjusted error of closure was _____. The survey shown hereon is a[n] _____ [urban or rural] class survey and the accuracy and precision of said survey meets all the specifications of this class and complies with 201 KAR 18.150. I further certify that this survey complies with the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations, and that dedicated areas including public ways or streets are within the boundaries of this survey.

_____ _____

DATE LAND SURVEYOR'S SIGNATURE

(SEAL)

OR

I hereby certify that the survey depicted by this plat was done by me or by persons under my direct supervision by the method of random traverse with side shots. The unadjusted error of closure was _____. The survey shown hereon is a[n] _____ [urban or rural] class survey and the accuracy and precision of said survey meets all the specifications of this class and complies with 201

KAR 18.150. I further certify that this survey complies with the Highland Heights Zoning Regulations and the Highland Heights Subdivision Regulations, and that dedicated areas including public ways or streets are within the boundaries of this survey

_____ _____

DATE LAND SURVEYOR'S SIGNATURE

(SEAL)

10.2 DEDICATION CERTIFICATE

The following certificate shall appear on all final plats presented to the Highland Heights Planning Commission for approval. The certificate shall be clearly legible, lettering shall be not less than 3/32-inch in height and shall be dated, signed, and notarized before submission to the Planning Commission.

DEDICATION CERTIFICATE

"(I) (We) hereby certify that (I am) (We are) the owner(s) of the property shown and described hereon and that (I) (We) hereby adopt this plan of subdivision with (my) (our) free consent, establish the minimum building restriction lines, and dedicate all streets, alleys, walks, parks, and other open spaces to public or private use as noted. (I) (We) further certify that title to the property shown hereon was acquired by Deed recorded in Deed Book _____ Page _____ of the Campbell County Clerk's office.

_____ _____

Date Owner(s)

One of the following Notary Public's Certificates must be included as part of this Dedication Certificate. Note that different Notary Public's Certificates are required for different types of owners.

(1) For an individual acting in his own right:

State of _____

County of _____

The foregoing instrument was acknowledged before me this (date) by (name of person acknowledged).

(Signature of person taking acknowledgment)

(Title or rank)

(Serial number, if any)

(2) For a Corporation:

State of _____

County of _____

The foregoing instrument was acknowledged before me this (date) by (name of officer or agent, title of officer or agent) of (name of corporation acknowledging) a (state or place of incorporation) corporation, on behalf of the corporation.

(Signature of person taking acknowledgment)

(Title or rank)

(Serial number, if any)

(3) For a partnership:

State of _____

County of _____

The foregoing instrument was acknowledged before me this (date) by (name of acknowledging partner or agent), partner (or agent) on behalf of (name of partnership), a partnership.

(Signature of person taking acknowledgment)

(Title or rank)

(Serial number, if any)

(4) For an individual acting as principal by an attorney in fact:

State of _____

County of _____

The foregoing instrument was acknowledged before me this (date) by (name of attorney in fact) as attorney in fact on behalf of (name of principal).

(Signature of person taking acknowledgment)

(Title or rank)

(Serial number, if any)

(5) By any public officer, trustee, or personal representative:

State of _____

County of _____

The foregoing instrument was acknowledged before me this (date) by (name and title of position).

(Signature of person taking acknowledgment)

(Title or rank)

(Serial number, if any)

10.3 FINAL PLAT APPROVAL CERTIFICATE

The following certificate shall appear on all final plats presented to the Highland Heights Planning Commission for approval. The certificate shall be clearly legible, lettering shall be not less than 3/32-inch in height and shall have space for the date and the signature of the Chairman of the Highland Heights Planning Commission.

HIGHLAND HEIGHTS PLANNING COMMISSION APPROVAL CERTIFICATE

"This plat has been found to be in compliance with the Highland Heights Zoning and Subdivision Regulations and is being submitted for recording in the office of the Campbell County Court Clerk."

_____ _____

Date Chairman's Signature

10.4 COUNTY CLERK'S STAMP

A 1.5 inch high by 3.5 inch wide blank space shall be reserved on all Final Plats for the pre-printed recording stamp affixed by the Campbell County Clerk's office at the time of recording. A title stating "County Clerk's Stamp" shall be printed over the prescribed blank space.

10.5 CERTIFICATES FOR CONVEYANCE PLATS

FOR BUILDABLE LOTS
LAND SURVEYOR'S CERTIFICATE

I certify that I have examined the records of the Campbell County Court Clerk and find that this is the (first)(second) (third) (fourth) (fifth) conveyance made under the present ownership of the parent tract.

_____ _____
Signature of Surveyor Date

FOR NON-BUILDABLE LOTS
LAND SURVEYOR'S CERTIFICATE

I certify that this plat of land in and of itself does not meet the current zoning regulations for use and is being transferred for non-building purposes.

_____ _____
Signature of Surveyor Date

DEDICATION CERTIFICATE

"(I) (We) hereby do dedicate the right-of-way of_____ as shown hereon to public use, forever.

_____ _____
Date Signature of Grantor(s)

*(To be used with the different notarization statements as specified in Appendix B of the Highland Heights Subdivision Regulations.)

Highland Heights PLANNING COMMISSION APPROVAL CERTIFICATE

Approved for recording the transfer of property only by the Highland Heights Planning Commission this _____ day of _____, 20_____.

_____
Chairman's Signature

10.6 STREETS AND UTILITIES SIGNATURES

I hereby certify that all public improvements (streets, storm sewer systems, sanitary sewers, and water lines) have been installed and inspected in accordance with the applicable specifications of the Highland Heights Subdivision Regulations in the section or phase of this subdivision and are publicly accepted and maintained 45 days from the recording of this plat; or that a guarantee has been posted with the applicable accepting agency to assure completion of all improvements.

STREETS

Signature of City/County Official	Title	Date

Amount of Guarantee	Expiration Date	Signature for Release	Date

STORM SEWER SYSTEM

Signature of City/County Official	Title	Date

Amount of Guarantee	Expiration Date	Signature for Release	Date

SANITARY SEWER SYSTEM

Signature of City/County Official	Sewer Commission/District	Date

Amount of Guarantee	Expiration Date	Signature for Release	Date

WATER LINE SYSTEM

Signature of City/County Official	Water Commission/District	Date

Amount of Guarantee	Expiration Date	Signature for Release	Date

10.7 Standard Terms and Conditions of Dedicated Easements

The utility easements shown and described on this plat are dedicated to the use and benefit of the named utility. The respective rights, duties, and obligations of the individual lot owner and the respective utility are set forth in a separate recorded document in the Campbell County Clerk's office. Terms and conditions of the document listed below are incorporated by reference.

Sanitary Sewers - Sanitation District No. 1 - Miscellaneous Book 1179, Page 942

Storm Sewers - Sanitation District No. 1 - Miscellaneous Book 1179, Page 945

10.8 Surface Drainage Easement Definition

"Surface Drainage Easements" shown on this plat are not accepted by the legislative body of jurisdiction. The legislative body is not obligated to maintain or repair any channels or installations in said easements. The easement area of each lot and all improvements in it shall be maintained continuously by the owners of the lots. Within the easements, no structure, planting, fill material or other material shall be placed or permitted to remain which may obstruct, retard or change the direction of flow of water through the drainage channel in the easement.

10.9 UTILITY STATEMENT For valuable consideration, we the undersigned do hereby permanently grant to Union Light, Heat & Power Company/Cinergy, Duke Energy, Owen Electric Cooperative, Inc. and/or the Cincinnati Bell Telephone Company, their successors and assigns, forever, nonexclusive easements as shown on the within plat and designated as "Utility Easement" for the construction, operation, maintenance, repair or replacement of any and all necessary fixtures for the overhead or underground distribution of gas, electric, telephone, or telecommunications, or other utilities. Said utility companies shall have the right of ingress and egress and also the right to cut, trim and remove any trees, undergrowth or overhanging branches within said easement or adjacent thereto. No buildings or other structures may be built within said easement, nor may the easement area be physically altered so as to (1) reduce clearances of either overhead or underground facilities; (2) impair the land support of said facilities; (3) impair the ability to maintain the facilities; or (4) create a hazard. We acknowledge having full power to convey this easement and will defend the same against all claims. _____ _____ Signature of Owner(s) Date

10.10 WATER MAIN EASEMENTS The Water Main Easement(s) as shown on this plat are subject to the DECLARATION OF MASTER WATER FACILITY EASEMENT AGREEMENT as set forth in (select the appropriate location from one of the following:) Easement Book 129, Page 145 of the Campbell County Clerk's records at Alexandria, Kentucky. Easement Book 304, Page 466 of the Campbell County Clerk's records at Newport, Kentucky.

Appendix A: Standard Construction Drawings

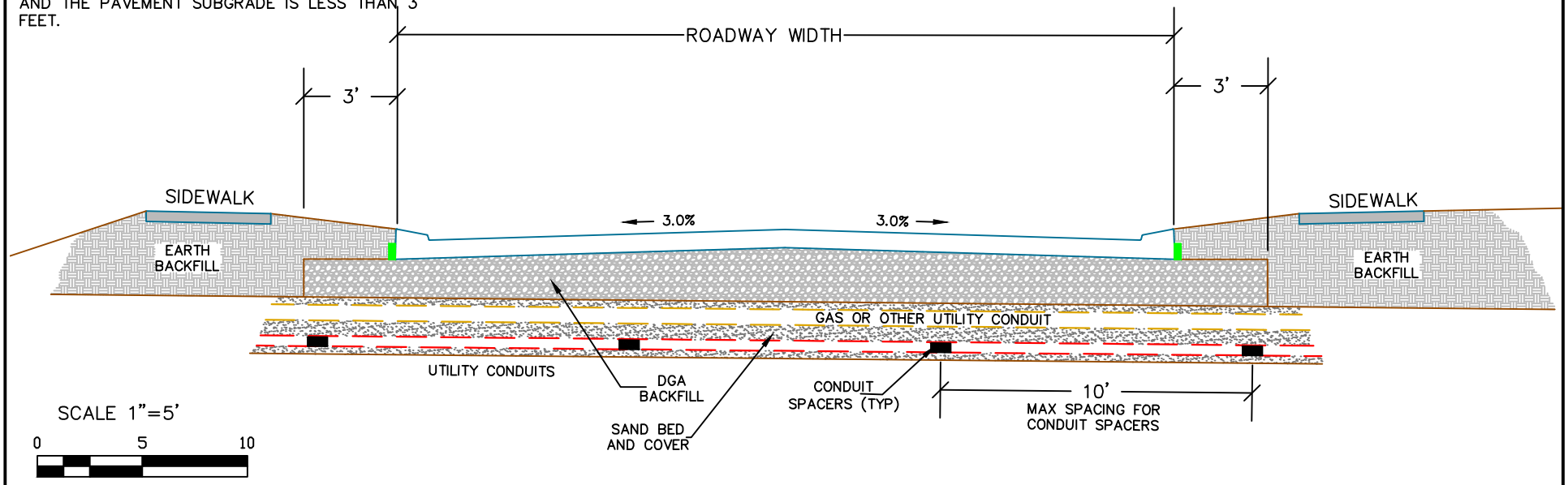
Drawings Begin on Next Page

THIS DETAIL SHALL APPLY TO ALL SHALLOW UTILITY CROSSINGS UNDER THE STREET. SHALLOW IS DEFINED AS WHEN THE DISTANCE BETWEEN THE TOP OF THE INITIAL GRANULAR COVER & BEDDING AND THE PAVEMENT SUBGRADE IS LESS THAN 3 FEET.

STREET CROSS SECTION AT SHALLOW UTILITY CROSS OVER

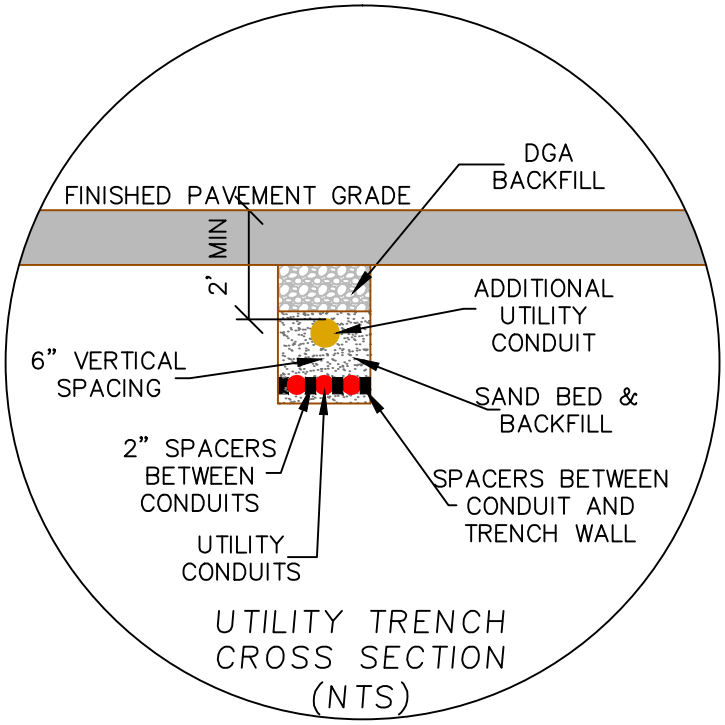
DETAIL #1

CONCRETE STREET SHOWN



SCALE 1"=5'

0 5 10



UTILITY TRENCH CROSS SECTION (NTS)

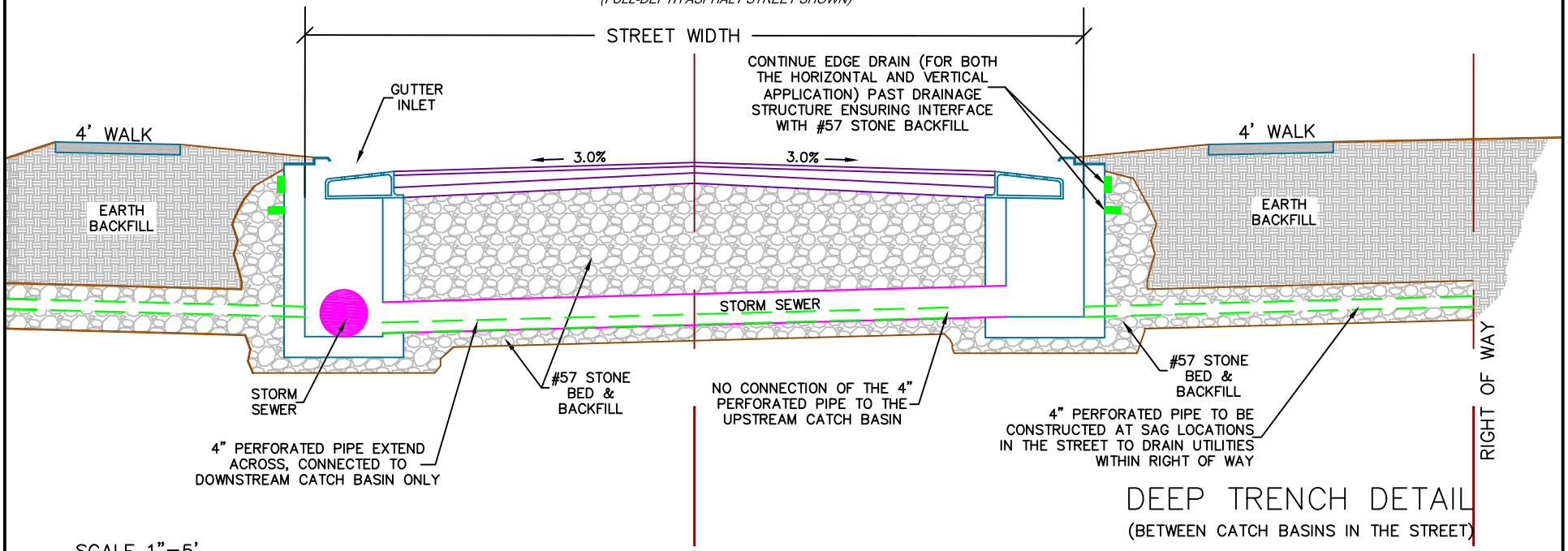
SHALLOW UTILITY CROSSOVER INSTALLATION PROCEDURE

1. ALL UTILITY CONDUITS SHALL BE SDR–35 OR EQUAL.
2. A MINIMUM OF 4" BETWEEN EACH OUTSIDE CONDUIT AND THE WALL OF THE TRENCH. (EACH CONDUIT MUST HAVE A MINIMUM SPACING OF 2" BETWEEN THE OUTSIDE EDGE OF EACH CONDUIT)
3. INSTALL A MINIMUM SAND BEDDING OF 3" IN THE BOTTOM OF THE TRENCH.
4. INSTALL UTILITY CONDUITS IN ONE SINGLE ROW (DO NOT STACK CONDUITS DIRECTLY ON TOP OF EACH OTHER) WITH A MINIMUM SPACING OF 2" BETWEEN THE OUTSIDE EDGE OF EACH CONDUIT AND A MINIMUM OF 4" BETWEEN THE LAST CONDUIT AND THE TRENCH WALL. THE MINIMUM 2" SPACING BETWEEN CONDUITS MUST BE ACCOMPLISHED USING SPACERS SUCH AS MANUFACTURED SPACERS, BRICKS, BLOCKS, ETC. THERE SHALL BE BLOCKS / SPACERS BETWEEN THE TRENCH WALL AND EACH OUTSIDE CONDUIT. SPACERS SHALL BE INSTALLED AT THE BEGINNING AND THE END OF EACH UTILITY TRENCH AND AT MINIMUM OF EVERY 10 FEET ALONG THE CONDUIT IN THE TRENCH.
5. BACKFILL CONDUITS WITH SAND TO A MINIMUM COVER OF 6" AND COMPACT WITH VIBRATORY PLATE COMPACTOR MAKING A MINIMUM OF 2 PASSES.
6. INSTALL NEXT ROW OF CONDUITS (IF NECESSARY) A MINIMUM OF 6" VERTICAL ABOVE THE FIRST ROW OF CONDUITS (MEASURED FROM THE TOP OF THE LOWER CONDUIT TO THE BOTTOM OF THE UPPER CONDUIT)
7. BACKFILL CONDUITS WITH SAND TO A MINIMUM COVER OF 6" AND COMPACT WITH VIBRATORY PLATE COMPACTOR MAKING A MINIMUM OF 2 PASSES.
8. INSTALL DGA BACKFILL (PUG MILLED) UP TO SUBGRADE OF STREET USING MAXIMUM LIFTS OF 8" AND COMPACTING WITH A VIBRATORY PLATE COMPACTOR MAKING A MINIMUM OF 2 PASSES.
9. THIS METHOD SHALL APPLY TO ALL SHALLOW UTILITY CROSSINGS (WATER MAIN, WATER SERVICES, ELECTRIC, TELEPHONE, CABLE, ETC.).

DETAIL #2

STREET CROSS SECTION AT PAIRED CATCH BASIN CROSSING

(FULL-DEPTH ASPHALT STREET SHOWN)



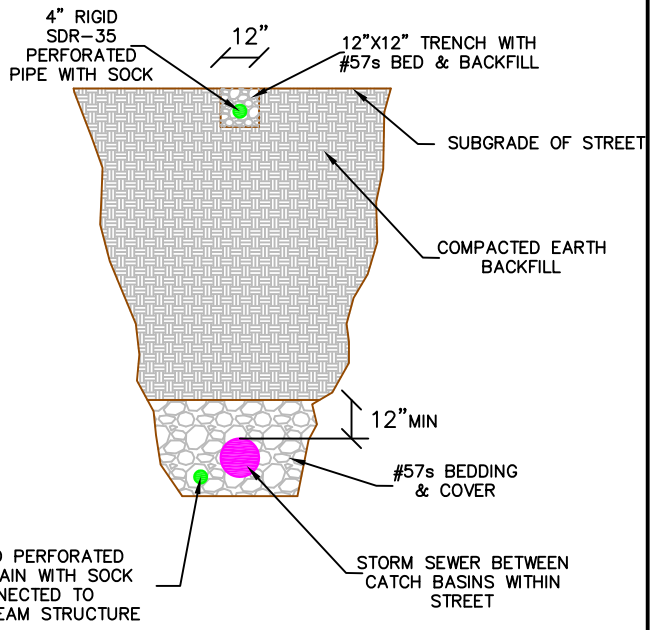
SCALE 1"=5'

0 5 10

NOTE: DEEP TRENCH DETAIL CAN BE USED WHEN THE DISTANCE BETWEEN THE TOP OF THE GRANULAR COVER & BEDDING AND THE SUBGRADE OF THE STREET IS 3 FEET OR GREATER.

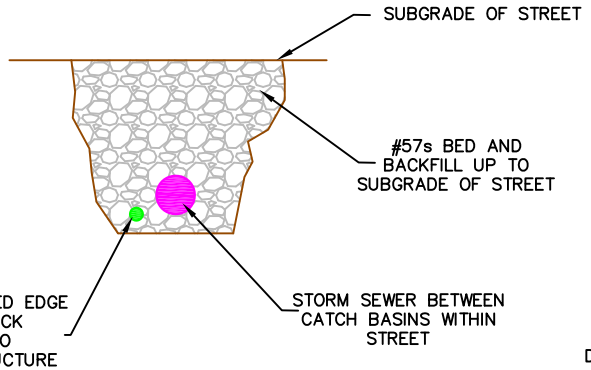
DEEP TRENCH DETAIL

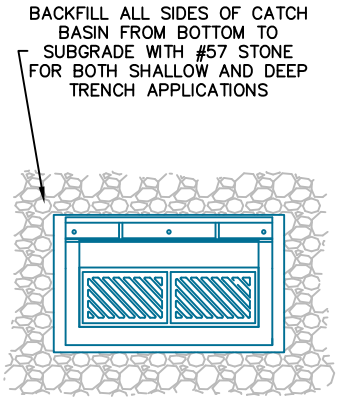
(BETWEEN CATCH BASINS IN THE STREET)



SHALLOW TRENCH DETAIL

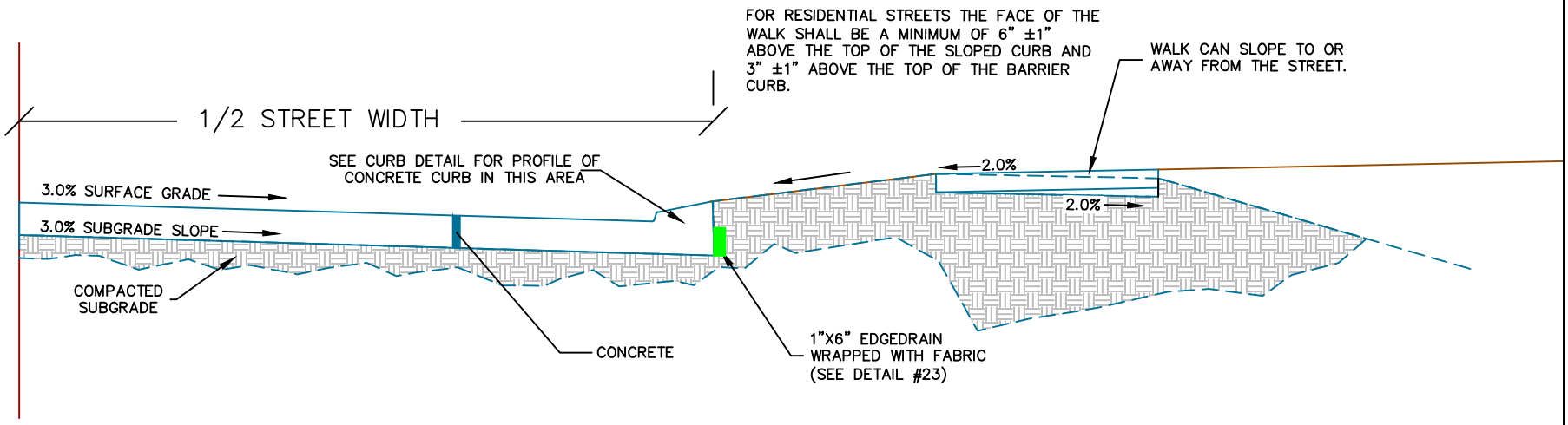
(BETWEEN CATCH BASINS IN THE STREET)





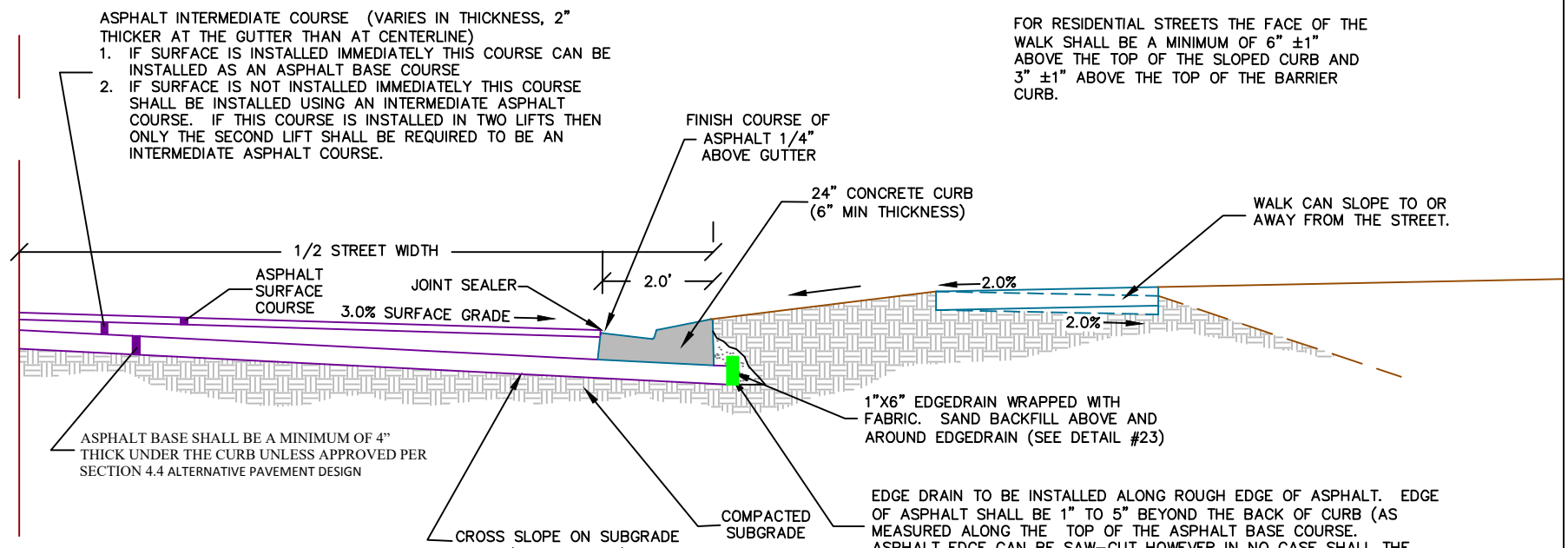
SUBURBAN & URBAN PAVEMENT SECTIONS

DETAIL #3

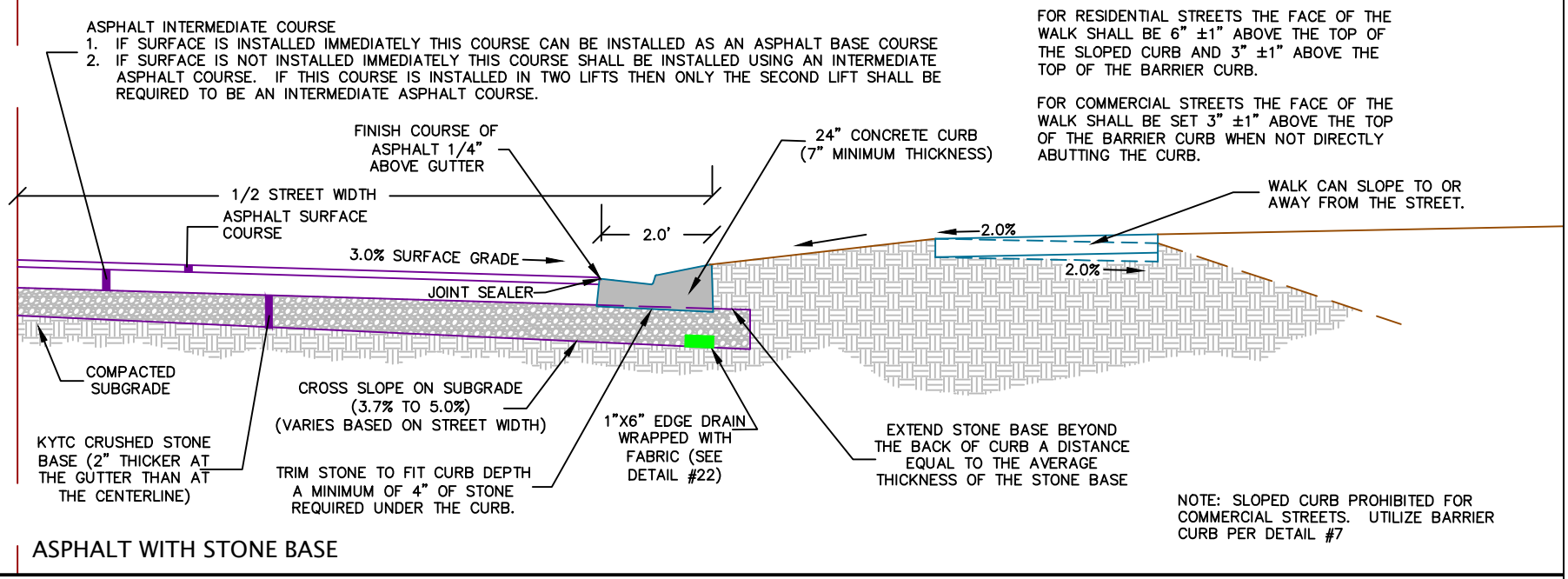


SEE TABLE 4.4–2 FOR ALL PAVEMENT THICKNESSES

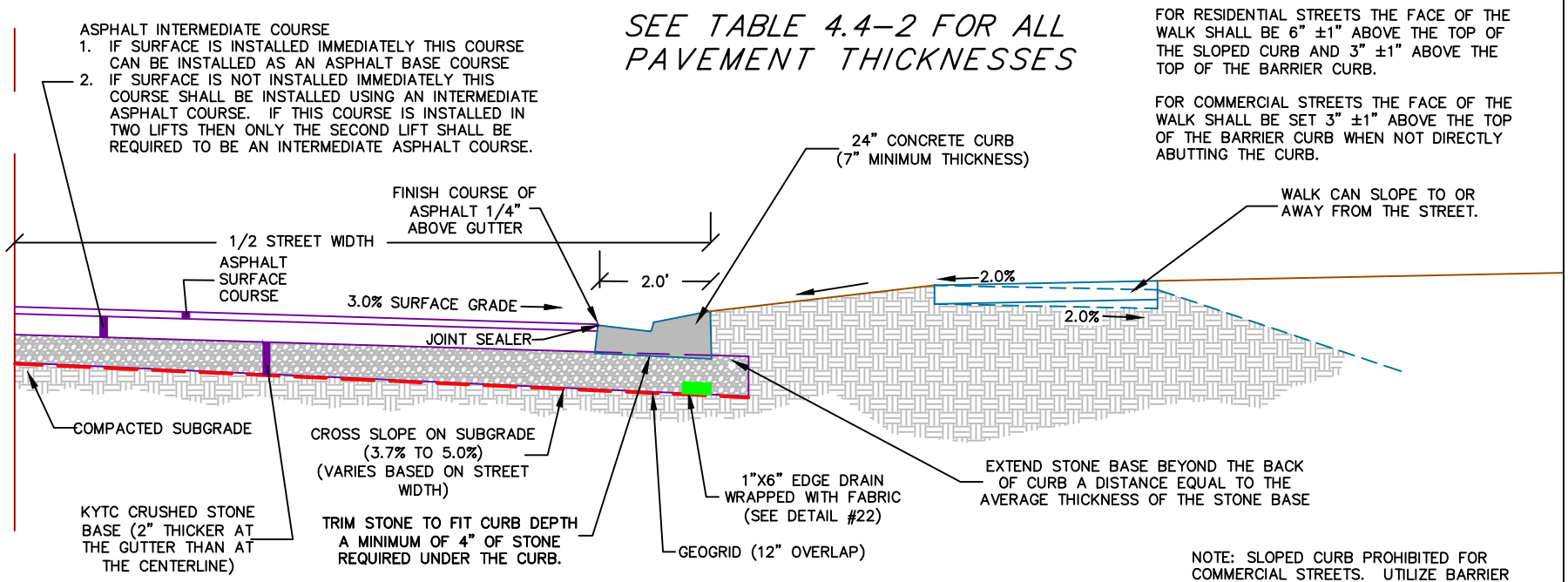
CONCRETE



FULL DEPTH ASPHALT



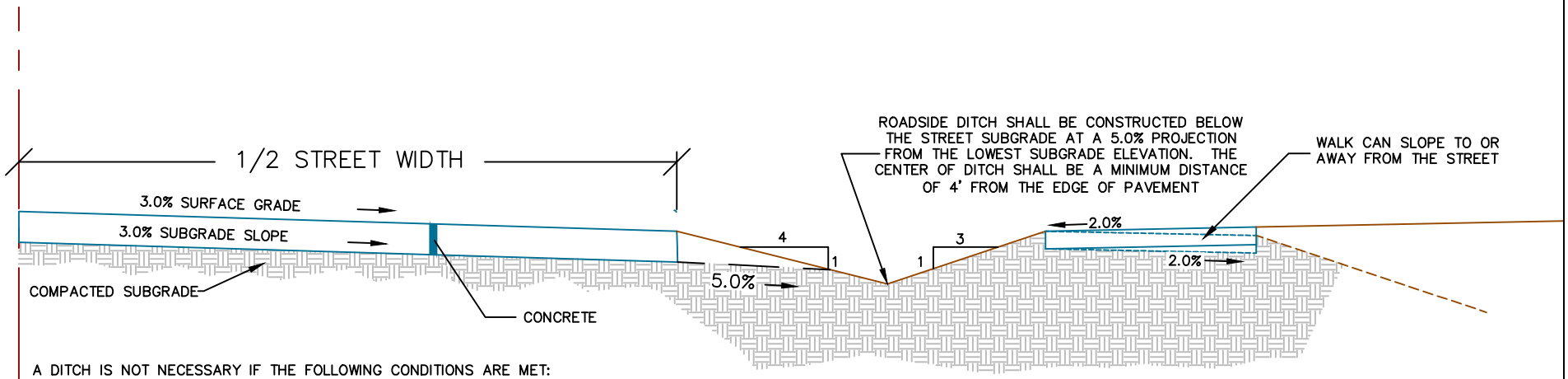
ASPHALT WITH STONE BASE



ASPHALT WITH STONE BASE & GEOGRID

RURAL PAVEMENT SECTIONS

DETAIL #5

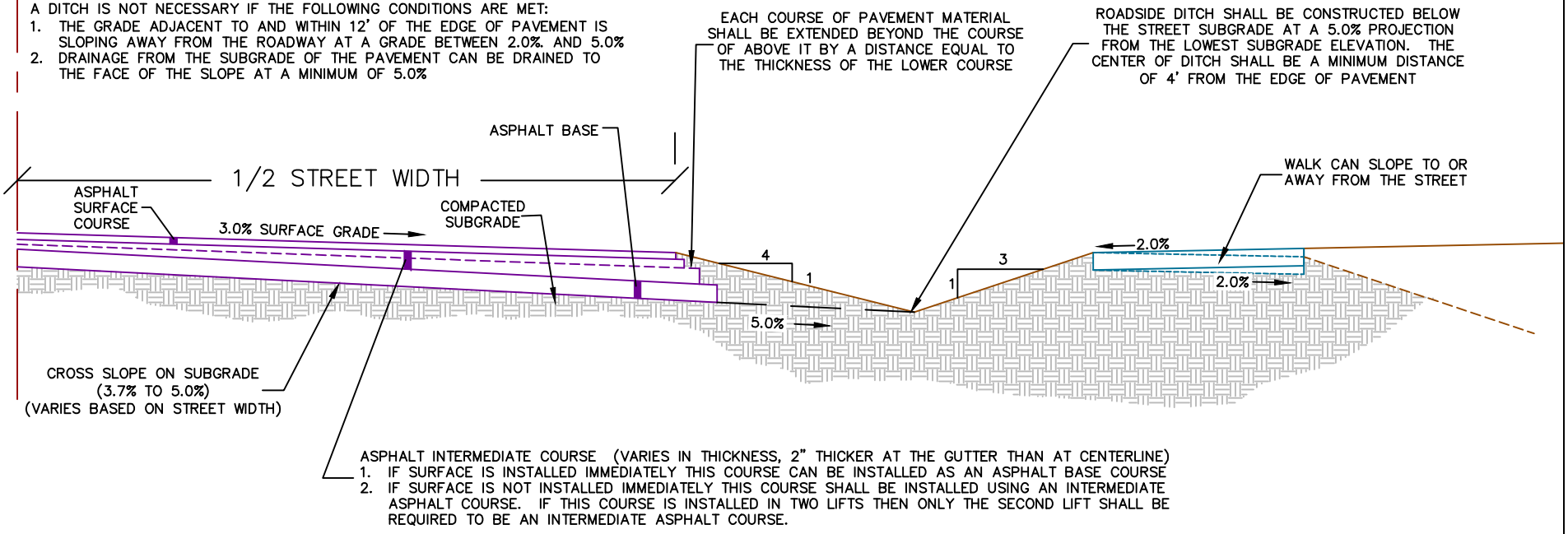


A DITCH IS NOT NECESSARY IF THE FOLLOWING CONDITIONS ARE MET:
1. THE GRADE ADJACENT TO AND WITHIN 12' OF THE EDGE OF PAVEMENT IS SLOPING AWAY FROM THE ROADWAY AT A GRADE BETWEEN 2.0%. AND 5.0%
2. DRAINAGE FROM THE SUBGRADE OF THE PAVEMENT CAN BE DRAINED TO THE FACE OF THE SLOPE AT A MINIMUM OF 5.0%

CONCRETE

SEE TABLE 4.4–2 FOR ALL PAVEMENT THICKNESSES

A DITCH IS NOT NECESSARY IF THE FOLLOWING CONDITIONS ARE MET:
1. THE GRADE ADJACENT TO AND WITHIN 12' OF THE EDGE OF PAVEMENT IS SLOPING AWAY FROM THE ROADWAY AT A GRADE BETWEEN 2.0%. AND 5.0%
2. DRAINAGE FROM THE SUBGRADE OF THE PAVEMENT CAN BE DRAINED TO THE FACE OF THE SLOPE AT A MINIMUM OF 5.0%

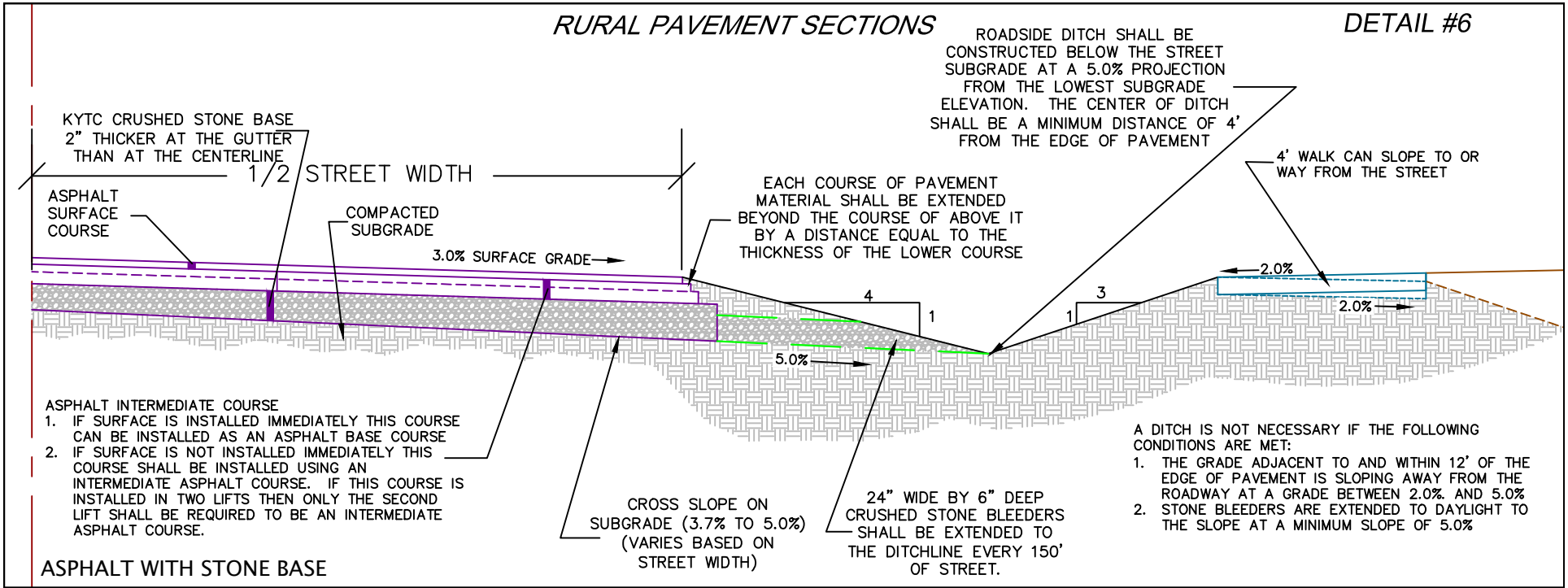


ASPHALT INTERMEDIATE COURSE (VARIES IN THICKNESS, 2" THICKER AT THE GUTTER THAN AT CENTERLINE)
1. IF SURFACE IS INSTALLED IMMEDIATELY THIS COURSE CAN BE INSTALLED AS AN ASPHALT BASE COURSE
2. IF SURFACE IS NOT INSTALLED IMMEDIATELY THIS COURSE SHALL BE INSTALLED USING AN INTERMEDIATE ASPHALT COURSE. IF THIS COURSE IS INSTALLED IN TWO LIFTS THEN ONLY THE SECOND LIFT SHALL BE REQUIRED TO BE AN INTERMEDIATE ASPHALT COURSE.

FULL DEPTH ASPHALT

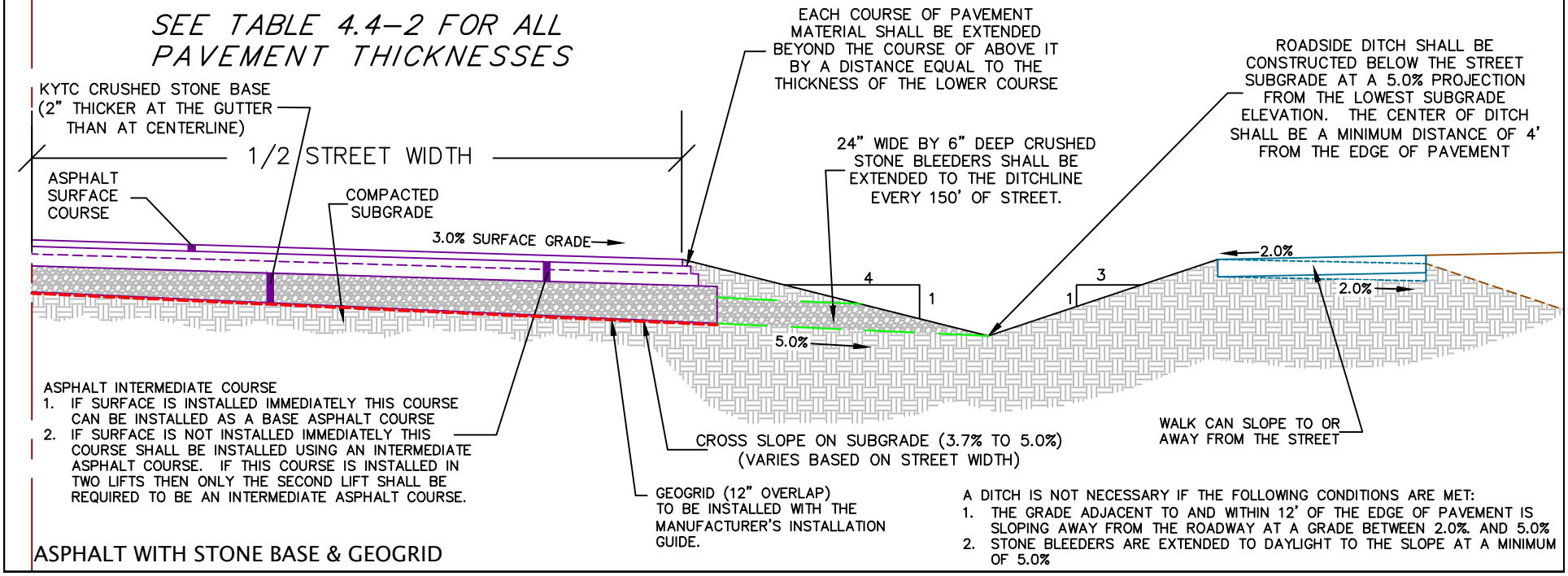
RURAL PAVEMENT SECTIONS

DETAIL #6



ASPHALT WITH STONE BASE

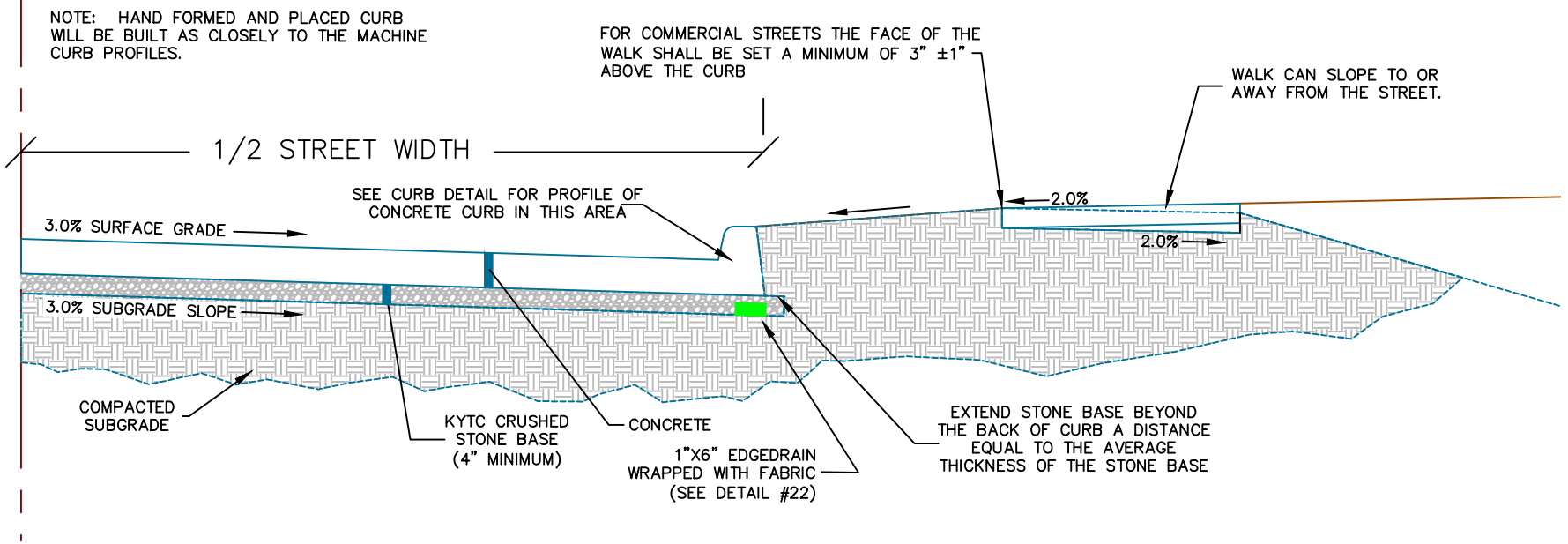
SEE TABLE 4.4-2 FOR ALL PAVEMENT THICKNESSES



ASPHALT WITH STONE BASE & GEOGRID

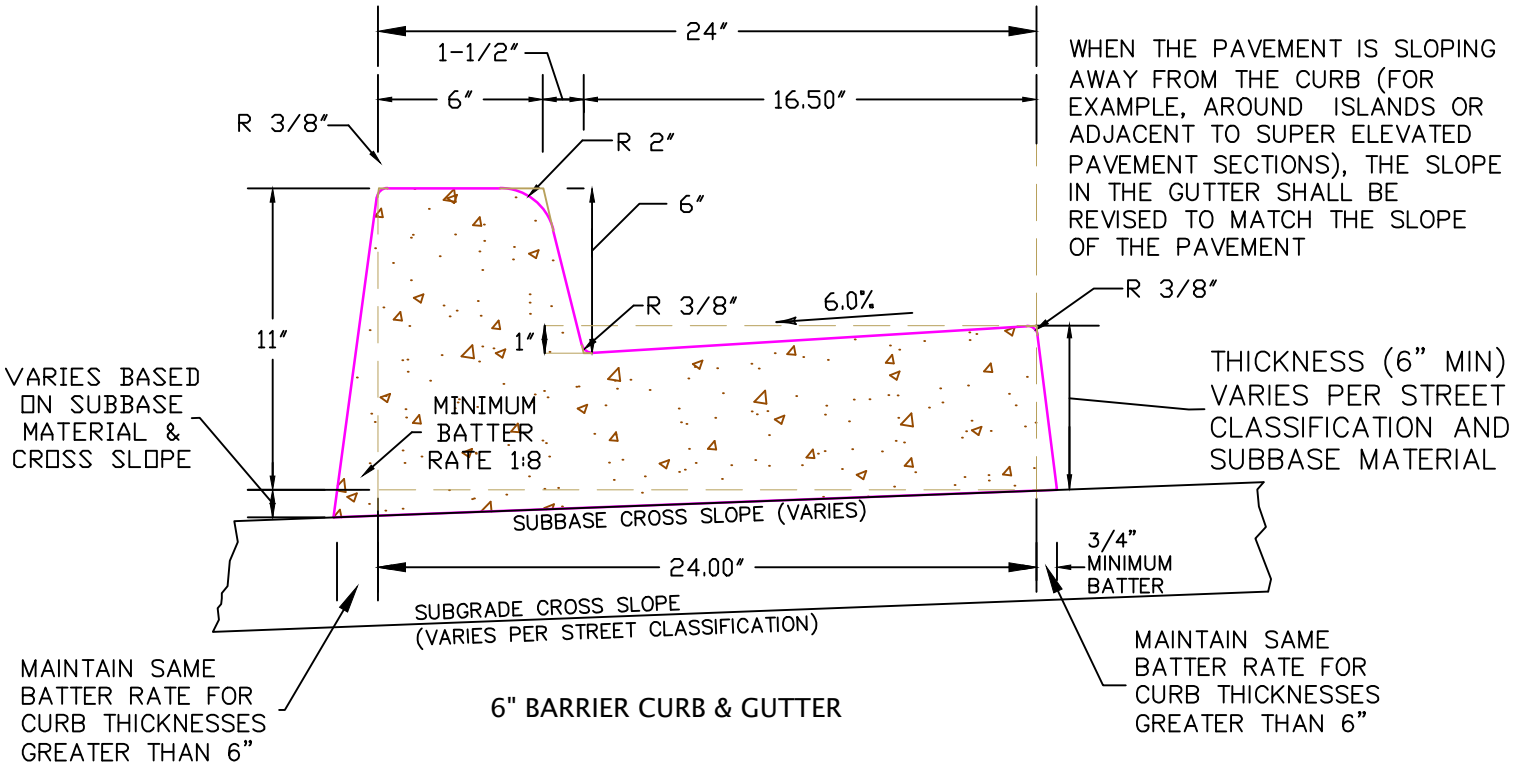
COMMERCIAL PAVEMENT SECTIONS

DETAIL #6A



MACHINE PLACED CURB DETAILS
ASPHALT STREETS

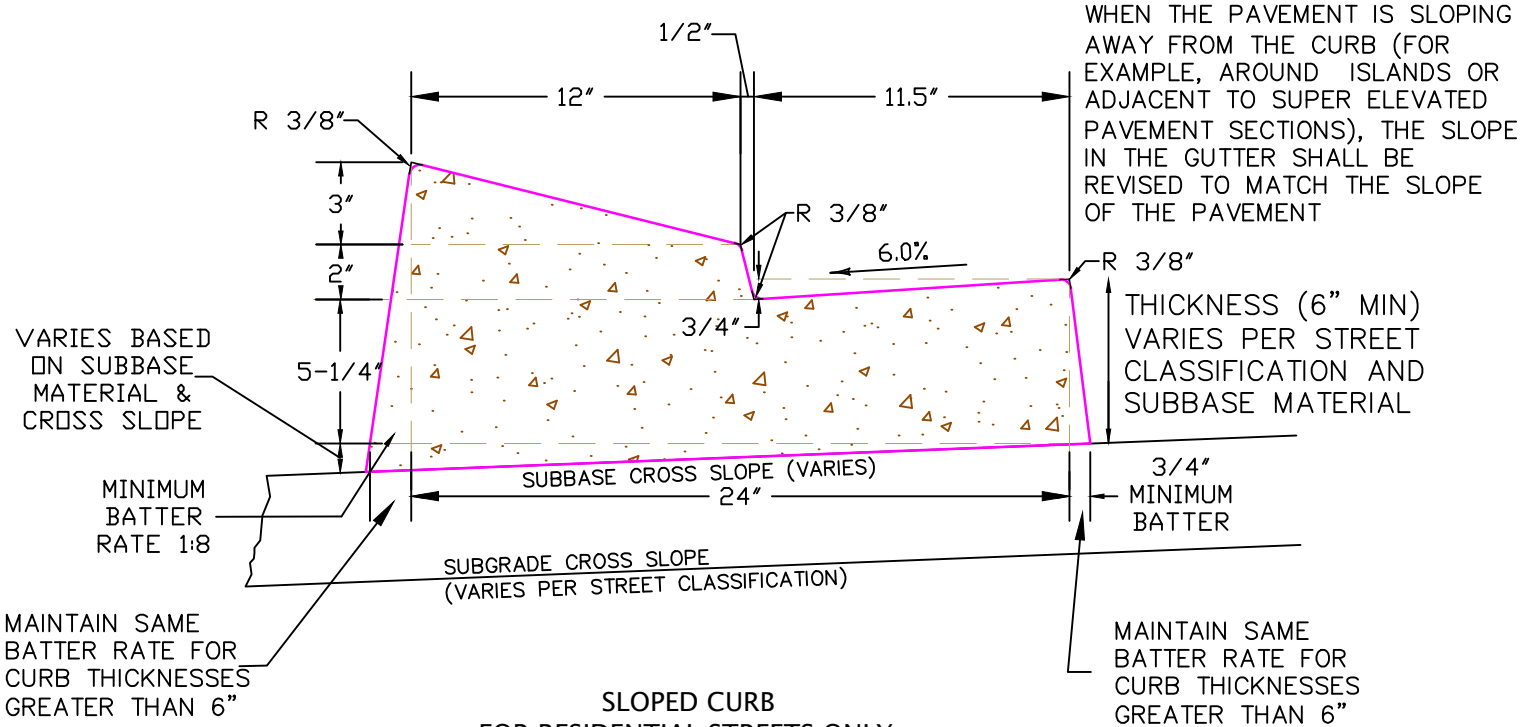
DETAIL #7



WHEN THE PAVEMENT IS SLOPING AWAY FROM THE CURB (FOR EXAMPLE, AROUND ISLANDS OR ADJACENT TO SUPER ELEVATED PAVEMENT SECTIONS), THE SLOPE IN THE GUTTER SHALL BE REVISED TO MATCH THE SLOPE OF THE PAVEMENT

6" BARRIER CURB & GUTTER

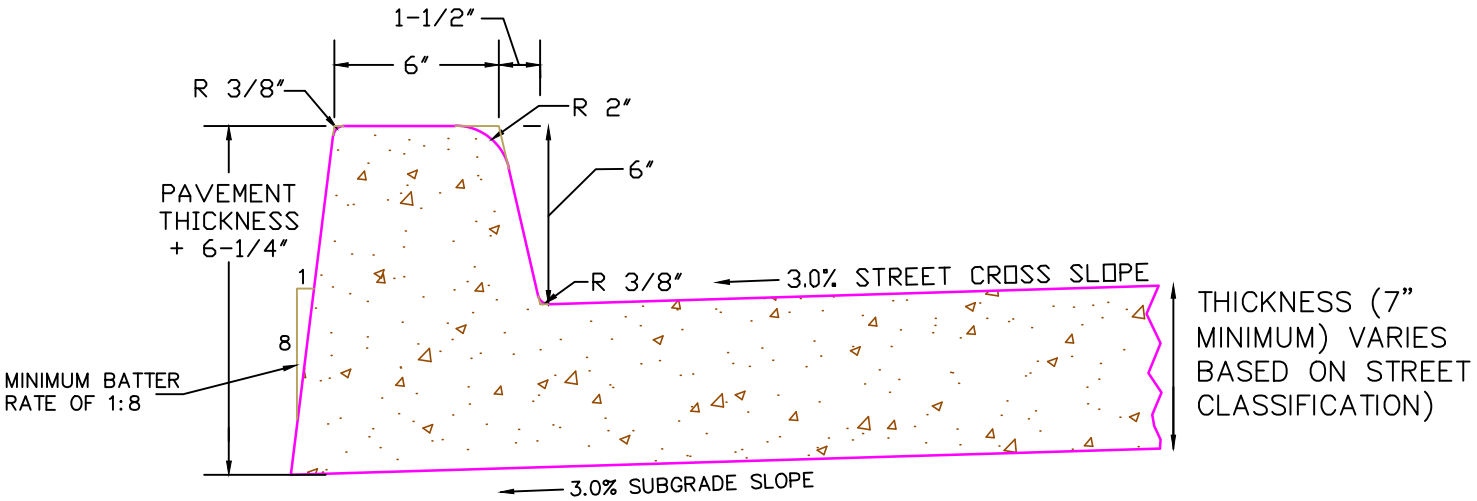
BATTER SHOWN ON THESE DETAILS ARE THE MINIMUM FOR MACHINE FORMED CURBS. HAND FORMED AND PLACED CURBS DO NOT REQUIRE THE BATTER SHOWN



WHEN THE PAVEMENT IS SLOPING AWAY FROM THE CURB (FOR EXAMPLE, AROUND ISLANDS OR ADJACENT TO SUPER ELEVATED PAVEMENT SECTIONS), THE SLOPE IN THE GUTTER SHALL BE REVISED TO MATCH THE SLOPE OF THE PAVEMENT

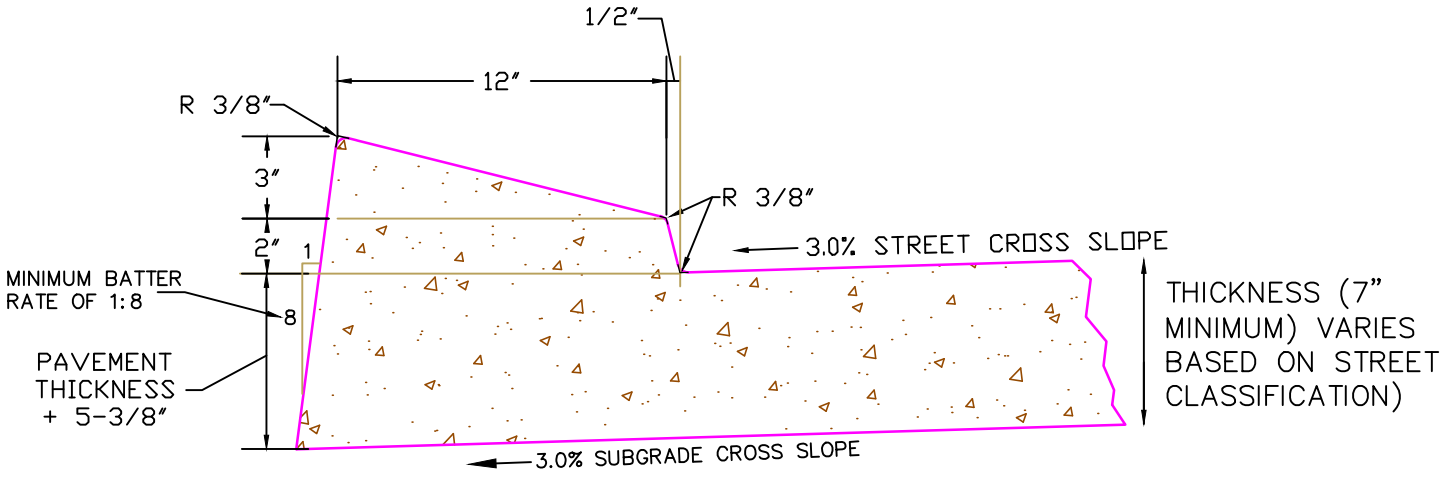
SLOPED CURB
FOR RESIDENTIAL STREETS ONLY

MACHINE PLACED CURB DETAILS
CONCRETE STREETS

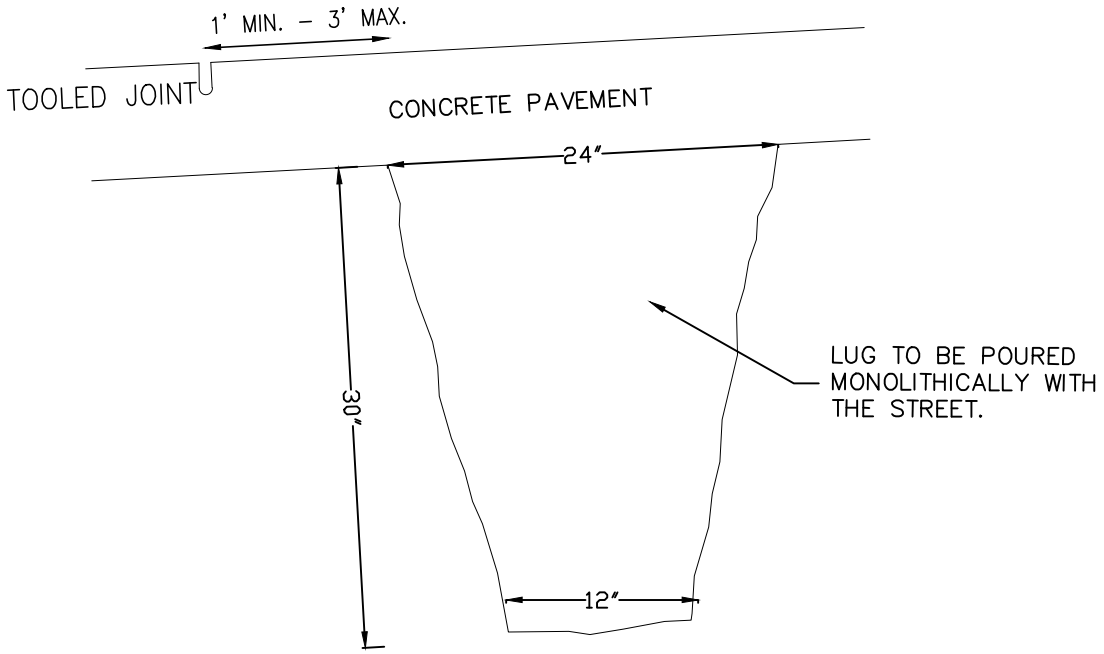


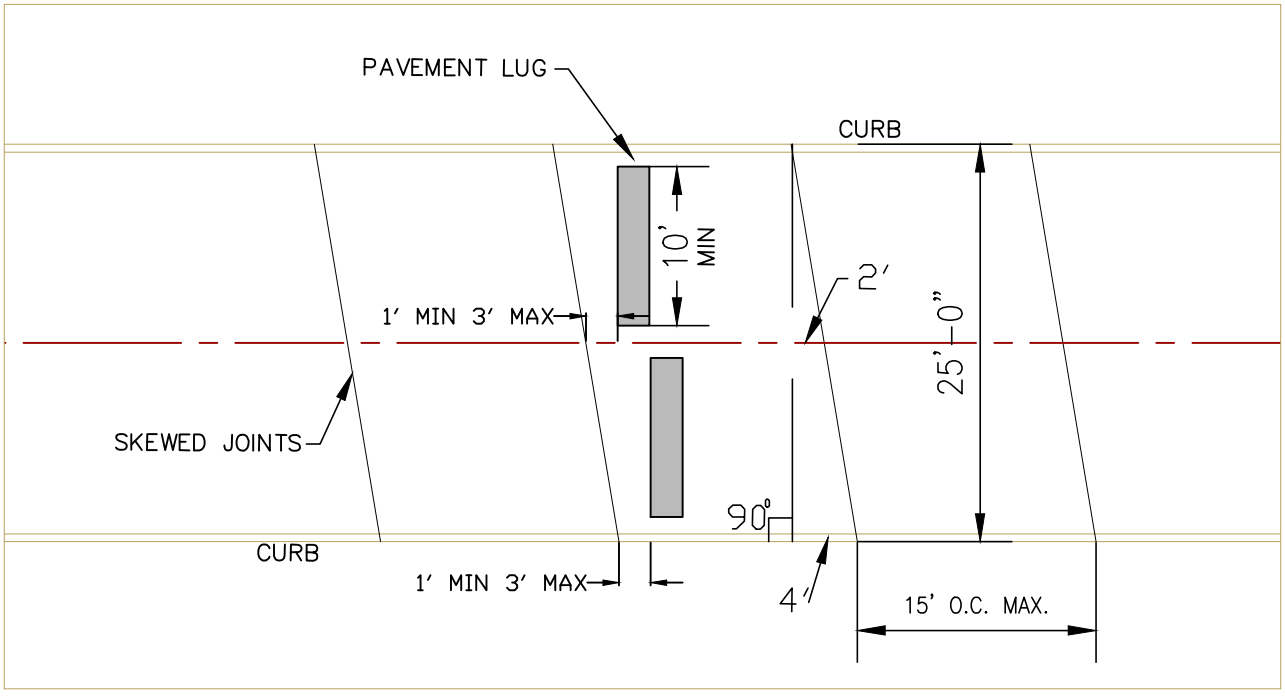
6" BARRIER INTEGRAL CURB

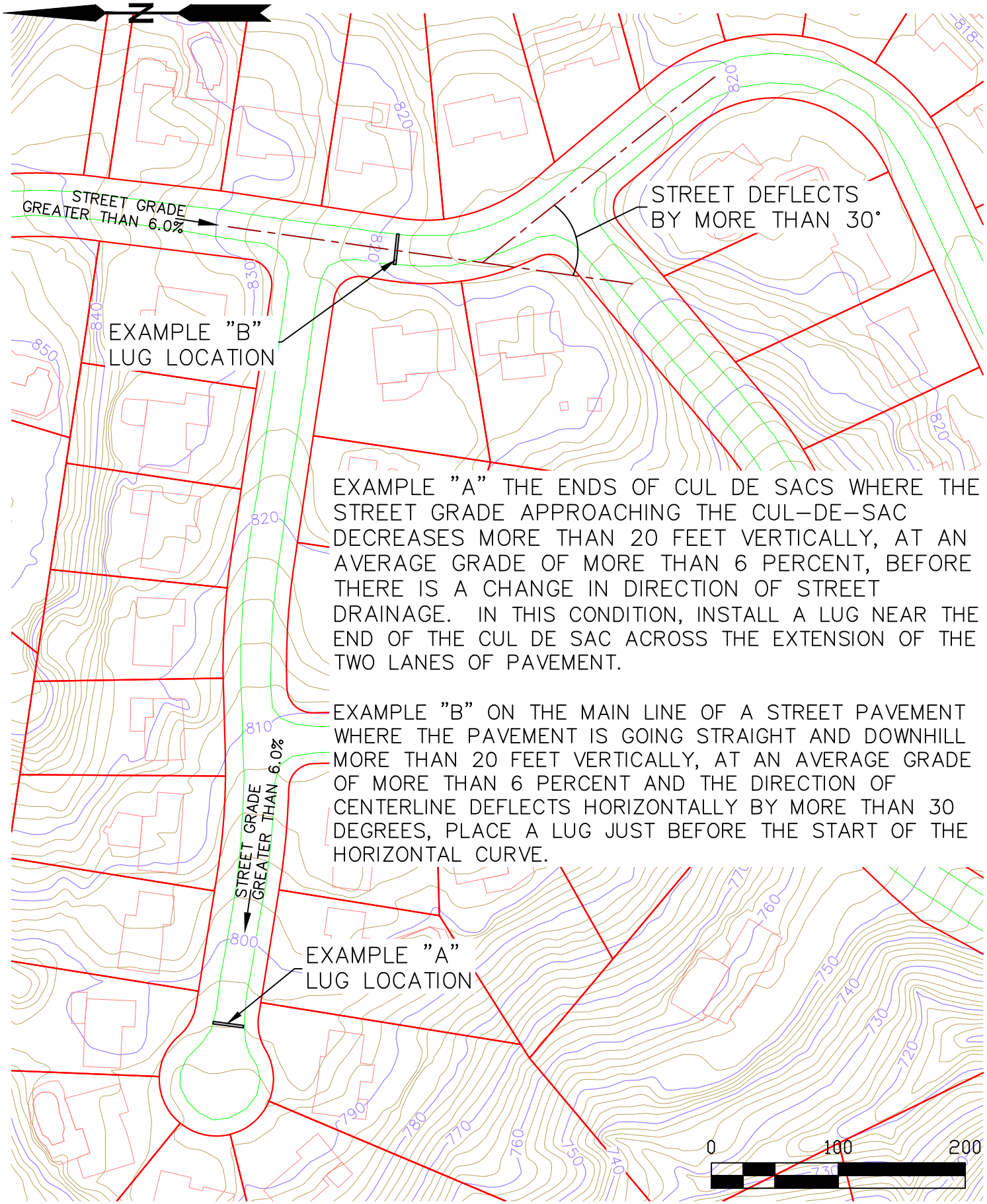
BATTER SHOWN ON THESE DETAILS ARE THE MINIMUM FOR MACHINE FORMED CURBS. HAND FORMED AND PLACED CURBS DO NOT REQUIRE THE BATTER SHOWN



SLOPED INTEGRAL CURB
FOR RESIDENTIAL STREETS ONLY

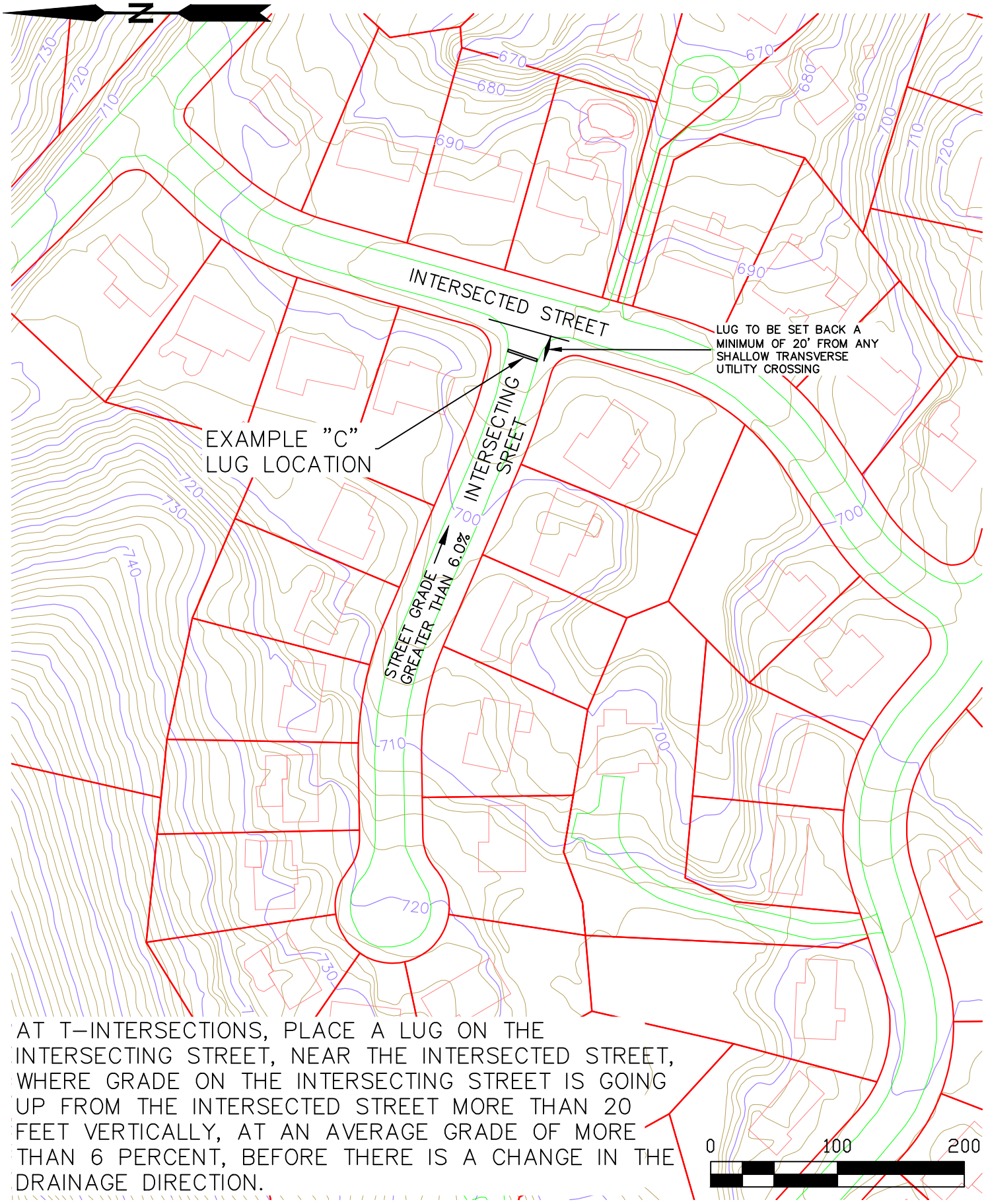

1' MIN. – 3' MAX.
TOOLED JOINT
CONCRETE PAVEMENT
24"
30"
12"
LUG TO BE POURED
MONOLITHICALLY WITH
THE STREET.


PAVEMENT LUG
CURB
10' MIN
2'
1' MIN 3' MAX
25'-0"
SKEWED JOINTS
90°
CURB
1' MIN 3' MAX
4"
15' O.C. MAX.



EXAMPLE "A" THE ENDS OF CUL DE SACS WHERE THE STREET GRADE APPROACHING THE CUL-DE-SAC DECREASES MORE THAN 20 FEET VERTICALLY, AT AN AVERAGE GRADE OF MORE THAN 6 PERCENT, BEFORE THERE IS A CHANGE IN DIRECTION OF STREET DRAINAGE. IN THIS CONDITION, INSTALL A LUG NEAR THE END OF THE CUL DE SAC ACROSS THE EXTENSION OF THE TWO LANES OF PAVEMENT.

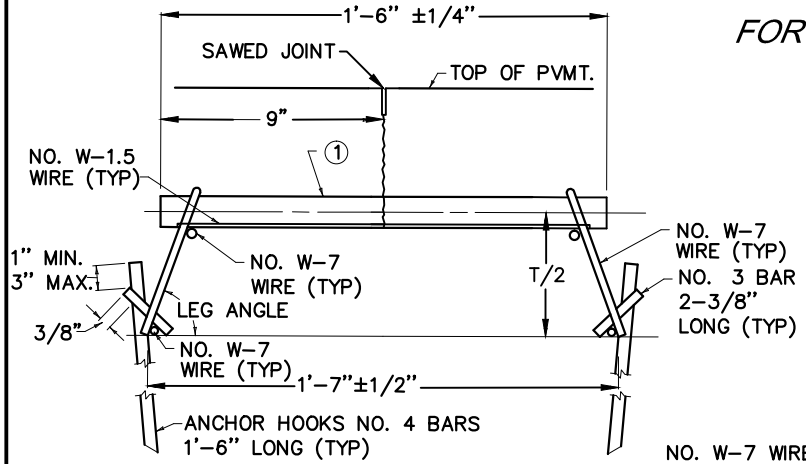
EXAMPLE "B" ON THE MAIN LINE OF A STREET PAVEMENT WHERE THE PAVEMENT IS GOING STRAIGHT AND DOWNHILL MORE THAN 20 FEET VERTICALLY, AT AN AVERAGE GRADE OF MORE THAN 6 PERCENT AND THE DIRECTION OF CENTERLINE DEFLECTS HORIZONTALLY BY MORE THAN 30 DEGREES, PLACE A LUG JUST BEFORE THE START OF THE HORIZONTAL CURVE.



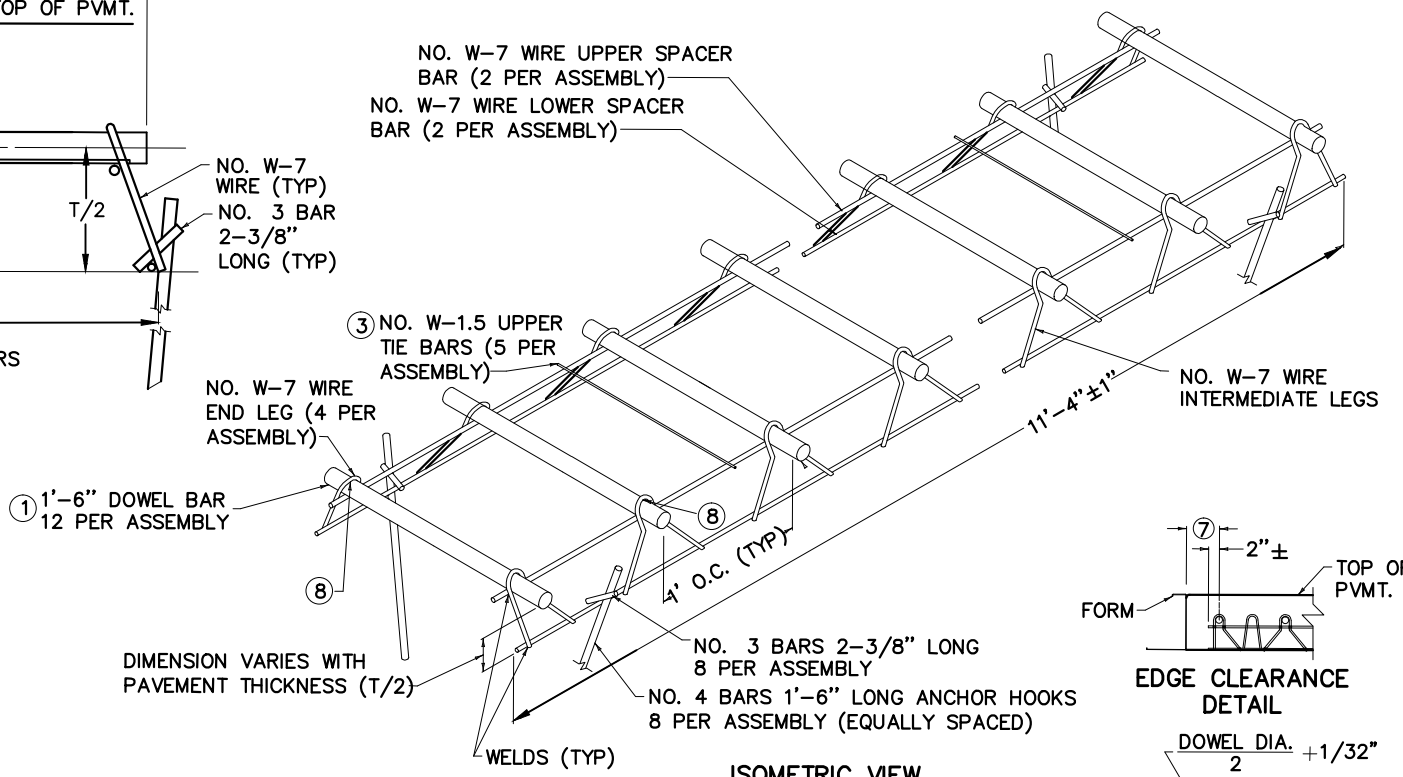
AT T–INTERSECTIONS, PLACE A LUG ON THE INTERSECTING STREET, NEAR THE INTERSECTED STREET, WHERE GRADE ON THE INTERSECTING STREET IS GOING UP FROM THE INTERSECTED STREET MORE THAN 20 FEET VERTICALLY, AT AN AVERAGE GRADE OF MORE THAN 6 PERCENT, BEFORE THERE IS A CHANGE IN THE DRAINAGE DIRECTION.

DOWELED TRANSVERSE JOINT DETAIL
FOR ALL COMMERCIAL & INDUSTRIAL PAVEMENTS

DETAIL #11



END ELEVATION



ISOMETRIC VIEW

EDGE CLEARANCE DETAIL

NOTES

① DOWEL BAR SIZES

PAVEMENT THICKNESS						
8"	9"	10"	11"	12"	13"	14"
BAR DIAMETER						
1-1/4"			1-1/2"		1-3/4"	
LEG ANGLES +/- 3 DEGREES						
63	63	63	70	70	70	70

② NOT USED

③ NO. W-1.5 UPPER TIE BARS WELDED TO UPPER SPACER BARS CUT AFTER FIRST CONCRETE PLACEMENT.

④ FOR END LEGS, BEND WIRE AS SHOWN BY PHANTOM LINES IN INTERMEDIATE LEG DETAIL.

⑤ REFERENCE POINTS SHALL BE REQUIRED ON EACH SIDE OF THE LOAD TRANSFER ASSEMBLY, IN ORDER TO LOCATE THE INTENDED SAWED JOINT AFTER PAVING. ALL SAWING SHALL BE ACCURATELY CONTROLLED TO THE CENTERLINE OF THE LOAD TRANSFER ASSEMBLIES. LONGITUDINAL ORIENTATION OF DOWEL BARS SHALL BE SUCH THAT ALL DOWEL BARS ARE PARALLEL WITH THE CENTERLINE OF EACH PAVING LANE.

⑥ NOT USED

⑦ 4-1/2" MIN. AND 10-1/2" MAX. FOR VARIABLE SLAB WIDTH. 6" FOR UNIFORM OR STD. SLAB WIDTH. LOCATION AND SPACING SEE APPLICABLE PAVEMENT STANDARD DRAWINGS.

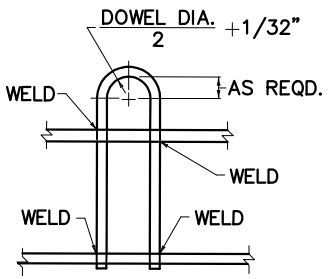
⑧ WELD EITHER NO. W-7 UPPER SPACER BAR OR LEG SUPPORT TO ALTERNATE ENDS OF DOWEL BARS AS TYPICALLY SHOWN.

⑨ DOWEL ENDS SHALL NOT VARY MORE THAN 1/4" FROM A STRAIGHT LINE.

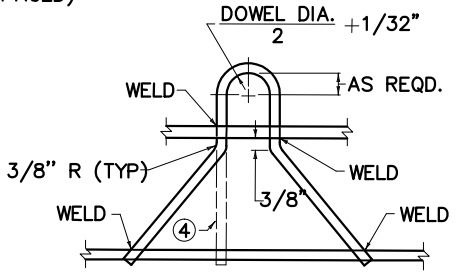
⑩ DOWELS SHALL BE PARALLEL WITH BASE, WITH A TOLERANCE OF 1/4".

⑪ EPOXY SHALL BE CLEANED OFF TO BARE METAL BEFORE WELDING DOWEL TO WIRE.

⑫ "U" LEG OR "A" LEG ARE ACCEPTABLE ALTERNATES PROVIDING MATCHED LEGS ARE SUPPLIED.



INTERMEDIATE OPTIONAL "U" LEG DETAIL



INTERMEDIATE OPTIONAL "A" LEG DETAIL

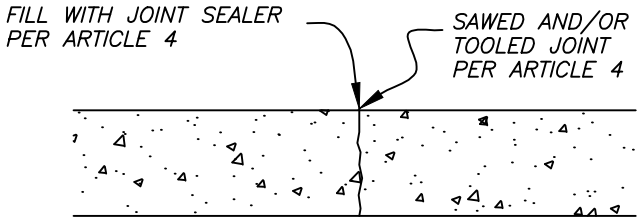
KENTUCKY DEPARTMENT OF HIGHWAYS

CONTRACTION JOINT LOAD TRANSFER ASSEMBLIES FOR COMMERCIAL & INDUSTRIAL STREETS

STANDARD DRAWING NO. RPS-020-13

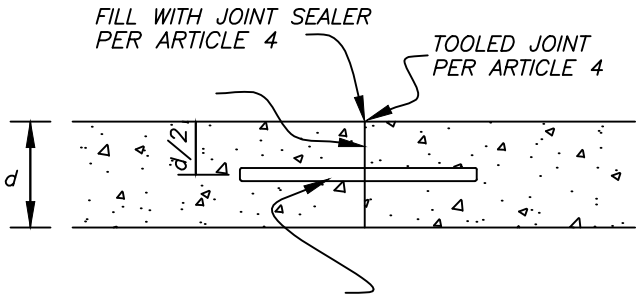
SUBMITTED _____ DIRECTOR DIVISION OF DESIGN _____ DATE

APPROVED _____ STATE HIGHWAY ENGINEER _____ DATE

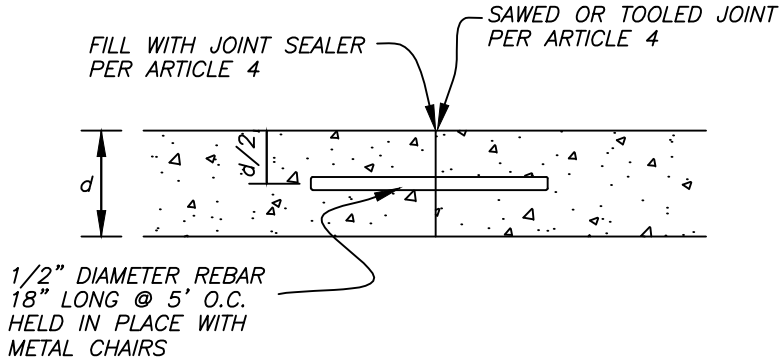


NOTE: TRAVERSE JOINTS FOR COMMERCIAL AND INDUSTRIAL PAVEMENTS SHALL USE LOAD TRANSFER ASSEMBLIES PER DETAIL #11.

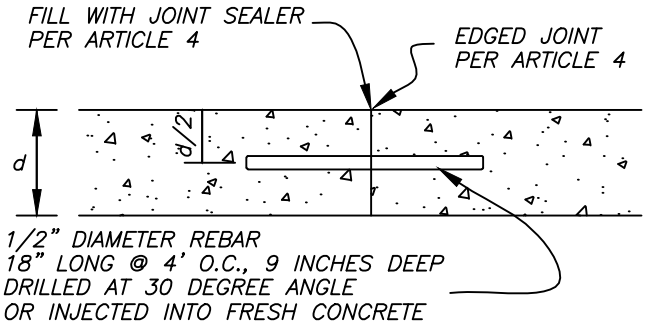
TRANSVERSE CONTRACTION JOINT (SAWED OR TOOLED JOINT)



TRANSVERSE CONSTRUCTION JOINT
(PLANNED OR EMERGENCY)
COINCIDE WITH CONTRACTION JOINT



LONGITUDINAL SAWED OR TOOLED JOINT
(PLANNED – COINCIDE WITH CONTRACTION JOINT)



LONGITUDINAL CONSTRUCTION JOINT
(DRILLED OR INJECTED)

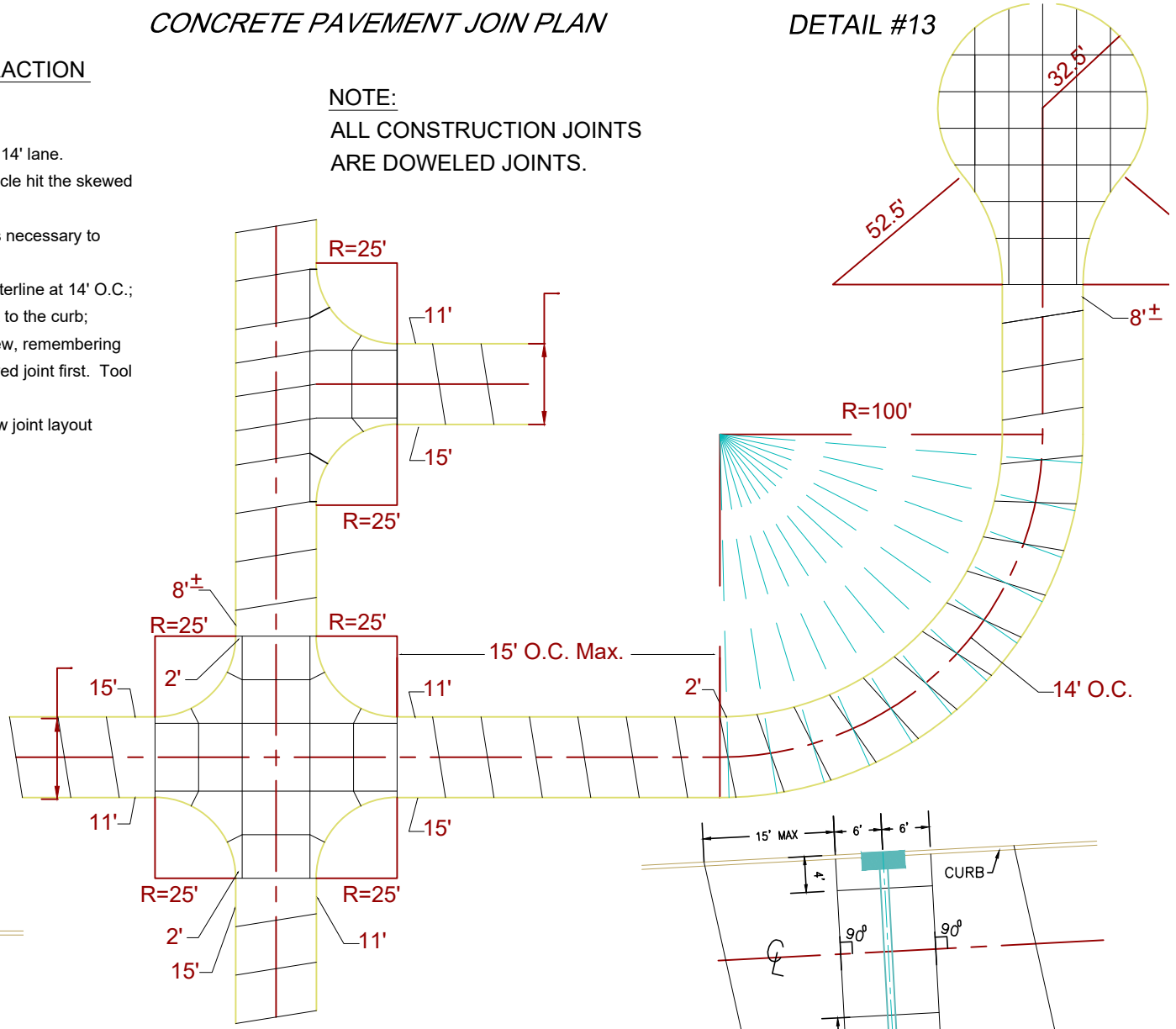
CONCRETE PAVEMENT JOIN PLAN

DETAIL #13

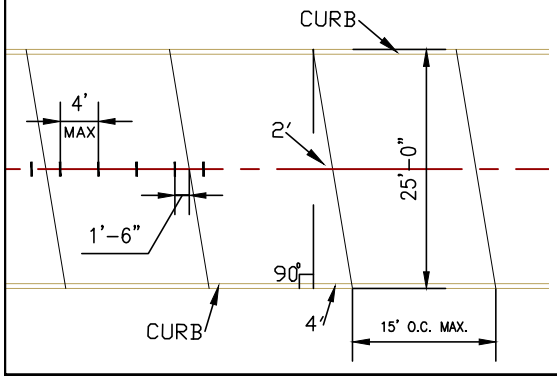
GENERAL RULES OF TOOLED CONTRACTION JOINT LAYOUT

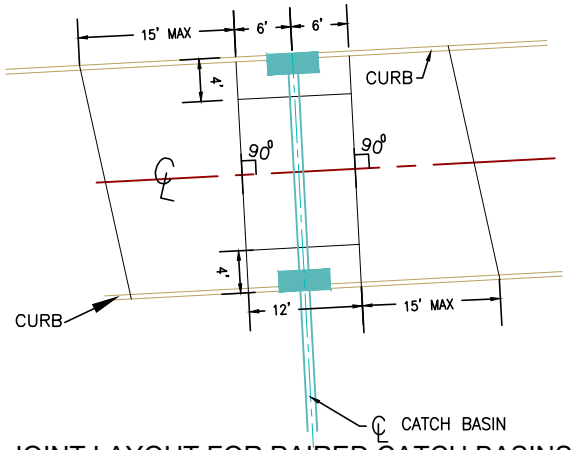
1.) Skew joints 2' in each 12.5' lane; 2'-4" skew in each 14' lane.
2.) Always have the driver's side front wheel of the vehicle hit the skewed joint first.
3.) Maximum joint spacing = 15'; adjust joint spacing as necessary to keep spacing above a 8' minimum.
4.) On horizontal curves, layout joint spacing along centerline at 14' O.C.; visually determine a radial line from the centerline back to the curb; measure back (forward) from that point 2' to set the skew, remembering the driver's side front wheel of the vehicle hits the skewed joint first. Tool the joint at the skewed line.
5.) At intersections, catch basins and cul-de-sacs, follow joint layout shown.

NOTE:
ALL CONSTRUCTION JOINTS ARE DOWELED JOINTS.



TYPICAL SKEWED JOINT AND ℄ BENT BAR LAYOUT
SCALE: N.T.S

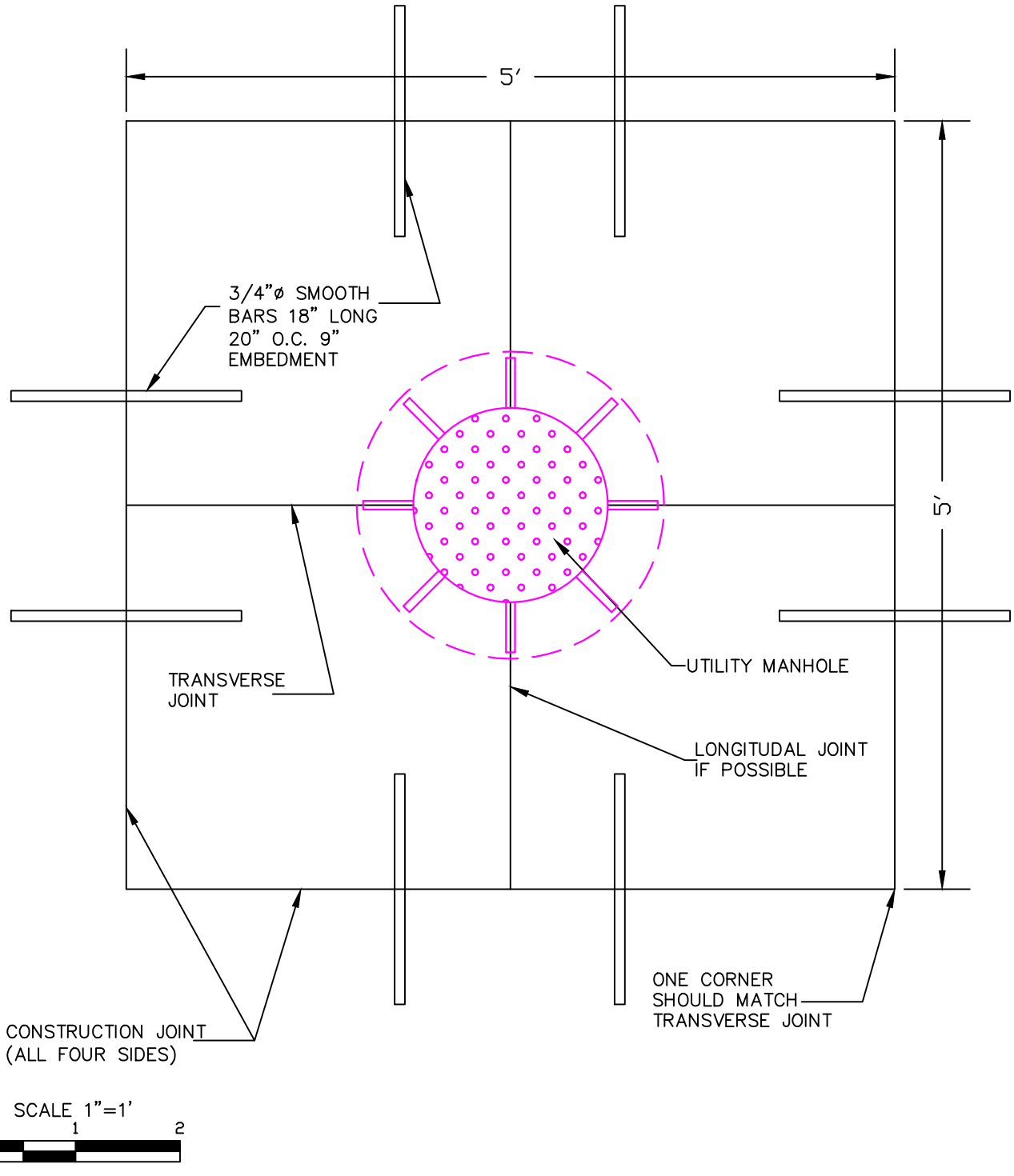




JOINT LAYOUT FOR PAIRED CATCH BASINS

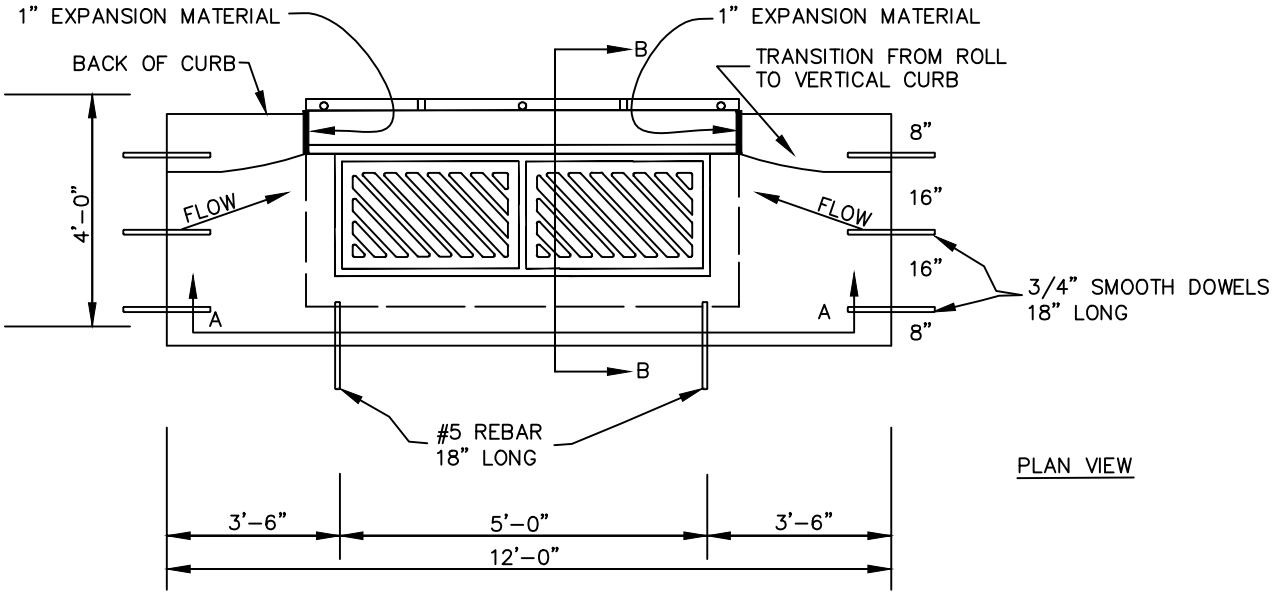
DETAIL #14

MANHOLE BLOCK OUT DETAIL
(CONCRETE PAVEMENT)
THIS DETAIL DOES NOT APPLY FOR UTILITIES ALREADY BROUGHT TO GRADE

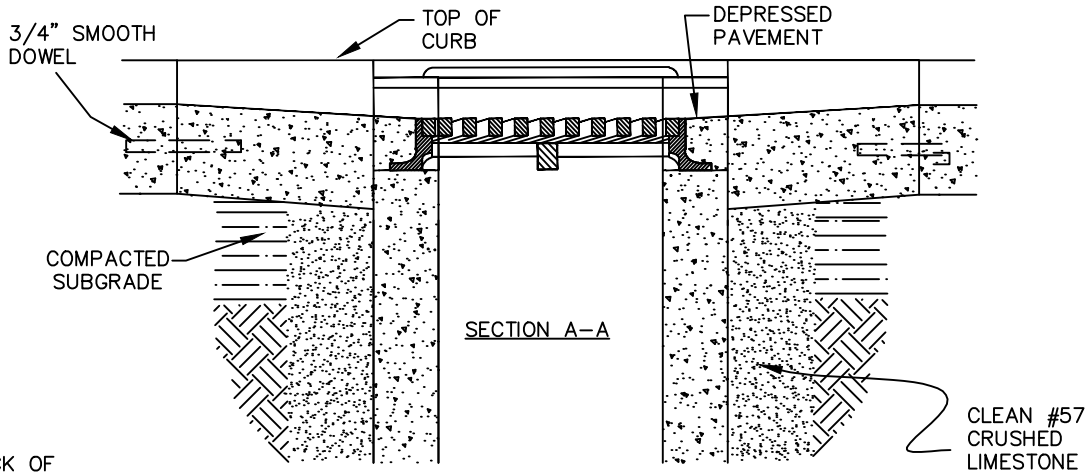


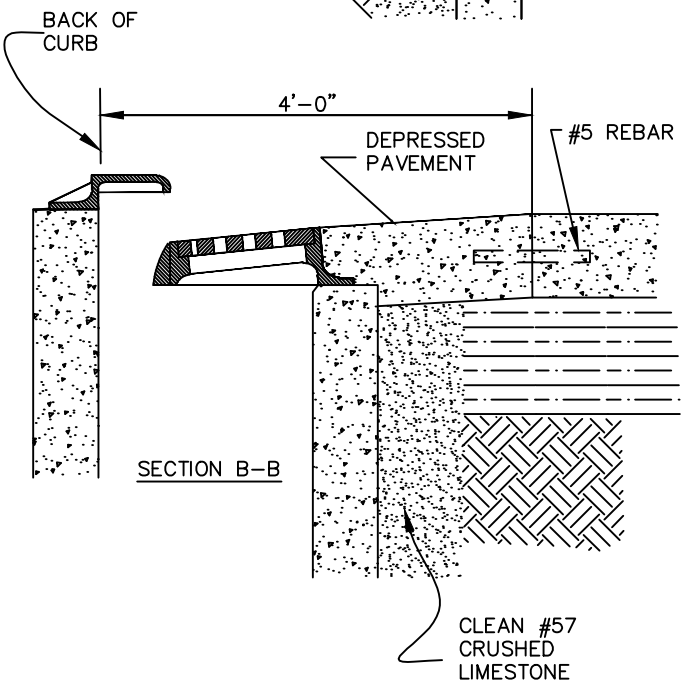
STANDARD CURB INLET
(CONCRETE PAVEMENT BLOCKOUT DETAIL)

DETAIL #15



PLAN VIEW





NOTES:

CONCRETE PAVEMENT FOR THE BLOCKOUTS SHALL MEET THE SAME REQUIREMENTS AS THE CONCRETE PAVEMENT.

BLOCKOUTS SHALL BE PAVED WITH 4000 PSI AIR ENTRAINED PORTLAND CEMENT CONCRETE

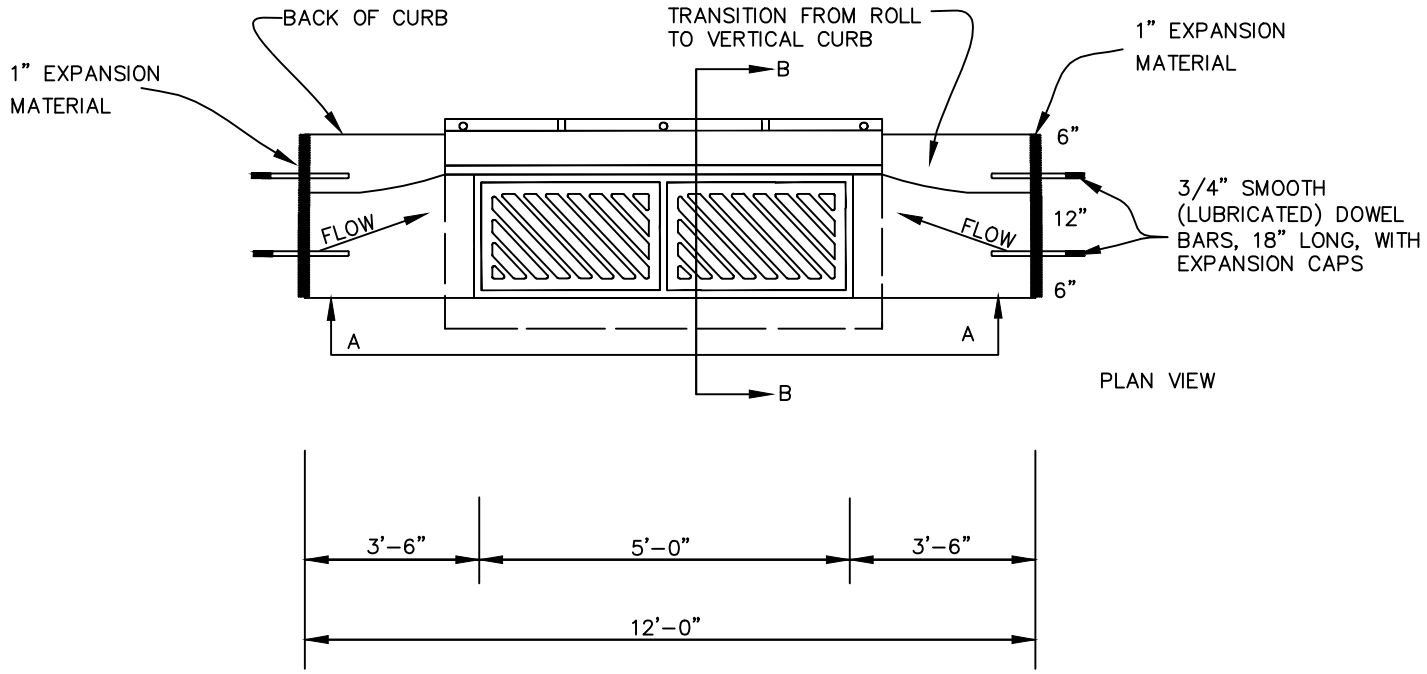
BLOCKOUTS FOR SINGLE INLET CATCH BASINS SHALL BEAR THE SAME DIMENSIONS AS THE DOUBLE INLET CATCH BASIN

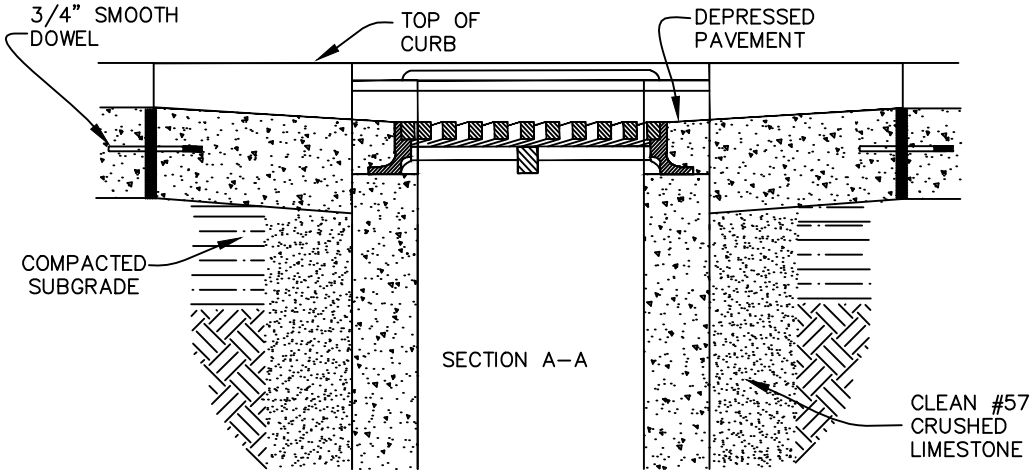
3/4"X18" DOWELS ARE REQUIRED FOR CONCRETE PAVEMENT OR GUTTER BLOCKOUT

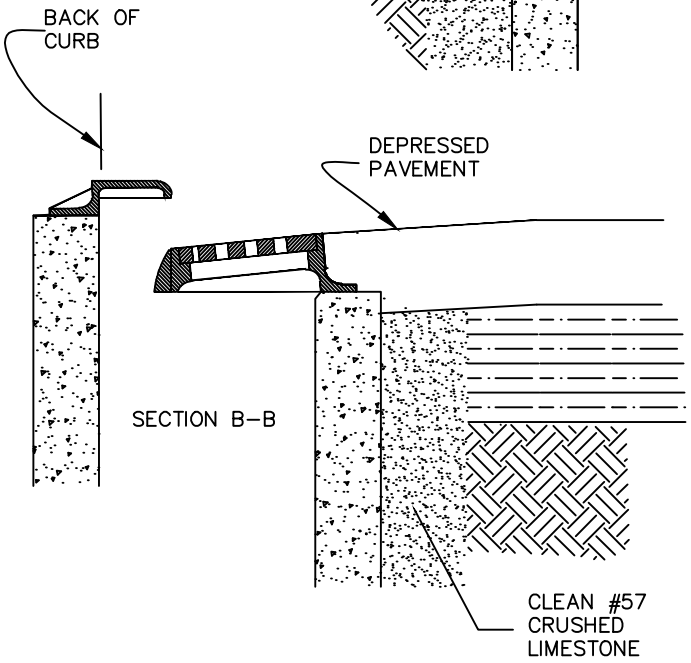
TWO #5 BARS, 18" LONG ARE REQUIRED ALONG BUTT JOINT OF ISOLATION AREA

STANDARD CURB INLET
(ASPHALT PAVEMENT BLOCKOUT DETAIL)

DETAIL #16







NOTES:

CONCRETE PAVEMENT FOR THE BLOCKOUTS SHALL MEET THE SAME REQUIREMENTS AS THE CONCRETE PAVEMENT.

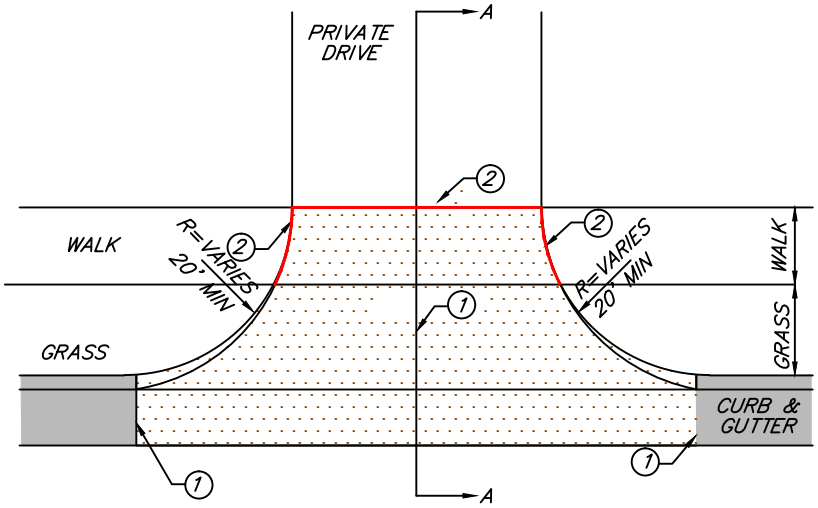
BLOCKOUTS FOR SINGLE INLET CATCH BASINS SHALL BEAR THE SAME DIMENSIONS AS THE DOUBLE INLET CATCH BASIN

3/4"X18" DOWELS ARE REQUIRED FOR CONCRETE PAVEMENT OR GUTTER BLOCKOUT.

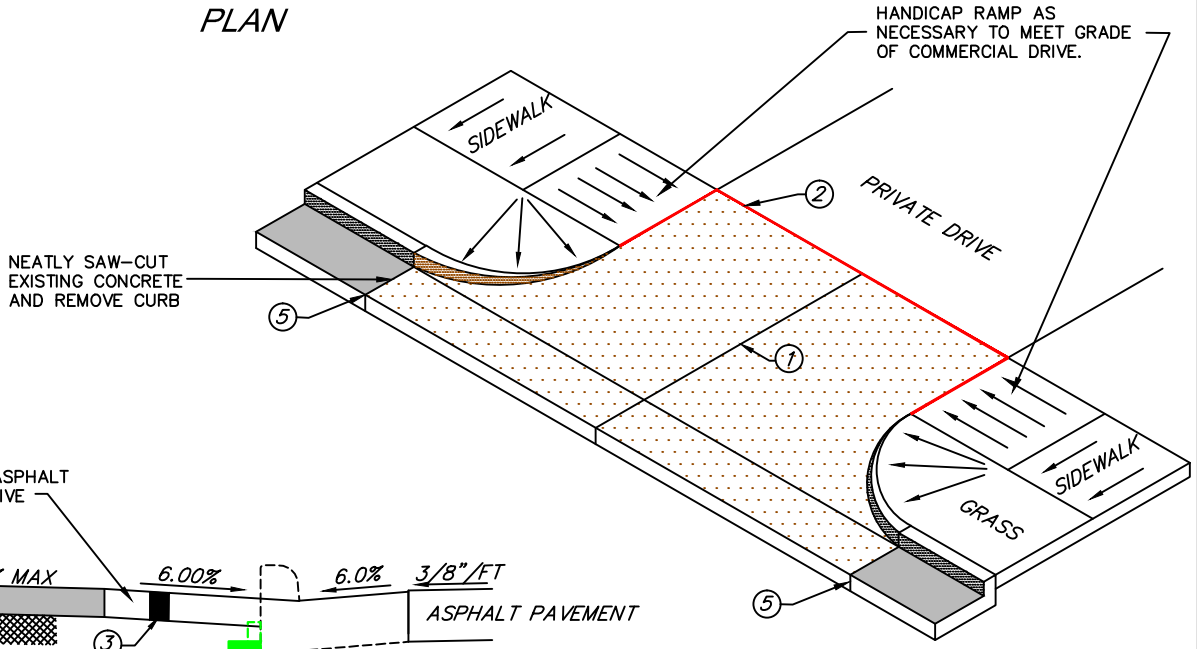
PAVEMENT THICKNESS SHALL CONFORM TO THE RELATED STREET CLASSIFICATIONS.

COMMERCIAL DRIVEWAY APRON
ASPHALT STREET WITH CURB & GUTTER

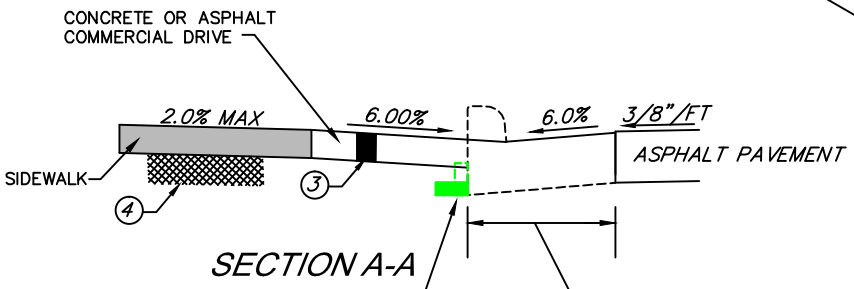
DETAIL #17



PLAN



ISOMETRIC VIEW



SECTION A-A

IF EDGE DRAIN EXISTS BEHIND THE CURB, REMOVE AND REPLACE AS NECESSARY. DUE TO THE PAVEMENT DEPTH OF THE COMMERCIAL DRIVEWAY, A HORIZONTAL EDGE DRAIN (MEETING THE REQUIREMENTS OF THIS REGULATION) MAY NEED TO BE UTILIZED.

COMMERCIAL ASPHALT DRIVE IN THIS AREA TO MATCH THE DEPTH OF THE ASPHALT STREET. COMMERCIAL CONCRETE DRIVE SHALL MATCH CURB THICKNESS

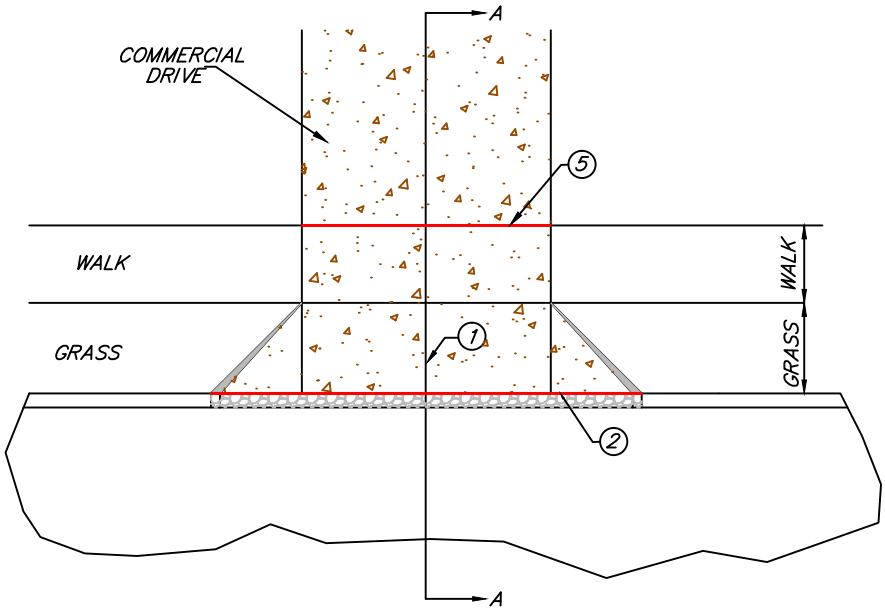
CONCRETE COMMERCIAL DRIVE NOTES

1. CONTRACTION JOINT
2. 1' EXPANSION MATERIAL
3. COMMERCIAL DRIVE
4. PREPARED SUBGRADE
5. CONSTRUCTION JOINT

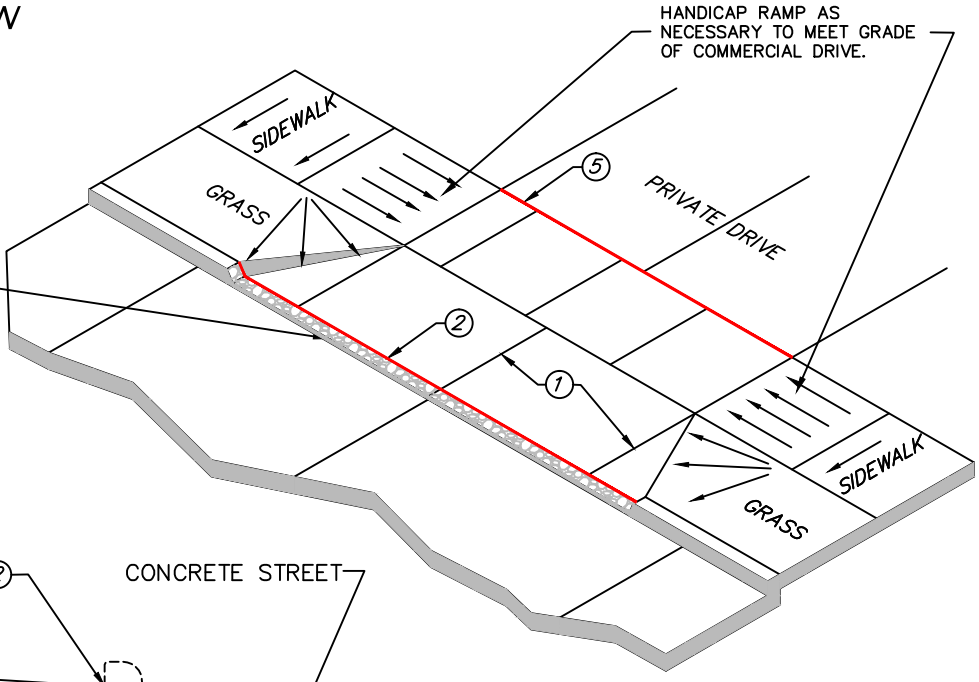
EXPANSION MATERIAL MUST EXCEED THE DEPTH OF THE DRIVEWAY PAVEMENT

COMMERCIAL DRIVEWAY APRON
CONCRETE STREET

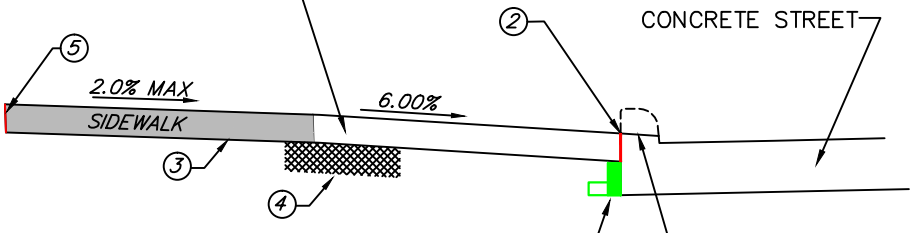
DETAIL #18



PLAN



ISOMETRIC VIEW



SECTION A-A

NEATLY SAW-CUT EXISTING CONCRETE CURB LEAVING 1-3/4" REVEAL AT GUTTER AS SHOWN

IF EDGE DRAIN EXISTS BEHIND THE CURB, REMOVE AND REPLACE AS NECESSARY. DUE TO THE PAVEMENT DEPTH OF THE COMMERCIAL DRIVEWAY, A HORIZONTAL EDGE DRAIN (MEETING THE REQUIREMENTS OF THIS REGULATION) MAY NEED TO BE UTILIZED.

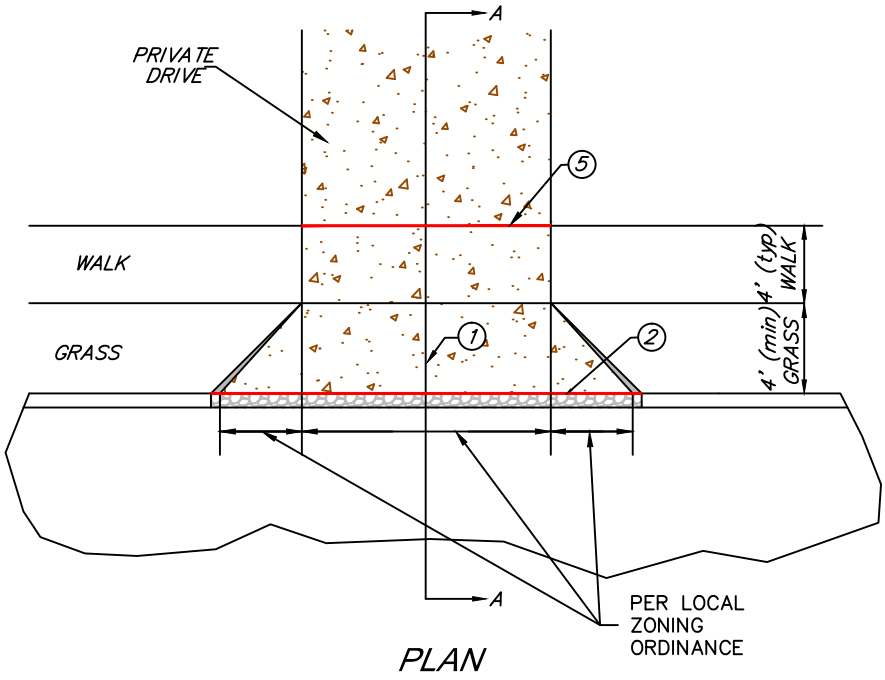
EXPANSION MATERIAL MUST EXCEED THE DEPTH OF THE DRIVEWAY PAVEMENT

CONCRETE COMMERCIAL DRIVE NOTES

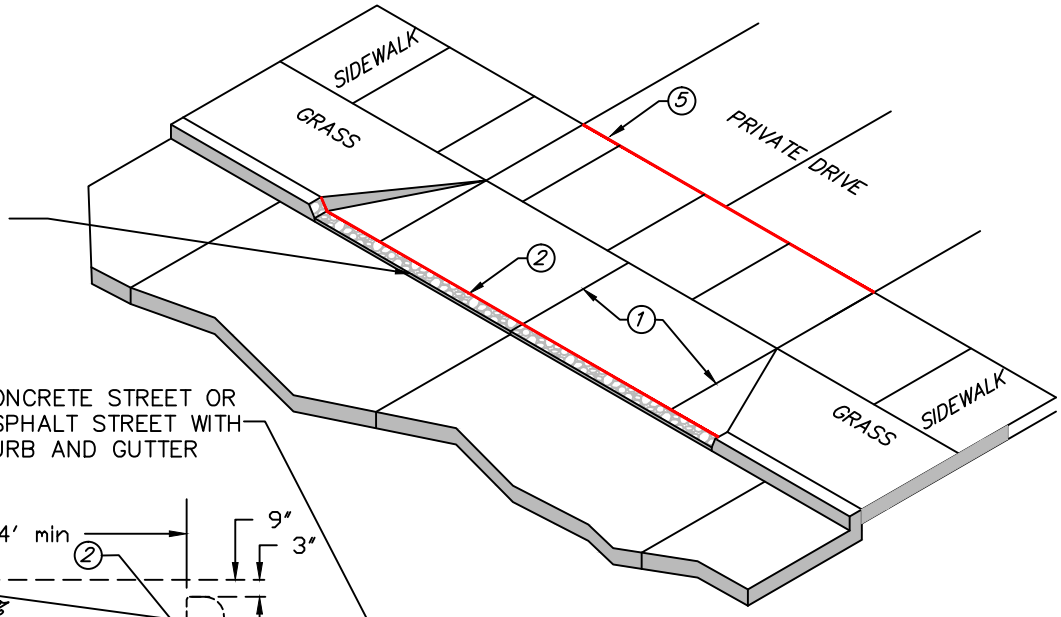
1. *CONTRACTION JOINT*
2. *2" EXPANSION MATERIAL*
3. *COMMERCIAL DRIVEWAY*
4. *PREPARED SUBGRADE*
5. *1" EXPANSION MATERIAL*

RESIDENTIAL DRIVEWAY APRON WHEN VERTICAL CURB EXISTS

DETAIL #19



PLAN

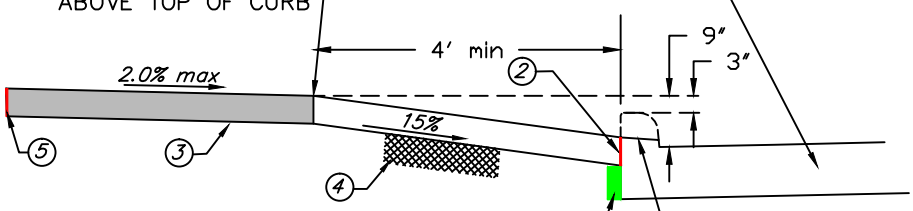


ISOMETRIC VIEW

NEATLY SAW-CUT EXISTING CONCRETE CURB LEAVING 1-3/4 REVEAL AT GUTTER AS SHOWN. SAW-LINE TO SLOPE TOWARD STREET

CONCRETE STREET OR ASPHALT STREET WITH CURB AND GUTTER

FACE OF WALK 3" ABOVE TOP OF CURB



SECTION A-A

NEATLY SAW-CUT EXISTING CONCRETE CURB LEAVING 1-3/4" REVEAL AT GUTTER AS SHOWN

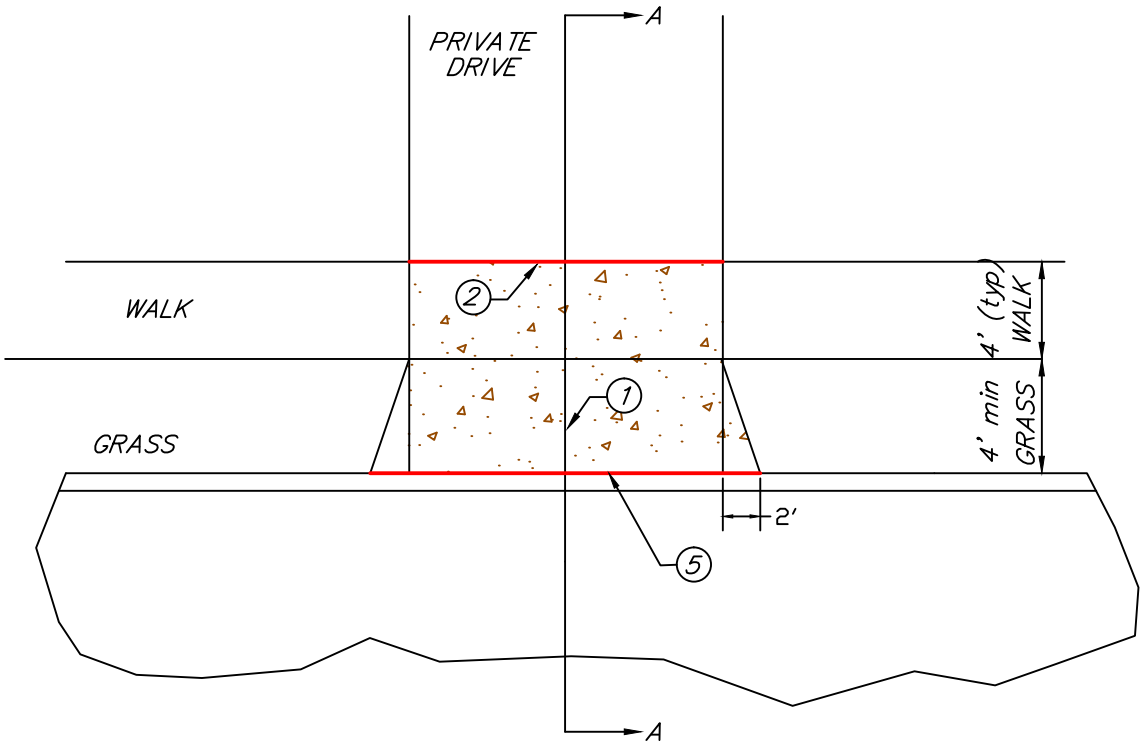
IF EDGE DRAIN EXISTS BEHIND THE CURB AND IS DAMAGED, REMOVE AND REPLACE AS NECESSARY

1. CONTRACTION JOINT
2. EXPANSION MATERIAL (1" FOR ASPHALT STREET, 2" FOR CONCRETE STREETS)
3. SIDEWALK
4. PREPARED SUBGRADE
5. EXPANSION MATERIAL (1")

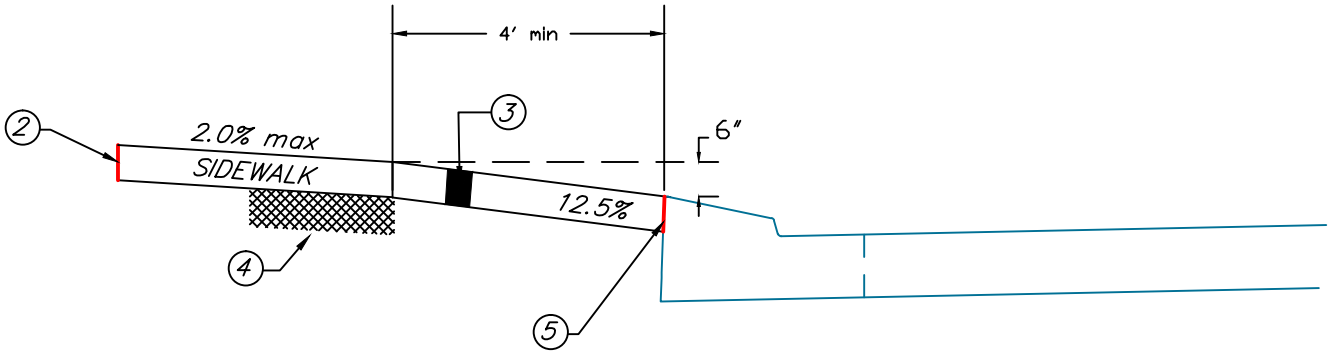
EXPANSION MATERIAL MUST EXCEED THE DEPTH OF THE DRIVEWAY PAVEMENT

RESIDENTIAL DRIVEWAY APRON
SLOPED CURB

DETAIL #20



PLAN

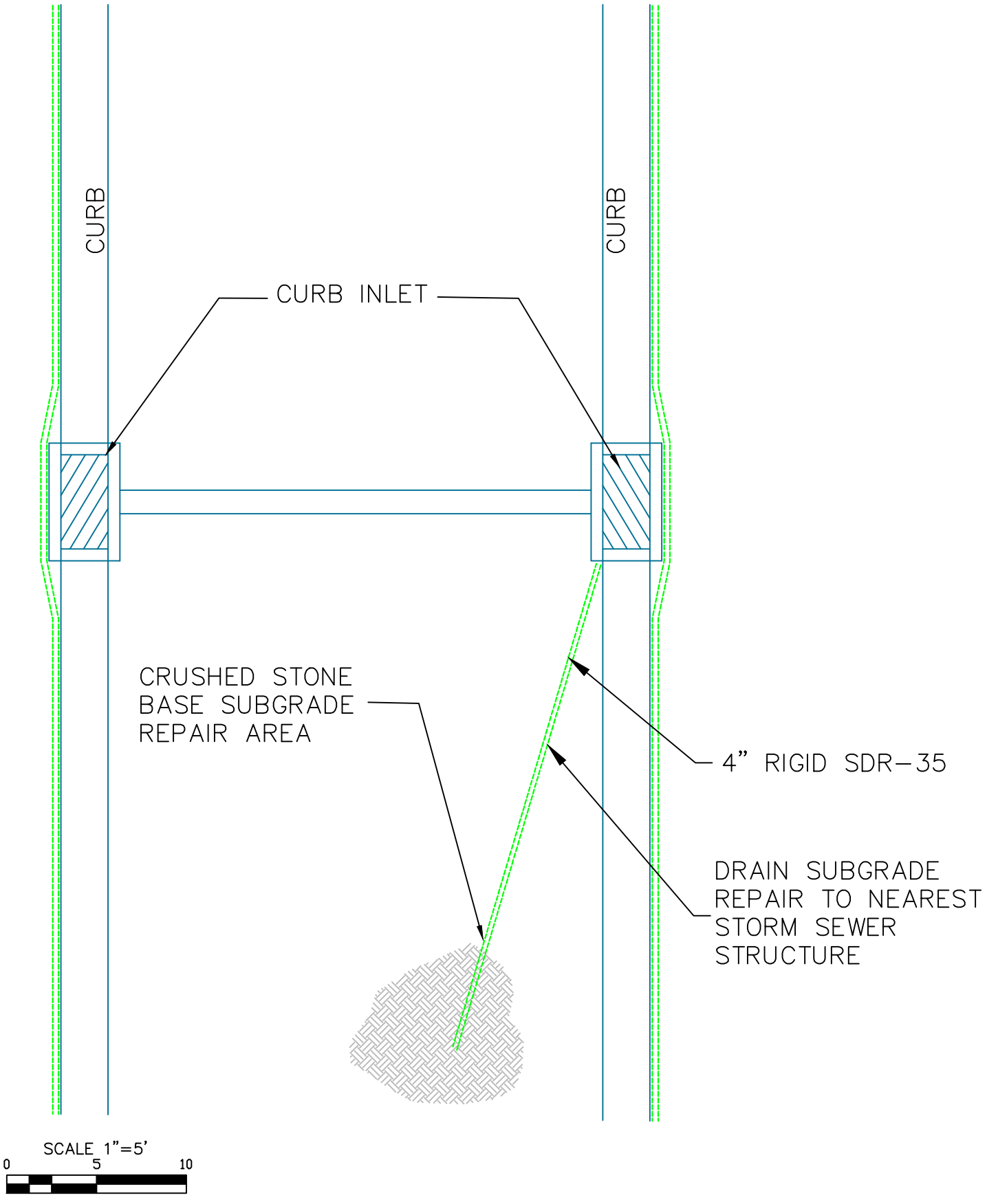


SECTION A-A

1. CONTRACTION JOINT
2. 1" EXPANSION MATERIAL
3. 5" CONCRETE RESIDENTIAL DRIVE
4. PREPARED SUBGRADE
5. EXPANSION MATERIAL (2" CONCRETE STREET, 1" ASPHALT STREET)

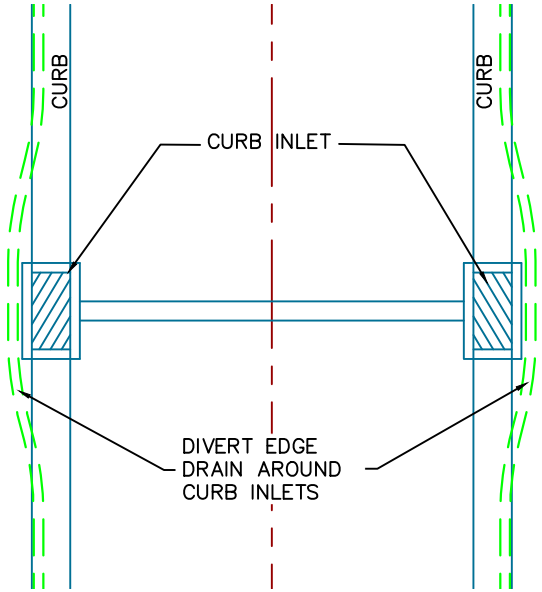
EXPANSION MATERIAL MUST EXCEED THE DEPTH OF THE DRIVEWAY PAVEMENT

DRAINAGE FOR SUBGRADE REPAIR *DETAIL #21*



EDGE DRAIN INSTALLATION WITH STONE BASE STREETS

DETAIL #22



EDGE DRAIN INSTALLATION PROCEDURE FOR STONE BASE STREETS

1. ROLL OUT EDGE DRAIN FLAT (HORIZONTAL) SO THAT OUTSIDE FACE OF EDGE DRAIN ALIGNS WITH THE OUTSIDE EDGE OF CURB.
2. TACK EDGE DRAIN EVERY 5 FEET TO THE SUBGRADE USING 16 PENNY NAILS OR EQUAL.
3. DO NOT DRIVE CONSTRUCTION EQUIPMENT DIRECTLY ON EDGE DRAIN.
4. INSTALL STONE BASE TO A MINIMUM THICKNESS OF 4" OVER EDGE DRAIN.
5. COMPACT STONE BASE AS NECESSARY AND PROCEED WITH REMAINING PAVEMENT INSTALLATION.
6. AT CATCH BASINS CONTINUE EDGE DRAIN ALONG THE BACK SIDE OF CATCH BASIN.
7. EDGE DRAIN SHALL BE CONTINUOUS ALONG BOTH SIDES OF CURB.
8. EDGE DRAIN SHALL BE IN DIRECT CONTACT WITH #57 STONE BACKFILL AT ALL CATCH BASINS.
9. SPLICES IN EDGE DRAIN SHALL BE MADE WITH MANUFACTURERS COUPLERS OR OTHER APPROVED CONNECTION BY MANUFACTURER.

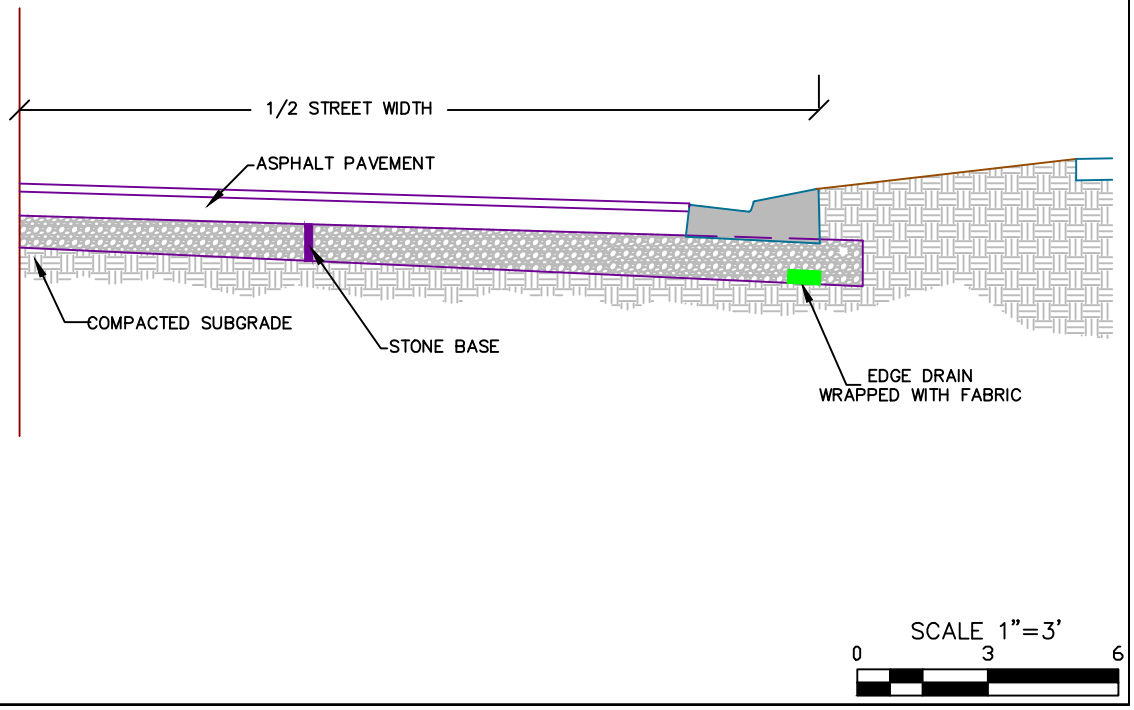
EDGE DRAIN MATERIAL SPECIFICATIONS

A. CORE
   1. MATERIAL: POLYETHYLENE OR POLYPROPYLENE. POLYSTYRENE WILL NOT BE ACCEPTED.
   2. MINIMUM THICKNESS: 1.0"
   3. WIDTH = 6" (MINIMUM)
   4. MINIMUM COMPRESSIVE STRENGTH:
      ONE-SIDED (OPEN-CORE) NOT ACCEPTED
      CLOSED CORE CONDUIT = 6,000 PSF (ASTM D-1621) OR
      = 4,000 PSF (ASTM D-6364)

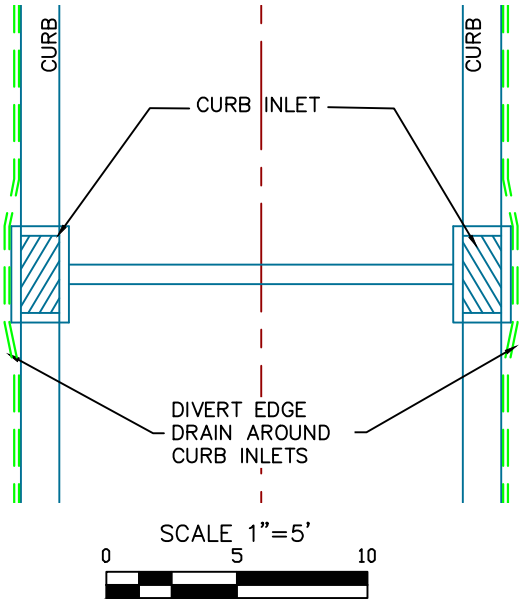
B. GEOTEXTILE FILTER FABRIC:
   1. MATERIAL: NON-WOVEN NEEDLE PUNCH GEOTEXTILE FABRIC THAT MEETS AASHTO CLASS 3.
   2. ATTACHMENT: THE GEOTEXTILE FILTER FABRIC SHALL BE WRAPPED AROUND THE DRAINAGE COMPOSITE CORE AND SECURED IN PLACE.

C. CERTIFICATIONS
   1. CONTRACTOR SHALL SUPPLY MANUFACTURER'S CERTIFICATION THAT THE EDGE DRAIN INSTALLED MEETS PERFORMANCE SPECIFICATION AND THE INTENDED USE SHOWN ON THIS DETAIL.

D. APPROVED PRODUCTS: ADS ADVANEDGE, MULTI-FLOW OR EQUAL



EDGE DRAIN INSTALLATION FOR CONCRETE & FULL DEPTH ASPHALT STREETS — DETAIL #23



EDGE DRAIN MATERIAL SPECIFICATIONS

A. CORE
   1. MATERIAL: POLYETHYLENE OR POLYPROPYLENE. POLYSTYRENE WILL NOT BE ACCEPTED.
   2. MINIMUM THICKNESS: 1.0"
   3. WIDTH = 6" (MINIMUM & MAXIMUM)
   4. MINIMUM COMPRESSIVE STRENGTH:
      ONE-SIDED (OPEN-CORE) EDGE DRAIN = 6,000 PSF (ASTM D-1621)
      CLOSED CORE CONDUIT = 6,000 PSF (ASTM D-1621)
      OR = 4,000 PSF (ASTM D-6364)

B. GEOTEXTILE FILTER FABRIC:
   1. MATERIAL: NON-WOVEN NEEDLE PUNCH GEOTEXTILE FABRIC THAT MEETS AASHTO CLASS 3.
   2. ATTACHMENT: THE GEOTEXTILE FILTER FABRIC SHALL BE WRAPPED AROUND THE DRAINAGE COMPOSITE CORE AND SECURED IN PLACE.

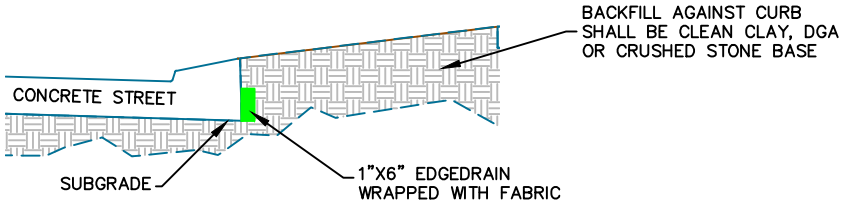
C. CERTIFICATIONS
   1. CONTRACTOR SHALL SUPPLY MANUFACTURER'S CERTIFICATION THAT THE EDGE DRAIN INSTALLED MEETS PERFORMANCE SPECIFICATION AND THE INTENDED USE SHOWN ON THIS DETAIL.

D. APPROVED PRODUCTS: J-DRAIN MVP-6, MULTI-FLOW OR EQUAL

EDGE DRAIN INSTALLATION PROCEDURE FOR CONCRETE STREET

1. WHILE CONCRETE CURB IS STILL WET ENSURE BACK OF CURB IS FREE OF BLOW-OUTS, HAS A CLEAN EDGE AND IS IN CONTACT WITH THE EARTH SUBGRADE.
2. ROLL OUT EDGE DRAIN ALONG BACK OF CURB (VERTICAL). EDGE DRAIN MUST BE INSTALLED AT THE BASE OF THE CONCRETE CURB AS SHOWN.
3. INSTALL DIMPLED SIDE OF EDGE DRAIN AGAINST CONCRETE CURB.
4. WHILE THE CONCRETE IS STILL GREEN, TACK EDGE DRAIN EVERY 5 FEET TO THE BACK OF CURB USING 10 PENNY NAILS OR EQUAL.
5. AT CATCH BASINS CONTINUE EDGE DRAIN ALONG THE BACK SIDE OF CATCH BASIN.
6. EDGE DRAIN SHALL BE CONTINUOUS ALONG BOTH SIDES OF CURB.
7. EDGE DRAIN SHALL BE IN DIRECT CONTACT WITH #57 STONE BACKFILL AT ALL CATCH BASINS.
8. ONCE CONCRETE IS CURED BACKFILL CURBS AND EDGE DRAIN.
9. SPLICES IN EDGE DRAIN SHALL BE MADE WITH MANUFACTURERS COUPLERS OR OTHER APPROVED CONNECTION BY MANUFACTURER.

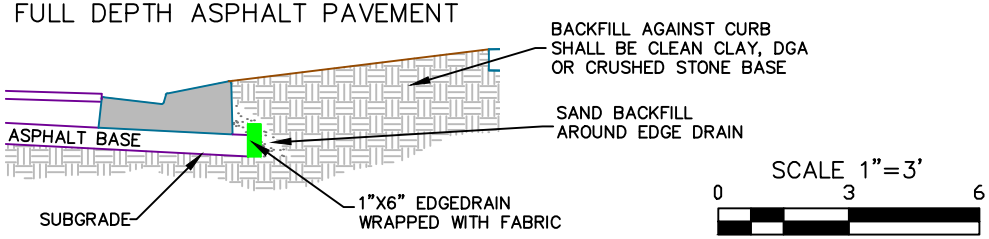
CONCRETE PAVEMENT

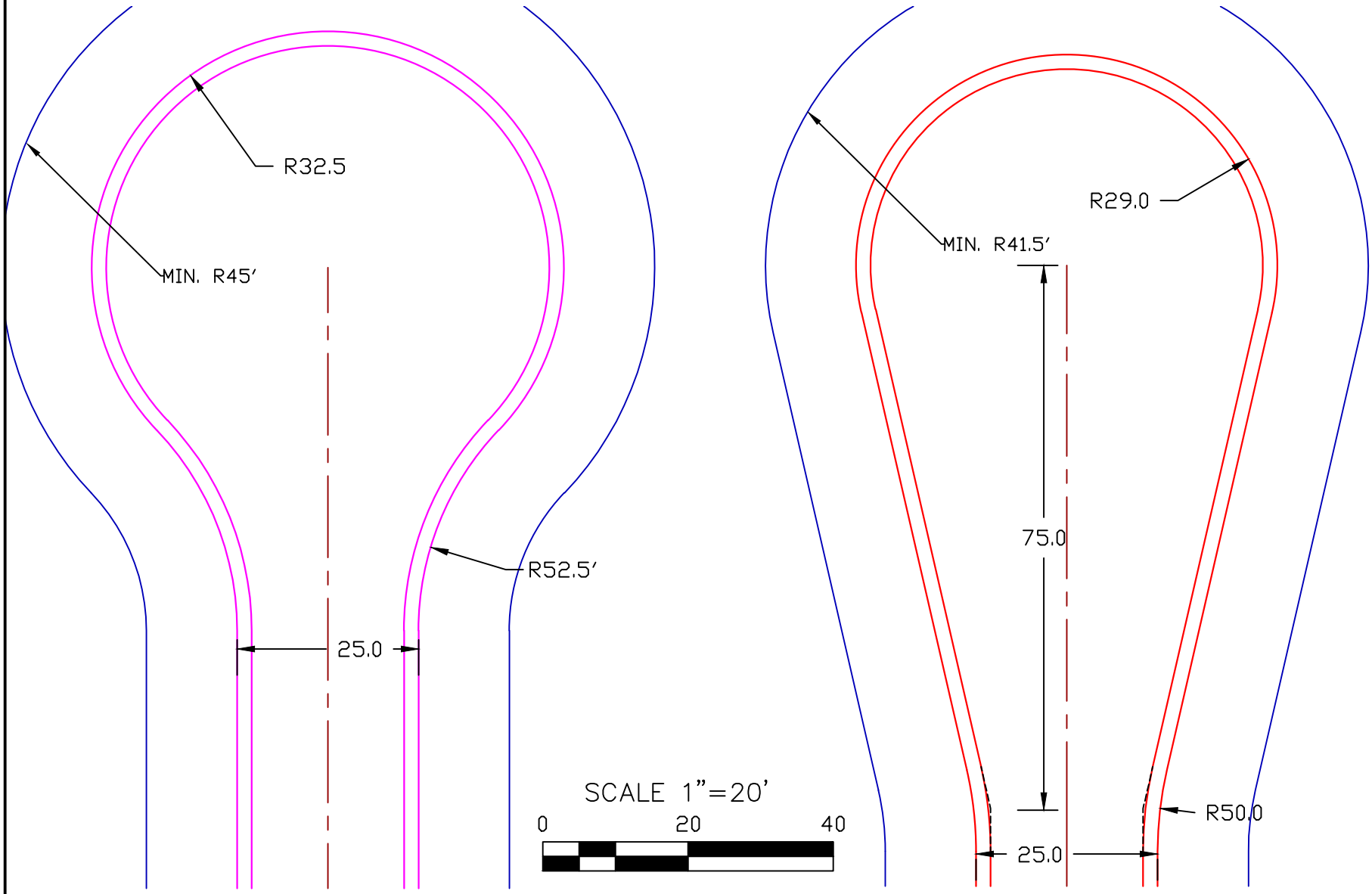


EDGE DRAIN INSTALLATION PROCEDURE FOR FULL-DETPH ASPHALT STREET

1. ROLL OUT EDGE DRAIN ALONG BACK OF CURB (VERTICAL). EDGE DRAIN MUST BE INSTALLED AT THE INTERFACE BETWEEN THE ASPHALT BASE AND SUBGRADE AS SHOWN.
2. INSTALL DIMPLED SIDE OF EDGE DRAIN AGAINST ASPHALT EDGE.
3. TACK EDGE DRAIN EVERY 5 FEET TO THE EDGE OF THE ASPHALT USING 10 PENNY NAILS OR EQUAL.
4. AT CATCH BASINS CONTINUE EDGE DRAIN ALONG THE BACK SIDE OF CATCH BASIN.
5. BACKFILL AND COVER EDGE DRAIN WITH SAND.
6. EDGE DRAIN SHALL BE CONTINUOUS ALONG BOTH SIDES OF CURB.
7. EDGE DRAIN SHALL BE IN DIRECT CONTACT WITH #57 STONE BACKFILL AT ALL CATCH BASINS.
8. ONCE CONCRETE IS CURED BACKFILL CURBS AND EDGE DRAIN.
9. SPLICES IN EDGE DRAIN SHALL BE MADE WITH MANUFACTURERS COUPLERS OR OTHER APPROVED CONNECTION BY MANUFACTURER.

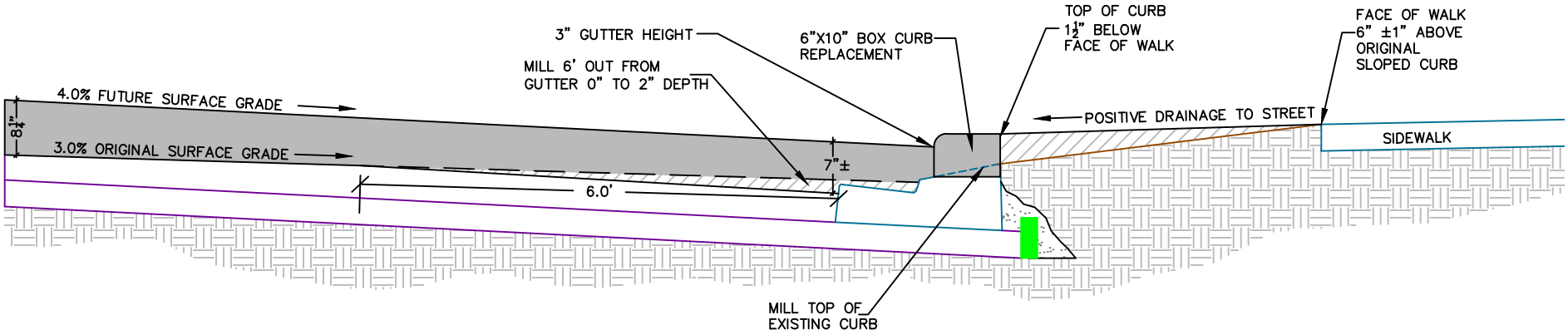
FULL DEPTH ASPHALT PAVEMENT





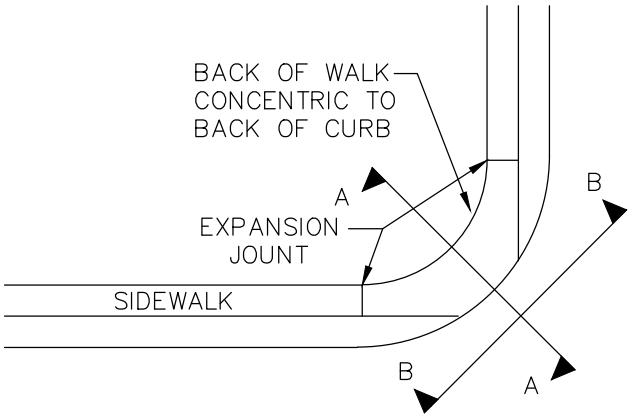
STANDARD CUL-DE-SAC

OPTIONAL TEAR DROP CUL-DE-SAC



NOTE: DRIVEWAY APRONS TO BE REPLACED AND CURB INLETS TO BE ADJUSTED AS NECESSARY.

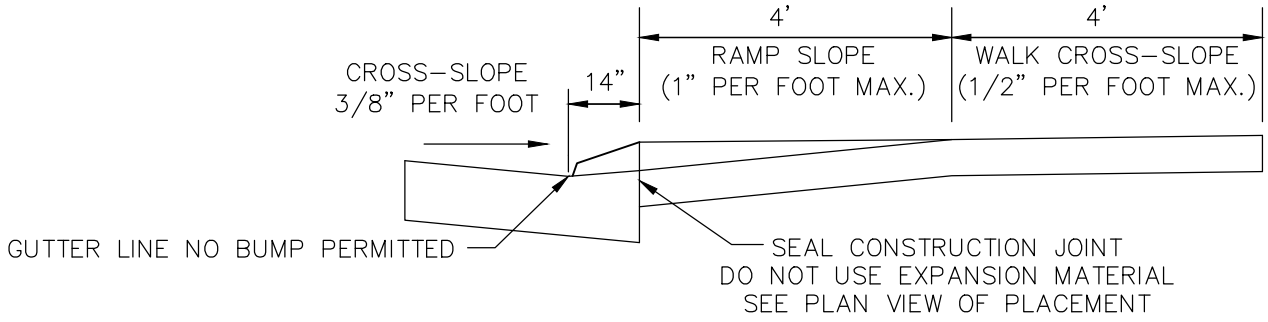
0 2 4



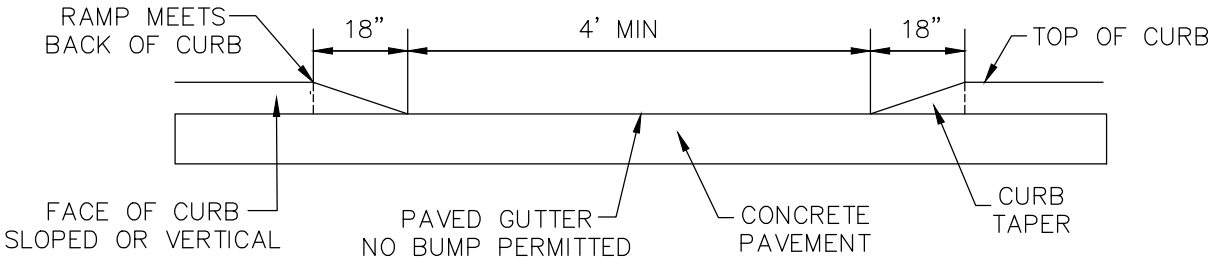
PLAN VIEW

NOTES

1. SIDEWALK RAMPS SHALL BE CONSTRUCTED OF MINIMUM 4000 PSI AIR–ENTRAINED CONCRETE. A BROOM FINISH OR EQUAL NON–SKID FINISH IS REQUIRED.
2. NORMAL GUTTER LINE SHALL BE MAINTAINED THROUTHE AREA OF THE RAMP FOR DRAINAGE.
3. MINIMUM THICKNESS FOR RAMPS, SHALL BE 4 INCHES, SAME AS SIDEWALKS
4. NO FREE DRAINING GRANULAR FILL PERMITTED UNDER RAMPS.
5. HANDICAP RAMPS SHALL MEET ADA REQUIREMENTS AND CONTAIN DETECTABLE WARNINGS CONSISTING OF RAISED TRUNCATED DOMES. ONLY COMPOSITE INLAYS WILL BE PERMITTED.



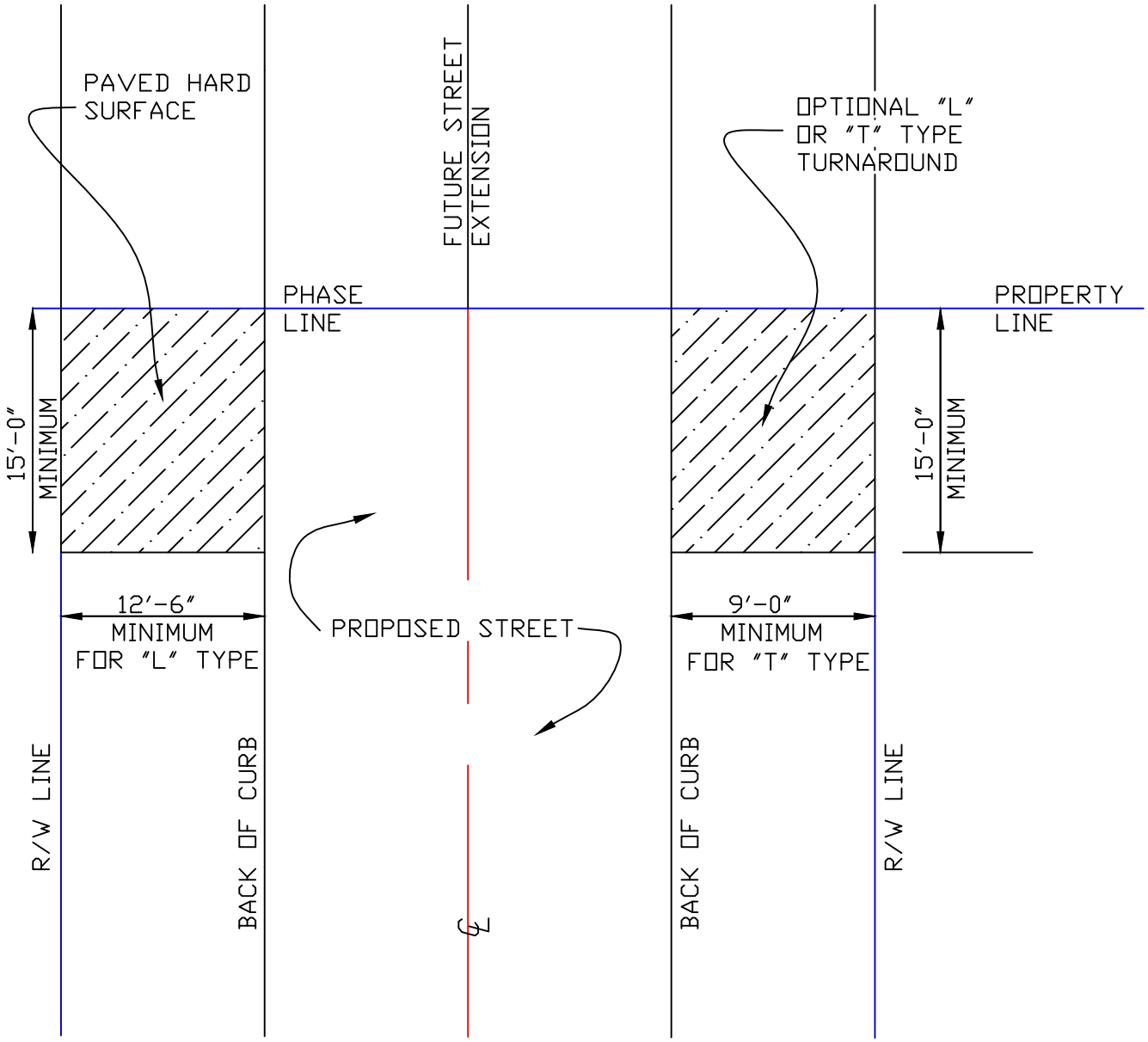
SECTION A–A

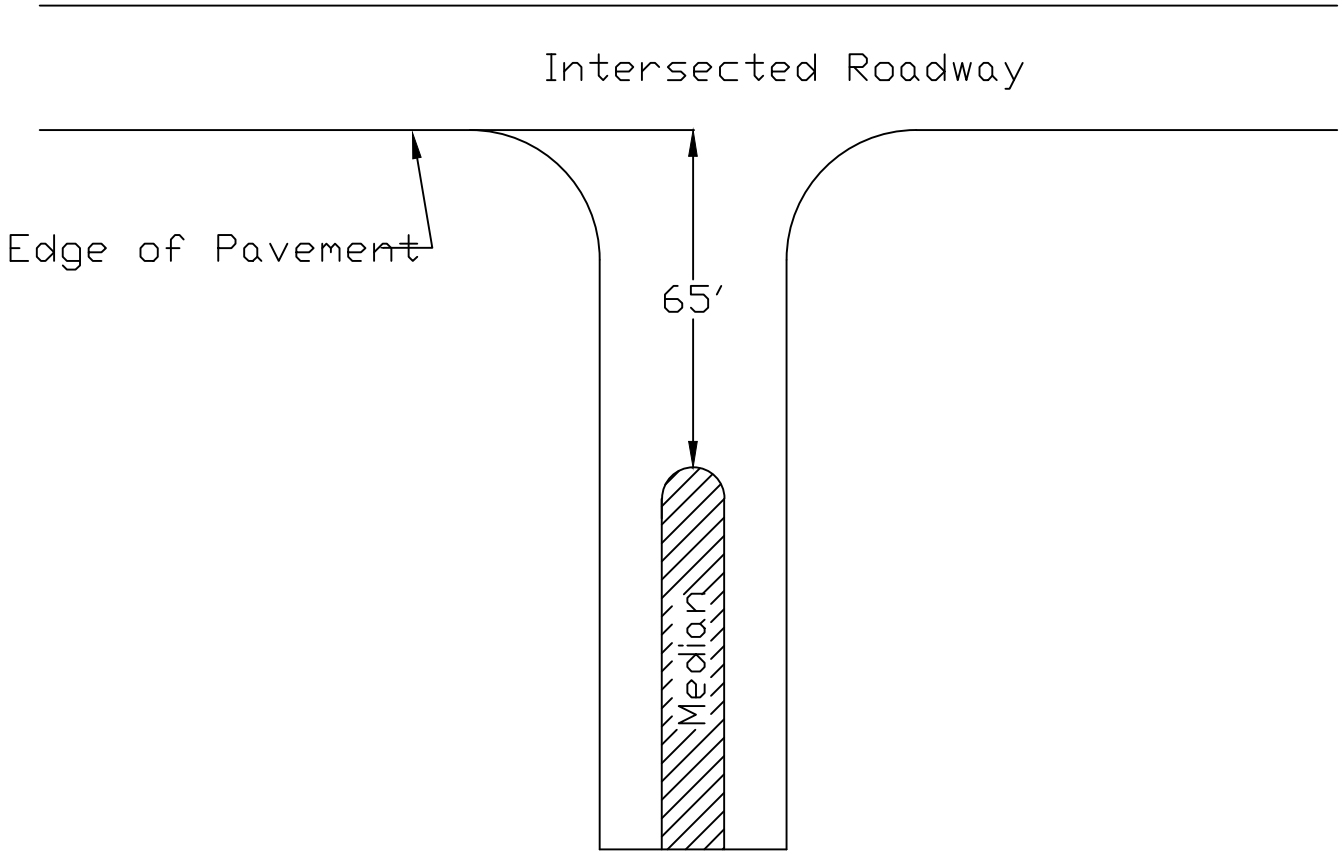


SECTION B–B

TEMPORARY TURN-AROUND DETAIL

DETAIL #27



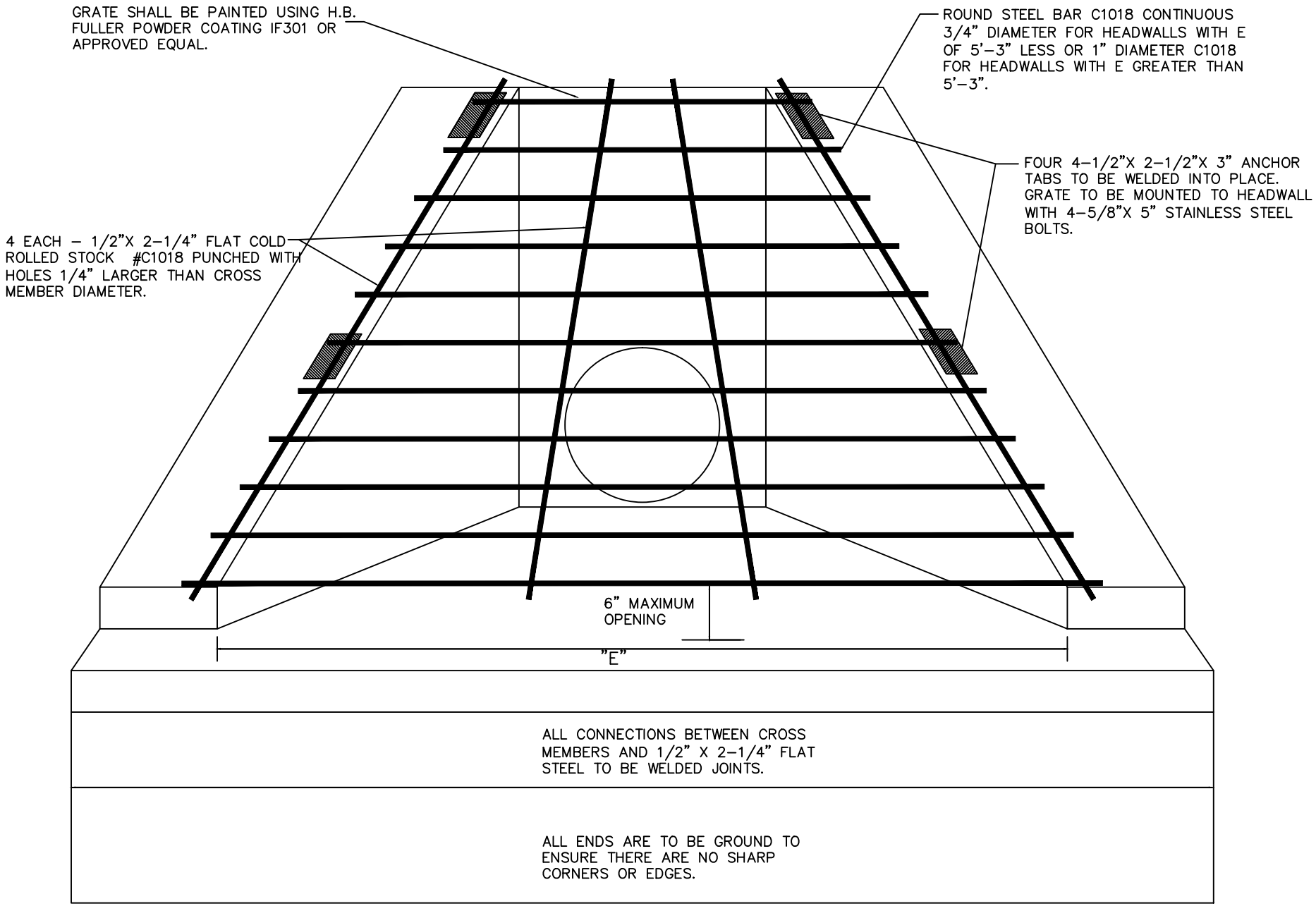


Notes:

1. Center Medians shall be set back a minimum of 65 feet from the edge of the intersecting roadway.
2. Medians shall use a semicircular nose design with a diameter equal to the proposed median width
3. A constant roadway width shall be maintained from the median location to the intersecting roadway.

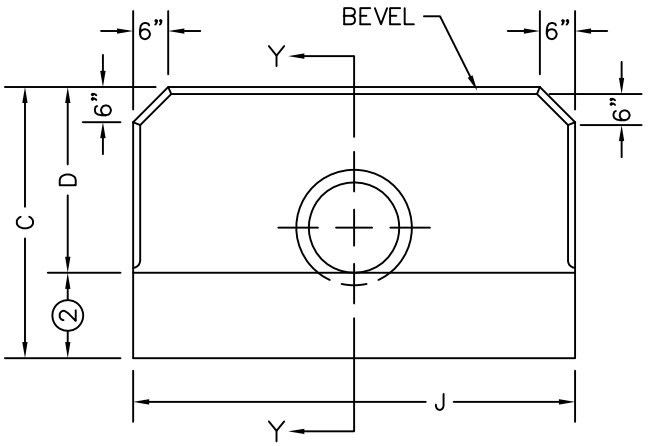
ENCLOSURE GRATE FOR INLET HEADWALL 24" DIAMETER OR LESS

DETAIL #29

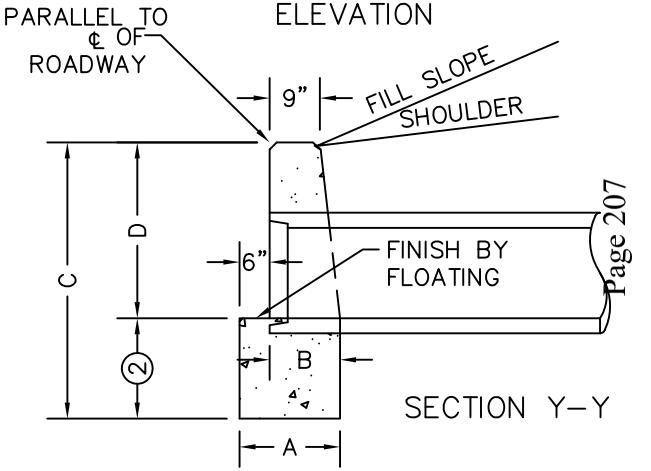


CONCRETE HEADWALL

HEADWALL TYPE	DIAMETER OF PIPE	HEADWALL DIMENSIONS									CUBIC YARDS CONCRETE FOR ② ONE HEADWALL	
		A	B	C	D	E	F	G	H①	J	EARTH	ROCK
STANDARD	12"	1'–8"	1'–2"	4'–0"	2'6"	–	–	–	–	6'–0"	1.05	0.87
	15"	1'–8.5"	1'–2.5"	4'–3"	2'–9"	–	–	–	–	6'–9"	1.25	1.03
	18"	1'–9"	1'–3"	4'–6"	3'–0"	–	–	–	–	7'–6"	1.48	1.23
	21"	1'–9.5"	1'–3.5"	4'–9"	3'–3"	–	–	–	–	8'–3"	1.73	1.46
	24"	1'–10"	1'–4"	5'–0"	3'–6"	–	–	–	–	9'–0"	1.99	1.69
RAISED	12"	1'–8"	1'–2"	4'–6"	3'–0"	–	–	–	–	7'–6"	1.45	1.23
	15"	1'–8.5"	1'–2.5"	4'–9"	3'–3"	–	–	–	–	8'–3"	1.69	1.43
	18"	1'–9"	1'–3"	5'–0"	3'–6"	–	–	–	–	9'–0"	1.96	1.67
	21"	1'–9.5"	1'–3.5"	5'–3"	3'–9"	–	–	–	–	9'–9"	2.25	1.93
	24"	1'–10"	1'–4"	5'–6"	4'–0"	–	–	–	–	10'–6"	2.54	2.19
STANDARD ELL	12"	1'–8"	1'–2"	4'–0"	2'–6"	2'–0"	3'–8"	3'–0"	2'–6"	4'–8"	1.19	0.99
	15"	1'–8.5"	1'–2.5"	4'–3"	2'–9"	2'–3"	3'–11.5"	3'–6"	2'–9"	5'–2.5"	1.42	1.19
	18"	1'–9"	1'–3"	4'–6"	3'–0"	2'–6"	4'–3"	4'–0"	3'–0"	5'–9"	1.67	1.41
	21"	1'–9.5"	1'–3.5"	4'–9"	3'–3"	2'–9"	4'–6.5"	4'–6"	3'–3"	6'–3.5"	1.93	1.63
	24"	1'–10"	1'–4"	5'–0"	3'–6"	3'–0"	4'–10"	5'–0"	3'–6"	6'–10"	2.22	1.89
RAISED ELL	12"	1'–8"	1'–2"	4'–6"	3'–0"	2'–9"	4'–5"	3'–9"	3'–3"	5'–5"	1.62	1.37
	15"	1'–8.5"	1'–2.5"	4'–9"	3'–3"	3'–0"	4'–8.5"	4'–3"	3'–6"	5'–11.5"	1.88	1.59
	18"	1'–9"	1'–3"	5'–0"	3'–6"	3'–3"	5'–0"	4'–9"	3'–9"	6'–6"	2.16	1.85
	21"	1'–9.5"	1'–3.5"	5'–3"	3'–9"	3'–6"	5'–3.5"	5'–3"	4'–0"	7'–0.5"	2.47	2.12
	24"	1'–10"	1'–4"	5'–6"	4'–0"	3'–9"	5'–7"	5'–9"	4'–3"	7'–7"	2.79	2.41

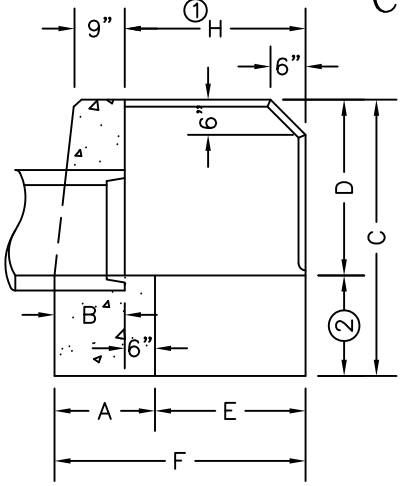


ELEVATION

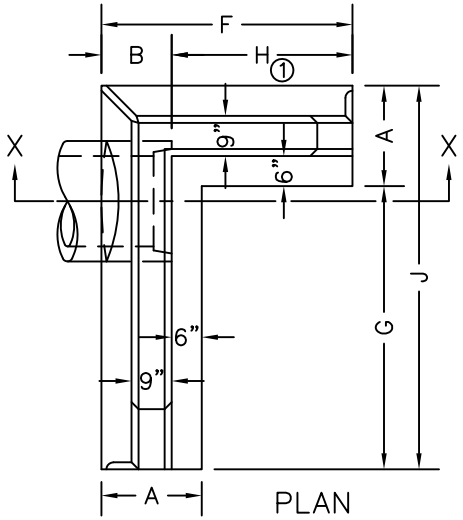


SECTION Y–Y

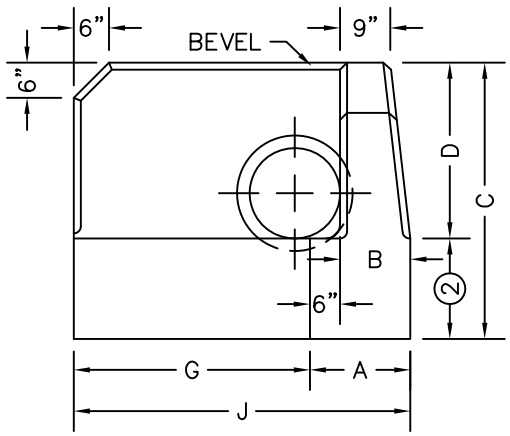
CONCRETE ELL HEADWALL



SECTION X–X



PLAN



ELEVATION

NOTES

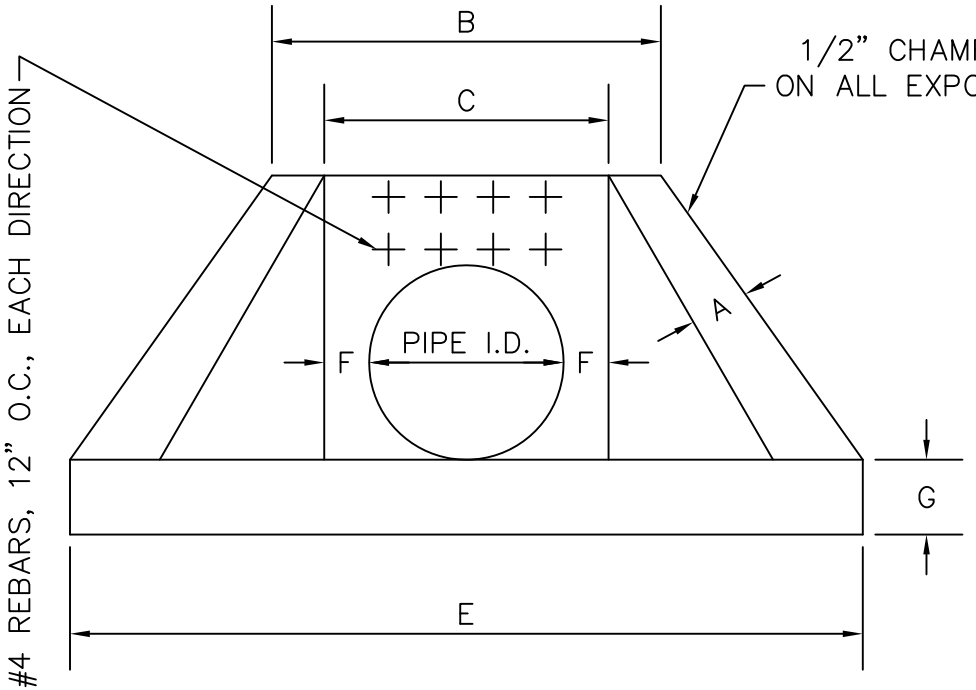
CIRCULAR PIPE INCLUDES SLIGHTLY ELLIPTICAL CONCRETE PIPE WITH CIRCULAR REINFORCMENT.

VOLUME DISPLACED BY BARREL OF PIPE HAS BEEN COMPUTED USING INSIDE DIMENSION OF PIPE.

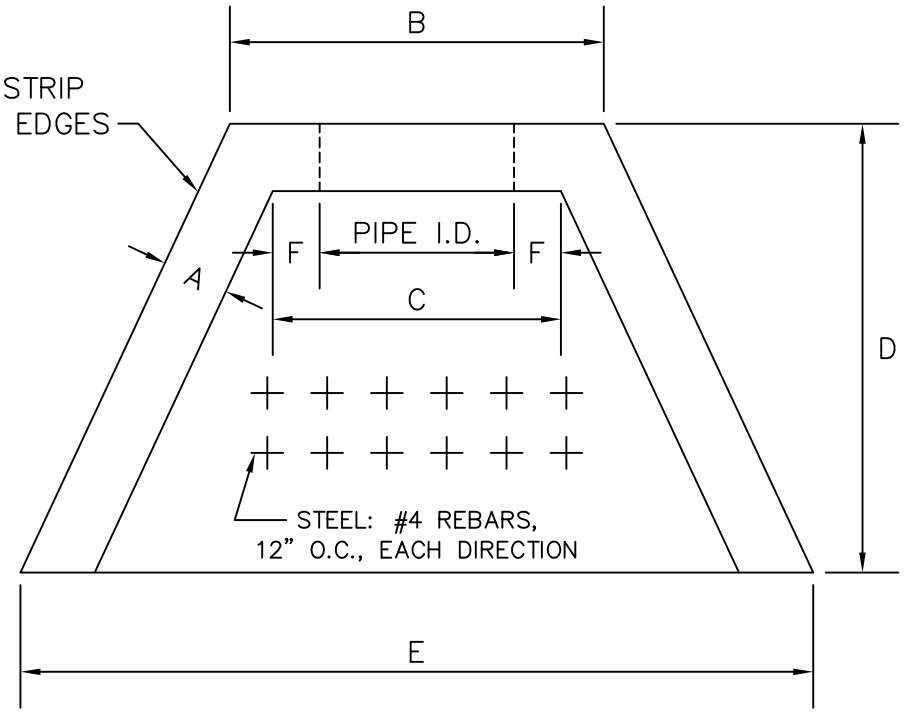
① THE DIMENSION AND/OR THE ANGLE OF INTERSECTION BETWEEN THE WALLS MAY BE VARIED ON CONSTRUCTION.

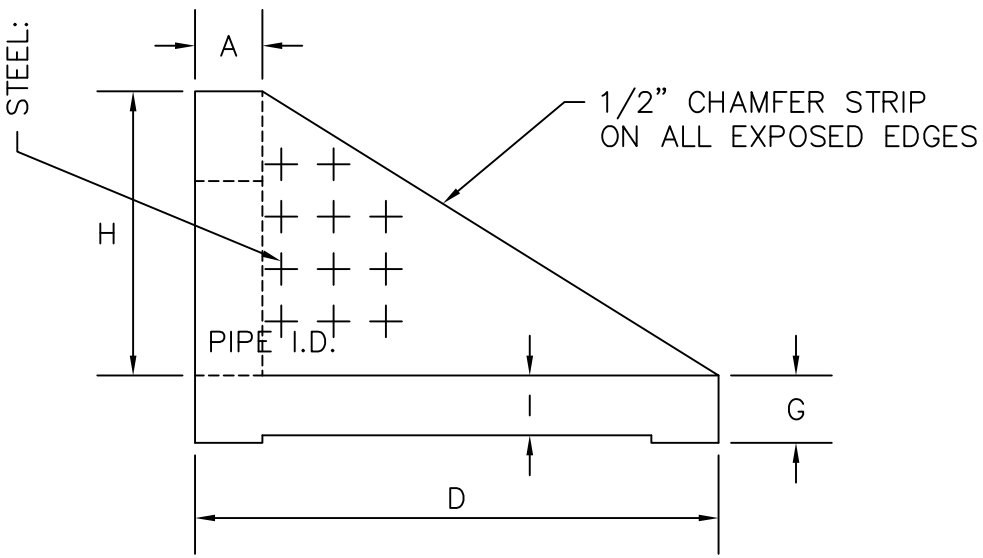
② VOLUME BASED ON VALUES OF 18" FOR EARTH, 12" FOR ROCK.

FRONT VIEW



TOP VIEW





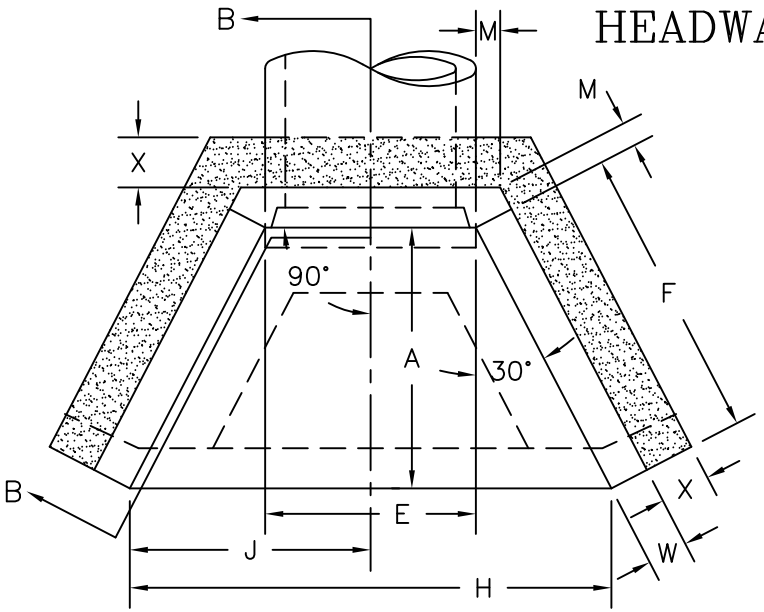
SIDE VIEW

MINIMUM DIMESIONS

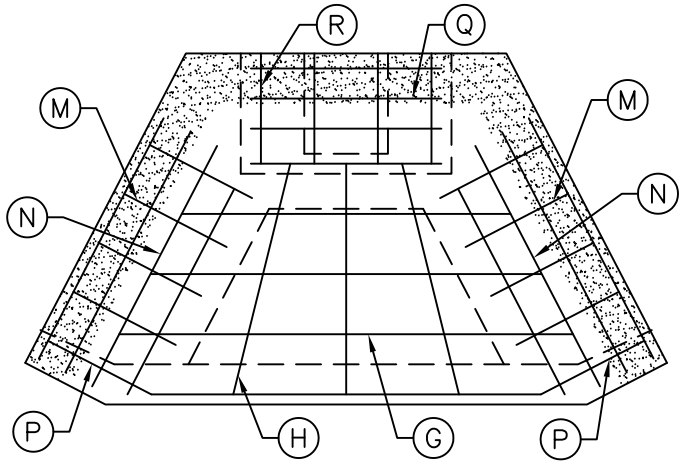
A: 7"
B: PIPE I.D. + 14"
C: PIPE I.D. + 6"
D: 4' OR 2 X PIPE I.D. WHICHEVER IS GREATER
E: 5' OR 2.5 X PIPE I.D. WHICHEVER IS GREATER
F: 3"
G: 8"
H: PIPE I.D. + 12"
I: 6"

HEADWALL DETAIL FOR 12" THRU 36" I.D. PIPE

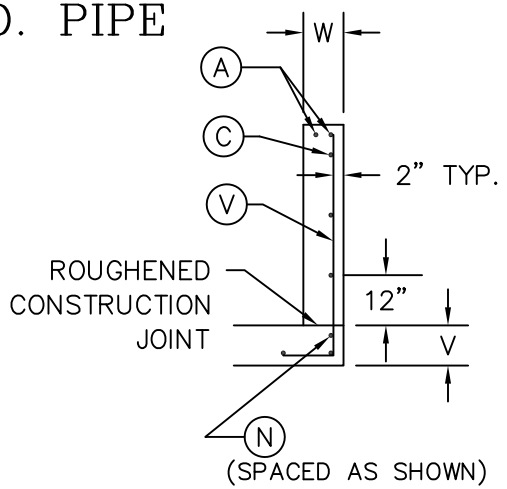
HEADWALL DETAIL 42" THRU 108" I.D. PIPE



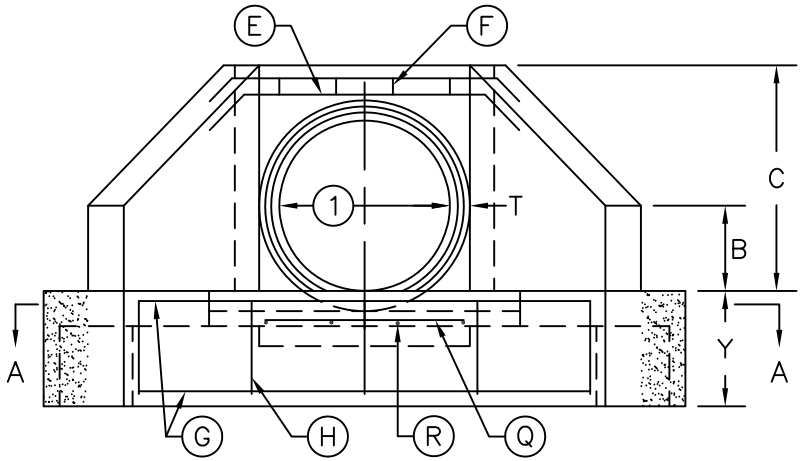
PLAN VIEW



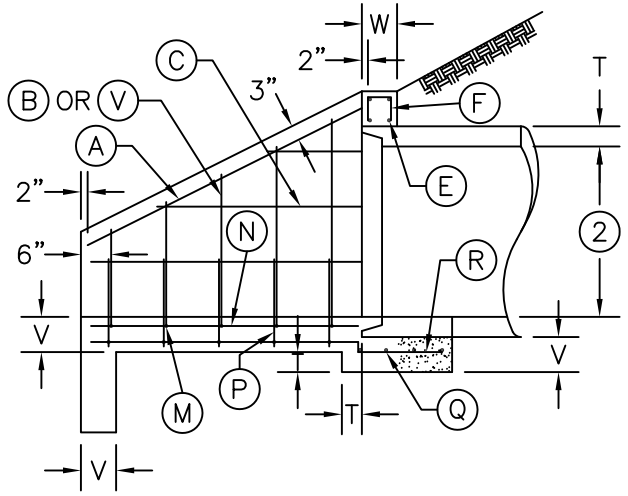
SECTION A–A



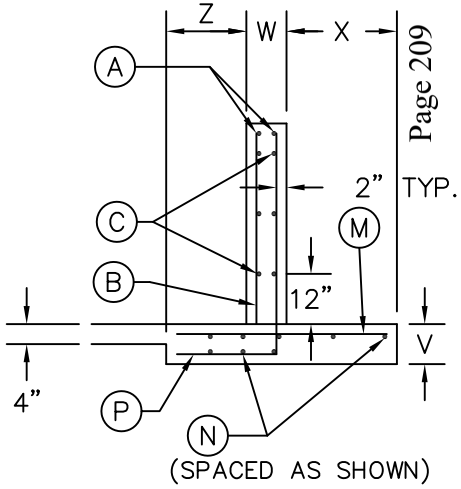
WING SECTION
42" TO 60" CIRCULAR PIPE
42" TO 72" NON–CIRCULAR PIPE



FRONT ELEVATION

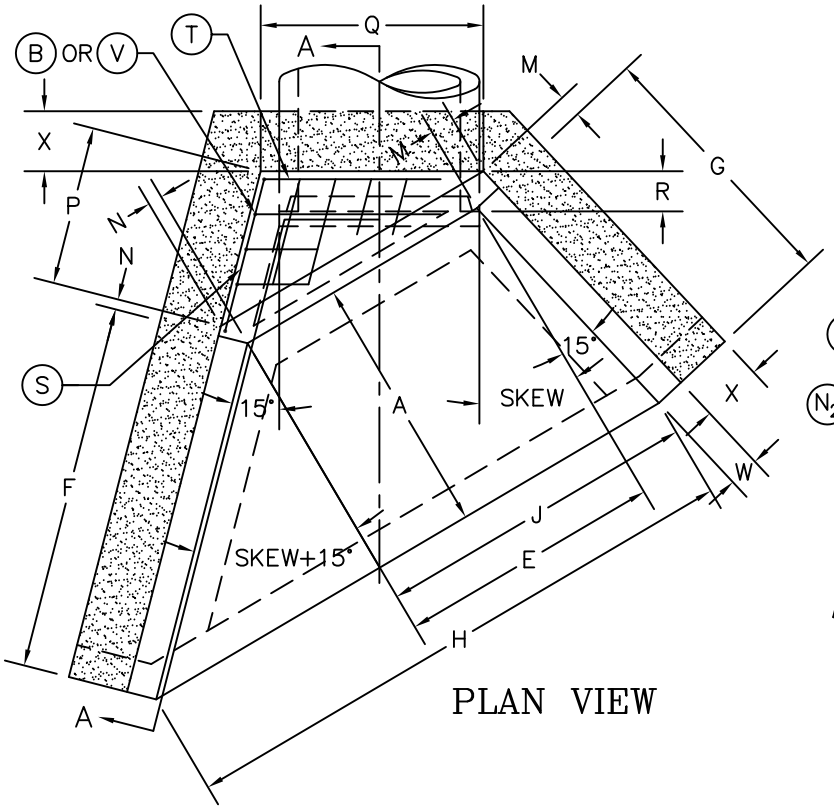


SECTION B–B

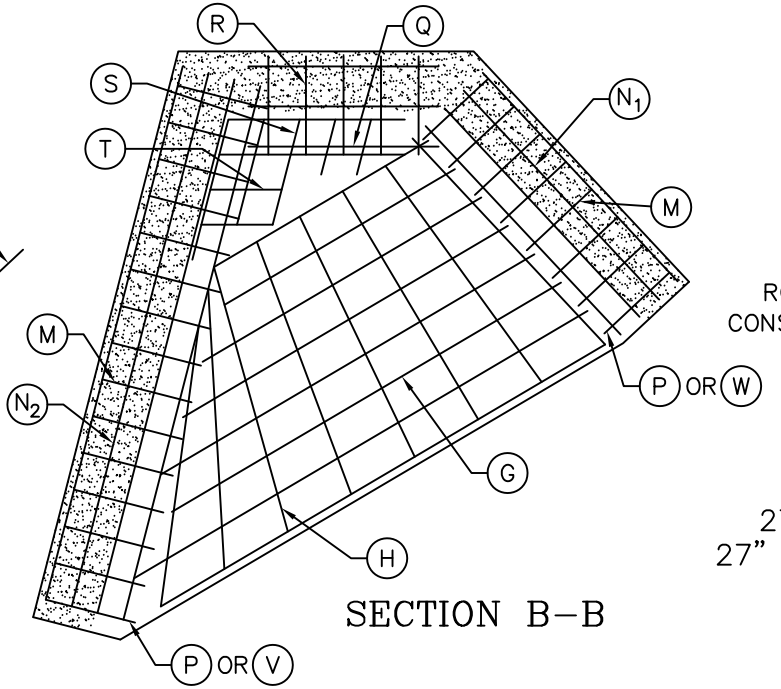


WING SECTION
66" TO 108" CIRCULAR PIPE

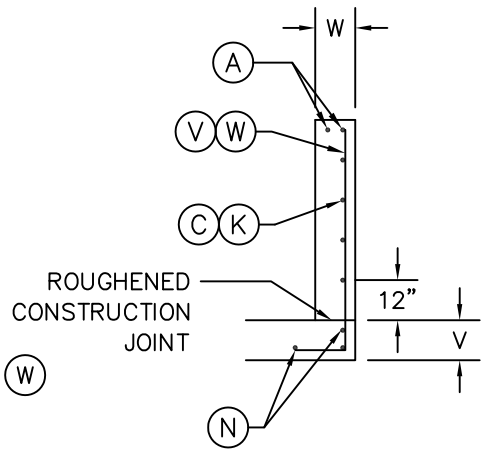
① DIAMETER OF CIRCULAR PIPE OR SPAN OF NON–CIRCULAR PIPE.
② DIAMETER OF CIRCULAR PIPE OR RISE OF NON–CIRCULAR PIPE.
3. [ ] APPLIES TO 66" DIAMETER AND GREATER (CIRCULAR PIPE).
4. SEE CURRENT STANDARD DRAWINGS RDH–200 AND 300 SERIES FOR DIMENSIONS,QUANTITIES, AND BILL OF REINFORCEMENT.
5. DIMENSIONS FROM FACE OF CONCRETE TO STEEL SHALL BE 2" CLEAR DISTANCE.
6. ENCIRCLED LETTERS, Ⓐ, INDICATE STEEL BAR LOCATIONS.
7. BARS Ⓑ, Ⓒ, Ⓖ, Ⓟ, Ⓜ, Ⓥ ARE SPACED 1'–0" O.C. ALL OTHER BARS SHALL BE EVENLY SPACED.
8. BARS Ⓑ AND Ⓥ ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE TOP OF EACH WING.
9. BARS Ⓒ ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE TOP OF EACH WING.
10. HEADWALLS LOCATED AT EDGE OF SHOULDER SHALL BE PARALLEL TO CENTERLINE OF THE ROAD.
11. APRON BETWEEN WINGS SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE. FRONT FACE OF HEADWALL AND ENDS OF WINGS SHALL REMAIN VERTICAL.



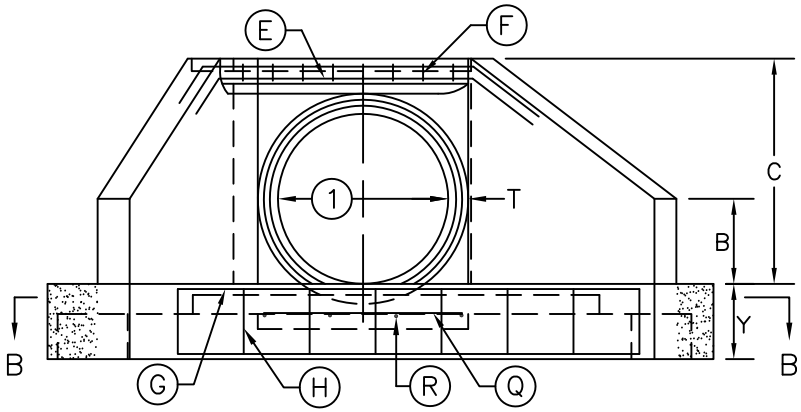
PLAN VIEW



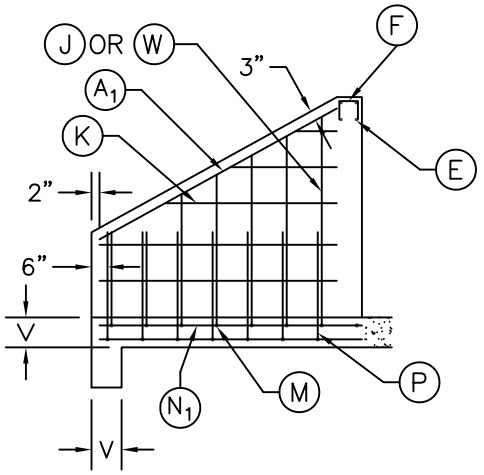
SECTION B–B



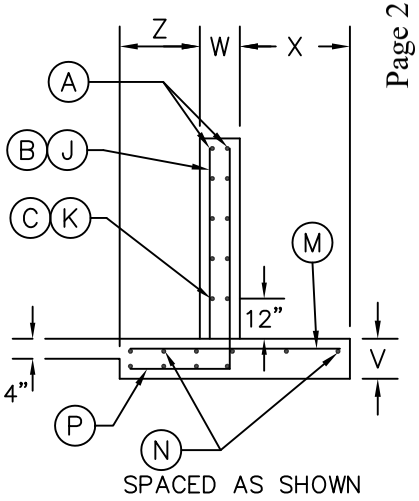
WING SECTION
27" TO 60" CIRCULAR PIPE
27" TO 72" NON–CIRCULAR PIPE



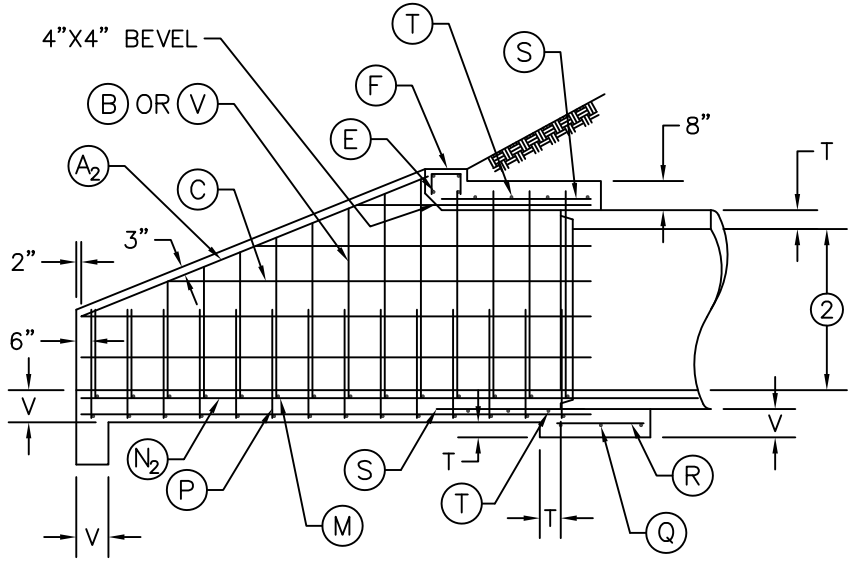
FRONT ELEVATION



SHORT WING SECTION



WING SECTION
66" TO 108" CIRCULAR PIPE



SECTION A–A

NOTES

① DIAMETER OF CIRCULAR PIPE OR SPAN OF NON–CIRCULAR PIPE.
② DIAMETER OF CIRCULAR PIPE OR RISE OF NON–CIRCULAR PIPE.
3. APPLIES TO 66" DIAMETER AND GREATER. (CIRCULAR PIPE)
4. SEE CURRENT STANDARD DRAWINGS RDH–200 AND 300 SERIES FOR DIMENSIONS, QUANTITIES, AND BILL OF REINFORCEMENT.
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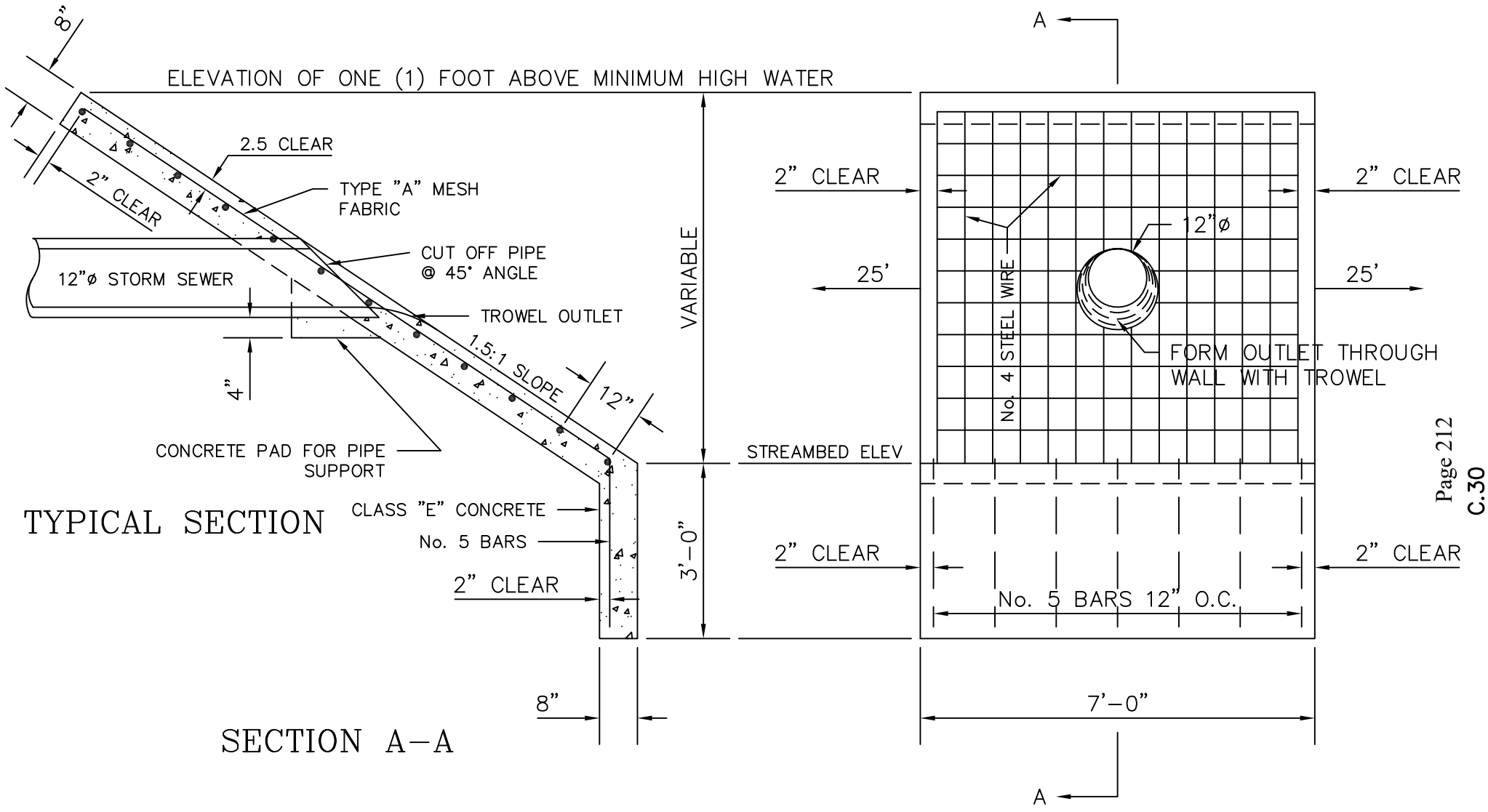
6. ENCIRCLED LETTERS, ◯, INDICATE STEEL BAR LOCATIONS.
7. BARS Ⓑ , Ⓒ , Ⓖ , Ⓟ , Ⓜ , Ⓥ ARE SPACED 1'–0" O.C. ALL OTHER BARS SHALL BE EVENLY SPACED.
8. BARS Ⓑ AND Ⓥ ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE TOP OF EACH WING.
9. BARS Ⓒ ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE TOP OF EACH WING.
10. HEADWALLS LOCATED AT EDGE OF SHOULDER SHALL BE PARALLEL TO CENTERLINE OF THE ROAD.
11. APRON BETWEEN WINGS SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE. FRONT FACE OF HEADWALL AND ENDS OF WINGS SHALL REMAIN VERTICAL.

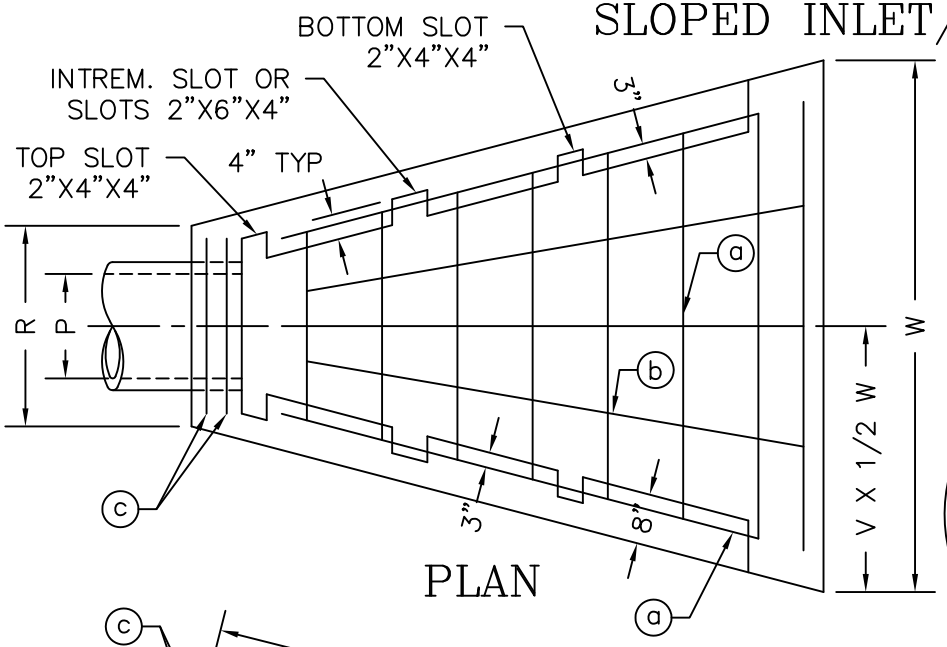
SLOPED HEADWALL



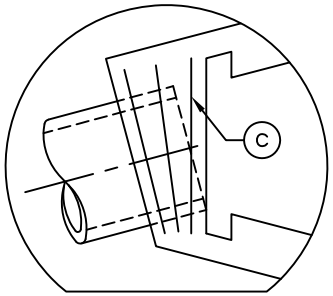
NOTE:

INCREASE WIDTH OF WALL SIX (6) INCHES FOR EACH THREE (3) INCH INCREASE IN DIAMETER OF OUTFALL PIPE.
ALL MESH FABRIC SHALL BE FURNISHED IN FLAT SHEETS.
EDGE TOOL ALL EXPOSED CONCRETE EDGES IN SLOPE WALLS.
GRADE BANK OF STREAM FROM THE HEADWALL SLOPE TO A WARPED SURFACE TO MEET THE EXISTING BANK SLOPE IN TWENTY-FIVE (25) FEET EACH WAY.

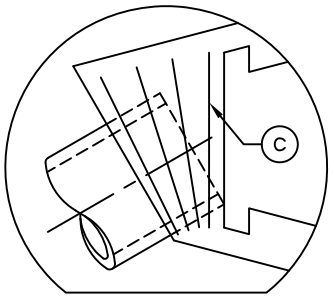
SLOPED INLET/OUTLET



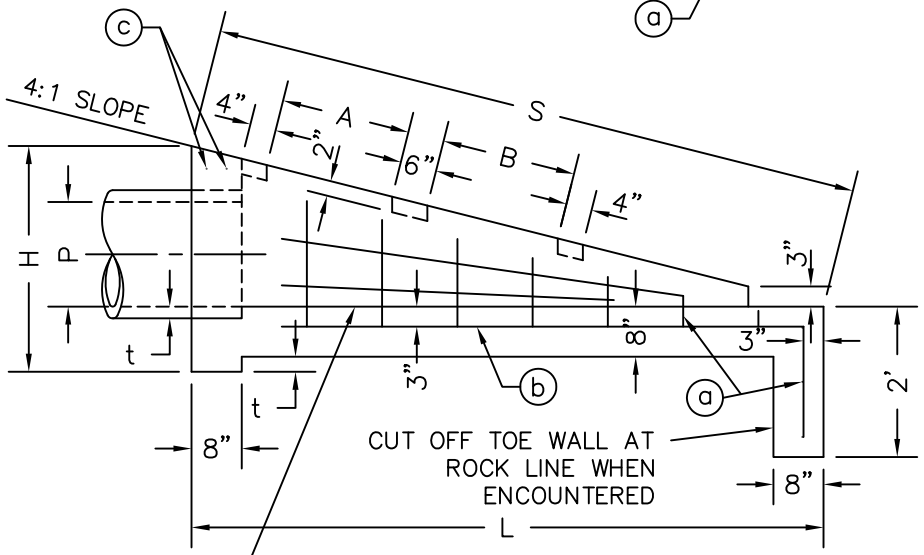
PLAN



15° SKEW

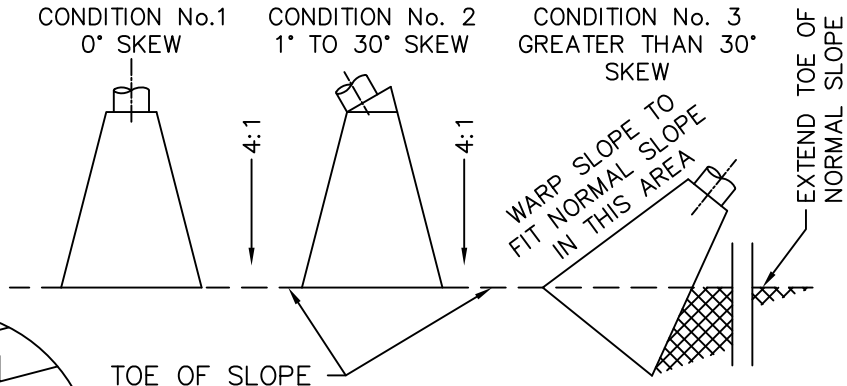


30° SKEW



ELEVATION

PLAN VIEW OF STRUCTURE LOCATIONS



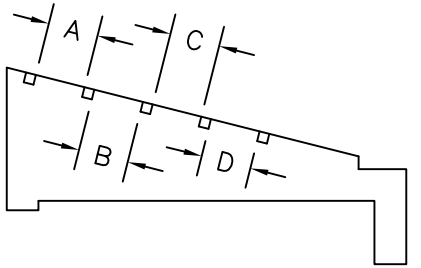
NOTES

THE MINIMUM REQUIREMENT FOR REINFORCING STEEL SHALL BE GRADE 40. FIELD BENDING WILL BE PERMITTED.

(1) ONE ADDITIONAL C BAR WILL BE REQUIRED FOR EACH 15° SKEW.

SEE CURRENT EDITION OF RDB–106.

DETAIL SHOWING LOCATION OF SLOTS FOR GRATES

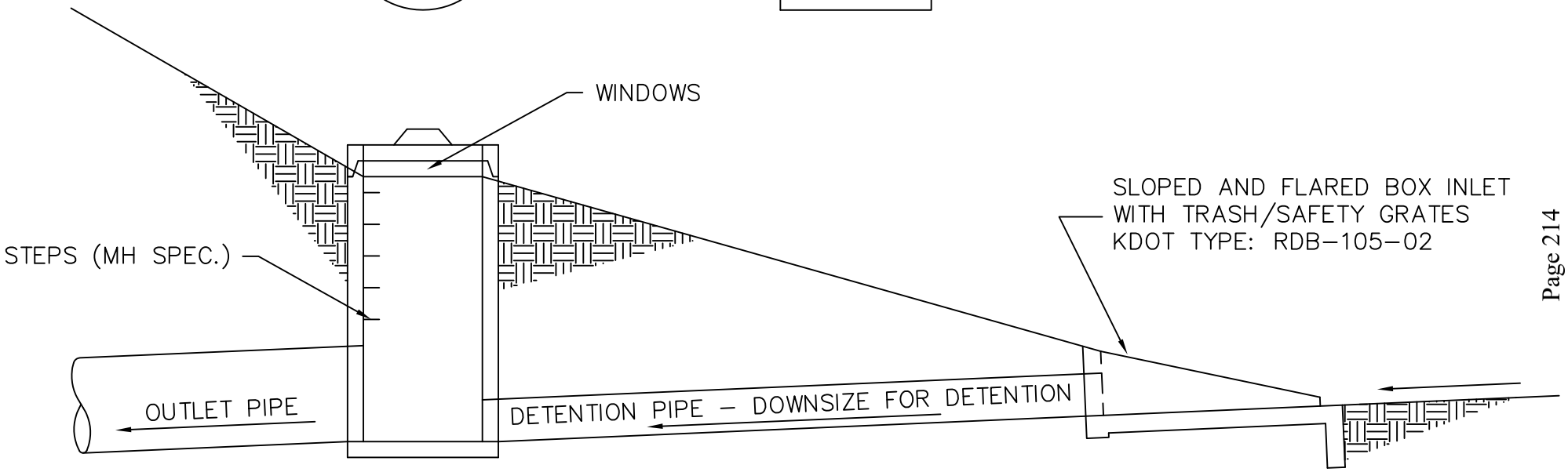


A,B FOR 2 GRATES
A,B,C FOR 3 GRATES
A,B,C,D FOR 4 GRATES

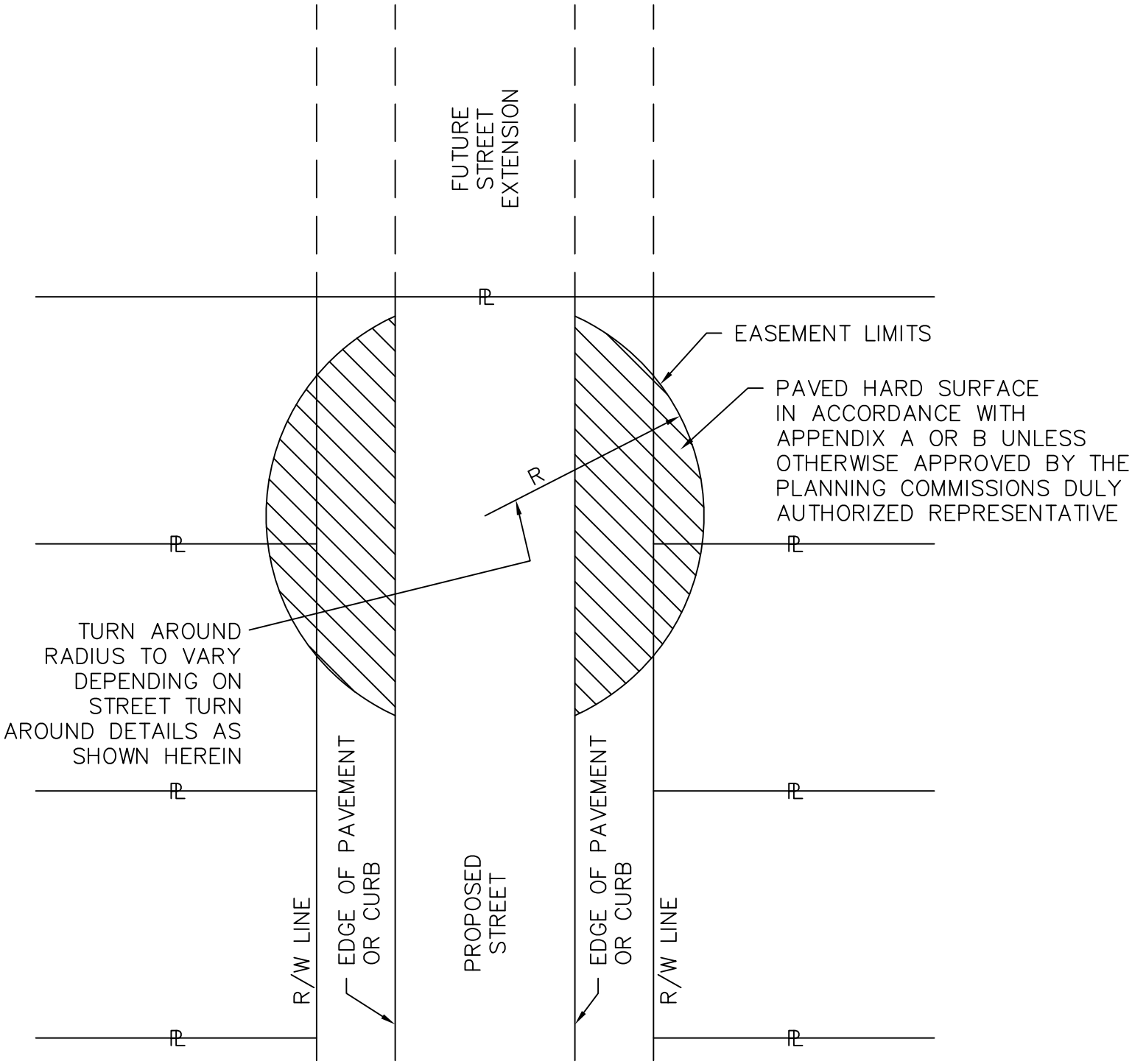
DIMENSIONS											No. OF GRATES REQ'D.		No. 4 REINFORCEMENT BARS NUMBER – LENGTH AND WEIGHT				CLASS A CONC.
P	H	L	S	R	V	W	A	B	C	D	2'	3'	ⓐ	ⓑ	① ⓒ	LBS.	CU. YD.
18"	3'–0"	8'–6"	8'–9.5"	2'–6.5"	3'–5"	6'–10"	1'–9"	1'–9"	–	–	2	–	14 @ 6'–0"	3 @ 8'–6"	2 @ 2'–3"	76	1.7
24"	3'–7"	10'–8"	11'–0"	3'–0.5"	4'–2.5"	8'–5"	2'–9"	2'–9"	–	–	–	2	16 @ 7'–6"	3 @ 10'–6"	2 @ 2'–9"	105	2.5
30"	4'–2"	12'–10"	13'–2.75"	3'–6.5"	5'–0"	10'–0	2'–9"	2'–9"	1'–9"	–	1	2	18 @ 9'–0"	3 @ 12'–9"	2 @ 3'–3"	137	3.6
36"	4'–9"	15'–0"	15'–5.5"	4'–0.5"	5'–9.5"	11'–7"	2'–9"	2'–9"	1'–9"	1'–9"	2	2	20 @ 10'–8"	3 @ 15'–0"	2 @ 3'–9"	177	4.8

DETENTION OVERFLOW BOX
4' X 4' CONC. BOX W/ SLAB TOP
OR 4' DIA. MANHOLE WITH SLAB TOP

BEEHIVE CASTING ON TOP SLAB
NEENAH FOUNDRY CO.
FRAME AND CASTING R-4346 OR
APPROVED EQUAL



SAMPLE
DETENTION OVERFLOW BOX WITH SLOPED AND FLARED BOX INLET AND TRASH/SAFETY GRATES



DETAIL OF TEMPORARY TURNAROUND FOR FUTURE STREET EXTENSION

APPENDIX B

STORM WATER FACILITY DESIGN AND CALCULATIONS

Storm Water Management, Drainage and Residential Lot Grading

Storm sewer systems are designed to collect and convey storm water runoff from street inlets, runoff control structures, and other locations where the accumulation of storm water is unsafe. No storm sewer shall be permitted to run into a sanitary sewer system within a proposed subdivision. In general, the cumulative amount of storm water runoff discharged from the boundary of the subdivision should be equal in terms of pre-development and post-development. Storm water runoff from a site or subdivision shall not adversely impact natural drainage from an uphill drainage basin or to a downhill drainage basin or adjacent properties. The property owner shall be responsible for storm water drainage facilities located on private property where runoff will be principally collected within that property and be minimally discharged over a larger area before the storm water naturally drains on adjacent properties. For isolated areas of the subdivision, where increased runoff may leave the boundary, downstream conditions must be considered to ensure that the increased runoff will not adversely impact existing drainage patterns.

The impact of development changes both the storm water quantity and quality over the watershed that drains to a stream, river, lake or reservoir and directly impacts the condition of that water body and downstream waters. To help minimize this adverse effect, runoff generated from the first 0.8 inches of rain shall pass through a water quality Best Management Practice (BMP).

The post-construction controls chosen shall be designed to minimize the impact of stormwater discharges on channel stability (hydromodification) and environmental integrity of local receiving streams. The design of post-construction controls shall attempt to maintain the natural flow regime such that erosive flows (volume and duration) more closely resemble pre-development hydrology, or be equally protective.

For technical guidance and information on the preparation of storm water site plans, the use of better site design techniques, hydrological techniques, selection and design of appropriate structural storm water control, and drainage (hydraulic) design, please refer to the *Storm Water Best Management Practices Manual* by Sanitation District No. 1 of Northern Kentucky.

All publicly maintained storm sewer systems shall be designed for peak flows calculated on the ten year (10 yr.) storm frequency. Overflows shall be designed on the one hundred year (100 yr.) storm frequency. No living area shall be affected by the one hundred year (100 yr.) storm. Safety swales shall be designed to carry all runoff away from any residential structure.

Basic Design Criteria for a Storm Drainage System

A) Degree of Protection Required- The storm drainage system shall be adequate to handle the runoff from storms having various frequencies of occurrence for various degrees of site development, in accord with the following general categories:

1.	Conservation, agricultural and low density residential (2 acre lots or larger)	10 year frequency
2.	All other residential and commercial	10 year frequency
3.	Industrial areas	10 year frequency
4.	For concentrated high value areas	10 year frequency
5.	For flood control facilities	100 year frequency

The runoff computed from these storm frequencies shall be from the area within the subdivision and all other areas draining thereto.

B) Determination of Quantity of Runoff for Design of Storm Water Collection System- Each portion of the storm water drainage collection system shall be capable of handling the peak flow of runoff. For drainage areas less than one hundred (100) acres, either the "Rational Method" or Soil Conservation Service (SCS) Method may be used. For areas greater than one hundred (100) acres, either the "Soil Conservation Service (SCS) Method" or the "Regional Method" of the Kentucky Transportation Cabinet, Bureau of Highways shall be used:

1. "Rational Method" where Q = CiA
   - Q = peak runoff quantity in cubic feet per second;
   - C = runoff coefficient varying with perviousness and other characteristics of the drainage area;
   - I = average intensity of precipitation in inches per hour, varying with frequency of storm occurrence, duration or concentration time, and area of the tributary watershed;
   - A = area in acres of the tributary watershed.

A. Runoff Coefficients: The runoff coefficient is the portion of the precipitation, expressed as a decimal, that will reach a given storm water facility. Each lot within a subdivision contributes runoff from the roof, driveway, sidewalk and street. Generally, the smaller the lot width, the less impervious area. As the lot increases in width so does the impervious area. Weighted coefficients shall be used with the impervious areas C = 0.95 and all other areas C = 0.40

Table 2 - Rational Method Runoff Coefficients for Composite Analysis

Land Use Description	**Average Percent Imperviousness**	**Runoff Coefficient (C)**
Natural and Undisturbed Areas	Varies	0.40
Single Family Residential Average Lot Size/Width	Varies (See Below for Value)	0.43 - 0.76 (See Below for Value)
3 acres/300 feet	6	0.43
2 acres/200 feet	7	0.44
1 acre/100 feet	12	0.47
½ acre/100 feet	23	0.53
12,500 sq. ft./80 feet	34	0.59
9,000 sq. ft./70 feet	42	0.63
7,500 sq. ft./60 feet	44	0.64
6,000 sq. ft./50 feet	48	0.66
<6,000 sq. ft./<50 feet	65	0.76

Industrial	72	0.80
Multi-Family Residential	75	0.81
Commercial/Office	85	0.87
Impervious Areas Including; Pavement, Roofs, Drives, Sidewalks, etc.	100	0.95

B. Intensity of Precipitation: The "point" values of average precipitation intensity in inches per hour, for Northern Kentucky can be determined from Exhibit No. 4-904 Kentucky Bureau of Highways "Rainfall Intensity-Duration-Frequency Curves." For any given storm duration (concentration time of runoff) the curves show the average precipitation intensity of storms having 2, 5, 10, 25, 50, and 100 year frequencies or the precipitation intensity can be calculated by using the following formula and constants developed by the Kentucky Transportation Cabinet:

$$I_{RI} = B/(Tc+D)^{E}$$

Return Interval (RI)	B	D	E
2	34.5848	6.9000	0.7899
5	54.0284	9.5000	0.8211
10	65.6903	10.6000	0.8262
25	87.9368	. 12.4000	0.8499
50	100.0737	13.0000	0.8553
100	114.6446	13.8000	0.8614

C. The time of concentration is the time associated with the travel of runoff from an outer point that best represents the shape of the contributing areas. Runoff from a drainage area usually reached a peak at the time when the entire area is contributing, in which case the time of concentration is the time for a drop of water to flow from the most remote point in the watershed to the point of interest. Runoff may reach a peak prior to the time the entire drainage area is contributing. Sound engineering judgement should be used to determine the time of concentration. The time of concentration to any point in a storm drainage system is a combination of the sheet flow (overland), the shallow concentrated flow and the

channel flow, which includes storm sewers. The minimum time of concentration for any area shall be 6 minutes.

The Soil Conservation Service TR-55 method for calculating the time of concentration shall be used.

At no time shall the Time of Concentration be greater than 30 minutes for design of storm inlets.

2. The Soil Conservation Service (SCS) Method may be used to calculate the peak discharge rates; develop runoff hydrographs for basins and subbasins; determine runoff volumes; and provide inflow information to determine the required storage volume for detention and retention basins. The SCS Method is the preferred method for performing hydrologic analysis. The SCS Method will utilize the formulas, constants and data in the current manual from the U.S. Natural Resources Conservation Service. The Soil Conservation Service utilizes a 24-hour storm duration, which is considered to be acceptable for Northern Kentucky. When the Soil Conservation Service methods are used, the Type II rainfall distribution shall be used.

   For detailed information, the user is referred to the following Soil Conservation Service publications:

   1. NEH-4: "Hydrology," Section 4, National Engineering Handbook;

   2. TR-20: Computer Program for Project Formulation, Hydrology;

   3. TR-55: Urban Hydrology for Small Watersheds;

   4. TP-149: A Method for Estimating Volume and Rate of Runoff in Small Watersheds.

3. The Regional Method of the Kentucky Transportation Cabinet, Bureau of Highways (Regional Method) may be used to calculate the peak discharge rates when required by regulatory agencies such as the Kentucky Division of Water. The Regional Method will utilize the formulas, constants and data from the current Manual of Instruction of Drainage and Design, Kentucky Transportation Cabinet, Bureau of Highways.

C) Storm Water System Facilities-

1. Flow times in sewers or conduits to the point of design may be determined from the hydraulic properties of the sewers upstream of that point, assuming average flow-full velocity at the proposed sewer slopes.

2. Pipe Capacities- Public storm sewer pipes shall be designed to carry peak flows as determined by the methods previously described. At the design storm the drainage system shall be designed as open channel (non-surcharged) flow. Sizes shall be determined by Manning's formula using a range of roughness coefficients (n=0.009-0.024). For roughness

coefficients see Street, Storm, and Sidewalk Specifications.

3. Minimum Pipe Size- The minimum diameter for public storm sewer pipe shall be fifteen inches (15") for inlet headwalls and twelve inches (12") for systems with a catchbasin at the initial point.

4. Minimum and Maximum Velocities- Velocities in public storm sewer pipes, when flowing full at average peak flows, shall not be less than two feet (2.0') per second and not greater than twenty five (25') per second.

5. Pipe Grades - The sewer pipe shall be laid on gradients so that the velocity (flowing full) shall be kept within the foregoing stated minimum and maximum unless other special provisions are made. Storm sewer pipe shall be laid on gradients so that the velocity (flowing full) shall be kept within the foregoing stated minimum and maximum, unless other special provisions are made. Sewers on twenty percent (20%) slopes or greater shall be anchored securely with concrete anchors or equal, spaced as follows:

   A. Not over thirty six feet (36') center to center on grades twenty percent(20%) and up to thirty five percent (35%);

   B. Not over twenty four feet (24') center to center on grades thirty five percent (35%) and up to fifty percent (50%); and

   C. Not over sixteen feet (16') center to center on grades fifty percent (50%) and over.

6. Hydraulic Grades- To ensure against surface ponding or street flooding due to surcharging, the hydraulic grade line (HGL) of the design storm in any pipe may not be higher than the top of pipe for the ten year (10 yr.) design storm; and one foot (1') below the inlet or manhole for the twenty five year (25 yr.) check storm.

   Design of all public storm sewer appurtenances shall consider the balance of energy plus the loss due to entrance in all structures having a critical change in horizontal or vertical alignment. In no case shall the difference in invert elevations be less than the result of equal crowns when a smaller pipe empties into a larger one. In no case shall storm sewer pipe sizes be reduced unless the upstream pipe is an approved underground detention structure.

7. Manholes (Junction Boxes)- Manholes shall be constructed in accord with Standard Construction Drawings as shown in the current city/county street specifications. Drop manholes may be required to reduce the slope of any sewer line. Pipes shall not extend more than two inches (2") into the side of the manhole, and the invert of the outlet pipe shall be at the bottom.

8. Inlets (Catch Basins)-
   Capacity: The capacity of the grate on the inlet should not be less than the quantity of flow tributary to the inlet. Inlets at low points or sags should have extra capacity as a safeguard

for street flooding from flows overtopping the street curb. A safety swale designed for the 100 year storm shall be placed at all low points or sags. Curb openings on combination inlets should be used for overflows in the event that the grate is clogged. Special inlets may be required for streets with steep gradients to provide the extra capacity such situations require. Pipes shall not extend more than two inches (2") into the side of the manhole, and the invert of the outlet pipe shall be at the bottom.

Type: Combination type inlets (single or double) shall be used and installed in accord with "Standard Construction Drawings" as shown in the current city/county street specifications. Any catch basin not placed on a lot line or within three feet of a driveway shall use a roll type grate as shown in the Street Specifications, and capacity calculations must be based on the type of inlet. Curb inlets and gutters shall accommodate the flow from a storm with an intensity of four (4) inches per hour.

Location: Inlet spacing shall be based upon gutter and inlet capacity, street slope and contributing drainage area. The spacing of inlets should ensure that street drainage generated along continuous grades or in sags will not damage and flood private properties or residential basements. For the design storm, no more than 5 cfs shall enter any grade inlet; no more than 8 cfs shall enter any sump inlet; and no more than 2.5 cfs is permitted to flow in side yards between houses.

A. Along continuous grades (less than 2 percent) - 400 feet maximum;

B. Along continuous grades (2 percent and over) - 600 feet maximum;

C. At sag locations (draining less than 2 percent grades) - 400 feet maximum between inlets or from a high point;

D. At sag locations (draining 2 percent and over grades) -600 feet maximum between inlets or from a high point.

Special consideration should be given to storm drainage entering cul-de-sacs. Additional inlets shall be required when drainage areas and/or street slopes are excessive. In addition to an inlet provided at the low point within the cul-de-sac two (2) additional inlets shall be required along each curb prior to the entrance of the cul-de-sac in accord with the following criteria:

A. For street slopes less than eight (8) percent and draining more than 400 feet of pavement; and

B. For all street slopes more than eight (8) percent and draining more than 300 feet of pavement.

9. Intersections - Storm water runoff crossing the intersection of a street shall be kept to a minimum.

10. Outfalls - When a storm sewer system outfalls into a flood plain of any major water course, the outfall must not be subject to frequent floods or backwaters. Standard headwalls and/or headwalls with wingwalls shall be constructed for all outfalls. To minimize adverse impacts on receiving channels one of the following conditions must be met: (1) the outlet velocity at a headwall or outfall of a paved channel shall be less than or equal to the natural velocity of the receiving channel or stream for the design storm but shall not be more than ten (10') feet per second; (2) structurally lined aprons or other acceptable flow spreading or energy dissipating devices shall be installed at the outlet to reduce the velocity; (3) the receiving channel shall be lined as per Article 3, Section 325 - Basic Design Criteria for Storm Water Drainage Channels, Water Courses, and Erosion Control, of these regulations for a sufficient distance to protect against erosion.

    When a storm sewer or paved channel outlets onto a slope without a defined drainage channel, either a channel shall be graded and properly protected down to its convergance with the natural channel, or the outlet flow shall be dispersed on the slope using acceptable flow spreading or energy dissipating devices. Storm sewers or paved channels that outlet at or near defined drainage channels, shall be designed to outlet at as near to parallel to the channel as practical.

    The outlet velocities of all headwalls shall be included in the drainage calculations. The invert of the first storm sewer appurtenance upstream of the outfall structure shall be above the elevation of the calculated one hundred (100) year flood plain. The calculated one hundred 100 year flood plain for all channels with a drainage area of more than fifty (50) acres within the project shall be shown on the Improvement Plan.

11. Culverts and Bridges - Culverts and bridges shall be designed in accordance with the methods given in the "Manual of Location and Design" published by the Kentucky Department of Highways; except that storm water quantities to be handled by the culverts and bridges shall be determined on the basis described in these standards. The allowable headwater (AHW) shall not be greater than $^{HW}/_{D} = 2.0$.

12. Headwalls - Standard headwalls for pipe sizes twelve (12) thru twenty-four (24) inch and headwalls including wingwalls and aprons for pipes larger than twenty-four (24) inch, shall be constructed at the outfall of all storm sewers in accord with "Standard Construction Drawings" as shown in the current city/county specifications. No grate shall be placed on any headwalls.

    Safety guards and railings: Safety guards and railings shall be provided along the top and sloped/winged sidewalls on all headwall inlet and outlet structures having a vertical drop of 4'-0" or greater. Such guards or railings shall be at least 42-inches in height measured vertically above the wall. Guards or railings shall not have an ornamental pattern that would provide a ladder effect. Vinyl coated chain link fencing is an acceptable guard type.

13. Other Drainage Improvement Measures - Other drainage improvement measures may be required to provide the necessary hydraulic characteristics required for adequate drainage. These other measures include stream bed clearing, removal or obstructions, stabilization

of banks or areas to eliminate erosion, widening, deepening or realignment of streams, construction of ponds behind dams, or other measures for adequate drainage.

14. Sub-Surface Springs - While constructing developments, sub-surface springs may be disturbed. In these cases, it is the responsibility of the developer to adequately address the removal of the water from the surface. This would include installing a pipe network to transfer water to a storm water structure or natural stream. Discharge of this type of water shall not be onto the lot directed toward the street, or on any part of the lot that will pond water. It is the responsibility of the builder/developer to correct any problems with sub-surface springs until a Certificate of Occupancy has been issued for the construction of a building on the affected lot.

15. Specifications for Construction and Materials, Storm Sewers follows:

1.1 The contractor shall furnish all material, equipment, tools, and labor necessary to do the work as shown on the contract drawings, and unload, haul and distribute all pipe, and accessories. The contractor shall excavate the trenches and pits to the required dimensions; sheet, brace, and support the adjoining ground or structures where necessary; handle all drainage or ground water; provide barricades, guards, and warning lights, lay the pipe; backfill and consolidate the trenches and pits; remove surplus excavated material; clean the site work, and maintain other surfaces over the trenches as specified.

ITEM 2.0 MATERIALS

2.1 Pipe

A. Reinforced Concrete Pipe (RCP AASTO M 170, ASTM C76 and AAASHTO M 198)
KYTC Type 1 installation
(1) 12"-18"; Class V Max. Cover 57+ feet
(2) 21"-24"; Class IV Max. Cover 36 feet
(3) 27" & Larger; Class III Max Cover 25 feet

B. Aluminized Type 2 Corrugated (2-2/3" X ½") Pipe (AASHTO M36 Type 1, AASHTO M274)
(1) 12" - 36" 16 Gauge
(2) 42" - 54" 14 Gauge
(3) 60" - 12 Gauge
(4) 66" - 72" 10 Gauge

C. Aluminized type 2 Spiral Rib (3/4" X 3/4" X 7- ½") Pipe (AASHTO M36 Type 1, AASHTO M274)
(1) 18" - 36" 16 Gauge
(2) 42" - 54" 14 Gauge
(3) 60" - 72" 12 Gauge

D. Aluminum Spiral Rib (3/4" X 3/4" X 7-1/2") Pipe (AASHTO M196 and M197)
(1) 18" 30" Gauge 14 Max. Cover 30 feet
(2) 36" - 48" Gauge 12 Max. Cover 30 feet
(3) 54" - 66" Gauge 10 Max. Cover 30 feet

E. Polyvinyl Chloride (PVC) Pipe

(1) Smooth Wall:

(a) Pipe/Fittings: ASTM D 3034; ASTM F679; AASHTO M 278
Material: ASTM D 1784
Joint: ASTM D 3212
Sizes 12" - 27" or other size available
Minimum Pipe Stiffness: 46 @ 5% deflection
Installation: ASTM D 2321.

(2) Ribbed:

(a) Pipe/Fittings: ASTM F794; ASTM F949; AASHTO M304
Material: ASTM D 1784
Joint: ASTM D 3212
Sizes: 12" - 48" or other size available
Minimum Pip Stiffness: 46 @ 5% deflection
Installation: ASTM D 2321
(b) Pipe/Fittings: AASHTO M 304
Material: ASTM D 1784
Joint: ASTM D 3212
Sizes: 18" - 48" or other size available
Installation: ASTM D 2321.

F. Polyethylene (HDPE) Pipe

(1) Corrugated:

(A) Pipe/Fittings: AASHTO M294 Type S
Material: ASTM D 3350
Joint: Minimum silt tight including: (a) thermally molded; (b) integral bell; or (c) bell and spigot with built-in gasket coupler assemblies only.
Sizes: 12" - 36" only
Minimum Pipe Stiffness: Variable @ 5% deflection
Installation: ASTM D 2321.

2.2 Bedding: Pipe bedding shall be clean natural or washed sand and gravel, crushed gravel or crushed stone, free from cementitious substances and flat or flaky particles in an amount to cause caking, packing, yielding or uneven support for the pipe. All material shall be of such sized that one-hundred percent (100%) passes the one and one half (1 1/2) inch screen, 40% or less passes the No. 40 sieve, and ten (10) percent or less passes the No. 200 sieve. Bedding material shall not consist of any organic soil or stone larger than 1 1/2-inch in any dimension.

2.3 Select Fill: Select fill shall be well graded sand and gravel, free from organic matter. Not more than 70 percent by weight shall pass through a No 40 sieve; not more than 10 percent by weight shall pass through a No. 200 sieve; and 100 percent shall pass through a 3-inch square sieve. See SD1 technical specification 02220 for further requirements of Select Fill.

2.4 General Backfill: General backfill shall be soil materials that are free of rock thicker than 6 inches or larger than 24 inches maximum in any dimension, debris, waste, frozen materials, vegetation and other organic matter and other deleterious materials. Previously excavated materials meeting these requirements may be used for backfill. All rock shall be excluded from fill within 24 inches of the pipe. If the excavated trench material does not meet these

requirements, this material shall be wasted and suitable imported material shall be used for backfill.

ITEM 3.0 CONSTRUCTION

3.1 No pipe shall be laid until the location has been staked by the engineer.

3.2 A trench shall be excavated and shall be equal to the outside width of the pipe plus 3/10 of the outside width of the pipe on each side or 12 inches on each side, whichever is greater. The wall of the trench shall be as nearly vertical as possible In case unstable foundation is encountered at the established grade, the unstable material shall be removed and replaced with a suitable material to a width and depth and in a manner that will provide a uniform and firm foundation. Storm sewers shall not be less than the diameter specified in Article 3 of the Subdivision Regulations. Manholes or junction boxes may be precast concrete or masonry. Boxes shall be sized to provide the space of a standard precast manhole and on concrete footing slab 6 inches thick and walls shall not be less than 6 inches thick.

3.3 In all operations such as placing the pipe, jointing, bedding, and backfilling, care shall be exercised and in shall be the contractor's responsibility to see that the pipes are not damaged during the unloading or placement on the bed, or during compaction of the backfill. Any pipe culvert which is not in true alignment and grade or which shows undue settlement after laying or is otherwise damaged, shall be taken up and replaced .

3.4 Storm sewer clean-outs shall be provided at a maximum of 500 foot intervals for pipes which have less than a thirty (30) inch diameter, and at a maximum of 600 foot intervals for pipes having a larger diameter. Clean-outs may be catch basins, junction boxes or headwalls.

3.5 Curb drainage inlets and/or catch basins shall be provided at intervals along roadways. Maximum intervals shall meet the existing Design Standards in the current Subdivision Regulations.

ITEM 4.0 BACKFILL AND COMPACTION

4.1 Backfill Placement: Backfill shall be placed in horizontal loose lifts not exceeding 8-12 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness.

4.2 Compaction requirements are as follows:

A. Select Fill and Pipe Bedding: For fill and bedding beneath structures and foundations, compact granular materials that exhibit a well-defined moisture density curve to at least 98 percent of the standard proctor maximum dry density (ASTM D698). For all other fill and bedding, compact granular materials that exhibit a well-defined moisture-density curve to at least 95 percent (ASTM D698). Moisture-condition fill materials to within a range of two (2) percent below to three (3) percent above optimum moisture content (ASTM D698). Compact granular materials that do not exhibit a well-defined moisture-density curve to at least 85 percent relative density (ASTM D4253 and D4254) beneath structures and foundations, and to at least

75 percent relative density (ASTM D4253 and D4254) for all other areas.

B. General Backfill: Compact materials that exhibit a well-defined moisture density curve to at least 98 percent of the standard proctor maximum dry density (ASTM D698) beneath structures, foundations and the top one (1) foot below pavements, and at least 95 percent (ASTM D698) in all other areas. Moisture-condition fill materials to within a range of two (2) percent below to three (3) percent above optimum moisture content (ASTM D698). Compact granular or rock materials that do not exhibit a well-defined moisture-density curve to at least 85 percent relative density (ASTM D4253 and D4254) beneath structures and foundations, and to at least 75 percent relative density (ASTM D4253 and D4254) for all other areas.

(1) After the pipe sections have been embedded up to a point 12-inches or more above the top of the pipe, the pipe sections have been encased in concrete, or the structures or appurtenances have been constructed, as specified on the drawings, in non-ROW areas, the remainder of the trench or excavated area shall be back-filled using trench or structure excavated material if it meets the requirements as previously described. If the material does not meet these requirements, the trench or structure excavated material shall be wasted and suitable imported material shall be used for backfill.

(2) Backfill shall be placed in horizontal loose lifts not exceeding 8-12 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Backfill shall then be compacted as previously described to existing ground level or finished grade level if same has been established.

4.3 All trenches within the Public Right of Way shall be, backfilled with controlled low strength material (CLSM)(flowable fill).

4.4 Copies of all testing reports shall be submitted to the appropriate accepting agency.

CATCH BASINS, HEADWALLS & JUNCTION BOX

1.0 SCOPE OF WORK

1.1 The contractor shall furnish all materials, equipment and labor necessary to construct or install all drainage structures as shown on the attached detailed drawings.

2.0 MATERIALS

2.1 Concrete shall comply with the Street Paving Specifications. Precast or cast in place structures shall be a minimum of five (5) days old, prior to paving operation.

Basic Design Criteria for Storm Water Drainage Channels, Water Courses, and Erosion Control

Open channels provide many advantages in the management and control of storm water runoff. Such channels provide for natural infiltration of storm water into ground water supply and extend the Time of Concentration (T_c) helping to maintain the runoff rate nearer to that which existed prior to development. The objective of open channel flow design is: (a) to determine a channel slope and size that will have sufficient capacity to prevent undue flooding damage during the anticipated peak runoff period; and (b) to determine the degree of protection based on stream velocity to prevent erosion in the drainage channel. Existing drainage channels, which will remain undisturbed, shall not be required to be reconstructed unless additional capacity and erosion control is required.

A) Degree of Protection - Storm water drainage channels and water courses shall be adequate to handle runoff from storms of the frequencies of occurrence shown for the degrees of site development as follows:

1. For all subdivisions and developments twenty five year (25 yr.) frequency.

2. For main flood control channels - one hundred year (100 yr.) frequency. The runoff computed from these storms shall be that from the area within the subdivision and from all other areas considered as fully developed in accord with development planned in the City's Comprehensive Plan.

B) Determination of Quantity of Runoff - Each portion of the storm water system of drainage channels and water courses shall be capable of handling the peak flows as determined by the proper method previously described in Section 1.

C) Drainage Channel -Capacities- Drainage channels shall be designed to carry peak flows as determined by the methods previously described. Channel cross-section areas shall be determined by Manning's formula, using a value of n from the following chart.

Drainage Channel Manning's n Values	
Concrete	0.013
Earth (non-vegetated)	0.022
Rip-Rap	0.035
Rock Cuts	0.035
Grass-mowed short	0.05
Grass-tall stand	0.10
Natural Channel:	
-Clean and Straight	0.030
-Stones and Some Weeds*	0.035
-Gravel and Rock	0.040
-Weedy and Winding	0.06
-Dense Weeds & Brush	0.10

*this is typical for a natural intermittent stream

When open drainage channels require various lining types to attain ultimate design capacity, the earth sections of the drainage channel and its structure shall be designed and constructed to the ultimate design required. The design engineer shall provide swale sizing calculations for any proposed swale that drains more than one (1) acre of area. The Planning Commission's engineer may require sizing calculations for swales draining less than one (1) acre of area, where said swale may have an adverse impact on the development or downstream properties.

D) Erosion Control for Drainage Channels - Runoff flows in open channels may cause accelerated erosion. Such erosion can be controlled by limiting velocities, changing the channel lining, and reshaping the channel to spread the flow of runoff. Methods of controlling erosion in open channels include the following:

1. Sown grass covers, seeded degradable turf reinforcing mats;
2. sod
3. permanent turf reinforcing mats;
4. aggregate channel lining (minimum KDOT Type II channel lining, underlain with filter fabric)
5. aggregate filled gabion baskets or mattresses (underlain with filter fabric);
6. interlocking concrete blocks or cabled mattress (underlain with filter fabric;
7. reinforced concrete or precast paving (of at least 4" thickness);
8. energy dissipators.

Any placement of erosion control materials in a channel could require a permit from the Kentucky Division of Water (KDOW) and the US Army Corps of Engineers.

*Alternate methods of channel erosion control will be considered on an individual case basis. Note that the methods above are generally listed (and numbered) in order of increasing erosion protection ability. The design requirements below indicate the minimum level of protection. Any method listed above with a higher erosion protection ability than the minimums stated below will be acceptable.

1. Design velocity should generally be greater than 1.5fps to avoid excessive deposition of sediments. When flattened slopes are unavoidable, method (7) should be used to accelerate runoff.

2. Design velocity between one and one-half (1.5) and five (5) feet per second: Method (1) shall be used. The bottom and sides of the earth channel shall be seeded, mulched and fertilized to an elevation of three (3) feet above the design water surface, or three (3) feet beyond the top of the channel bank. Seeding shall be a perennial or annual mixture of grass seeds applied at a rate of 75 pounds per acre. Acceptable whole fertilizer shall be applied at a rate of 75 pounds per one thousand square feet. Where seeding is required and the soil is not capable of supporting vegetation (such as sandy soil or clay types), appropriate action shall be taken to bring the soil to an acceptable condition which will support the growth of seed. A degradable turf reinforcing mat is recommended to help stabilize the soil until the grass has become fully established.

3. Design velocity between one and one-half (1.5) and five (5) feet per second: Method (2) or (3) shall be used. The bottom and sides of the earth channel shall be sodded and pegged to remain in place, or a permanent turf reinforcing mat shall be installed and seeded. Where seeding or sodding is required and the soil is not capable of supporting vegetation (such as sandy soil or clay types), appropriate action shall be taken to bring the soil to an acceptable condition which will support the growth of seed or sod.

4. Design velocity between nine (9) and fourteen (14) feet per second: Method (3) or (4) shall be used.

5. Design velocity between fourteen (14) and twenty (20) feet per second: Method (4) or (5) shall be used.

6. Design velocity greater than twenty (20) feet per second: Method (5) or greater shall be used.

A method greater than the required minimum may also be necessary at bends, changes in alignment, junctions with other ditches, and at other locations where erosion is more likely to occur. Design velocity at the downstream end of a protected channel shall be equal to or less than the natural velocity in the receiving channel. Energy dissipation may be necessary to reduce the velocity prior to reintroduction into a receiving channel.

E) Drainage Channel or Water Course Relocations- In order to minimize hillside slippage near relocated drainage channels or water courses due to drainage channel depth or character of the earth in the drainage channel fill and side slopes, precautions shall be taken to compact the fill and side slopes, provision of under drainage, bank protection or reinforcing or other measures. Additional easement width shall be provided at such possible slide areas.

F) Erosion Control - All subdivision developments shall have a Best Management Practices (BMP) document prepared and submitted with the Improvement Plan. This document shall meet the minimum requirements as stated in the current "Kentucky Best Management Practices For Construction Activities" prepared by The Kentucky Division of Water (KDOW). A copy shall be on site at all times. Permit applications with the KDOW and US Army Corps of Engineers shall be submitted with the Improvement Plan. All graded areas are to be maintained at all times to prevent erosion and excessive runoff. Several methods used to prevent soil erosion during development are included in the current city/county street specifications. Drainage swales, silt checks, temporary sedimentation basins, rock check dams, etc., are to be used and maintained during the grading operation. All collected sedimentation shall be removed from the detention site. All slopes and graded areas are to be seeded after the grading of that area has been completed.

Additional erosion control measures to prevent erosion and excessive runoff may be required if necessary.

G) Mud and Debris - Until all lot and street improvements in the subdivision have been completed, the subdivider shall take such measures as are necessary to prevent erosion of graded surfaces, and to prevent the deposit of soil and debris from graded surfaces onto public streets, into drainage channels or sewers, or onto adjoining land. All public streets shall be kept clear of mud and debris per local ordinances.

H) Specifications for Construction and Materials - In all other respects, the design, materials, and construction shall be as specified in Sections 206, 212, 601, 610, 703, 710 of the current State of Kentucky Standard Specifications for Road and Bridge Construction and in accord with "Standard Construction Drawings" shown in the current city/county street specifications.

I) Equipment on Streets - Any equipment on any existing pavements shall be per local ordinances.

Basic Design Criteria for Stormwater Runoff Control Facilities

These regulations affect all subdivision and developments:

A) General- In order to minimize runoff damage to downstream properties, sediment pollution of public and private waters and hydraulic overloading of existing drainage facilities, the storm water runoff from a subdivision after development shall not exceed the pre-

development discharge from that subdivision calculated by using a undeveloped runoff coefficient c= 0.40. Detention shall be provided for all subdivisions and developments. The detention facility may be designed for each individual lot in commercial or industrial zones, but regional basins are encouraged to be provided throughout the subdivision or development. All basins within residential zones must be regional. Such facilities shall be designed so that no standing water will remain in detention basins during dry weather, or the design of retention ponds that will not allow standing water to stagnate and present health hazards. In certain cases, other non-basin detention/retention techniques such as underground vault storage and ponding water on parking lots may be utilized when approved by the commission. Individual site storm water management shall be reviewed under the current Highland Heights Zoning Regulations. The amount of water to be detained shall be determined by the method described in the following paragraphs using the design criteria as referenced in Table 1 and Figures 3, 4, and 5.

Storm Water Control Facility Volume Calculations
Estimated Runoff by:

An accepted method that generates an inflow/outflow hydrograph such as the Soil Conservation Service (SCS) method or Modified Rational Method (MRM) as detailed in the Street and Storm Drainage Specifications. It is recommended that these methods are used through a computer program. All documentation shall be submitted for review by the Planning Commission's Engineer.

B) Pre-Development - Calculations - Calculate the subdivision or development site runoff based on a 2, 10, 25 and 50 year storm frequency. The entire acreage contributing to the runoff, shall be included in the calculations.

C) Post-Development Runoff Calculations - Calculate the proposed ultimate development runoff based on a 2, 10, 25, 50 and 100 year storm frequency curve. The entire acreage contributing to the runoff shall be included in the calculations.

D) Storage Requirement - The amount of detention/retention required for a subdivision or development shall be the amount determined from the inflow/outflow hydrograph as previously outlined based on the fifty year (50 yr.) storm frequency. If the Modified Rational Method is used, the storm duration used shall be the one that produces the maximum storage.

E) Discharge from Detention Basin - The discharge from the detention/retention basin shall be controlled by a multi-stage release outlet structure and not be greater than a pre-developed runoff rate based on a 2, 10, 25 and 50 year storm frequency at that particular point where the discharge occurs. Alternative methods using water quality volume design may be used upon approval. The routing of an emergency spillway shall be shown based on the one hundred year (100 yr.) storm frequency. Trash racks may be required to be installed on the low flow outlet in detention basins to prevent clogging.

Detention Basins/Retention Ponds - Standards and Specifications

A) Definition and Scope- These standards apply to permanent and temporary storm water runoff, sediment and debris basins formed by an embankment, or excavation. These standards are limited to the installation of basins on sites where:

1. Failure of the structure will not result in loss of life, damage to homes, or interruption of use or service of public utilities.

2. Drainage area does not exceed two hundred acres (200).

3. The water surface at the crest of the emergency spillway does not exceed five (5) acres.

4. All detention basins that shall be designed and built with side-slopes no greater than 3:1 (three feet horizontal per one foot vertical), and proper outlet structures to insure no standing water during dry periods.

5. All retention ponds shall have dams that conform to the current Design Criteria For Dams and Associated Structures, Kentucky Division of Water. In cases when the top of the dam is also a publicly dedicated street right-of-way, the developer shall have a geotechnical report prepared with recommendation on the design and construction of the dam.

NOTES:

a. All computations to be prepared by a Kentucky Licensed Professional Engineer.

b. All detention areas and methods to be approved by the engineer for the city or county. In the event the city or county does not have an engineer, the approval will be by the engineer for the Planning Commission.

c. Fencing may be required when the location of the detention area is not easily observed or in the opinion of the inspector a safety problem would exist.

d. All sedimentation must be removed from all detention basins/ retention ponds prior to acceptance by proper legislative body.

Residential Lot Grading and Drainage

A) Lot Grading - Lot grading shall be accomplished as follows: Within the limits of the public right-of-way adjacent to street pavements, all final grading for grass strip, sidewalk, and yards to the building structure, shall comply with minimum and maximum grades in accord with typical sections for streets as shown in the current city/county street specifications. For lots that drain toward the street, the areas between the right-of-way line and the curb shall

be graded so that water drains to the street at a minimum grade of 1 inch per foot (approximately 8 percent) except where sidewalks are required (see Typical Sections). All grading behind the street shall be done in a fashion that does not allow ponding of water adjacent to the paved street. For lots that drain away from the street, the area between the right-of-way line and the curb shall be graded so that water drains away from the street at a minimum grade of ½ inch per foot (approximately 4 percent) except where sidewalks are required (see Typical Sections). Grading and surface drainage at the building shall conform to the current edition of the Kentucky Residential Code. Lot areas outside of the limits of the building structure shall be graded per the detail in the current Highland Heights Street, Storm, and Sidewalk Specifications.

Building Elevation: All Zoning Permit applications shall be consistent with the subdivision Improvement Plan in relation to the lot grading. The Zoning Permit application requires the difference in elevations between the street curb at the center of the driveway and the basement floor, first floor, and lowest opening (if applicable.) The difference in the elevations shall be consistent with the elevations of the grading on the Improvement Plan.

Temporary Driveway: All residential lots shall have a single point access and a temporary driveway of crushed stone with fabric placed in the location of the permanent driveway. The temporary driveway shall be constructed after completion of foundation. It shall be a minimum of three inches (3") in depth with a separation fabric and a minimum of ten feet (10') in width. All construction traffic to the site must utilize the temporary driveway and shall not drive on any other portion of the lot without prior approval of the city/county inspector.

Slope for Permanent Driveway: Driveways shall not exceed fifteen (15) percent slope within the front yard area unless approved by the Zoning Administrator. Relief from this requirement shall be granted only when a steeper grade is unavoidable due to on-site conditions and will not have a detrimental impact on the subject lot or adjoining lots.

Top Soil: If grading results in the stripping of top soil, top soil shall be uniformly spread over the lots as grading is finished. Temporary silt barriers should be installed around stock-piled top soil for erosion and sediment control.

Trees: As many trees as can be reasonably utilized in the final development plan shall be retained and the grading adjusted to the existing grade of the trees where practicable.

B) Swales - Swales carry surface runoff from roofs, yards, and other areas to the rear of lots or along common property lines to streets or other drainage areas to prevent ponding of water near building structures or other portions of the lot. Surface drainage swales shall have a minimum grade of two (2) percent and shall be constructed so that the surface water will drain onto a street, storm inlet, or natural drainage area. Swales for handling lot drainage shall be constructed as a part of final lot grading and be seeded and mulched or sodded as soon as possible to prevent erosion.

C) Roof and Subsurface Drains - Roof downspouts, footing or foundation drains shall be discharged onto the same parcel of land from which the water is generated. Roof downspouts shall terminate onto a splash block or if a private, on-site sidewalk is blocking the flow, within two feet (2') of the lower edge of the walk. All subsurface drains including sump pumps shall outlet toward the rear of the lot unless infeasible based on site conditions, and the water from such drains shall be dispersed on the subject lot. No subsurface drain shall outlet nearer than ten feet (10') to a property line and twenty feet (20') to the right-of-way line. If a collection system was approved, then sump pump drains may be connected to the system.

D) Buffer Zone - To help protect natural channels and streams within a development, there shall be Buffer zones placed over these areas. These Buffer Zones shall coincide with the Buffer Zones as defined in the Kentucky Division of Water Permit KYR10. A copy of the application for this permit with the SWPPP shall be submitted to the Planning Commission. Upon approval of the application, a copy of the approval shall also be submitted. The location of these zones shall be shown on the Improvement Plan. The location of the zone shall be field staked prior to any clearing or grading in the vicinity of the zone.

Maintenance of Retention/Detention Areas

In all developments the owner of each lot and/or the developer shall be responsible for properly maintaining each retention/ detention areas in order for such facility to function according its design and purpose. Maintenance for the detention/retention areas shall be noted on the Improvement Plan, including access roads. For all basins, only the appropriate easements around inlets structures and outlet structures, and a retention easement over the area of the fifty year (50 yr.) storm event shall be dedicated to the appropriate legislative body or utility. The area of the pond or lake shall be owned and maintained by the adjoining residents or Home Owners Association (HOA). This shall include maintaining the shoreline and removing sedimentation, and shall be included in the Subdivision's Restricted Covenants

Storm Water Quality BMP Sizing Requirements

In accordance with the Kentucky Pollutant Discharge Elimination System (KPDES) permit for Small Municipal Separate Storm Sewer Systems (Phase II MS4 General Permit: SD1 KPDES No. KYG200007, for new development and redevelopment projects, runoff generated from the first 0.8" of rainfall must pass through a water quality BMP. This runoff treatment standard is based on the 80th percentile precipitation event.

These BMP sizing standards are volume-based standards and are appropriate for sizing BMPs that provide their primary treatment function by storing the water quality design volume (Vwq). As such, volume-based BMPs are designed to treat a volume of runoff, which is detained for a certain period of time to allow for settling of solids and associated pollutants, as well as any biochemical treatment processes that may be provided for dissolved pollutants such as adsorption, precipitation, biodegradation, and plant uptake. Example volume-based BMPs include extended detention basins, retention basins, media bed filters, and rain gardens.

Flow based sizing standards are needed for structural BMPs that have minimal storage where their performance is related more to the peak flow rate that they are designed to treat rather than the storage capacity. As such, flow-based BMPs treat water on a continuous flow basis. Examples of flowbased BMPs include vegetated swales, filter strips, and many proprietary hydrodynamic treatment devices. These types of BMPs are more appropriately sized using a water quality design flow rate (Qwq).

While the distinction between volume-based and flow-based controls is not always clear, especially in a sequence of BMPs or BMPs that include multiple storage and flow-through treatment components, this manual differentiates these BMP types for the purposes of providing simple sizing guidelines for each type of control. Continuous hydrologic simulation modeling may be used to demonstrate an equivalent level of treatment in lieu of the simple sizing methods presented below.

Simple Sizing Method for Volume Based Controls

The water quality design volume used for sizing volume-based treatment BMPs may be computed using the Simple Method (Schueler, 1987). This method uses a volumetric runoff coefficient:

$$Rv = 0.009 \times \%IMP + 0.05 \quad (3\text{-}1)$$

Where:

Rv = the volumetric runoff coefficient (unit-less)

%IMP = the percent imperviousness of the drainage area (%)

Using the design storm volume summarized above, the water quality design volume may be computed using a modified form of the rational formula:

$$Vwg = 3630 \times Rv \times P \times A \quad (3\text{-}2)$$

Where:

Vwq = the water quality design volume (ft3)

Rv = the mean volumetric runoff coefficient, a unit-less value that is a function of the imperviousness of the drainage area (see Equation 3-1 above).

P = the rainfall depth of the storm (in) [For SD1: use 0.8 for new development in the separate system, 0.4 for redevelopment in the separate system, or use 0.8 for new development and redevelopment in the combined system; for City of Florence use 0.8 for both new development and redevelopment]

A = the BMP drainage area (acres)

The water quality design volume should be used to initially size the BMP using the design criteria provided in the individual BMP fact sheets. Additional storage capacity must be provided if the BMP is designed to attenuate peak flows.

Note about Drawdown Time

Drawdown time is the time required to drain a volume-based BMP that has reached its design capacity, usually expressed in hours. Drawdown time is important because it is the time required to fully replenish the storage capacity, which affects the capture efficiency of the next storm, and is a surrogate for residence time, which affects treatment. Estimates for design drawdown time vary, and ideally would be determined based on site-specific information on the size, shape, and density or settling velocity of suspended particulates in the runoff. This information is generally not available and estimates of appropriate ranges for settling time have relied on settling column test information reported in literature.

An important source of drawdown time information is settling column tests conducted by Grizzard et. al. (1986) as part of the Nationwide Urban Runoff Program (NURP). Grizzard found that settling times of 48 hours resulted in removals of 80% to 90% of total suspended solids (TSS). Rapid initial removal was also observed in storm water samples with medium (100 to 215 mg/L) and high (721 mg/L) initial TSS concentrations. For example, at settling times of 24 hours, the 80% to 90% removals were already achieved in samples with medium and high initial TSS, whereas only 50% to 60% removal was achieved in those with low initial TSS.

Given the data provided above, a drawdown time of 36 to 48 hours is recommended for sizing outlet structures for volume-based BMPs that depend on settling as the primary treatment. For volume-based BMPs, such as bioretention and media filters, which depend on filtration as the primary treatment mechanism, the drawdown time for the entire system (ponded water plus the filtration media pore water) should be less than 48 hours (i.e., there is no minimum drawdown time for volume-based BMPs that include filtration as the primary treatment mechanism). The upper limit of the drawdown time is consistent with the recommendation of various vector control agencies that structures be designed to drain in less than 72 hours to minimize mosquito breeding opportunities.

Simple Sizing Method for Flow-Based Controls

The water quality design flow rate for a flow-based BMP may be selected such that it treats an equivalent proportion of the long-term runoff volume as a volume-based BMP would. In order to use this approach, continuous runoff modeling techniques must be performed. A spreadsheet can be used to statistically analyze the long time series of runoff predicted by the continuous model for a project site to determine the flow rate associated with treating the volume of runoff determined using the volumetric sizing criteria discussed above.

An alternative simple approach is to select a design storm intensity and use the rational formula to compute the design flow rate. The design storm intensity may be based on the 80th percentile rainfall intensity. However, if hourly rainfall data are used to compute this value, the design intensity will be an under-prediction of the 80th percentile computed from shorter duration intensities. For example, during a one hour period peak rainfall, intensities may only occur for a few minutes and these peaks would be smoothed by the hourly averaging period. Therefore, a conservative

approach for selecting a design storm intensity is to use twice the 80th percentile rainfall intensity from hourly historical rainfall data.

The 80th percentile hourly rainfall intensity measured at the Cincinnati-Northern Kentucky Airport is approximately 0.08 in/hr (Strecker and Rathfelder, 2008). Therefore, doubling this intensity gives a 0.16 in/hr design storm intensity, which can be converted to a design flow rate using the rational formula:

Qwg = Rv x i x A

Where:

Qwq = the water quality design flow rate (cfs)

Rv = the mean volumetric runoff coefficient, a unit-less value that is a function of the imperviousness of the drainage area

i = rainfall intensity (in/hr) [use 0.16 in/hr]

A = the BMP drainage area (acres)

Note that 1 acre-in/hr = 1.0083 cfs; this conversion factor can be used with Equation 3- 3, but is not necessary as the uncertainty for the other parameters is generally well above 0.8%.