SPECIFICATIONS FOR CONSTRUCTION

In general, unless specifically set forth herein, the work, materials, and methods of measurement and payment shall conform to the applicable divisions and paragraphs (as noted on the Bid Proposal or in the plans) of the most current edition of the:

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS, FRANKFORT

Standard Specifications
for
Road and Bridge Construction

SPECIAL PROVISIONS

ITEMS 105.07 / 107.15 - COOPERATION WITH UTILITIES

All portions of Item 105.07 and Item 107.15 of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction shall apply.

At least two (2) working days prior to commencing construction operations in an area which may involve underground utility facilities as shown on the plans, the Contractor shall notify the Engineer, the registered utility protection service, and the owners of each underground utility facility not members of the registered utility protection service.

The existing underground utilities are shown as accurately as possible on the plans, based on information available. The Owner and/or the Engineer do not assume any liability for location of these underground utility service lines. Any utility services damaged that were previously marked in the field shall be replaced at the Contractor's expense.

Where the plans provide for conduit to be connected to, or to cross either over or under, or close to an existing underground structure, it shall be the responsibility of the Contractor to locate the existing structure, both as to line and grade, before he starts to lay the proposed conduit, in order to assure compatibility with line and grade of the proposed conduit. Payment for all operations described above shall be included in the unit price bid for the pertinent conduit item.

The Contractor shall adjust or arrange with utility company to adjust to proposed grade all existing utility facilities, i.e., manholes, catch basins, valves, boxes, etc., prior to the commencement of paving operations. This shall include utility facilities not shown on the plans, which may be found to be located within the pavement area. Work performed on the utility facilities shall be in strict accordance with the specifications of the applicable utility company and shall be performed under the direction, supervision, and inspection of said company.

COORDINATION WITH UTILITIES

Coordination of work schedules with affected utilities will be required. Upon the contract award, the coordination of all necessary relocations or adjustment of all utility facilities become the responsibility of the Contractor.

ITEM 105.06 - COOPERATION BETWEEN CONTRACTORS

The Contractor shall coordinate his work with other Contractors within or adjacent to the project limits. All improvements completed under this contract shall meet the line and grade of other work in an acceptable manner.

ITEM 106 - CONTROL OF MATERIAL

Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of proper quality and sufficient for the purpose contemplated. The Contractor shall furnish, if so required, satisfactory evidence as to type and quality of materials and workmanship.

All items of equipment and/or material proposed by the Contractor for substitutions must be approved by the Engineer in writing and shall be equal or superior to the items specified in the contract documents. If said substitution proposed by the Contractor for a specified item requires engineering revisions, the total expense of said revisions shall be paid by the Contractor.

Any items of labor and materials required, but not shown as a separate pay item in the proposal, shall be furnished and installed as incidental to the contract, except as noted in the plans and specifications.

ITEM 106.08 - STORAGE OF MATERIALS

The Contractor shall obtain prior approval in writing from the Owner for the locations to be used for the temporary storage of construction materials, tools, and/or machinery. All such materials, tools, and machinery shall be neatly and compactly piled in such a manner as to cause the least inconvenience to the property owners and to traffic. Under no circumstances shall existing drainage courses be blocked or water hydrants, valves, or meter pits covered. All materials, tools, machinery, etc., stored upon public thoroughfares must be provided with warning lights and reflective sheeting at nighttime and weekends to alert traffic of such obstructions.

ITEM 108.02 - PRECONSTRUCTION CONFERENCE

Prior to the commencement of construction activities, the Engineer will arrange a meeting between the Contractor, the representatives of the Owner, and the representatives of each of the utility companies. The time, date, and location of said meeting will be determined after the awarding of the contract, and the parties will be notified by the Engineer.

The agenda for the preconstruction meeting shall include the following items:

1. Announcement of Award
2. Utility Company Requirements
3. Designation of Emergency 24-hour Contractor Contacts
4. Discussion of Critical Plan Items
5. Review of Testing and Inspection Procedures
6. Operations Schedule
7. Listing of Haul Roads
8. Identification of Subcontractors
9. Review of Change Order Process

10. Payment Request Submittal Procedure

The Contractor shall coordinate all work with the Engineer. A detailed schedule of operations shall be furnished by the Contractor to the Engineer at the preconstruction meeting and shall list the order of operations and the time frame for the completion of each item of work. The schedule of operations shall be approved by the Engineer and the Owner in writing prior to the beginning of the work. Changes to said schedule are to be issued in writing and approved by the Engineer and the Owner before operations are changed or rescheduled. No payment will be made to the Contractor while he is delinquent in the submission of a progress schedule.

The Contractor shall supply to the Engineer at the preconstruction meeting, a list of the local roads to be used for the purpose of hauling equipment and/or material to or from the job site. Only the local roads in the vicinity of the project have to be listed; state and/or federal roads do not have to be included. Where necessary, the list shall include the extent of the roads to be affected and any special restrictions, such as height or weight restrictions, which may be applicable along said roads. Construction shall not commence until the Engineer and/or Owner has reviewed the haul road list and approved the haul roads in writing.

The submission of the list to and the review and approval of the list by the Engineer do not relieve the Contractor of the responsibility for the conforming to and the obeying of all applicable height and weight restrictions on the haul roads and of the responsibility for any damage done to and/or along said haul roads. The Contractor is referred to Item 105.10 concerning load restrictions.

ITEM 107.04 - PERMITS, LICENSES AND TAXES

The Contractor shall insure that all required notices are given and all permits acquired before the commencement of work. The Engineer will discuss any special permits required for this project at the preconstruction meeting.

ITEM 107.14 - CONTRACTOR'S RESPONSIBILITY FOR WORK

It shall be the responsibility of the Contractor to perform his work in such a manner as not to damage or destroy any existing feature (i.e., existing inlets, conduits, etc.), which is not marked for replacement or removal. The Contractor shall exercise due care during construction so as not to destroy any trees, plants, shrubs or structures not specifically marked for removal or relocation within the work limits. In some instances, the Contractor will be required to excavate under and around the existing utilities. Extreme care should be used not to damage the utility during this operation. The Contractor shall schedule his operations so that the improved areas have had sufficient time to cure, set and/or harden before the area is opened to traffic or use. The Contractor shall be responsible for the immediate repair of the improved area if any damage is done by traffic. The Contractor shall also be responsible for the immediate rectification of problems created in areas outside of the improved areas which are attributable to the failure of the improved area, i.e., the tracking of materials into unimproved areas.

The Contractor shall be responsible for the protection of areas outside of the designated work limits, but which may be adjacent to those work limits. This will include those areas used by construction traffic for access to and from the work areas. Where the Engineer and/or the Owner determine that the Contractor's operations have been responsible for damage to areas outside of the work limits, the Contractor shall be responsible for the repair of the area subject to the approval of the Engineer. No additional compensation will be due to the Contractor for any such repairs as described above.

ITEM 202 – CLEARING AND GRUBBING:

Clear grub, remove and dispose of all vegetation, building and foundations not removed by others, and debris within designated limits inside the right-of-way and easement areas. Do not remove objects designated to remain or to be removed according to other provisions of the Contract. Also, protect from injury or defacement all vegetation and objects designated to remain. All planters and plant materials other than grass and trees marked for removal shall be salvaged and set aside in a location conveniently accessed by the property owner. During final restoration it shall be the Contractor's responsibility to replace the planters and plant materials to match the existing locations and dimensions. This item shall also include all labor, equipment and personnel to remove, salvage and reinstall all signs, mailboxes and fences as per the plan and to remove all trees as indicated on the plans. Portions of the fence that are damaged during work operations, or are in a condition such that they cannot be reused, shall be replaced with new, like material at no additional cost to the Owner. Whenever work is not taking place, all fence areas that have been removed shall be provided with temporary fencing to close off the opening until such time as the fence can be replaced with permanent materials. All work shall be in accordance with Kentucky Transportation Cabinet Standard Specifications Section 202. Payment shall be one lump sum.

ITEMS 202 / 203 REMOVALS

When a bid item is to include the cost of removal of a classified or unclassified material, it shall be the responsibility of the Contractor to verify in the field the type of material and the thickness of the material to be removed prior to submitting his bid. No additional allowance will be due the Contractor for added expense of removals due to unknown materials or thickness.

ITEMS 202 / 203 - DEBRIS REMOVAL

The Contractor will be responsible for removal of all construction debris from the site. All debris shall be disposed of in a proper manner and shall be as directed by all applicable local, state, or federal regulations.

ITEM 204 – EXCAVATION FOR GRANULAR BASE

This item shall apply to Ridgemont Avenue.

This item shall include removal and disposal of unclassified material between the bottom of existing pavement and proposed subgrade within existing pavement areas and between existing surface grade and proposed subgrade outside of existing pavement areas. Surface grading outside of the proposed curb (per cross sections) shall be incidental to this item. Payment shall be made per square yard measured between the proposed back of curbs.

ITEM 204 – EXCAVATION

This item shall apply to Helen Ruth Drive

This item shall include removal and disposal of unclassified material between the bottom of existing pavement and proposed subgrade within existing pavement areas and between existing surface grade and proposed surface grade outside of existing pavement areas. Payment shall be made per cubic yard of material removed from the project area including areas outside of the pavement.

ITEM 205 – EMBANKMENT

This item shall apply to Helen Ruth Drive

Where the proposed pavement subgrade is higher than the existing subgrade it will be necessary to bring in fill material to match grades. This item shall include providing, hauling, placing and compacting of suitable fill material bottom of existing pavement and proposed subgrade within existing pavement areas and between existing surface grade and proposed surface grade outside of existing pavement areas. Payment shall be made per cubic yard of material placed in the project area including areas outside of the pavement.

ITEM SPL - YARD RESTORATION (4" TOPSOIL, SEED & MULCH)

The Contractor shall provide all labor, materials, tools, and equipment required to grade, fertilize, seed, and mulch in good, workmanlike manner the areas where shown on the plans or where directed by the Engineer and as specified herein.

A. Materials

1. Topsoil – Topsoil shall be per ASTM D5268 with a pH range of 5.5 to 7. Topsoil shall not contain more than 40% clay in that portion passing a No.10 sieve, shall contain not less than 5% or more than 20% organic matter as determined by loss on ignition of samples oven dried to constant weight at 212 degrees Fahrenheit, and shall be free of rock and other foreign material greater than 1 inch in any dimension and other

extraneous materials harmful to plant growth.

2. Fertilizer –

   a. Fertilizer shall be lawn or turf grade 12-12-12

   b. Agricultural ground limestone when used shall have a minimum total neutralizing power of 90 and at least 40 percent passing a No. 100 sieve, and at least 95% passing a No. 8 sieve.

3. Seed – All areas to be seeded shall be seeded with the following mixture:

   By:

Weight	Name of Grass	Purity	Germination
40%	Fine Lawn Turf-Type Fescue	95%	90%
40%	Creeping Red Fescue (Festuca rubra)	95%	90%
20%	Annual Ryegrass (Lolium multiflorm)	95%	90%

   Weed seed content not over 0.25 percent and free of noxious weeds.

4. Mulch – Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats or barley.

5. Asphalt Emulsion – ASTM D977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

B. Installation

1. Preparation of Seed Bed

   a. Topsoil - If suitable topsoil is available as part of the excavated material it shall be removed, stored and used to backfill the top 4 inches of the excavation. If sufficient material is not available on site it shall be imported on site at no additional cost to the Owner. All grass, weeds, roots, sticks, stones, and other debris are to be removed and the topsoil carefully brought to the finish grade by **hand raking.** The topsoil shall be sufficiently compacted, by tracking in the material, to prevent significant settlement. Promptly and thoroughly remove topsoil and other materials dropped on pavement surfaces before being compacted by traffic. Before any fertilizer or seed is placed the topsoil shall be inspected and approved by the Engineer.

2. Fertilizing - Fertilizing shall be uniformly applied to all areas to be seeded at the rate of 1 pound per 100 square. The fertilizer shall be thoroughly disked, harrowed or raked into the soil to a depth of not less than 2 inches. Immediately before sowing the seed, the Contractor shall rework the surface until it is a fine, pulverized, smooth seed bed, varying not more than 1 inch in 10 feet. A second application of fertilizer shall be applied at the same rate once the grass has been established or within 6 weeks of seeding.

3. Seeding - Immediately after the preparation and fertilization of the seed bed the Engineer shall inspect and approve the site prior to seeding. The seed shall be thoroughly mixed and then evenly sown over the prepared areas at the rate of 3 to 4 pounds per 1000 square feet. Seed shall be sown dry or hydraulically. After sowing, the area shall be raked, dragged, or otherwise treated to cover the seed to a depth of approximately 1/4 inch.

4. Mulching - Within 24 hours after any given area is seeded, mulching material shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre, when seeding is performed between the dates of March 15 and October 15, and at the approximate rate of 3 tons per acre when seeding is performed between the dates of October 15 and March 15 of the succeeding year. Mulching material shall be removed once a good turf has been established.

    a. Emulsion - Mulching materials shall be kept in place with asphalt emulsion applied at a minimum rate of 10 to 13 gallons per 1000 square feet of mulch or by methods as approved or may be otherwise required to prevent displacement of material. Mulching which is displaced shall be replaced at once but only after the seeding or other work which preceded the mulching and which work was damaged as a result of displacement of mulching material has been acceptably repaired.

5. Maintenance – Contractor shall water, mow, weed and otherwise maintain all seeded areas as necessary to secure a good turf. Settled areas shall be filled, graded, and re-seeded. Seeded areas shall be free of weeds and other debris. The Contractor shall be responsible for the condition of the seeded areas for a period of 1 year from the date of Final Acceptance. A satisfactory lawn shall consist of a healthy uniform, close stand of grass, free of weeds, rocks and surface irregularities, with coverage exceeding 95% over any 10 square feet, and bare spots not exceeding 2 by 2 inches.

ITEM 212 / 213 - EROSION CONTROL AND WATER POLLUTION CONTROL

The Contractor shall take extreme care to prevent unnecessary erosion, water pollution and siltation at all points of the project. Temporary seeding and mulching, Dandy Curb Bags, straw bales, slope drains, etc., shall be used as necessary or as directed by the Engineer. The cost of all temporary erosion control measures shall be included in the lump sum bid item.

FULL-DEPTH PAVEMENT SAWING

All existing pavement to be widened and/or removed shall be sawed full depth at the limits of removal, using a diamond saw blade to provide a uniform edge and prevent damage to pavement that is to remain in place. The cost of the sawing shall be incidental to the contract.

ITEM 214 – WOVEN GEOTEXTILE

Payment for Woven Geotextile will be made at the contract unit price per square yard for all materials, equipment and labor to complete the work per Kentucky Standard Specification for Road and Bridge Construction Section 214 to furnish and install Mirafi 600X or approved equal, to the manufacturer's specifications and these plans and specifications. **The Contractor shall supply the City with the specifications prior to beginning work. The measurement area is based on the area between the edge of the underdrains. No additional payment will be made for required overlaps.**

ITEM 302 / SPL –CRUSHED STONE BASE FOR SUBGRADE REPAIR

A contingency amount of Item 302/SPL –Crushed Stone Base has been included for repair of soft and yielding, unsuitable subgrade material and should be used only when directed by the engineer. The cost of all labor, equipment, and material necessary to excavate and dispose of unsuitable material, place and compact the aggregate as per plan shall be included in the unit price bid for item 302/SPL – Crushed Stone Base for Subgrade Repair.

ITEM SPL – GEOGRID REINFORCEMENT FOR SUBGRADE REPAIR

A contingency amount of Item SPL – Geogrid Reinforcement for Subgrade Repair has been included for repair of soft, yielding and unsuitable subgrade material and should be used only when directed by the Engineer. The cost of all labor, equipment, and materials necessary to place the geogrid (Tensar BX 1200 or equivalent) as per plan shall be included in the Unit price bid for Item SPL – Geogrid Reinforcement for Subgrade Repair.

ITEM 505 - SIDEWALK AND/OR DRIVEWAY APRON FINISH

The finish applied to the Portland Cement concrete surface used as a sidewalk or driveway apron shall be a broom finish. All joints and outside edges of the pavement shall be tooled with an edger or joint tool after brooming the final finish. Final finish, joints, and edges shall be subject to the approval of the Engineer.

It is the Contractor's responsibility to protect the new surface until it cures.

ITEM SPL - CONCRETE WALK REPLACEMENT

The unit price bid for Item SPL shall include all labor, material, and equipment necessary for the removal of existing sidewalk, grading and placement of the new concrete walk. The walk shall be four (4) inches in thickness, except in walk areas through the driveway aprons and curb ramps, where the thickness shall be increased to six (6) inches.

Preformed expansion joint material, 3/4-inch thick, shall be placed at maximum 40 feet spacing and / or adjacent to all existing remaining walk or structures.

Curb ramp construction shall conform to National ADA Standards. Curb ramp standard dimensions will be adjusted as required by the Engineer in the field to provide adequate access for handicapped persons in the vicinity of poles or other fixed objects behind the curb. Curb ramps in new concrete walks will be measured as the number of each complete and shall include the cost of any additional materials, grading, forming and finishing not included in the concrete walk item (separate), which is measured through the curb ramp area.

It is the Contractor's responsibility to protect the new surface until it cures.

All sidewalks shall be constructed in accordance with the Kenton County Subdivision regulations.

Cost shall include any additional fill or excavation necessary to bring the sidewalk to grade, including areas outside of the sidewalk.

ITEM SPL - CONCRETE DRIVEWAY REPLACEMENT

The unit price bid for Item SPL shall include all labor, material, and equipment necessary for the removal and disposal of the existing concrete or asphalt driveway, excavation to proposed subgrade, subgrade compaction and the placement of the new concrete driveway.

In the event the driveway has settled, a stone fill leveling course shall be added to bring the driveway back to the grade of the existing sidewalk or curb, and shall be incidental to the driveway replacement item.

The finish applied to the concrete driveways shall be a light broom finish. All joints and outside edges of the pavement shall be tooled with an edger or joint tool after brooming or hand finishing of the final finish.

The Contractor must notify the affected residents in writing at least 48-hours prior to closing driveways. If the residents and businesses have not been notified 48-hours in advance of the anticipated drive closure, the contractor will be prohibited from making these closures until such time as the proper advance notification is made.

The maximum time period for driveway closure shall be ninety-six (96) hours. The contractor shall place new driveways twenty-four (24) hours after removal.

The contractor shall keep driveways closed for a seventy-two (72) hour period after concrete placement to permit the curing of concrete curbs and driveways.

No concrete removal may take place on a Thursday or Friday unless the contractor will pour concrete on a Saturday.

It is the Contractor's responsibility to protect the new concrete surface until it cures.
All existing driveway aprons shall be removed and replaced with concrete, unless noted otherwise.

The areas indicated on the plans may not be the final replacement areas and are subject to adjustments in the field by the Engineer.

Driveways shall be constructed in accordance with the Kenton County Subdivision regulations.

UTILITY ADJUSTMENTS

Utility adjustments including water meter/valve, catch basin, gas valves & gas meters, and telephone or cable manholes shall be incidental to the project. Adjustment to grade of storm and sanitary structures shall be paid on a per each basis per SD1 requirements.

ITEM 601 - CONCRETE - GENERAL

All concrete for roadway paving, curbs, sidewalks, drive aprons, and steps shall be in accordance with the Kenton County Subdivision Regulations with the following exceptions:

Concrete Roadway Pavement:

- Expansion for joint filler material shall consist of a flexible foam material such as Ceramar by W.R. Meadows or approved equal.
- Pavement lugs may be omitted.
- Contractor may substitute No. 57 crushed limestone for No. 4 crushed limestone.

ITEM 701 – GRADING AT INLETS AND OUTFALLS OF PROPOSED CONDUITS

The cost of the necessary reconstruction and/or regrading of swales or disturbed areas at the inlets and outfalls of all proposed conduits shall be included in the price bid for the pertinent conduit and inlet items.

EXISTING PIPE

The location, size, type and depth of all existing pipes are shown as nearly exact as available information will permit. The Engineer will not be responsible for any variations found during construction.

Where the plans provide for conduit to be connected to, or to cross either over or under, or close to an existing underground structure, it shall be the responsibility of the Contractor to locate the existing structure, both as to line and grade, before he starts to lay the proposed conduit, in order to assure compatibility of line and grade of the proposed conduit.

Payment for all operation described above shall be included in the unit price bid for the pertinent conduit item.

ITEM 701 - REVIEW OF DRAINAGE FACILITIES

Before any work is started on the project and again before final acceptance by the Owner, the Contractor, with the Engineer, shall make an inspection of the existing sewers within the work limits, which are to remain in service and which may be affected by the work. The condition of the existing conduits and their appurtenances shall be determined from field observations. Written records of the inspection and/or photographic documentation shall be kept by the Engineer.

All existing sewers inspected initially by the above-mentioned parties shall be maintained and left in a condition reasonably comparable to that determined by the original inspection. Any change in the condition resulting from the Contractor's operations shall be corrected by the Contractor to the satisfaction of the Engineer. All existing and/or new conduits, inlets, catch basins, and manholes constructed and/or cleaned as a part of the project shall be free of all foreign matter and in a clean condition before the project will be accepted by the Owner. Payment for all operations described above shall be included in the unit prices bid for the pertinent item.

ITEM SPL - TRENCH FOR SEWER CONSTRUCTION

Per Sanitation District No. 1 Specifications Section 02630.

Trench excavation for sewer construction shall be adequately maintained and protected with barricades at all times.

Placement of proposed sewer pipe and backfill material shall follow as closely as possible behind excavation operations. The length of sewer trench, which is open at any one time, shall be held to a minimum and shall, at all times, be subject to the approval of the Engineer.

ITEM SPL - STORM SEWER PIPE MATERIAL

As per Sanitation District No. 1 Specifications Section 02630.

ITEM SPL – CONDUIT, DRAINAGE AND UTILITY ITEMS

Unless otherwise specified on the plans, the unit price bid for the pertinent conduit, drainage and/or utility item shall include the cost of all necessary appurtenances, connections, fittings, plugs, tees, collars, etc.

Unless otherwise noted on the plans, the unit price for the pertinent conduit, drainage and/or utility item is to include the costs involved in the excavation of the trench in unclassified material, the

supplying and placing of the required bedding material and the backfilling of the trench with the specified material to the appropriate subgrade elevations.

Any additional fill required due to the relocation of storm sewer shall be included in the storm sewer unit price. All backfill in pavement areas shall consist of flowable fill.

ITEM 701 - PIPE CUT-OFFS

When bell-and-spigot pipe is used, any necessary pipe cut-offs shall be made at the spigot end of the length of pipe adjacent to the end length. When tongue-and-groove pipe is used, the length of pipe next to the end length shall be cut and a butt joint formed with a collar.

ITEM SPL - PIPE BEDDING AND BACKFILL

Pipe Bedding

As per Sanitation District No. 1 Specifications Section 02220.

Low-Strength Mortar Backfill Material

As per Sanitation District No. 1 Specifications Section 02220.

Excavation Material for Compacted Backfill

As per Sanitation District No. 1 Specifications Section 02220.

ITEM 701 REMOVAL OF WATER

The Contractor shall keep all excavations free from water while the excavation for or the construction of conduits is in progress; shall build all dams, bulkheads, underdrains, sumps, and other work necessary for this purpose; and shall provide and keep the excavation dry and free from water at all times.

The Contractor shall provide for the disposal of all water removed from the excavations in such manner as to prevent injury to the public, the public health, public or private property, or to any portion of the work completed or in progress, or the surface of the streets, and to prevent any inconvenience to the public. No ground and/or surface water shall be diverted into existing sanitary sewers.

No conduits shall be laid or built in water, and waste shall not be allowed to flow over to rise upon any concrete, brick masonry or conduit until the work has been observed and has set for at least twenty-four (24) hours.

The flow of water in all existing sewers, drains, gutters, or watercourses encountered during the construction period shall be adequately maintained by the Contractor at his expense.

ITEM 704 - UNDER DRAIN

Payment for Item 704 - Under Drain will be made at the contract unit price per linear foot for all materials, equipment and labor to complete the work per Kentucky Standard Specifications for Road and Bridge Construction Section 704 and these plans and specifications.

Payment shall include 4" rigid perforated PVC pipe, Non-Woven Geotextile (Mirafi 140N or Approved Equal), No. 57 Stone backfill and trench as shown and noted on the provided plans/details. Payment shall also include any connections/taps to drainage structures.

ITEM 704 - UNDER DRAIN OUTLET

Payment for Item 704 - Under Drain Outlet will be made at the contract unit price per linear foot for all materials, equipment and labor to complete the work per Kentucky Standard Specifications for Road and Bridge Construction Section 704 and these plans and specifications.

Payment shall include excavation, 4" solid PVC pipe, bedding and backfill. Payment shall also include any connections/taps to the underdrain system. Yard Restoration will be paid as a separate bid item.

ITEM 610 / 710 - CONDUIT END TREATMENT

Immediately after placement of any conduits, the Contractor shall construct the end treatments required by the plans at both the outlet and inlet ends. This shall include headwalls, concrete riprap, rock channel protection, sodding, etc. The cost of the necessary reconstruction and/or regrading of swales or disturbed areas at the inlets and outfalls of all proposed conduits shall be included in the price bid for the pertinent conduit and inlet items.

ITEM SPL - STORM SEWER, MANHOLES, INLETS, CATCH BASINS AND HEADWALLS

Storm sewer manholes, inlets and catch basins shall be constructed as per the details on the construction drawings and conforming to the requirements of SD1 Specifications Section 02630. All castings for manholes, catch basins and inlets shall conform to those specified in the standard construction drawings. Grated inlet tops shall be placed as specified on the plans. Tops of casting elevations are subject to final adjustments as approved by the Engineer. All castings used shall be subject to the final approval of the Engineer. Payment for these items shall include connection to proposed or existing storm sewer conduit.

Any additional backfill required due to the removal of an existing storm structure and relocation of the proposed storm structure shall be incidental to the manhole, inlet or catch basin. All backfill in pavement areas shall consist of flowable fill.

SHORING AND TRENCH BOX

Trenches and excavations for appurtenances shall be adequately shored and braced or a trench box utilized whenever the trenches and excavations cannot be opened up to a sufficient width to maintain natural soil stability and sloped per current OSHA regulations. All shoring shall meet safety codes in effect at the time of the work; and, if none are in effect, they shall meet the requirements of Employers Mutual, Factory Mutual, Associated General Contractors safety manuals or OSHA guidelines.

The Contractor is fully responsible at all times for the safety of their excavators and total compliance with OSHA regulations.

Shoring and sheeting, when used, that does not extend below the top of the sewer pipes may be removed at the Contractor's option after the trench backfill has been placed and compacted to a point one foot above the top of the pipes. Following removal of the shoring and sheeting, the space left shall be filled immediately with backfill material and compacted.
Shoring and sheeting that extends below the top of the sewer pipes shall be left in place below a point one foot above the top of the pipes and not be disturbed. The Contractor may remove the portion of shoring and sheeting above this point at his option.

When shoring and sheeting is not removed, the portion to a point two feet (2′) below finished grade shall be removed. Bracing shall not be removed until after the trench backfill has been placed and compacted to a point one foot (1′) above the top of the sewer pipes.

ITEM SPL - SHEETING AND SHORING

The Contractor shall furnish, put in place, and maintain such piling, sheeting, bracing, etc., as is required by the State of Kentucky. The Contractor shall furnish, put in place, and maintain and remove such sheeting, shoring, planking and bracing as may be required to support the sides of the excavations and to prevent any movement which could in any way injure the work, human life, or adjacent structures and property, obstruct surface drainage channels or waterways, or otherwise injure or delay the work. If required at any time by the Engineer, the Contractor shall furnish and install such additional sheeting, shoring and bracing as may be necessary to protect the work, but compliance with such orders or failure on the part of the Engineer to give such orders shall in no case release the Contractor from liability for any damages or injuries caused by weak or insufficient sheeting, shoring and bracing, nor from his responsibility to protect the work or adjacent property.

Except when ordered left in place, all wood sheeting above the top of the pipe, steel sheet piling, braces, shorer, walers or stringers, shall not be withdrawn until the backfill is practically complete. As the backfill progresses to the elevation of a set of walers and braces, such bracing shall be removed. All sheeting and bracing specified, shown on the plans, or directed by the Engineer to be left in place shall not be removed. All sheeting left in place shall be cut off at least two (2) feet below final finish grade. During the removal of sheeting, care must be taken to prevent movement of the sides of the excavation. All voids left by the withdrawal of sheeting shall immediately be

carefully refilled by ramming with tools adapted to the purpose, pneumatic or other approved type, or by flushing sand into the voids.

Whenever the Engineer, in writing, orders any type sheeting, shoring, bracing or foundation material left in place, or when so shown on the plans or specified, the Contractor will be paid for the actual amount so left in place at prices stipulated for the applicable items. Sheeting, shoring and bracing left in place by the Contractor for his own convenience will not be paid for under any item.

CONTROL OF WORK

Construction work shall take place between the hours of 7:00 A.M. to 7:00 P.M., Monday through Saturday.

Driveways and driveway aprons removed shall be formed and poured within 24 hours.

Driveways and driveway aprons may be removed on Thursday, but must be formed and poured on Friday.

Driveways and driveway aprons may not be removed on Friday.

"OR APPROVED EQUAL" ITEMS

In the preparation of these documents and plans, several proprietary products may have been specified. In all such cases, it is to be understood that the Contractor may offer a substitute for the specified product, as indicated by the words "Or Approved Equal." However, the Contractor must be aware that, before commencement of construction, he must provide information to the Engineer concerning the substituted product, and that the Engineer must approve in writing the offered product as being equal to the specified product before use or incorporation into the work.

Unless otherwise modified by the Engineer, proprietary products are to be installed and/or constructed in strict compliance with the pertinent Manufacturer's specifications.

PAYMENT

No adjustments to unit prices shall be due to the Owner or the Contractor for increases or decreases in the Engineer's approximate unit quantities shown in the proposal resulting from changes in the amount of work performed.

THE OWNER RESERVES THE RIGHT TO AWARD OR DELETE ANY OR ALL COMBINATIONS.

ELECTRIC UTILITY NOTES

DUKE ENERGY

1. **DANGER** - Contractor shall contact the company prior to excavation in vicinity of electric underground facilities (approximate plan location shown) or when working near overhead electric facilities.

   (A) For Field Inspector to locate underground electric line, in Ohio call "Ohio Utilities Protection Service" at 1-800-362-2764, and in Kentucky call "Kentucky Underground Protection Service (KUPS)" at 1-800-752-6007 (at least 48 hours in advance), excluding hours Sat., Sun., and State Legal Holidays.

   (B) For notification of construction activity near energized electric facilities, call Mr. Bob Schroeder, 287-3426.

   (C) For additional underground electric record information, call 287-2454.

   (D) For electric engineering notification, agreements and correspondence, address to Mr. James Dugan, Central Accounting Marketing Section, Duke Energy, P. O. Box 960, Cincinnati, Ohio 45202-0960.

2. Contractor shall be responsible for all damages to electric facilities during construction.

3. Electric facilities to be kept in service at all times.

4. Contractor shall be responsible for supporting existing electric facilities affected by the proposed construction.

   A. Where high pressure oil filled pipe type cable installations are exposed or otherwise interfered with by the Contractor, protection by the Contractor will be required against damage to the coating or surrounding thermal sand envelope.

   B. Where concrete encased conduit systems or direct buried cable systems are exposed or otherwise interfered with, the Contractor shall protect the system as necessary against damage. As soon as feasible, the Contractor shall take additional appropriate steps to provide permanent measures to restore support. The methods used shall be based on conditions to be determined by the utility.

   C. Where poles or anchors that support overhead electric facilities are exposed or otherwise interfered with, the contractor shall protect them from damage and provide temporary support to insure the integrity of the system. As soon as feasible, the Contractor shall take additional appropriate steps to provide permanent measures to restore support. The methods used shall be based on conditions to be determined by the utility.

   D. Where the depth of excavation for the proposed work is greater than five (5) feet, the Contractor shall sheet and shore the trench to continuously maintain the support of electric facilities at locations where the electric facilities are within the zone of influence adjacent to the excavation as determined by the natural angle of repose of the soil.

   E. All damage to electric facilities and services requiring adjustments, relocations and/or repairs will be made at the Contractor's cost.

5. Contractor shall not backfill exposed electric facilities until the company has inspected its facility or performed any adjustments and/or maintenance that may be required.

NOTE: Should Contractor damage electric facilities, Contractor shall immediately notify the Electric Service Desk through the Company Operator (381-2000). Contractor shall keep everyone clear of damaged electric facilities until company personnel arrive at the work site.

GAS FACILITY NOTES

DUKE ENERGY COMPANY

Gas Facility Notes

I. For Gas Engineering Notification, agreements, and official correspondence, address to:

Duke Energy
139 East Fourth Street
P.O. Box 960, Room 460-A
Cincinnati, Ohio 45202

II. The gas main information provided shows the approximate locations and depths of cover and is provided to comply with statutory regulations. This information should be used only for planning, not construction.

III. All gas main depths of cover noted are approximate depths of cover recorded at the time of installation. Any resulting grade changes since the time of the main installation will cause the existing depth of cover to be different. Extreme care must be taken to ensure safe excavation when approaching known or suspected gas facilities.

IV. All gas services were installed at a minimum of 1'-6" of cover. See item III above.

V. For additional gas facility record information, call 1-800-372-7612.

VI. To comply with federal and state regulations concerning damage prevention programs, the utility companies must be contacted at least 48 hours (two working days) prior to excavation by calling the OHIO UTILITIES PROTECTION SERVICE (OUPS), toll free, at 1-800-362-2764.

Construction Notes

I. Gas facilities are to be kept in service at all times.

II. The contractor shall be responsible for all damages to gas facilities during or as a result of the Contractor's construction. All damage to gas facilities requiring adjustments, relocations and/or repairs will be made at the contractor's cost.

III. The contractor shall sheet and shore all excavations as required to continuously support gas facilities within the zone of influence (as determined by the natural angle of repose of the soil).

IV. Crossing buried gas facilities with heavy construction equipment may cause damage to the gas facilities. Contact the Duke Energy Gas Engineering Department for details on how to protect the gas facilities from damage.

V. The contractor shall not backfill exposed gas facilities until the utility has inspected its facilities and performed any maintenance and/or adjustments that may be required.

VI. The contractor is responsible for preventing any damage to our gas facilities. This includes protection of coatings and wrappings on steel gas mains. It also includes any damage with may have occurred to plastic gas mains, such as crimps or gouges.

VII. When cast iron or similar gas facilities are exposed or interfered with by the contractor, replacement or reinforcement by Duke Energy may be required at the contractor's expense. Backfill with control low strength material will be required.

VIII. Blasting or other construction procedures which may transmit loads or vibrations in the vicinity of gas facilities must be approved by Duke Energy Gas Engineering Department. A blasting plan, identifying all pertinent information, must be submitted in writing by a blasting expert prior to any work.

Proposed Developments at Gas R/W & Easements (If Applicable)

I. Proposed development plans around and near gas facilities within private easements must be submitted to Duke Energy Gas Engineering Dept. for review. These plans must be approved before any work may begin within our easements.

II. Specified easement widths must be maintained in order for Duke Energy to protect its facilities.

III. No permanent structures may be built within the easements.

IV. Cuts and fills are generally not permitted within the easements. Some fills may be allowed, and will be reviewed on an individual basis. Any permitted fills will be limited to an amount which will allow Duke Energy to properly maintain its facilities.

V. Perpendicular utility crossings of gas easements are acceptable, provided proper clearances are maintained. Parallel installations are normally not allowed.

WATER WORKS NOTES

All work pertaining to water works items shall be done in strict accordance with the specifications of the Northern Kentucky Water Service District and under the direction, supervision and inspection of the Water District. Water main items are to be constructed in accordance with the provisions of the Kentucky 2000 Transportation Cabinet / Department of Highways, Standard Specifications for Road and Bridge Construction, dated January 1, 2000, and any supplements or changes thereto. Copies of all pertinent specifications may be obtained from the Northern Kentucky Water Service District.

A cushion of 12" shall be maintained between the proposed water mains and the existing sewers, inlet connections, and drains. If a greater clearance is desired, it will be so designated. Building sewer laterals are not to be disturbed or trapped. Existing drains, sewers and culverts are not be disturbed. If the water main is to be under culverts or pipe sewers, they shall be tunneled and backfilled with Class "T" concrete.

It shall be the Contractor's responsibility to arrange for removal and replacement of any poles and guys necessary for the installation of the proposed water mains, and any cost connected thereto shall be his expense.

All backfill to be Method "A" except where otherwise noted.

No part of any fire hydrant setting shall be installed closer than five feet to any driveway, inlet, utility pole, or guy wire anchor.

No extra payment will be made for lead joints.

SANITARY SEWER NOTES

Sanitary sewer and/or combination sewer items are to be constructed in accordance with the provisions of the Sanitation District No. 1, and under the direction, supervision and inspection of the Sanitation District No. 1. Sanitation sewer items are to be constructed in accordance with the provisions of the Kentucky 2000 Transportation Cabinet / Department of Highways, Standard Specifications for Road and Bridge Construction, dated January 1, 2000, and any supplements or changes thereto.

The Contractor shall supply separate bid items for raising manholes using manhole adjustment rings and for using brick and mortar. If only one bid item is received, the Contractor shall raise all manholes with brick and mortar. Sewer manhole adjustment prior to machine paving shall be done in accordance with the Sanitation District No. 1 Rules and Regulations.

In the event that manhole adjusting rings cannot be used on sanitary and/or storm sewer manholes, the Contractor shall be required to use brick masonry and to adjust manholes to grade. Stacking of adjusting rings shall not be permitted. Substandard or damaged manhole casting shall be replaced with standard casting.

SECTION 02630

STORM SEWERS AND DRAINAGE STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

The CONTRACTOR shall provide for all materials, equipment, tools, supplies, services, and labor necessary to install storm sewers and drainage structures as shown on the plans, project specifications, and contract documents and as may be further set out in any Special Provisions, Addenda, and Change Orders.

1.2 STANDARDS AND SPECIFICATIONS

1.2.1 SD1 Technical Specifications: Although this section has been developed to serve primarily as a stand-alone document, reference is made to other sections of the Sanitation District No. 1 (SD1) Technical Specifications. The ENGINEER or CONTRACTOR of a storm sewer project is responsible for obtaining a current edition of the SD1 Technical Specifications when designing or performing work that either involves SD1 funding or is to be accepted by SD1. Copies of the SD1 Technical Specifications may be obtained from:

Sanitation District No. 1
Capital Improvements Program
1045 Eaton Drive
Ft. Wright, KY 41017

and

http://www.sd1.org/

1.2.2 KTC Standard Specifications and Drawings: In this section, reference is made to the current Kentucky Transportation Cabinet (KTC) Standard Specifications for Road and Bridge Construction and the KTC Standard Drawings. In addition, construction requirements and material specifications not specifically covered in this section or in the referenced SD1 Technical Specifications shall conform to KTC Standards. The ENGINEER or CONTRACTOR of a storm sewer project is responsible for obtaining a current edition of the KTC Standard Specifications and the latest edition of the KTC Standard Drawings when designing or performing work that either involves SD1 funding or is to be accepted by SD1.

Copies may be obtained from:

Kentucky Transportation Cabinet
Manager, Policy and Procedures
Development Branch
112 State Office Building
Frankfort, Kentucky 40622

1.2.3 Latest Revisions: Wherever reference is made to any published standards, codes or standard specifications, it shall mean the latest standard code, specification or tentative specification of the technical society, organization or body to which reference is made. Where specified articles, sections, paragraphs or other subdivisions of the referenced publications are not stated, the referenced publication shall apply in full.

1.3 SUBMITTALS

1.3.1 For projects that are approved and funded, designed, or bid by SD1, submittals shall be required as follows:

A. Product Data: For the following:
- Pipe and fittings.
- Precast concrete manholes and drainage structures.
- Structure frames and grates.
- Any other items as requested by the ENGINEER or SD1.

B. Shop Drawings: For the following:
- Manholes: Include plans, elevations, sections, details, and frames and covers.
- Drainage Structures: Include plans, elevations, sections, details, and frames, covers, and grates.
- Cast-in-place and Precast Structures: Include plans, elevations, reinforcing, concrete mix design, and structural calculations stamped by a Professional Engineer, registered in the State of Kentucky, competent in structural design.
- Pipe material and layout for prefabricated sections
- Any other items as requested by the ENGINEER or SD1.

C. Test Reports: The CONTRACTOR shall submit test reports for materials supplied to SD1 whenever SD1 has not received certified letters from suppliers that materials meet the applicable specifications called for, or there is visible evidence on the work site that the materials do not conform to the applicable specifications. These tests would include any concrete tests and soil tests performed for the project.

D. The CONTRACTOR shall furnish one copy of the supplier's certification stating that pipe materials were manufactured, sampled, tested and inspected in accordance with the applicable standards and specifications.

1.3.2 For privately-funded storm sewer projects that include components to be dedicated to SD1 or another public entity, submittals shall be provided at the request of the ENGINEER or SD1. Submittals shall not normally be provided, except at the request of SD1 or the ENGINEER.

1.4 UNDERGROUND STRUCTURES AND UTILITIES (For SD1 Funded Projects)

1.4.1 The CONTRACTOR shall verify the locations of all underground structures and utilities prior to the start of construction. The CONTRACTOR shall avoid damaging existing utilities while verifying their locations. The CONTRACTOR shall notify the Kentucky Underground Utility Protection, Inc. at 1-800-752-6007, SD1, the local Water District (Northern Kentucky Water District for Campbell and Kenton Counties, Boone County Water District for Boone County) 48 hours in advance of any construction.

1.4.2 The CONTRACTOR shall be responsible for the protection of any structure or utility encountered on the site. The cost of repair, removal, replacement, relocation, etc. of such facilities arising because of carelessness or negligence on the part of the CONTRACTOR shall be the CONTRACTOR'S responsibility. The CONTRACTOR shall make every effort to protect private structures and utility service connections whether in right-of-way/easement or on private property, including sanitary and storm sewer facilities.

1.4.3 Should uncharted or incorrectly charted utilities be encountered, consult SD1 and the Utility Owner for directions. It shall be the sole responsibility of the CONTRACTOR to meet the requirements of the respective utility.

PART 2 STORM SEWER PIPE

2.1 MATERIALS

Storm sewer pipe shall be as specified on the approved design plans, unless otherwise approved by SD1. ENGINEER may select the following material types described in this section. Any pipe that is found defective, or otherwise not meeting the Specifications, shall be rejected and replaced by pipe meeting these Specifications at no cost to SD1.

2.1.1 Reinforced Concrete Pipe (RCP): Circular reinforced concrete pipe shall meet the requirements of ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Storm Pipe. Elliptical reinforced concrete pipe shall meet the requirements of ASTM C 507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.

Rubber and plastic joints, or approved equal, shall be the jointing method for RCP and shall meet the requirements of AASHTO M 315 / ASTM C 443. Other methods of joining RCP will only be allowed upon explicit approval from SD1.

When RCP is used under pavement or driveways, a minimum of Class III RCP shall be

required.

2.1.2 Corrugated Metal Pipe (CMP): Corrugated steel pipe shall meet the requirements of AASHTO M36. Corrosion protection shall be provided through an aluminized coating conforming to AASHTO M274. Aluminum alloy spiral pipe shall meet the requirements of AASHTO M196. Coating materials shall be evaluated on a per project basis. Asphalt coatings shall not be permitted for corrugated metal pipe.

Joints for CMP shall be made using coupling bands and gaskets meeting the requirements of AASHTO M 36 and AASHTO M 274.

2.1.3 Ductile Iron Pipe (DIP): Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51. Pressure class 350 shall be used for all piping, unless otherwise shown on the drawings or specified. Fittings shall conform to ANSI/AWWA C110/A21.10, or ANSI/AWWA C153/A21.53, with a minimum working pressure rating of 350 psi.

All gravity sewer piping shall be push-on joint or mechanical joint. Push-on joints and mechanical joints shall be in accordance with ANSI/AWWA C111/A21.11. All buried ductile iron pipe shall have cementitious lining inside, factory applied.

All buried ductile iron pipe shall be encased per the following requirements:

(A) Polyethylene encasement shall be provided for all buried ductile iron pipe, including all straight pipe, bends, tees, wyes, adapters, closure pieces, field restraint devices, valves and other fittings or specials, in accordance with ANSI/AWWA C105/A21.5, Method A. Preparation of the pipe shall include, but not be limited to: removing lumps of clay, mud, cinders, etc., prior to installation.

(B) Where ductile iron pipe is also embedded or encased in concrete or within a casing pipe, the polyethylene encasement shall be installed over the ductile iron pipe prior to concrete placement and in conjunction with installation in the casing pipe.

(C) The pipe shall be wrapped with 8-mil thickness polyethylene tube wrap, using the recommended minimum flat tube widths for the specified pipe sizes. The polyethylene tube wrap shall be of virgin polyethylene as produced from DuPont Alathan resin or equal.

(D) The polyethylene tube seams and overlaps shall be wrapped and held in place by means of 2-inch wide plastic backed adhesive tape. The tape shall be Polyken Number 900, Scotchrap Number 50, or equal. The tape shall be such that the adhesive shall bond securely to both metal surfaces and polyethylene film.

(E) The polyethylene film supplied shall be clearly marked at a minimum of 2-ft along its length, containing the following information:
   a. Manufacturer's name or trademark
   b. Year of Manufacture
   c. ANSI/AWWA C105/A21.5
   d. Minimum film thickness and material type (LLDPE or HDCLPE)

e. Applicable range of nominal pipe diameter size(s)
f. Warning--Corrosion Protection--Repair any Damage

2.1.4 Polyvinyl Chloride (PVC) Pipe: The following PVC pipe types are permitted in storm sewer applications:

(A) Smooth-Wall: PVC pipe meeting the requirements of ASTM D 3034, Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract, SDR 35 pipe shall be required.

(B) Large Diameter: PVC pipe meeting the requirements of ASTM F 679, Standard Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract, SDR 35 shall be required.

(C) Profile-Wall: PVC open or closed profile pipe meeting the requirements of ASTM F 794, Standard Specification for Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

(D) Corrugated: Corrugated PVC pipe meeting the requirements of ASTM F 949, Latest Revision, "Polyvinyl Chloride (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings".

Joints for PVC pipe shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

For Solid Wall PVC SDR 35 pipe, the maximum cover depth shall be 20-ft.

2.1.5 High Density Polyethylene (HDPE) Corrugated Pipe: Corrugated polyethylene pipe with an integrally formed smooth interior shall meet the requirements of AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe, 12 to 36 inch diameter, for Type S pipe. SD1 will consider the use of large diameter HDPE on a case-by-case basis; approval shall be at SD1's discretion

HDPE pipe shall be joined using an inline bell (IB) & spigot joint or fitting meeting AASHTO M294 or ASTM F2306. The joint or fitting shall be soil-tight and gaskets shall meet the requirements of ASTM F477.

2.1.6 Installation of all flexible pipe, regardless of diameter, shall follow the requirements of ASTM D2321, Standard Practice for Underground Installation of Thermoplastic Pipe. For installations of all pipe 30" or greater in diameter, full time inspection will be required during the bedding and backfill operations.

2.2 DESIGN REQUIREMENTS

Pipe selected shall be designed for the cover and loading requirements for each project. Pipe selection and size shall be designed to follow SD1's Stormwater Rules and Regulations. Pipe materials selected for installation in the project shall be approved by SD1 prior to construction. Design calculations for pipe wall thickness and structural design shall be provided by the ENGINEER, during the plan review process as requested by SD1. Engineer shall consider depth of burial, soil modulus of in situ material, type of in situ material in which the pipe is installed, bedding material required, etc when submitting calculations.

A minimum vertical separation of 18 inches or concrete encasement of pipes shall be required between storm pipes, sanitary pipes and water pipes, unless specifically waived by SD1. Minimum cover for all pipe types shall be 3 feet unless specifically waived by SD1. For pipe installations in rear-yard areas, less than three feet of cover may be approved by SD1 on a case-by-case basis. Drainage structures shall be installed at distances not greater than 500 feet for pipes 30 inches and less and 600 feet for pipes larger than 30 inches in diameter, unless waived by SD1. No curved alignments of pipe shall be allowed unless specifically approved by SD1.

PART 3 DRAINAGE STRUCTURES

3.1 GENERAL

3.1.1 Concrete for all cast-in-place storm drainage structures (including channels and benches) shall conform to Section 03300 of the SD1 Technical Specifications. Per that specification, the concrete design mix shall have a minimum 28-day compressive strength of 4,000 psi, a maximum water to cement ratio of 0.44, a minimum cement content of 564 pounds per cubic yard, entrained air between four (4) percent and eight (8) percent, a minimum slump of 1 inch and a maximum slump of 6 inches.

3.1.2 Grout shall consist of a mixture of water and cement or cement with fly ash, one part cement or cement with fly ash to two parts mortar sand as defined in Section 601.03.03B of the KTC Standard Specifications, by volume.

3.1.3 Non-shrink grout shall be an approved non-shrink, non-staining grout consisting of either a mixture of hydraulic cement, water, fine aggregate, and an approved nonferrous expansive admixture, or a packaged commercial product and shall meet the requirements of Section 601.03.03B of the KTC Standard Specifications.

3.2 MANHOLES AND STRUCTURES (Reference shall be made to SD1's Standard Drawings for the terminology used in this section)

3.2.1 Precast storm drainage structures with knockout panels shall only be used for curb inlets (catch basins) and yard drains and can be no greater than 6-ft in depth, unless load calculations are supplied. For pre-cast rectangular structures (other than those with

knockout panels), at least 6 inches of wall (measured from the interior corner) is required on each side of the pipe beyond the precast opening for the pipe. This rule is not applicable for structures which have pipe installed in opposite walls or where one outlet reinforced concrete pipe is utilized. Less than 6 inches of wall may be approved by SD1 with the submittal of design calculations.

3.2.2 Steps shall be PS1-PF (Press Fit polypropylene plastic) as manufactured by MA Industries, or equal, and provided when structure is greater than 4-ft in depth and shall conform to ASTM C 478.. Manhole and catchbasin steps shall be cast, epoxy grouted, or attached by mechanical means into the walls of the manholes in such manner as to conform with ASTM C 478. No steps shall be aligned over the flow channel. Step spacing shall be 16". Omit steps for structures less than 4-ft deep unless otherwise shown on the plans.

3.2.3 Castings for storm sewer manholes and drainage structures shall be heavy duty ductile iron conforming to ASTM A 536, Grade 60-40-18. Manhole frames and covers shall be Neenah R-1642 with the words "Storm Sewer" cast into the lids, or an approved equal, unless shown otherwise on the project plans. Catch basins and other structure castings shall be as specified on the standard details or project plans.

3.2.4 Round precast structures shall conform to ASTM C 478; square and rectangular precast structures shall meet the requirements of ASTM C 913. Structural calculations shall be provided for all precast structures as requested by SD1. Benching is required in the bottom of all drainage structures (curb inlets, yard drains, standard inlets, manholes) per SD1 standard details.

All standard inlets shall conform to the appropriate Standard Drawings No. STM-08 through STM-11. Pre-cast manholes shall conform to SD1's Standard Specifications, Section 02606 and Standard Drawings No. STM-13 and STM-13.1. All cone and transition sections shall be concentric in shape unless that requirement is specifically waived by SD1.

Base and riser sections shall be custom-made with openings to meet indicated pipe alignment conditions. The minimum distance allowed between precast holes, measured from edge to edge, in a manhole or standard inlet section shall be 12 inches. The maximum inside diameter (or horizontal dimension) of pipe to be used with a given size of manhole shall be as specified on SD1 standard drawing STM-13.

3.2.5 Joints between precast manhole, yard drain, and standard inlet sections in the roadway or yard areas shall be sealed with one of the following:

(A) ASTM C 443, a single, continuous rubber O-ring gasket and shall conform to AWWA C302.
(B) ASTM C-990, flexible butyl resin sealant such as Conseal CS-102, CS-202 as manufactured by Concrete Sealants, Inc.
(C) Hamilton-Kent "Kent-Seal No. 2"
(D) K.T. Snyder Co. "Rub'r-Nek"
(E) Press Seal Gasket "E-Z Stik".

Joints between riser sections for curb inlets (catch basins) are not required to have gaskets or butyl sealant between sections. These joints can be stacked dry as long as there are no holes or gaps in the joints. All holes or gaps shall be filled with non-shrink grout

3.2.6 For precast structures with openings cast into the unit, the minimum vertical distance from the pipe openings to the top of the structure or segment wall shall be 12 inches. If this distance is less than 12 inches, then additional reinforcing steel shall be furnished for this section. All pipe openings shall not be in joints between two precast sections unless specifically approved by SD1. The top slab must be designed for HS-20 loading in paved areas only.

3.2.7 Grade rings shall be used for all precast and masonry manholes to adjust height of manhole frame casting where required.

1. Grade rings shall be a maximum of ten (10) inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed.
2. The height of the grade ring shall be such as is necessary to bring the manhole frame to the proper grade.
3. One piece precast concrete rings shall be used for grade adjustment greater than six (6) inches and up to ten (10) inches in height. The ring shall be set concentrically on top of the cone section or top slab if used.
4. High density polyethylene (HDPE) rings shall be used for grade adjustment from two (2) inches to a maximum of six (6) inches in height. A maximum of three (3) HDPE grade rings is allowed to adjust the height of the manhole. Rings shall be set concentrically on top of the cone section or top slab if used.
5. All grade rings shall be sealed using two rows of butyl rubber sealant.
6. If structures are installed on slopes and a grade adjustment is needed to match the slope. cast-in-place concrete shall be placed and formed to construct the slope needed between the precast sections and the top slab. Bricks, blocks, etc. grouted in place to construct the slope will not be permitted.

3.2.8 Cast-in-place benches shall be of 4,000 psi concrete as described in 3.1.1 and shall conform to the shapes indicated on the Plans, SD1 Standard Drawings, or as otherwise directed. The invert channels shall be so constructed as to cause the least possible resistance to flow. The shapes of the invert channels shall conform uniformly to inlet and outlet pipes. Smooth and uniform finishes will be required. Inverts may also be precast into the structure.

3.2.9 PVC drainage structures and catch basins shall be approved on a case-by-case basis by SD1.

3.3 HEADWALLS AND OUTFALLS

3.3.1 Headwalls and outfalls shall be constructed of either cast-in-place or precast reinforced concrete that conforms to KTC Standard Specifications for Road and Bridge Construction.

3.3.2 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 and galvanized materials are an acceptable guard type.

3.3.3 Grates: Grates shall be provided on inlet headwalls for all pipes 24" and less. Grates shall be required for pipes greater than 24" as deemed necessary by SD1. Cases for pipes larger than 24" that would require a grated headwall include, but are not limited to, a propensity for debris to enter the sewer and become lodged, considerable length, drop structures or bends in the pipe run, etc.

3.4 CONNECTIONS

3.4.1 Flexible connections or hydrophilic sealant and Okum rope, or an approved non-bentonite equal, with the pipe grouted in place shall be used for all connections at manholes, yard drains, and standard inlets regardless of the pipe's diameter. Flexible connections at manholes shall be elastomeric gaskets or couplings, manufactured in accordance with ASTM C 1478, Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Structures, Pipes, and Laterals for pipes less than or equal to 48" in diameter.

3.4.2 For precast curb inlets (catch basins) (other than those with knockout panels), the opening around the pipe shall either be filled with non-shrink grout for the wall thickness of the structure or the pipe shall be encased with minimum 6 inch collar of concrete from the inside face of the wall to 1'-0" outside the outer face of the wall. The pipe shall be adequately supported to prevent settling while the grout or the concrete encasement is curing. The inside faces of the structure walls shall be finished with a trowel. The diameter of the opening shall be no more than 8 inches greater than the outside diameter of the pipe.

3.4.3 For precast yard drains and curb inlets (catch basins) with knockout panels, holes for the pipes shall not be cut into the structural members (i.e., top beams and corner columns) and non-shrink grout shall not be allowed to be placed around the pipes. The pipes shall be encased with a minimum 6 inch concrete collar all around the outside of pipe or a minimum of 3 inches beyond the hole knocked in the wall, whichever is greater. Also, the concrete encasement shall extend from the inside face of the wall to 1'- 0" outside the outer face of the wall.

3.5 STORM LATERAL CONNECTIONS

3.5.1 Roof downspouts, footing or foundation drains, and sump pumps shall discharge in accordance with the local governing subdivision regulations. All storm lateral connections (downspouts, footing or foundation drains, sump pumps, etc) to the storm sewer shall be prohibited unless explicitly approved by SD1 due to uncommon circumstances (i.e. inadequate discharge distances from foundations, narrow side yards, etc).

PART 4 EXCAVATION AND BACKFILL (Reference shall be made to section 02220 for additional requirements for excavation and backfill. This specification works in concert with the requirements in section 02220)

4.1 MATERIALS

4.1.1 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 sizes that one-hundred percent (100%) passes the one and one half (1 ½) 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 1½-inch in any dimension.

4.1.2 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.

4.1.3 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 properly disposed and suitable imported material shall be used for backfill.

4.1.4 Rip Rap / Channel Lining: Cyclopean stone rip rap, channel lining, Class II and Class III, per the requirements of the "Slope Protection and Channel Lining" section contained in the KTC Standard Specifications for Road and Bridge Construction shall be used. Other channel lining materials, such as turf reinforcing mats and energy dissipators, may be considered on a case-by-case basis and may only be used with the explicit approval of SD1. Installation of riprap or other channel lining systems shall conform to the "Slope Protection and Channel Lining" section contained in the "Kentucky Transportation Cabinet, Standard Specifications for Road and Bridge Construction," current edition.

4.1.5 Control Density Fill (CDF): Control Density Fill shall be used where shown on the drawings or as directed by SD1. CDF materials shall conform to Section 02220 of the SD1 Technical Specifications. Per that specification, CDF shall achieve an initial traffic bearing strength within 4 hours of placement and an ultimate strength of between 50 and 100 psi.

4.2 EXCAVATION

4.2.1 The CONTRACTOR shall perform all excavation, necessary or required, for the construction of the storm sewers and drainage structures. The excavation shall include the removal of all materials of whatever nature encountered and disposal of unsuitable material, including water and all obstructions that would interfere with the proper construction and completion of the storm sewers and drainage structures.

4.2.2 Excavation shall include the removal and subsequent handling of all materials required and disposal of unsuitable material for the installation of the sewer. This includes, but is not limited to, earth, loose rock, gravel, shale, layered rock, monolithic rock, vegetation, debris, junk, brick, stone and other foreign matter encountered within the excavation, and soils of any moisture content as encountered. Excavation operations shall conform to all safety standards set by the Occupational Safety and Health Administration (OSHA). An experienced supervisor representing the CONTRACTOR shall be onsite during all excavation and trenching operations.

4.2.3 Any required blasting shall be performed in accordance with Section 02222 of the SD1 Technical Specifications.

4.3 TRENCHING

4.3.1 Trench construction shall be per SD1 pipe bedding and trench condition details (same as KTC requirements) and ASTM D2321 for thermoplastic pipe and ASTM C1479M for rigid pipe as follows:

A. No more than 200 feet of trench may be opened in advance of pipe laying.

B. Trench width shall be minimized to greatest extent practical but shall conform to the following:

1. Flexible Pipe: Sufficient to provide room for installing, jointing and inspecting piping, but a minimum of pipe barrel OD plus two feet for 36" and less diameter pipe. For pipe that is greater than 36" in diameter, the trench width shall be the OD of the pipe plus four feet. For pipes greater than 36" diameter, a narrower trench width may be allowed if the pipe manufacturer can provide calculations showing that a narrower trench will provide the same level of structural design. The revised trench width must be approved by SD1.

2. Rigid Pipe: Sufficient to provide room for installing, jointing and inspecting piping, but a minimum of pipe barrel OD plus two feet for 36" and less diameter pipe. For pipe that is greater than 36" in diameter, the trench width shall be : **OD + 2*(OD/6).**
3. Enlargements at pipe joints may be made if required and approved by SD1.
4. Sufficient for shoring and bracing, or shielding and dewatering.
5. Sufficient to allow thorough compaction of bedding material adjacent to bottom half of pipe.
6. Do not use excavating or compaction equipment which requires the trench to be excavated to excessive widths.

C. Depth of trench shall be as shown on the plans. If required and approved by SD1, depths may be revised.

D. Where pipe is installed in a trench excavation, pipe bedding shall be carefully placed and compacted before the pipe is laid. If required by the pipe manufacturer, the middle third of the trench beneath the pipe shall be loosely placed to allow proper bedding and to avoid a point load at that location. Depth of pipe bedding below the pipe shall be at least 6 inches. After laying pipe, the balance of the backfill shall be placed as described herein.

E. Excavate for pipe bells in bedding carefully so as not to disturb the surrounding compacted material and lay pipe so that the bell bears uniformly on the compacted trench bedding material below the pipe.

F. Place all bedding in pipe trenches in horizontal layers not exceeding 6 inches in depth up to a point 12-inches or more above the top of the pipe and thoroughly compact each layer before the next layer is placed. Bedding material shall be sliced or worked-in along the length of the pipeline during each 6-inch layer lift and then compacted.

G. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

4.3.2 If the CONTRACTOR undercuts the trench bottom as described above more than eight (8) inches, the undercuts shall be backfilled with compacted bedding material.

4.4 STRUCTURES

4.4.1 The excavation for storm sewer manholes and other structures shall be of the width necessary to provide a minimum clearance of twelve (12) inches from the outside of the structure to the sides of the excavation to provide proper working space and maintain natural stability of the sides of the excavation.

4.4.2 The excavation bottom for manholes and other structures shall extend to a point that undercuts the structure not less than six (6) inches, nor more than eight (8) inches, below the entire base section. The undercut shall be backfilled bank to bank with bedding material and leveled to evenly support the manhole in plumb with no settling.

4.4.3 Bottom slabs or foundation footings may be poured against vertical sides of the excavation, thereby eliminating the need for form work for these items, unless the sides of the excavation will not stand almost vertical, in which case a form shall be required.

4.4.4 If the CONTRACTOR undercuts the excavation below the bottom of manholes and other structures more than 8-inches, other than when directed by SD1, the CONTRACTOR shall refill the undercut with compacted bedding material or other suitable fill material as approved by SD1 and compact the suitable fill material per Section 4.6. Any costs incurred in refilling unauthorized undercuts shall be borne by the CONTRACTOR. The cost for this work shall be considered incidental to the unit price for structure installation.

4.4.5 CONTRACTOR shall be required to compact bedding material around the entire circumference of the manhole and manhole excavation area to at least 12-inches above the highest incoming or outgoing pipe. CONTRACTOR shall compact general backfill around the entire circumference of the manhole and manhole excavation area to the proper grade, as shown on the drawings.

4.5 UNSTABLE SOIL AND DEWATERING

4.5.1 If in the course of excavation, unstable soil is encountered at the point of the bottom of the required excavation, the CONTRACTOR shall be required to undercut sufficiently to remove all of the unstable soil to the limits specified by the Geotechnical Engineer and in conjunction with the approval of SD1.

4.5.2 The CONTRACTOR shall refill the undercuts with bedding material or other suitable fill material as approved by SD1 and consolidate same to the required density of the material per Section 4.6, unless other means of refill are approved by SD1. CONTRACTOR is to provide reports from a qualified Geotechnical Engineering Firm indicating compliance with the required compaction limits. For SD1 funded projects, any costs incurred in refilling authorized undercuts in unstable soil shall be reimbursable to the CONTRACTOR on the basis of extra work or as otherwise set forth in the contract.

4.5.3 Ground Water: Pipe trenches and structure excavations shall be kept free from water during trench bottom preparation, pipe laying and jointing, pipe embedment and manhole installation as approved by a SD1 inspector or an authorized agent of SD1.

4.5.4 Where the trench or excavation bottom is saturated or otherwise unstable because of ground water, or where the ground water elevation is above the bottom of the trench or excavation, the ground water shall be lowered by means acceptable to SD1 to the extent necessary to keep the trench or excavation free from water while construction is in progress. The discharge of ground water from the trench or excavation area shall be to natural drainage channels, gutters, drains, or storm sewers which will conduct the water away from the trench or excavation area. Sediment control shall be provided at the point of discharge. Surface water shall be diverted away from the trench or excavation area in a manner acceptable to SD1; surface water shall be prevented from entering the trench or excavation area.

4.6 BACKFILL AND COMPACTION

4.6.1 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.

4.6.2 Compaction requirements are as follows:

A. Select Fill and Pipe Bedding: For fill and bedding within the influence zone of 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) within the influence zone 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) within the influence zone of 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) within the influence zone of structures and foundations, and to at least 75 percent relative density (ASTM D4253 and D4254) for all other areas. All pipes under State roadways shall meet KTC requirements for backfill.

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 set forth under *4.1.3 Excavation and Backfill: General Backfill.* 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 specified under *4.6.2 Compaction Requirements* up to existing ground level or finished grade level if same has been established.

4.6.3 Rock Backfill

A. Where the trench is located in areas from which rock had to be excavated in a quantity other than isolated stones, the excavated rock may be used as part of the backfill above a point 2 feet or more above the top of the pipe, or above a point 1 foot above pipe encasement. For backfill under paved areas, refer to Section 4.6.4.

B. The rock fragments used in the backfill shall not exceed rock thicker than 6 inches or larger than 24 inches maximum in any dimension, shall not be dropped into the trench directly over the pipe centerline and shall be used with sufficient smaller dimensioned material so that voids between larger fragments shall be filled. Compaction shall meet the requirements specified under Section 4.6, Backfill and Compaction, up to existing ground level or finished grade level if same has been established.

C. (For SD1 Funded Projects) Rock shall not be used in the top 12-inches of the backfill in yard areas, except across creeks, gullies, ravines or areas designated by the ENGINEER, where the rock may be used to the existing ground level as specified on the drawings.

4.6.4 Backfill in ROW Areas

A. For storm sewers and structures located within the public ROW, refer to local subdivision regulations for backfill material requirements.

4.6.5 If proper compactions are not achieved because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, or because of soil moisture content, the CONTRACTOR shall perform whatever work is required to provide the required densities. This work shall include complete removal of unacceptable bedding, backfill or fill areas, and replacement and recompaction until acceptable densities are provided.

4.6.6 Any methods of backfilling other than the above shall not be used unless special instructions have been issued by SD1 calling for other methods. Water flooding or jetting shall not be used in any instance. Water shall only be used in minor quantities to improve compaction qualities of backfill materials when so ordered by the Geotechnical Engineer and approved by SD1.

4.6.7 In all methods of backfilling that are used, no backfill material shall be dumped into the trench, or allowed to fall directly on the sewer centerline when the previously deposited cover is less than two (2) feet above the top of the pipe. All backfill material shall be slowly shoved or "rolled" into the trench.

PART 5 EXECUTION

5.1 CLEARING AND GRUBBING (FOR SD1 FUNDED PROJECTS)

5.1.1 The CONTRACTOR shall clear the area within the limits of the sewer easement that is necessary to construct the sewer, including but not limited to brush, hedges and trees (unless designated as not to be disturbed on the plans or by direction of SD1), stumps, logs and loose or projecting material so as to allow the construction work to be completed. The cleared debris shall be removed and legally disposed of off-site unless otherwise approved by SD1 in writing.

5.1.2 All existing fencing and retaining walls shall be temporarily removed where crossing the sewer easement, and shall be completely restored to the pre-construction condition after construction work has been completed. Materials used shall be equal to or better than the original materials in the existing fences or retaining walls. The cost for such restoration shall be considered incidental to pipe construction unless otherwise stated in the contract.

5.1.3 A surveyor licensed in the state of Kentucky must put any and all survey monumentation encountered and removed during the course of construction back in its original location at the completion of construction. Any dedication of said established monuments that are disturbed during construction shall be the sole responsibility of the CONTRACTOR.

5.1.4 Temporary closures shall be erected, maintained and removed at the completion of construction where livestock are in evidence or where directed by SD1. Trees designated as not to be disturbed shall be protected from harm by machinery, materials or the construction work.

5.2 PIPE INSTALLATION

5.2.1 Install piping, beginning at a downstream structure and consistent with the approved plans, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Placing pipe upstream to downstream will be allowed on a case-by-case basis, if approved by SD1. In these instances, bell ends shall still face upstream to avoid debris getting caught on the lip of the spigot. Care shall be taken to avoid getting bedding material into the bell when shoving the spigot home . Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

5.2.2 Install piping at constant slope between points and elevations indicated. The CONTRACTOR shall use laser beam alignment or other suitable methods and equipment to determine the exact position of each pipe section at the bottom of the trench. No pipe sections shall be disturbed in any manner after being laid and joints made. As the pipe sections are laid and joined, the interior of the pipe shall be cleaned of all dirt and foreign matter (water shall be excluded). Washing out is not permitted without controls to

intercept debris prior to discharge. Pipe laying shall not be performed in severe cold or wet weather.

5.2.3 At the end of any work or whenever pipe laying ceases, the end of the pipe shall be closed with a suitable close fitting stopper. All pipe ends, branch connections and leads not to be used immediately or connected to other facilities or structures shall be closed with a stopper or bulkhead and sealed in a manner similar to the pipe joints, unless otherwise called for.

5.3 STRUCTURE INSTALLATION

5.3.1 Manholes shall be neatly and accurately built in accordance with the Plans and SD1 Standard Drawings. When the manhole base slab will consist of cast-in-place concrete on an existing storm sewer line, the pipe and the lower precast barrel section shall be in place and supported by concrete blocks prior to placing concrete for the base. Inlets, catch basins, drains, junction structures, and other drainage structures shall be neatly and accurately built in accordance with the plans or SD1 Standard Drawings. The structure shall be either of cast-in-place concrete or precast concrete. Precast manhole or structure sections shall be installed in accordance with ASTM C 891.

5.3.2 All cast-in-place structures shall be built using 4,000 psi concrete as described in 3.1.1. The structures shall be built on prepared foundations and conform to the dimensions and shapes shown on the Plans and SD1 Standard Drawings. The construction shall conform to the methods, forms, placement, protection, and curing for concrete as specified in accordance with KTC and SD1 Standards. Any required reinforcement shall conform to the Plans and SD1's Standard Drawings. Installed concrete reinforcing shall be inspected and approved by SD1 before any concrete is placed.

5.3.3 Headwalls and outfalls shall be constructed of either cast-in-place or precast reinforced concrete in conformance with SD1's Standard Drawings and KTC Standard Specifications for Road and Bridge Construction. All headwalls and outfalls built into slopes shall be properly seated as to avoid disconnection from the adjoined pipe.

5.3.4 Connections for inlet and outlet pipes shall conform to the sizes, alignments, and elevations shown on the Plans. Inlet and outlet pipes shall be cut-off so as not to extend more than two (2) inches beyond the inside surfaces of the structure wall. Pipe bells shall not be allowed inside the structure wall. The pipes shall intersect at the structure so that the invert bench between the inlet and outlet pipes can be smoothly formed. No hammer modifications are allowed to precast or existing structures, not including those with knockout panels. Neat saw cuts or core drilling shall be utilized when modifying an existing structure.

5.4 PIPE / STRUCTURE ABANDONMENT

5.4.1 Pipe and structure abandonment under roadways shall consist of completely filling the designated pipes with controlled density fill (CDF), grout or other approved materials.

Appreciable deposits of debris shall be removed from other structures prior to placement of CDF, grout or other approved materials. Inlets / outlets shall be plugged by use of bulkheads containing small openings at the tops through which the fill may be pumped at a minimum pressure of 15 pounds per square inch. Bulkheads shall be 12-inch thick, brick masonry or concrete construction, threaded metal caps, plastic plugs, or other acceptable methods suitable for the size and type of material being closed. Do not use wood plugs. Pipes and structure under roadways shall be filled completely.

5.4.2 Structure abandonment shall be per SD1 standard drawings and consist of removing structure frames, covers, grates, and similar items. All connecting pipes shall be bulkheaded. The walls shall be lowered to 2 feet below final grade if in earth or to 12 inches below subgrade if in pavement. The remaining structure shall be filled with crushed stone or sand compacted to match all backfill requirements here-in or shall be filled with controlled density fill.

5.5 STORM SEWER PIPE TESTING

5.5.1 Pipe shall be fully backfilled and compacted at least 30 days prior to testing.

5.5.2 Deflection: Under normal circumstances, the CONTRACTOR shall test approximately 20% of all flexible storm sewer piping, as determined and directed by SD1, by use of a calibrated mandrel or other device/method approved by SD1, to ensure that no pipe deflection has occurred greater than five (5) percent of the inside diameter of the pipe. If, however, SD1 determines additional deflection testing is required based on the condition of the system, SD1 reserves the right to require such testing at no additional cost to SD1. The CONTRACTOR shall test the entire length of the sewer installed. Any pipe section exhibiting greater than 5 percent deflection shall be repaired in a manner approved and acceptable to SD1 and retested, at no additional cost to SD1. If the pipe fails a second deflection test, the pipe shall be replaced and retested at no additional cost to SD1.

5.5.3 Displacement: Storm sewer pipe sections may be checked by SD1 to determine if any displacement of the pipe sections from alignment and grade has occurred as each portion of the sewer is completed between structure locations. When the test is performed, it shall be as follows:

A. Flashing a light beam by means of a strong flashlight or reflecting sunlight through the portion of the sewer between structure locations or by utilizing a laser beam.
B. When viewed from the opposite end of the portion of the sewer from the light location, the light beam should be full throughout the sections, but not less than two-thirds full under any circumstances. There shall be no "dips" in the grade of the pipe invert.
C. If the pipe sections show any misalignment, displacement or any other defects in the sections or joints, the CONTRACTOR shall remedy the defect, at the CONTRACTOR'S sole cost, to the satisfaction of SD1.

5.5.4 Within the one-year warranty period, beginning when SD1 accepts the appropriate storm systems, storm sewer pipes may be CCTV inspected by SD1, at the discretion and sole

cost of SD1, to determine if any pipe defects exist. The one-year warranty period shall start at the time of acceptance of the roadway by the local city/county. If defects are found within this warranty period, the CONTRACTOR shall remedy the defect, at the CONTRACTOR's sole cost, to the satisfaction of SD1. Once repairs are made, SD1 will re-inspect the sewer by means of CCTV, at the CONTRACTOR'S sole cost.

5.6 LANDSCAPING / RESTORATION (FOR SD1 FUNDED PROJECTS)

5.6.1 Landscaping / restoration shall be performed in accordance with Section 02900 of the SD1 Technical Specifications.

5.7 ENVIRONMENTAL AND EROSION/SEDIMENT CONTROLS (FOR SD1 FUNDED PROJECTS)

5.7.1 Environmental and erosion/sediment controls shall be performed in accordance with the Regional Stormwater Management Program and SD1 Technical Specifications.

5.7.2 All privately funded projects shall follow requirements of SD1 Grading Permits and Land Disturbance Permits for erosion and sediment control requirements.

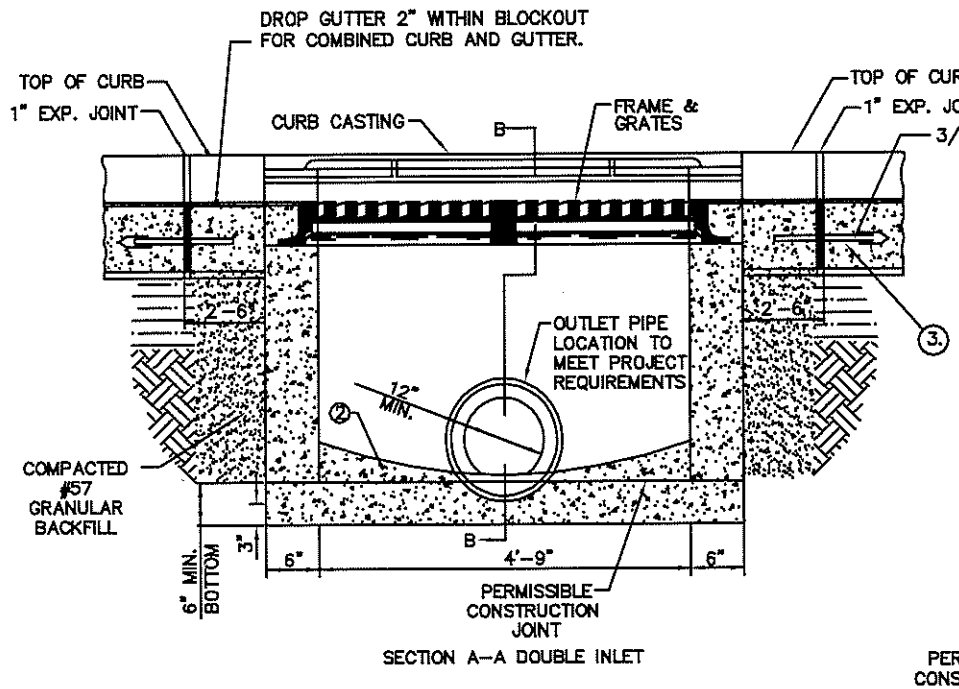
5.8 ENVIRONMENTAL IMPACTS

5.8.1 For projects that include environmental impacts (stream crossings, clearing, etc), permits from agencies other than SD1 may be required before beginning construction. Additional permits may be required from, but not limited to:
(a) US Army Corps of Engineers
(b) US Fish and Wildlife
(c) Kentucky Division of Water (KDOW)

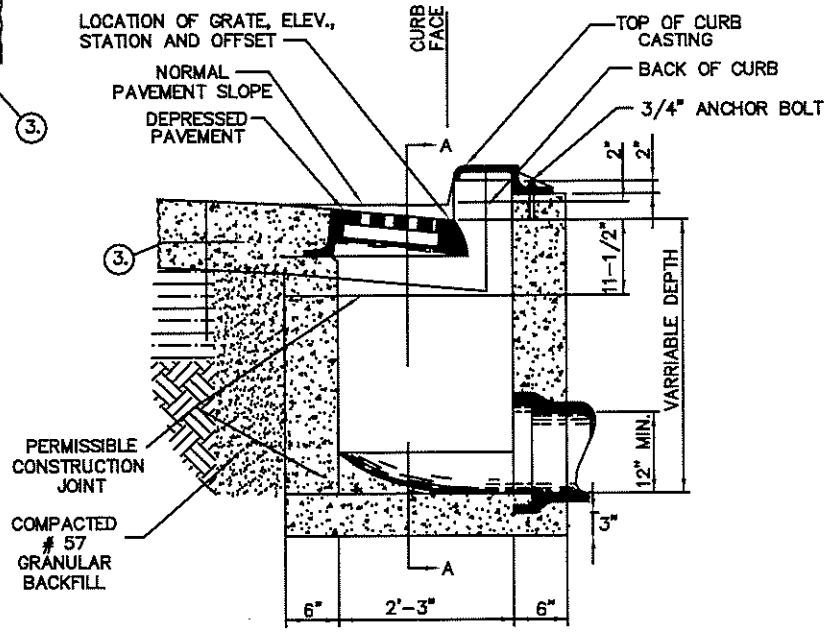
++ END OF SECTION ++

Index for Storm Water Standard Drawings

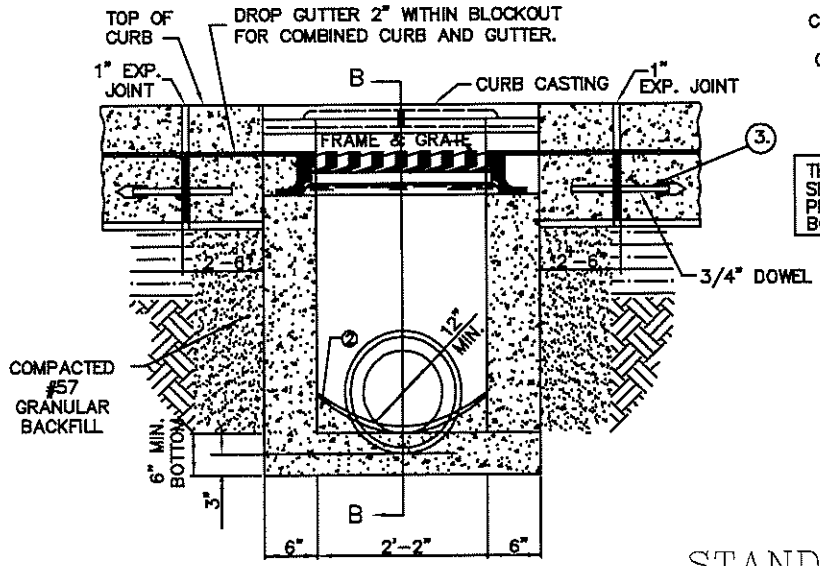
STM -01.1	Standard Curb Inlet
STM -01.2	Standard Curb Inlet Frame and Grate Details
STM -04	Standard Double Curb Inlet with Manhole
STM -07	Standard Yard Drain (12" - 21" outlet pipe)
STM -08	Standard Inlet (12" – 33" outlet pipe)
STM -09	Standard Inlet (36" – 42" outlet pipe)
STM -10	Standard Inlet (48" – 54" outlet pipe)
STM -11	Standard Inlet (60" – 72" outlet pipe)
STM -12	Inlet Detail with Bell for Combined Sewers
STM -13	Standard Manhole
STM-13.1	Large Diameter Manhole
STM -14	Slotted Drain Pipe
STM -15	Low Profile Headwall
STM -16	Sloped & Flared Headwalls (12" – 27" pipe)
STM -17.1	Headwalls 0^ Skew (30" – 108" circular pipe)
STM -17.2	Dimensions & Quantities Headwalls 0^ Skew (30" – 108" circular pipe)
STM -17.3	Bill of Reinforcement Headwalls (30" – 90" circular pipe) 0^ Skew
STM -17.4	Bill of Reinforcement Headwalls 96" – 108" circular pipe) 0^ Skew
STM -18.1	Headwalls – 15^/30^/45^ Skew (30" – 108" circular pipe)
STM -18.2	Dimensions & Quantities Headwalls 15^ Skew (30" – 108" circular pipe)
STM -18.3	Dimensions & Quantities Headwalls 30^ Skew (30" – 108" circular pipe)
STM -18.4	Dimensions & Quantities Headwalls 45^ Skew (30" – 108" circular pipe)
STM -18.5	Bill of Reinforcement Headwalls (30" – 72" circular pipe) 15^ Skew
STM -18.6	Bill of Reinforcement Headwalls (78" – 108" circular pipe) 15^ Skew
STM -18.7	Bill of Reinforcement Headwalls (30" – 66" circular pipe) 30^ Skew
STM -18.8	Bill of Reinforcement Headwalls (72" – 96" circular pipe) 30^ Skew
STM -18.9	Bill of Reinforcement Headwalls (102" – 108" circular pipe) 30^ Skew
STM -18.10	Bill of Reinforcement Headwalls (30" – 66" circular pipe) 45^ Skew
STM -18.11	Bill of Reinforcement Headwalls (72" – 96" circular pipe) 45^ Skew
STM -18.12	Bill of Reinforcement Headwalls (102" – 108" circular pipe) 45^ Skew
STM -19	Enclosure Grate for Inlet Headwall (24" diameter pipe or less)



SECTION A–A DOUBLE INLET



SECTION B–B WITH CURB (2" DEPRESSION)



SECTION A–A SINGLE INLET

THE BOTTOM MAY BE PRECAST SEPARATELY AND THE OUTLET PIPE PLACED ON TOP OF IT WITH THE BOTTOM SHAPED TO DRAIN

KEY NOTES:

1. DOWEL LOCATION FOR CURB AND GUTTER.
2. 4" MINIMUM DEPTH, 4,000 PSI CONCRETE WITH SCRIBED INVERT.
3. PAVEMENT BLOCKOUT. SEE DETAIL STM 1.2 FOR CONCRETE OR ASPHLAT STREET.
4. IF STRUCTURES WITH KNOCK OUT PANELS ARE USED AT DEPTHS GREATER THAN 6' STRUCTURAL CALCULATIONS MUST BE SUPPLIED

STANDARD CURB INLET (STM–01.1)

N.T.S.

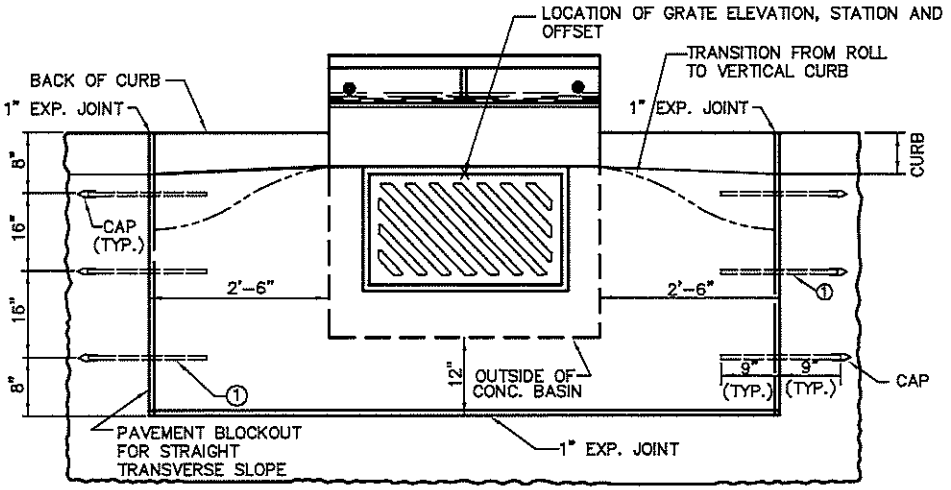
(REFERENCE –BOONE CO. SUB. DETAIL C.12 & ODOT CB 2.2)

REVISION

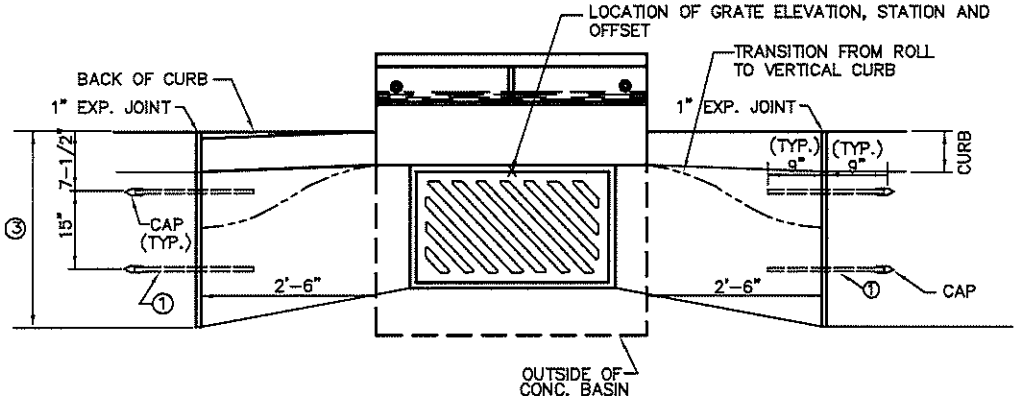
SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578–7460
Fax: (859) 331–2436

DATE: MAY 2010

STANDARD DRAWING NO: STM–01.1



PLAN OF CATCH BASIN BLOCKOUT IN RIGID PAVEMENT



PLAN OF CATCH BASIN BLOCKOUT IN FLEXIBLE PAVEMENT

NOTES:

1. GRATES AND CASTINGS: GRATES AND CASTINGS SHALL BE EJ 7350 FOR SINGLE INLETS AND EJ 7355 FOR DOUBLE INLETS OR AN APPROVED EQUAL. UNLESS THE PLANS SPECIFICALLY REQUIRE THE GRATE "V", THE DIAGONAL GRATE SHALL BE PROVIDED AND PLACED SUCH THAT THE DIAGONAL BARS DIRECT DRAINAGE FLOW TOWARD THE CURB.
2. GRATES AND CASTINGS FOR ALL DRIVEWAY AND MOUNTABLE CURB APPLICATIONS SHALL BE EJ 7390 FOR SINGLE INLETS AND EJ 7391 FOR DOUBLE INLETS OR AN APPROVED EQUAL.
3. PRECAST CONSTRUCTION: PERMITTED, EXCEPT FOR THE APRON. CONCRETE SHALL MEET REQUIREMENTS OF SECTION 02630, PARAGRAPH 3.1.1, OF SD1's STANDARD SPECIFICATIONS. PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 6" AND REINFORCING SHALL BE SUFFICIENT TO PERMIT SHIPPING AND PLACEMENT WITHOUT DAMAGE.
4. OPENINGS: THE MAXIMUM PIPE OPENING SHALL BE THE OUTSIDE DIAMETER (O.D.) OF THE PIPE BEING SUPPLIED PLUS 3" WHEN FIELD CUT.
5. DOWELS: FOUR 3/4" X 18" DOWELS ARE REQUIRED FOR CONCRETE PAVEMENT OR GUTTER BLOCKOUT. REFER TO DOWEL DETAIL THIS DRAWING.
6. BLOCKOUT: BLOCKOUTS SHALL BE CONSTRUCTED AS SHOWN IN THIS DETAIL. ALL CONCRETE AND ASPHALT SHALL CONFORM TO THE GOVERNING JURISDICTIONS REGULATIONS.

KEY NOTES:

1. 3/4" SMOOTH DOWEL LOCATION FOR CURB AND GUTTER.
2. 4" MINIMUM DEPTH, 4,000 PSI CONCRETE WITH SCRIBED INVERT.
3. FOLLOW LOCAL SUBDIVISION REGS FOR CURB DESIGN.

STANDARD CURB INLET (STM-01.2)

N.T.S.

(REFERENCE -BOONE CO. SUB. DETAIL C.12 & ODOT CB 2.2)

REVISION | BY | DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
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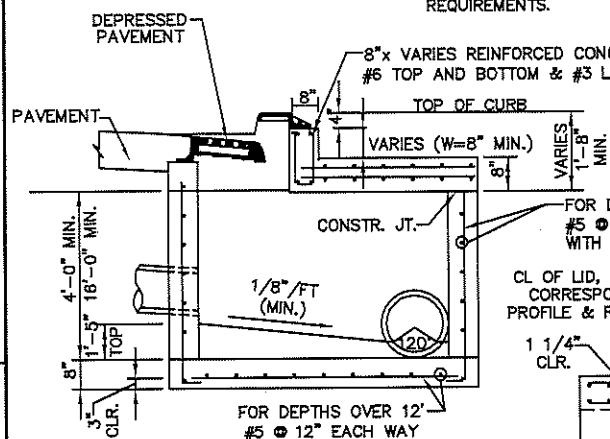
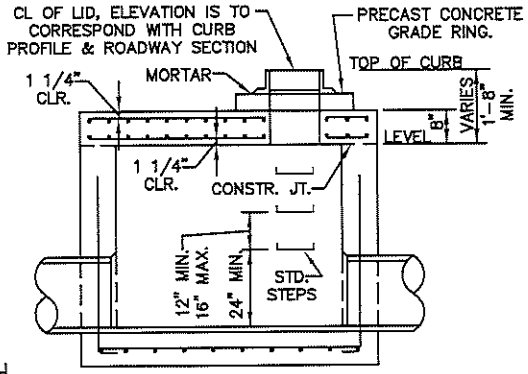
STANDARD DRAWING NO: STM-01.2

DATE: MAY 2010

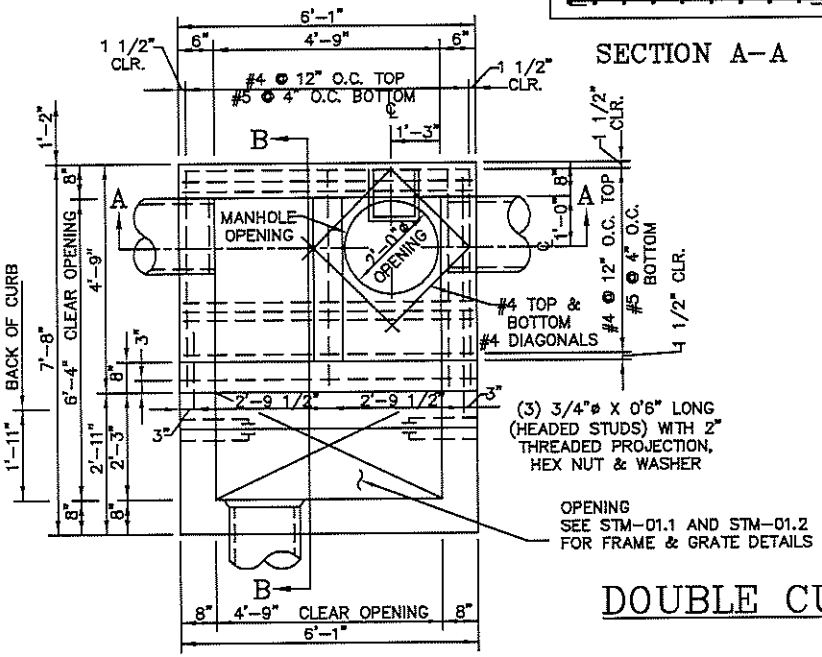
NOTE: SEE DETAIL STM-01.1 AND STM-01.2 FOR CASTING REQUIREMENTS.



SECTION B-B



SECTION A-A



PLAN VIEW

CONCRETE SLAB: MAY BE PRECAST CONCRETE WITH LIFT HOLES. PROVIDE REINFORCEMENT AS SHOWN ON PLAN VIEW SECTION A-A & SECTION B-B

INLET CHAMBER: SHALL BE BUILT OF NON-REINFORCED CONCRETE FOR DEPTHS OF 12'-0" OR LESS. INLET CHAMBERS SHALL BE PRECAST CONCRETE OR CAST IN PLACE CONCRETE IN ACCORDANCE WITH SD1'S CURRENT SPECIFICATIONS FOR DEPTHS GREATER THAN 12'-0". REINFORCEMENT SHALL BE IN ACCORDANCE WITH DETAIL.

PAVEMENT DETAILS: SHALL BE IN ACCORDANCE WITH AGENCY HAVING JURISDICTION.

STANDARD GRATES AND CASTINGS: SHALL BE IN ACCORDANCE WITH STM-01.1 AND STM-01.2. MANHOLE CASTINGS SHALL BE PER SPEC SECTION 02630.

BRICK OR MASONRY UNITS: SIDE WALLS WHEN USED IN PLACE OF CONCRETE SHALL BE 8" NORMAL THHICKNESS.

PRECAST CONSTRUCTION: IS PERMITTED. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S CURRENT SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1. PRECAST CONCRETE WALLS SHALL HAVE A MINIMUM THICKNESS OF 6" AND REINFORCEMENT SHALL BE SUFFICIENT TO PERMIT SHIPPING AND PLACEMENT WITHOUT DAMAGE. HOWEVER, PRECAST CONCRETE SLABS SHALL BE AS SHOWN HEREON.

BASE: MAY BE PRECAST MONOLITHIC WITH THE WALLS. A PERMISSIBLE ALTERNATE IS TO CAST AND SHIP THE BASE AND WALLS SEPARATELY. OPENINGS FOR INLET AND OUTLET PIPES SHALL BE PROVIDED EITHER WHEN THE UNIT IS CAST OR LATER, TO MEET FIELD CONDITIONS. BOTTOM CHANNELS MAY BE FORMED OF CONCRETE PRECAST IN THE BASE OR BY FIELD CONSTRUCTION.

DOUBLE CURB INLET WITH MANHOLE (STM-04)

N.T.S.

(REFERENCE -HAMILTON CO. OH CB3-MH, ODOT CB-3, & ODOT MH-1)

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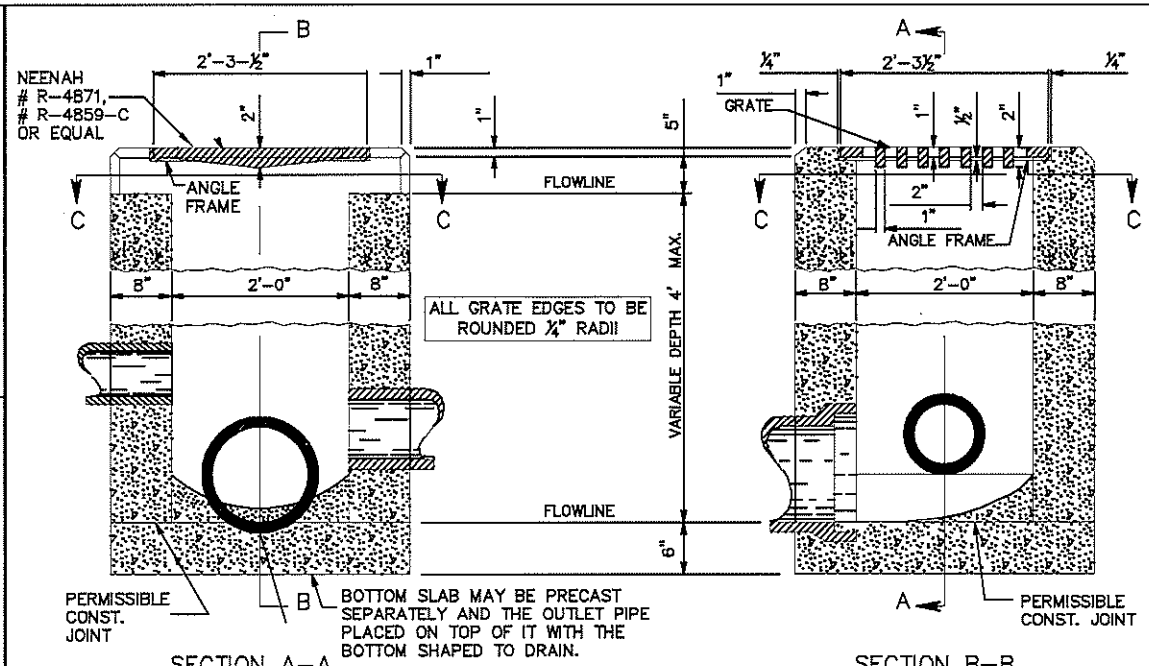
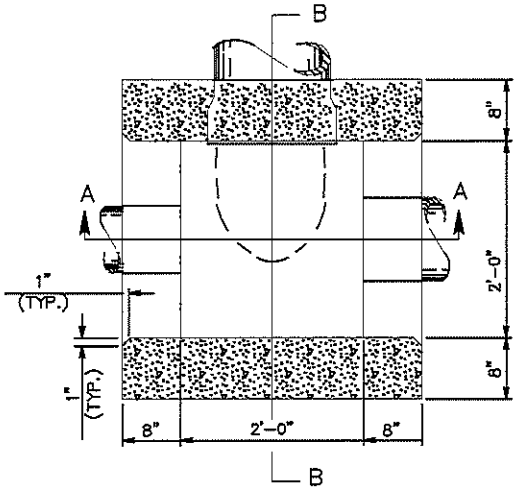
DATE: MAY 2010

STANDARD DRAWING NO: STM-04

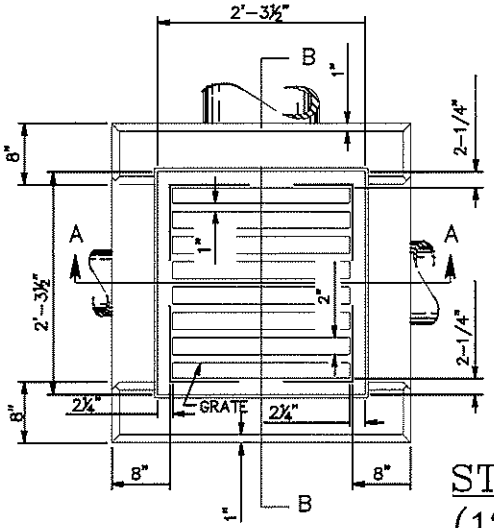


SECTION A–A

SECTION B–B



SECTION C–C



PLAN

NOTES

CATCH BASIN IS NOT INTENDED FOR TRAFFIC BEARING APPLICATIONS

GRATE AND FRAME: GRATES AND FRAMES SHALL BE NEENAH R-4871, R-4859-C, OR AN APPROVED EQUAL.

WALLS: CAST-IN-PLACE WALLS HAVE A NOMINAL THICKNESS OF 8". PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 6" AND BE REINFORCED SUFFICIENTLY TO PERMIT SHIPPING AND HANDLING WITHOUT DAMAGE. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS SECTION 02630, PARAGRAPH 3.1.1.

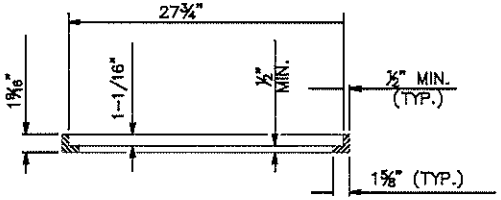
PRECAST BASE: IT SHALL BE SET DEEP ENOUGH SO THAT THE TOP CAN BE PLACED ON THE BASE TO PROVIDE THE GRATE ELEVATION SPECIFIED IN THE PLANS. GRADE ADJUSMENT SHALL BE MADE PER SECTION 02630, PARAGRAPHS 3.2.4 AND 3.2.5. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS SECTION 02630, PARAGRAPH 3.1.1.

LOCATION AND ELEVATION: WHEN GIVEN ON THE PLANS, LOCATION AND ELEVATION ARE AT THE TOP CENTER OF THE GRATE.

MINIMUM DEPTH: THE MINIMUM DEPTH SHALL BE THE OUTSIDE DIAMETER (O.D.) OF THE OUTLET PIPE PLUS 7".

OPENINGS: PIPE OPENINGS SHALL BE THE O.D. OF THE PIPE BEING SUPPLIED PLUS 3" WHEN FABRICATED OR FIELD CUT. THE INTERSTITIAL SPACE SHALL BE FILLED WITH GROUT.

SIDE INLETS: INLETS SHALL BE PROVIDED ON BOTH SIDES OF THE CATCH BASIN IN SAGS AND ON UPSTREAM SIDE ONLY WHERE THE DITCH HAS A CONTINUOUS DOWN GRADE PAST THE CATCH BASIN. SIDE INLETS SHALL NOT BE USED WITHIN THE CLEAR ZONE. THE FLOW LINE SHOULD BE 4" TO 6" BELOW THE NORMAL ELEVATION OF THE DITCH FLOW LINE, RETURNING TO NORMAL WITHIN 10' TO 15' OF THE BASIN.



SECTION THRU ANGLE FRAME

STANDARD YARD DRAIN (12"–21" OUTLET PIPE) (STM–07)

N.T.S.

(REFERENCE –ODOT CB 1.1 {2-2A} AND KENTON COUNTY SUB. DETAIL C-22 {2-2-S})

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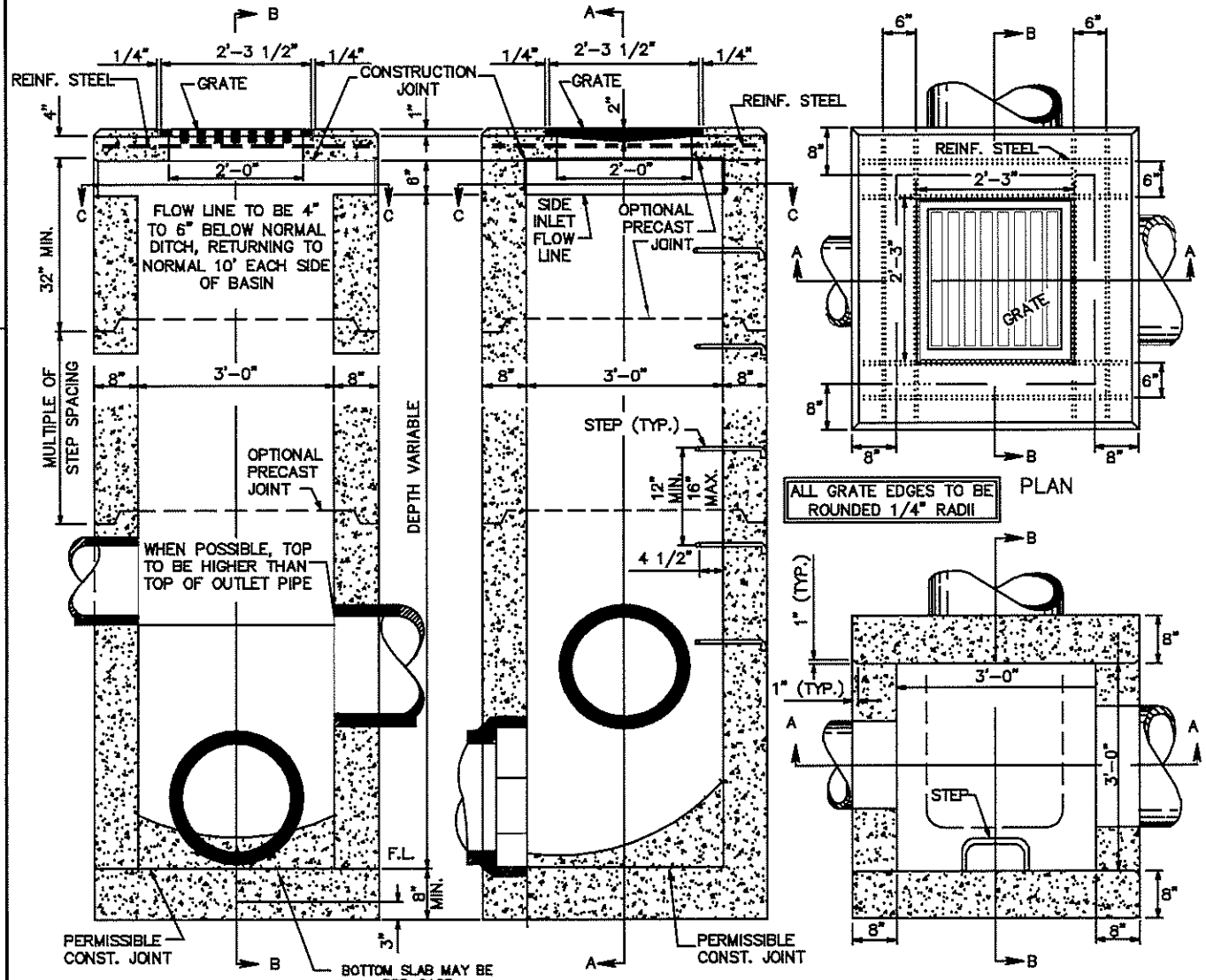
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-07



STANDARD INLET
(12" - 33" OUTLET PIPE)
(STM-08)
N.T.S.

(REFERENCE -ODOT CB 1.2 - {2-3})

KNOCKOUT PANELS: IF STRUCTURES WITH KNOCK OUT PANELS ARE USED AT DEPTHS GREATER THAN 6' STRUCTURAL CALCULATIONS MUST BE SUPPLIED

- NOTES -

GRATES:

GRATES SHALL BE NEENAH NO. R-4859-C OR EAST JORDAN NO. 5110 TYPE M2 OR APPROVED EQUALS.

WALLS: CAST-IN-PLACE WALLS SHALL HAVE A NOMINAL THICKNESS OF 8". PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 6" AND BE REINFORCED SUFFICIENTLY TO PERMIT SHIPPING AND HANDLING WITHOUT DAMAGE. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1.

REINFORCEMENT: REINFORCING IN THE TOP IS TO BE #4 BARS SPACED AT 6" CENTER TO CENTER. USE EIGHT BARS.

INLETS OVER 12 FEET IN DEPTH: SHALL BE PRECAST OR CAST-IN PLACE CONCRETE; REINFORCED WITH #4 BARS ON 12" CENTERS BOTH VERTICALLY AND HORIZONTALLY WITH 2" CLEARANCE FROM INSIDE WALL FACE.

PRECAST BASE: IF A PRECAST BASE IS USED, IT SHALL BE SET DEEP ENOUGH SO THAT THE TOP CAN BE PLACED ON THE BASE TO PROVIDE THE GRATE ELEVATION SPECIFIED IN THE PLANS. GRADE ADJUSTMENTS SHALL BE MADE PER SD1'S SPECIFICATION SECTION 02630, SECTION 3.2.4 AND 3.2.5. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1.

LOCATION AND ELEVATION: WHEN GIVEN ON THE PLANS, THE LOCATION AND THE ELEVATION ARE AT THE TOP CENTER OF THE GRATE. WHEN SIDE OPENINGS ARE PROVIDED, THE ELEVATION SHALL BE AT THE FLOW LINE OF THE SIDE INLET.

MINIMUM DEPTH: THE MINIMUM DEPTH SHALL BE THE OUTSIDE DIAMETER (O.D.) OF THE OUTLET PIPE PLUS 7".

OPENINGS: PIPE OPENINGS SHALL BE THE O.D. OF THE PIPE BEING SUPPLIED PLUS 3" WHEN PREFABRICATED OR FIELD CUT. THE INTERSTITIAL SPACE SHALL BE FILLED WITH GROUT.

SIDE INLETS: SHALL BE PROVIDED ONLY WHEN SPECIFIED ON THE PLANS.

STEPS: STEPS SHALL BE PROVIDED WHERE THE DEPTH EXCEEDS 4' AND SHALL MEET THE REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.2.2.

BENCHING: BENCHING SHALL BE REQUIRED IN ALL STRUCTURES AND SHALL MEET THE REQUIREMENTS OF SECTION 02630, PARAGRAPH 3.2.3, OF SD1's STANDARD SPECIFICATIONS

REVISION | BY | DATE

SANITATION DISTRICT NO. 1
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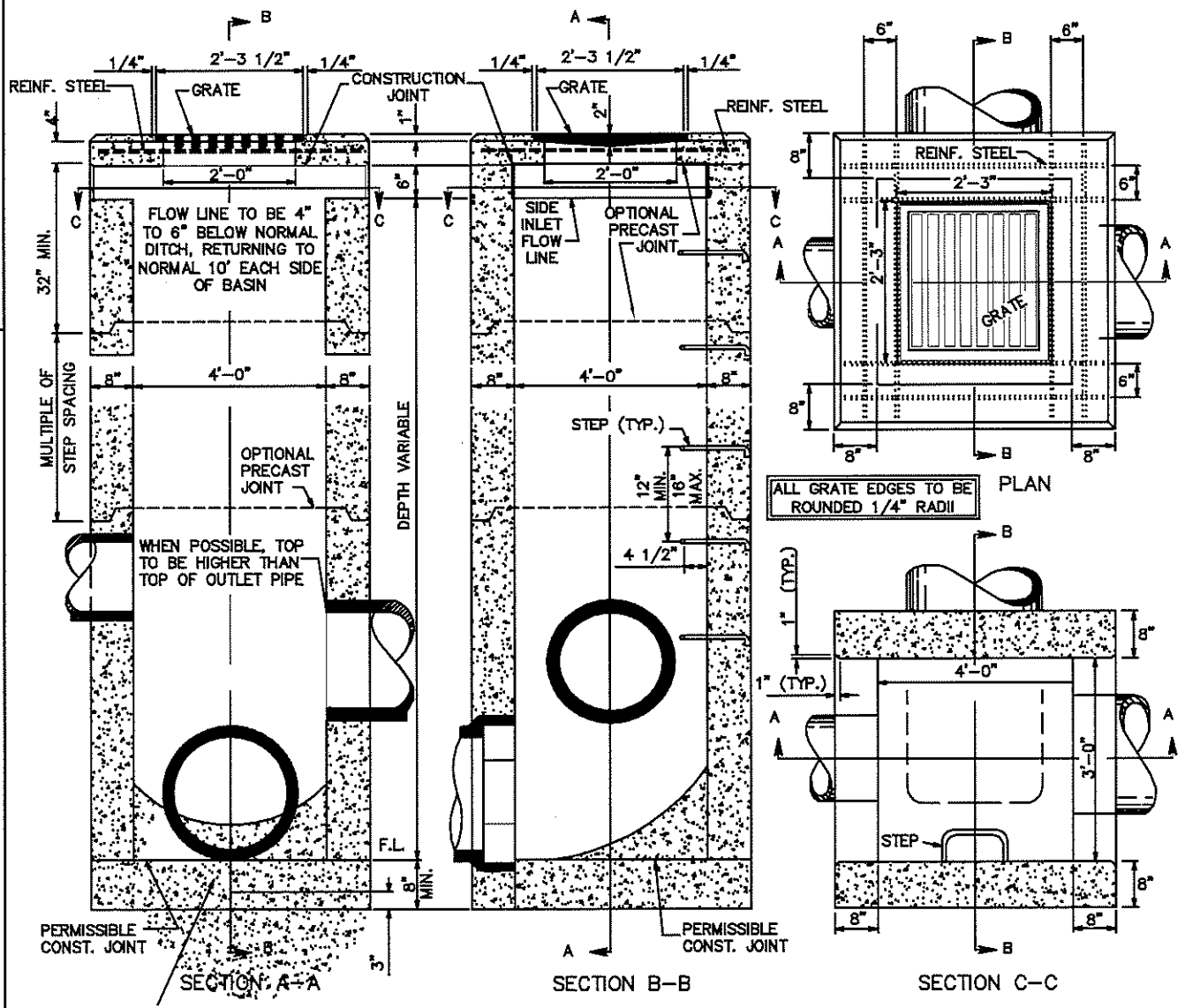
DATE: AUG 2009

STANDARD DRAWING NO: STM-08



STANDARD INLET (36" - 42" OUTLET PIPE)

(STM-09)

N.T.S.

(REFERENCE -ODOT CB 1.2 - {2-4})

- NOTES -

GRATES: GRATES SHALL BE NEENAH NO. R-4859-C OR EAST JORDAN NO. 5110 TYPE M2 OR APPROVED EQUALS.

WALLS: CAST-IN-PLACE WALLS SHALL HAVE A NOMINAL THICKNESS OF 8". PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 6" AND BE REINFORCED SUFFICIENTLY TO PERMIT SHIPPING AND HANDLING WITHOUT DAMAGE. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS SECTION 02630, PARAGRAPH 3.1.1.

REINFORCEMENT: REINFORCING IN THE TOP IS TO BE #4 BARS SPACED AT 6" CENTER TO CENTER. USE TWELVE BARS.

INLETS OVER 12 FEET IN DEPTH: SHALL BE PRECAST OR CAST-IN PLACE CONCRETE; REINFORCED WITH #4 BARS ON 12" CENTERS BOTH VERTICALLY AND HORIZONTALLY WITH 2" CLEARANCE FROM INSIDE WALL FACE.

PRECAST BASE: IF A PRECAST BASE IS USED, IT SHALL BE SET DEEP ENOUGH SO THAT THE TOP CAN BE PLACED ON THE BASE TO PROVIDE THE GRATE ELEVATION SPECIFIED IN THE PLANS. GRADE ADJUSMENT SHALL BE MADE PER SECTION 02630, PARAGRAPH 3.2.4 AND 3.2.5. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS SECTION 02630, PARAGRAPH 3.1.1.

LOCATION AND ELEVATION: WHEN GIVEN ON THE PLANS, THE LOCATION AND THE ELEVATION ARE AT THE TOP CENTER OF THE GRATE. WHEN SIDE OPENINGS ARE PROVIDED, THE ELEVATION SHALL BE AT THE FLOW LINE OF THE SIDE INLET.

MINIMUM DEPTH: THE MINIMUM DEPTH SHALL BE THE OUTSIDE DIAMETER (O.D.) OF THE OUTLET PIPE PLUS 7".

OPENINGS: PIPE OPENINGS SHALL BE THE O.D. OF THE PIPE BEING SUPPLIED PLUS 3" WHEN PREFABRICATED OR FIELD CUT. THE INTERSTITIAL SPACE SHALL BE FILLED WITH GROUT.

SIDE INLETS: SHALL BE PROVIDED ONLY WHEN SPECIFIED ON THE PLANS.

STEPS: STEPS SHALL BE PROVIDED WHERE THE DEPTH EXCEEDS 4' AND SHALL MEET THE REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.2.2.

BENCHING: BENCHING SHALL BE REQUIRED IN ALL STRUCTURES AND SHALL MEET THE REQUIREMENTS OF SECTION 02630, PARAGRAPH 3.2.3 OF SD1's SPECIFICATIONS

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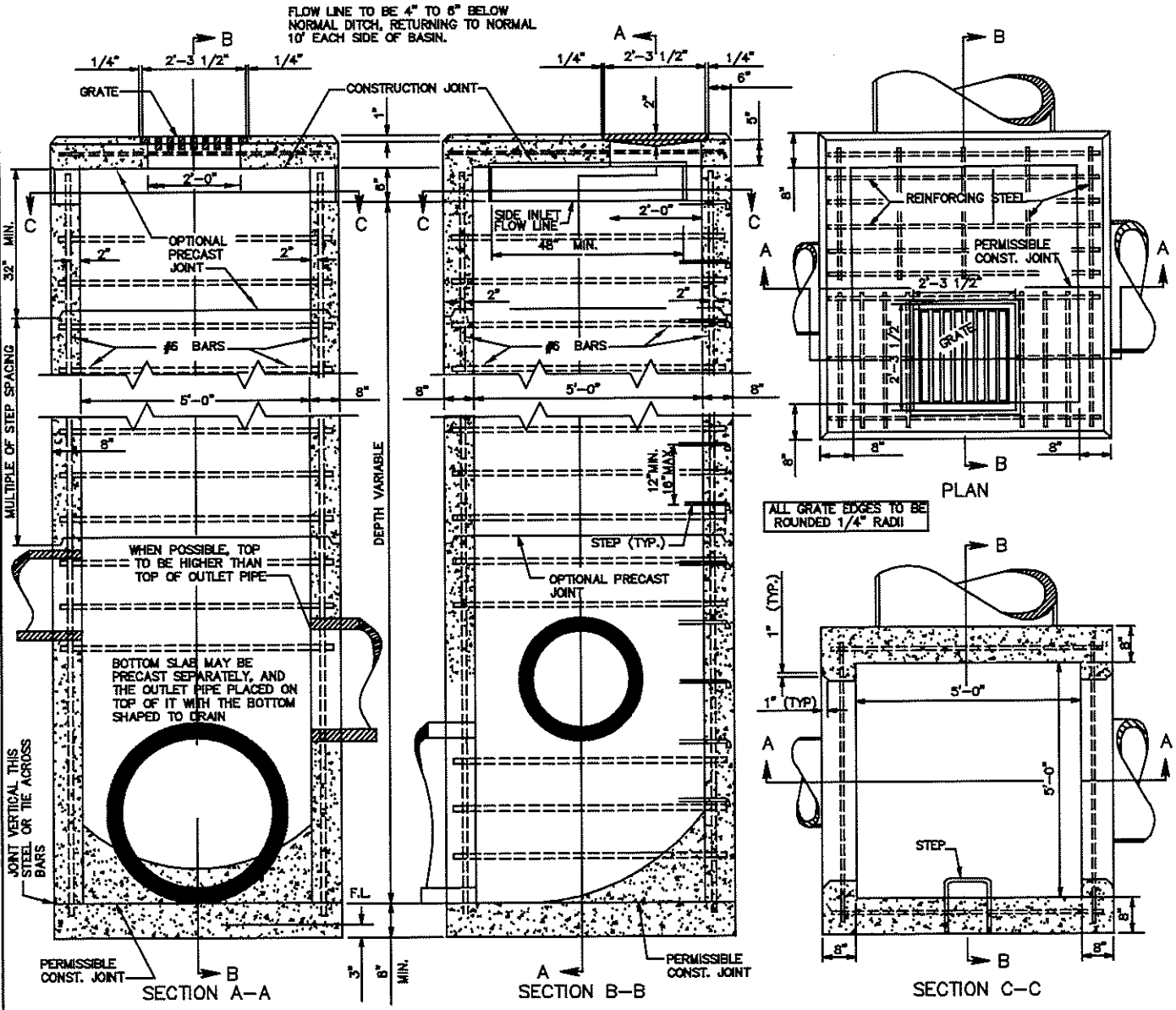
STANDARD DRAWING NO: STM-09

DATE: MAY 2010



STANDARD INLET (48" - 54" OUTLET PIPE)

(STM-10)

N.T.S.

(REFERENCE -ODOT CB 1.3 - §2-5§)

- NOTES -

GRATES: GRATES SHALL BE NEENAH NO. R-4859-C OR EAST JORDAN NO. 5110 TYPE M2 OR APPROVED EQUALS.

WALLS: SHALL BE 8" THICK WHEN REINFORCED, AS SHOWN. PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 8" AND BE REINFORCED SUFFICIENTLY TO PERMIT SHIPPING AND HANDLING WITHOUT DAMAGE AND SHALL BE AT LEAST EQUIVALENT TO REINFORCED CAST-IN-PLACE CONSTRUCTION. PRECAST TOPS SHALL MEET CAST-IN-PLACE TOPS FOR DIMENSIONS AND REINFORCEMENT. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1.

STEPS: STEPS SHALL BE PROVIDED WHERE THE DEPTH EXCEEDS 4' AND SHALL MEET THE REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.2.2.

REINFORCEMENT: REINFORCING IN THE TOP IS TO BE #6 BARS SPACED 6"CENTER TO CENTER AND #6TIE BARS SPACED AS SHOWN. MAIN BARS TO CLEAR BOTTOM OF SLAB BY 1". SIDE WALL TO BE REINFORCED WITH #6 BARS HORIZONTAL IN EACH SIDE, 6' LONG, SPACED AT 1' CENTER TO CENTER AND #6 BARS IN EACH CORNER LENGTH EQUALS DEPTH PLUS 1'.

PRECAST BASE: IF A PRECAST BASE IS USED, IT SHALL BE SET DEEP ENOUGH SO THAT THE TOP CAN BE PLACED ON THE BASE TO PROVIDE THE GRATE ELEVATION SPECIFIED IN THE PLANS. GRADE ADJUSTMENTS SHALL BE MADE PER SD1'S SPECIFICATION SECTION 02630, SECTION 3.2.4 AND 3.2.5. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1.

LOCATION AND ELEVATION: WHEN GIVEN ON THE PLANS, THE LOCATION AND THE ELEVATION ARE AT THE TOP CENTER OF THE GRATE. WHEN SIDE OPENINGS ARE PROVIDED, THE ELEVATION SHALL BE AT THE FLOW LINE OF THE SIDE INLET.

MINIMUM DEPTH: THE MINIMUM DEPTH SHALL BE THE OUTSIDE DIAMETER (O.D.) OF THE OUTLET PIPE PLUS 7".

OPENINGS: PIPE OPENINGS SHALL BE THE O.D. OF THE PIPE BEING SUPPLIED PLUS 3" WHEN FABRICATED OR FIELD CUT. THE INTERSTITIAL SPACE SHALL BE FILLED WITH GROUT.

SIDE INLETS: SHALL BE PROVIDED ONLY WHEN SPECIFIED ON THE PLANS.

BENCHING: BENCHING SHALL BE REQUIRED IN ALL STRUCTURES AND SHALL MEET THE REQUIREMENTS OF SECTION 02630, PARAGRAPH 3.2.3 OF SD1's STANDARD SPECIFICATIONS

KNOCKOUT PANELS: IF STRUCTURES WITH KNOCK OUT PANELS ARE USED AT DEPTHS GREATER THAN 6' STRUCTURAL CALCULATIONS MUST BE SUPPLIED

REVISION | BY | DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
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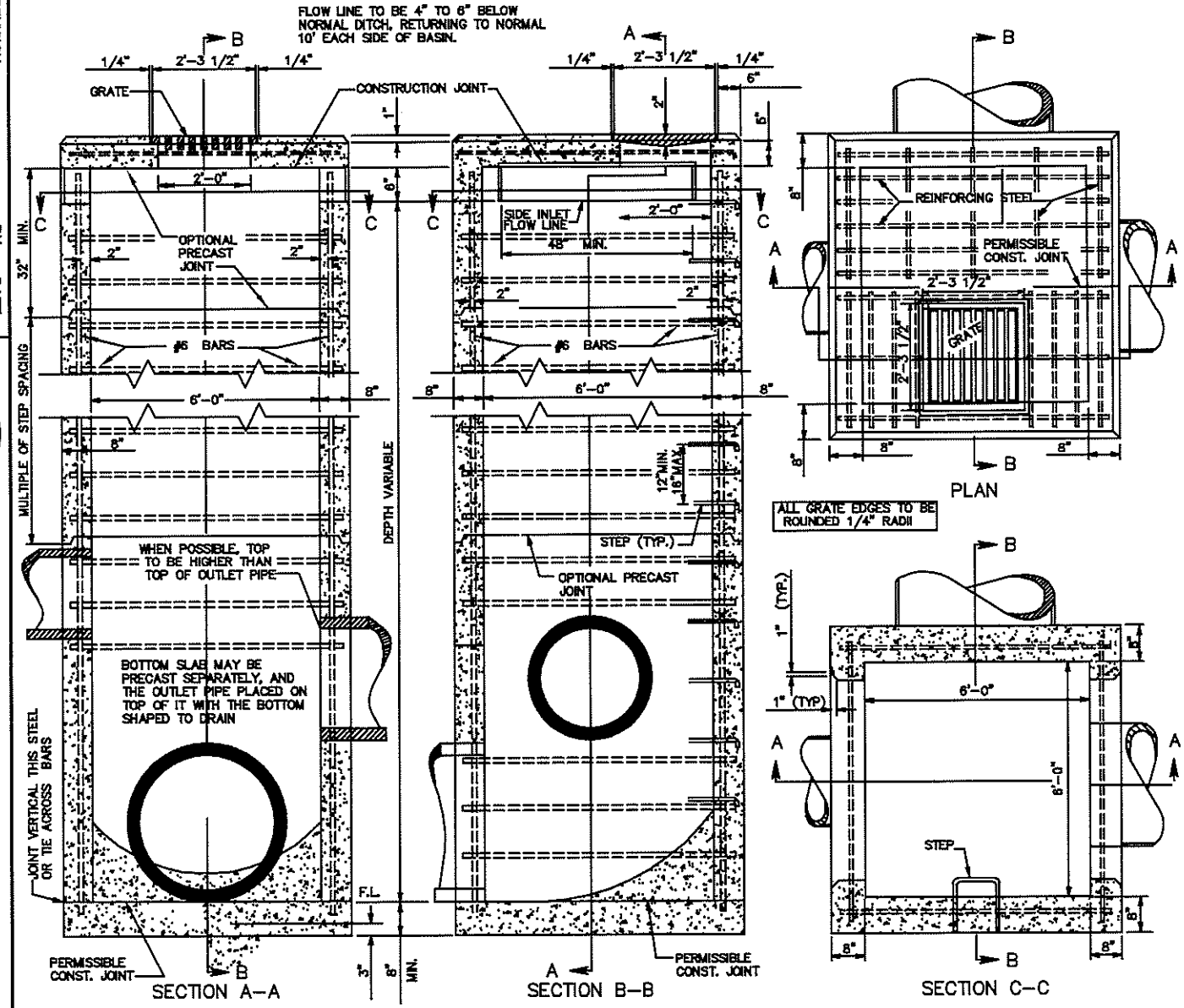
DATE: MAY 2010

STANDARD DRAWING NO: STM-010



STANDARD INLET (60" – 72" OUTLET PIPE)

(STM-11)

N.T.S.

(REFERENCE –ODOT CB 1.3 – {2-6})

– NOTES –

GRATES: GRATES SHALL BE NEENAH NO. R-4858-C OR EAST JORDAN NO. 5110 TYPE M2 OR APPROVED EQUALS.

WALLS: SHALL BE 8" THICK WHEN REINFORCED, AS SHOWN. PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 6" AND BE REINFORCED SUFFICIENTLY TO PERMIT SHIPPING AND HANDLING WITHOUT DAMAGE AND SHALL BE AT LEAST EQUIVALENT TO REINFORCED CAST-IN-PLACE CONSTRUCTION. PRECAST TOPS SHALL MEET CAST-IN-PLACE TOPS FOR DIMENSIONS AND REINFORCEMENT. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1.

STEPS: STEPS SHALL BE PROVIDED WHERE THE DEPTH EXCEEDS 4' AND SHALL MEET THE REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.2.2.

REINFORCEMENT: REINFORCING IN THE TOP IS TO BE #6 BARS SPACED 6"CENTER TO CENTER AND #6TIE BARS SPACED AS SHOWN. MAIN BARS TO CLEAR BOTTOM OF SLAB BY 1". SIDE WALL TO BE REINFORCED WITH #6 BARS HORIZONTAL IN EACH SIDE, 6' LONG, SPACED AT 1' CENTER TO CENTER AND #6 BARS IN EACH CORNER LENGTH EQUALS DEPTH PLUS 1'.

PRECAST BASE: IF A PRECAST BASE IS USED, IT SHALL BE SET DEEP ENOUGH SO THAT THE TOP CAN BE PLACED ON THE BASE TO PROVIDE THE GRATE ELEVATION SPECIFIED IN THE PLANS. GRADE ADJUSTMENTS SHALL BE MADE PER SD1'S SPECIFICATION SECTION 02630, SECTION 3.2.4 AND 3.2.5. CONCRETE SHALL MEET REQUIREMENTS OF SD1'S SPECIFICATIONS, SECTION 02630, PARAGRAPH 3.1.1.

LOCATION AND ELEVATION: WHEN GIVEN ON THE PLANS, THE LOCATION AND THE ELEVATION ARE AT THE TOP CENTER OF THE GRATE. WHEN SIDE OPENINGS ARE PROVIDED, THE ELEVATION SHALL BE AT THE FLOW LINE OF THE SIDE INLET.

MINIMUM DEPTH: THE MINIMUM DEPTH SHALL BE THE OUTSIDE DIAMETER (O.D.) OF THE OUTLET PIPE PLUS 7".

OPENINGS: PIPE OPENINGS SHALL BE THE O.D. OF THE PIPE BEING SUPPLIED PLUS 3" WHEN FABRICATED OR FIELD CUT. THE INTERSTITIAL SPACE SHALL BE FILLED WITH GROUT.

SIDE INLETS: SHALL BE PROVIDED ONLY WHEN SPECIFIED ON THE PLANS.

BENCHING: BENCHING SHALL BE REQUIRED IN ALL STRUCTURES AND SHALL MEET THE REQUIREMENTS OF SECTION 02630, PARAGRAPH 3.2.3 OF SD1's STANDARD SPECIFICATIONS

KNOCKOUT PANELS: IF STRUCTURES WITH KNOCK OUT PANELS ARE USED AT DEPTHS GREATER THAN 8' STRUCTURAL CALCULATIONS MUST BE SUPPLIED

REVISION | BY | DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
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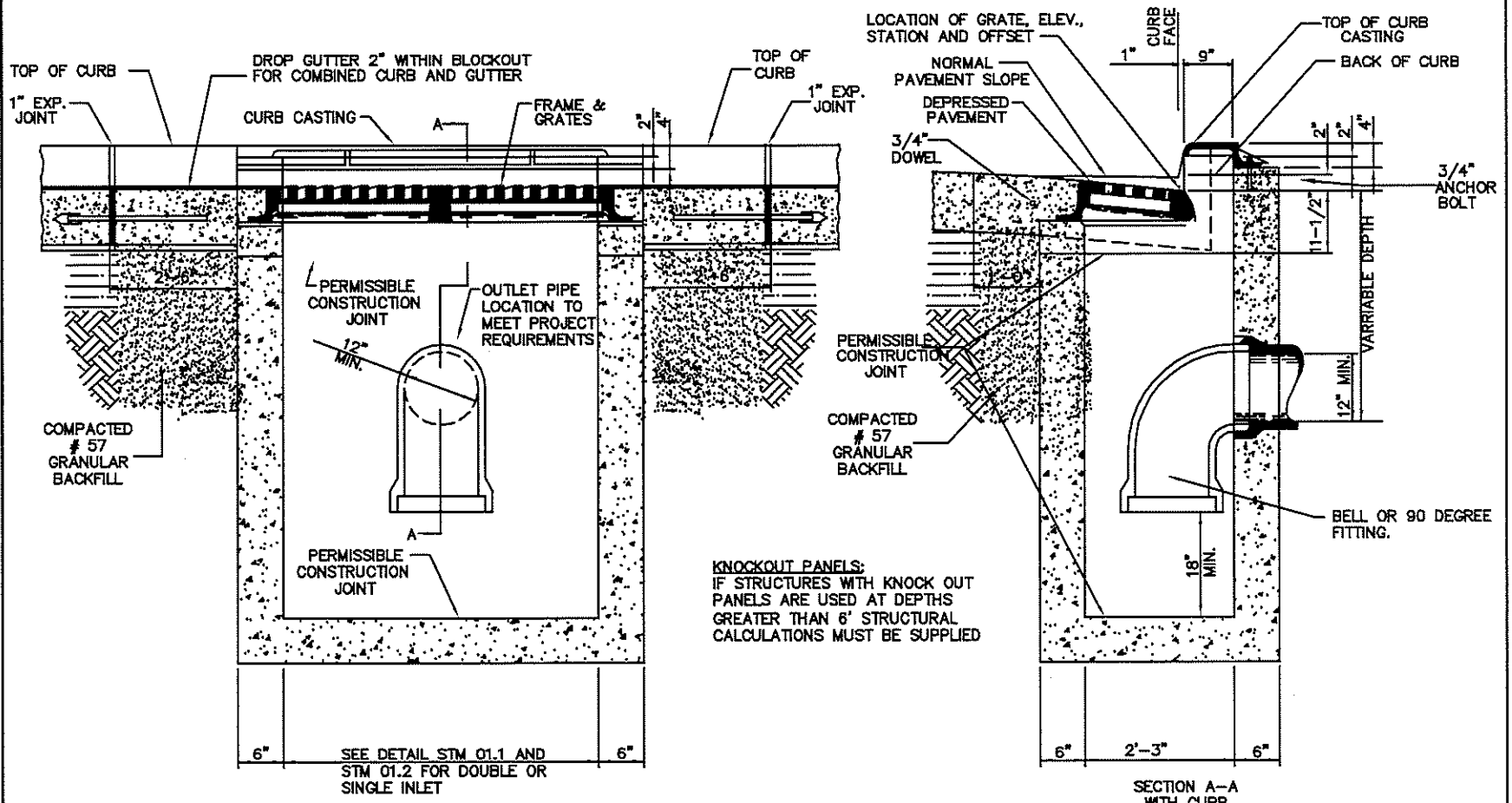
STANDARD DRAWING NO: STM-011

DATE: MAY 2010



KNOCKOUT PANELS:
IF STRUCTURES WITH KNOCK OUT PANELS ARE USED AT DEPTHS GREATER THAN 6' STRUCTURAL CALCULATIONS MUST BE SUPPLIED

NOTES:

1. TRAPPED CATCH BASIN IS TO BE USED IN THE COMBIMED SEWER SYSTEM OR AS DIRECTED BY SD1.
2. TRAPPED CATCH BASIN SHALL BE USED WTIH EITHER SINGLE OR DOUBEL CURB INLET. SEE DETAILS STM 01.1 AND 01.2 FOR INFORMATION ON GRATING, BLOCKOUTS, AND BACKFILL NOTES.
3. BOTTOM OF BELL SHALL MAINTAIN AT LEAST 18" OF VERTICAL SEPERATION FROM THE BOTTOM OF THE BASIN. ALSO, THE INVERT OF THE LOWEST OUTGOING PIPE SHALL BE HIGHER THAN THE BOTTOM OF THE BELL.
4. ANTI-SIPHON DEVICES ARE ACCEPTABLE BASED ON SD1 PRE-APPROVAL

REFER TO DWG STM 01.2 AND STM 02.1FOR NOTES

TRAPPED CATCH BASIN (STM-12.0)

N.T.S.

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SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
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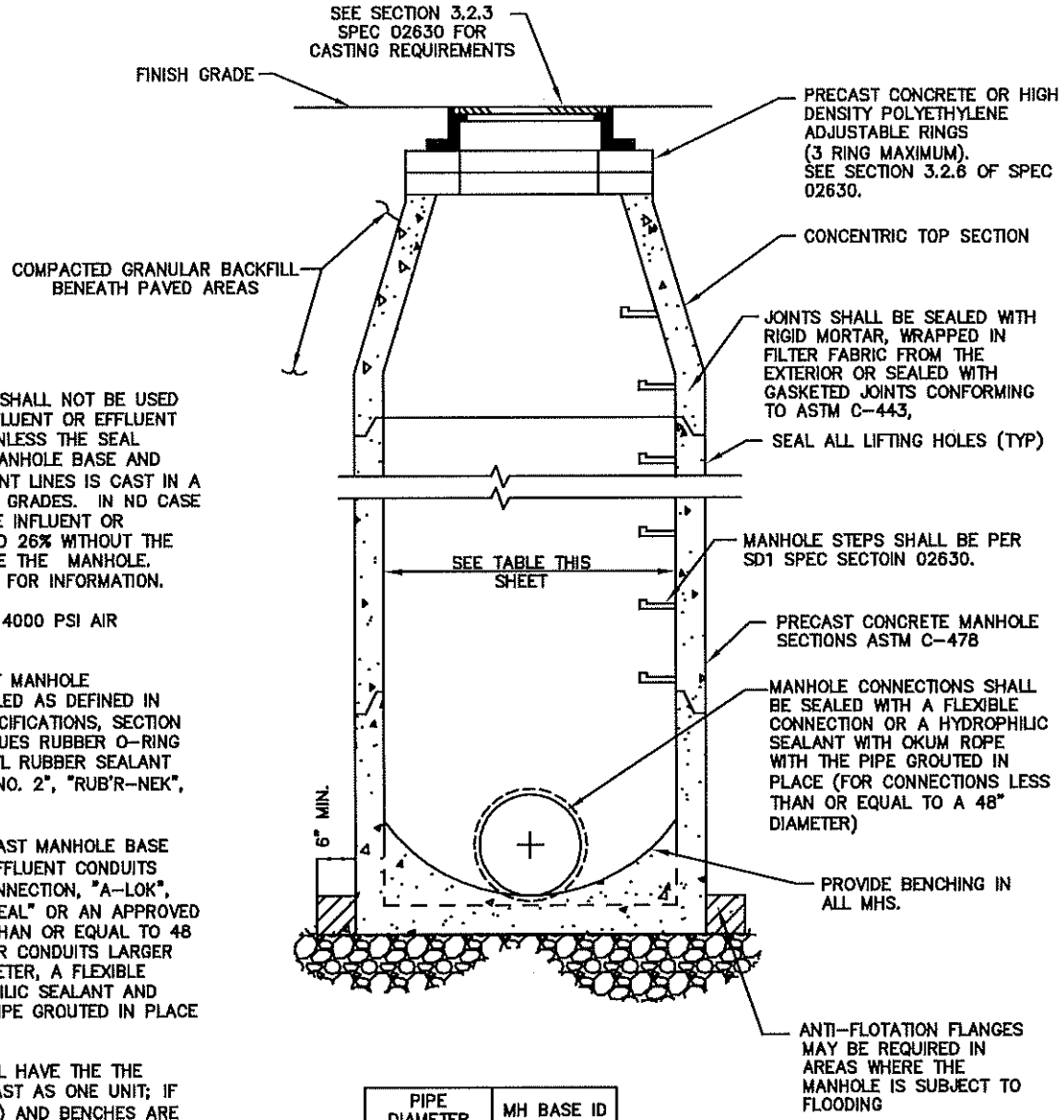
DATE: MAY 2010

STANDARD DRAWING NO: STM-12.0



NOTES:

1. PRECAST MANHOLE BASE SHALL NOT BE USED IF THE GRADE OF THE INFLUENT OR EFFLUENT CONDUIT EXCEEDS 10%, UNLESS THE SEAL BETWEEN THE PRECAST MANHOLE BASE AND INFLUENT AND/OR EFFLUENT LINES IS CAST IN A SKEW TO ACCEPT LARGER GRADES. IN NO CASE SHALL THE GRADE OF THE INFLUENT OR EFFLUENT CONDUIT EXCEED 26% WITHOUT THE USE OF A FITTING OUTSIDE THE MANHOLE. SEE SPECIFICATION 02606 FOR INFORMATION.
2. ALL CONCRETE SHALL BE 4000 PSI AIR ENTRAINED.
3. JOINTS BETWEEN PRECAST MANHOLE SECTIONS SHALL BE SEALED AS DEFINED IN PART 3.2.4 OF SD1'S SPECIFICATIONS, SECTION 02630: A SINGLE, CONTINUES RUBBER O-RING GASKET, A FLEXIBLE BUTYL RUBBER SEALANT (CONSEAL), "KENT-SEAL NO. 2", "RUB'R-NEK", OR "E-Z STIK".
4. THE SEAL BETWEEN PRECAST MANHOLE BASE AND INFLUENT AND/OR EFFLUENT CONDUITS SHALL BE A FLEXIBLE CONNECTION, "A-LOK", "KOR-N-SEAL", "DURA-SEAL" OR AN APPROVED EQUAL FOR PIPES LESS THAN OR EQUAL TO 48 INCHES IN DIAMETER. FOR CONDUITS LARGER THAN 48 INCHES IN DIAMETER, A FLEXIBLE CONNECTION OR HYDROPHILIC SEALANT AND OKAUM ROPE WITH THE PIPE GROUTED IN PLACE MAY BE USED.
5. THE PRECAST BASE SHALL HAVE THE THE FLOOR AND SIDE WALL CAST AS ONE UNIT; IF THE FLOW LINE (CHANNEL) AND BENCHES ARE NOT CAST AS A PART OF FLOOR AND SIDE WALL, THEY SHALL BE CAST IN PLACE
6. LIFT HOLES IN PRECAST MANHOLE BASE TO BE SEALED WITH HYDRAULIC CEMENT.
7. PRECAST MANHOLES SHALL BE INSTALLED PER SECTION 02606.
8. BENCHING SHALL BE SHAPED TO MAINTAIN A SMOOTH TRANSITION OF FLOW FOR PIPE ANGLES BETWEEN 90 AND 180 DEGREES, AS REFERENCED TO THE DOWNSTREAM FLOWLINE. NO ANGLES LESS THAN 90 DEGREES WILL BE ALLOWED BETWEEN INCOMING AND OUTGOING PIPES IN MHS.
9. ALL MANHOLES SHALL FOLLOW THE REQUIREMENTS OF SECTION 02630 OF SD1'S TECHNICAL SPECIFICATIONS.

PIPE DIAMETER	MH BASE ID
12" THRU 21"	48"
24" THRU 36"	60"
42" & 48"	72"
60"	90"
72"	108"

STANDARD MANHOLE

N.T.S.

REVISION	BY	DATE

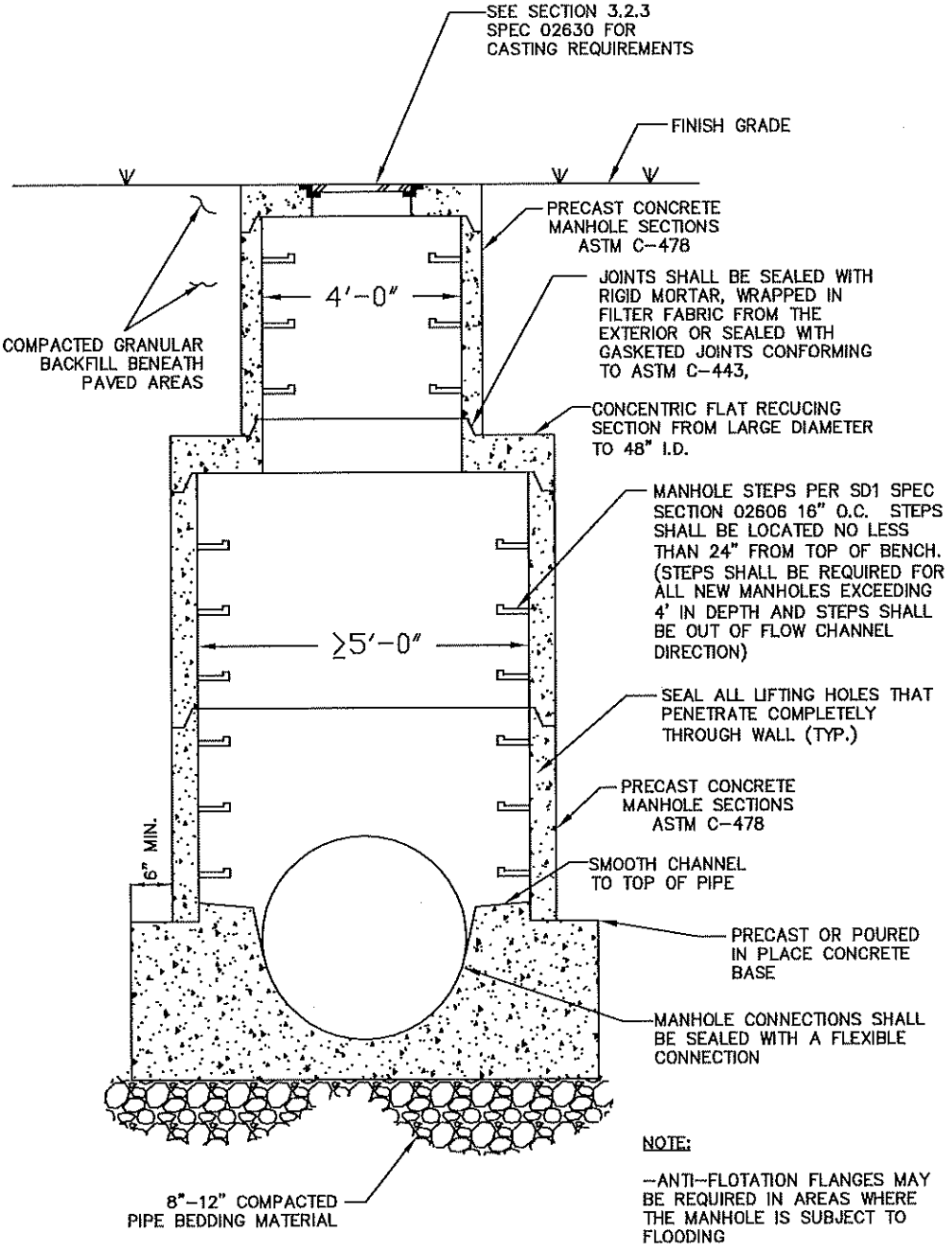
SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-13

NOTES:

1. PRECAST MANHOLE BASE SHALL NOT BE USED IF THE GRADE OF THE INFLUENT OR EFFLUENT CONDUIT EXCEEDS 10%, UNLESS THE SEAL BETWEEN THE PRECAST MANHOLE BASE AND INFLUENT AND/OR EFFLUENT LINES IS CAST IN A SKEW TO ACCEPT LARGER GRADES. IN NO CASE SHALL THE GRADE OF THE INFLUENT OR EFFLUENT CONDUIT EXCEED 26% WITHOUT THE USE OF A FITTING OUTSIDE THE MANHOLE. SEE SPECIFICATION 02606 FOR INFORMATION.
2. ALL CONCRETE SHALL BE 4000 PSI AIR ENTRAINED.
3. JOINTS BETWEEN PRECAST MANHOLE SENCTIONS SHALL BE SEALED WITH EITHER RIGID MORTAR, WRAPPED IN FILTER FABRIC ON THE EXTERIOR, OR SEALED WITH A GASKET TO PROVIDE A SILT-TIGHT CONNECTIONS BETWEEN MANHOLE SECTIONS. THE GASKET BETWEEN THE PRECAST MANHOLE BASE AND THE MANHOLE RISERS SHALL MEET THE REQUIREMENTS OF A.S.T.M. C-443, EXCEPT THAT ONLY "O" RING AND PROFILE GASKETS ARE ACCEPTABLE.
4. THE SEAL BETWEEN PRECAST MANHOLE BASE AND INFLUENT AND/OR EFFLUENT CONDUITS SHALL BE A FLEXIBLE CONNECTION, "A-LOK", "KOR-N-SEAL", "DURA-SEAL" OR AN APPROVED EQUAL FOR PIPES LESS THAN OR EQUAL TO 48 INCHES IN DIAMETER. FOR CONDUITS LARGER THAN 48 INCHES IN DIAMETER, A FLEXIBLE CONNECTION OR HYDROPHILIC SEALANT AND OKAUM ROPE WITH THE PIPE GROUTED IN PLACE MAY BE USED.
5. THE PRECAST BASE SHALL HAVE THE THE FLOOR AND SIDE WALL CAST AS ONE UNIT; IF THE FLOW LINE (CHANNEL) AND BENCHES ARE NOT CAST AS A PART OF FLOOR AND SIDE WALL, THEY SHALL BE CAST IN PLACE
6. LIFT HOLES IN PRECAST MANHOLE BASE TO BE SEALED WITH HYDRAULIC CEMENT.
7. PRECAST MANHOLES SHALL BE INSTALLED PER SECTION 02606.
8. BENCHING SHALL BE SHAPED TO MAINTAIN A SMOOTH TRANSITION OF FLOW FOR PIPE ANGLES BETWEEN 90 AND 180 DEGREES, AS REFERENCED TO THE DOWNSTREAM FLOWLINE. NO ANGLES LESS THAN 90 DEGREES WILL BE ALLOWED BETWEEN INCOMING AND OUTGOING PIPES IN MHS.
9. ALL MANHOLES SHALL FOLLOW THE REQUIREMENTS OF SECTION 02630 OF SD1'S TECHNICAL SPECIFICATIONS.



NOTE:

-ANTI-FLOTATION FLANGES MAY BE REQUIRED IN AREAS WHERE THE MANHOLE IS SUBJECT TO FLOODING

LARGE DIAMETER MANHOLE N.T.S.

REVISION	BY	DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
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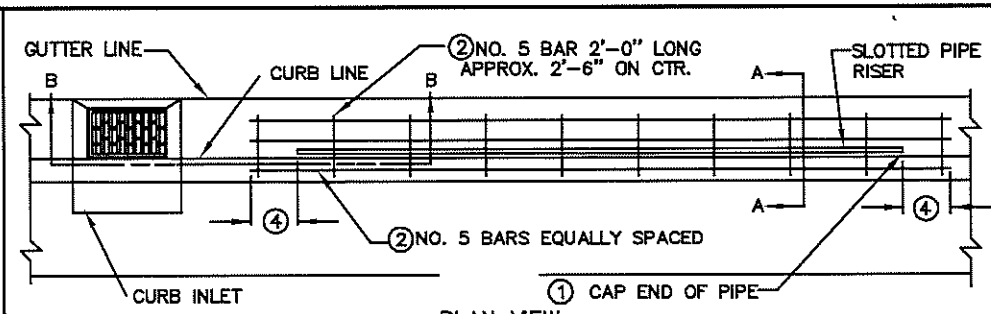
DATE: MAY 2010

STANDARD DRAWING NO: STM-13.1



PLAN VIEW

— NOTES —

① THE CAP SHALL BE A STANDARD MANUFACTURED ITEM FURNISHED BY THE PIPE SUPPLIER.

② ALL REINFORCING STEEL SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE PER LINEAR FOOT OF SLOTTED DRAIN PIPE. ALL REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH THE DEPARTMENTS STANDARD SPECIFICATIONS.

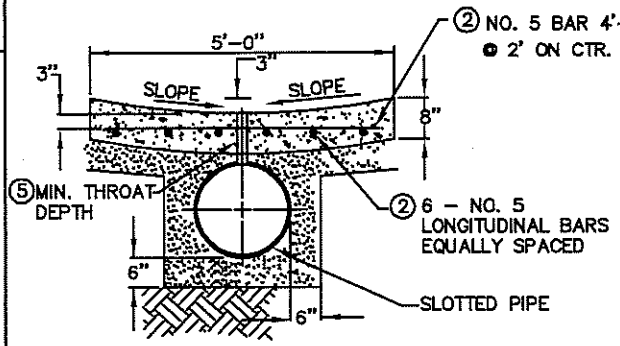
③ USE DROP BOX INLET TYPE 10 WITH VALLEY GUTTER (LIMITED TO 24" METAL PIPE SIZE).

④ EXTEND LONGITUDINAL BAR APPROXIMATELY 1'-6" PAST END OF SLOTTED DRAIN PIPE.

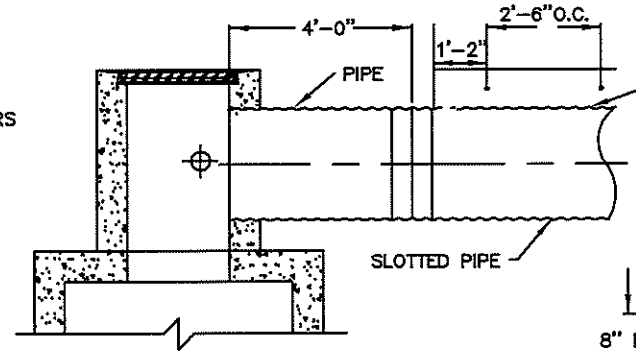
⑤ MINIMUM THROAT DEPTH FOR SLOTTED DRAIN PIPE SHALL BE 10".

⑥ CONTROLLED-LOW-STRENGTH-MATERIAL OR FLOWABLE FILL MAY BE USED FOR BACKFILL.

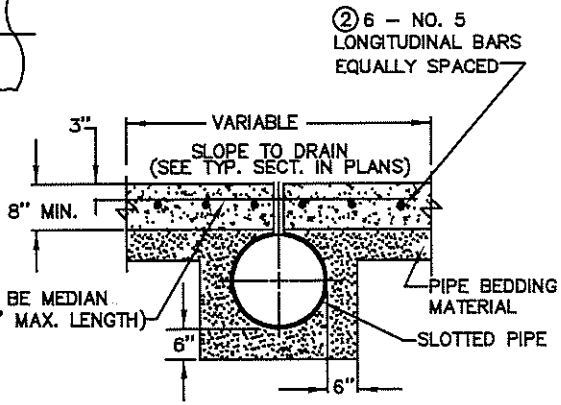
⑦ 12" MINIMUM DIA., 20' MAXIMUM LENGTH.



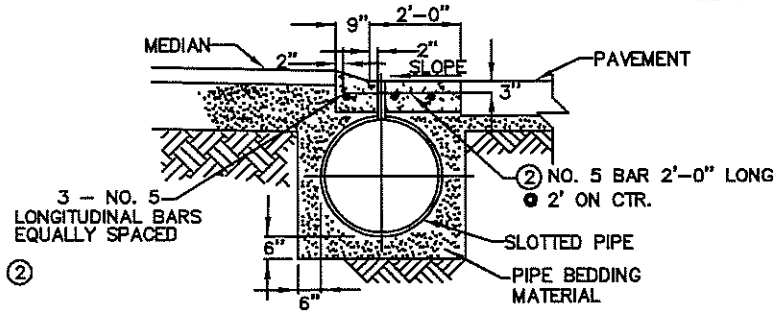
VALLEY GUTTER SECTION ③



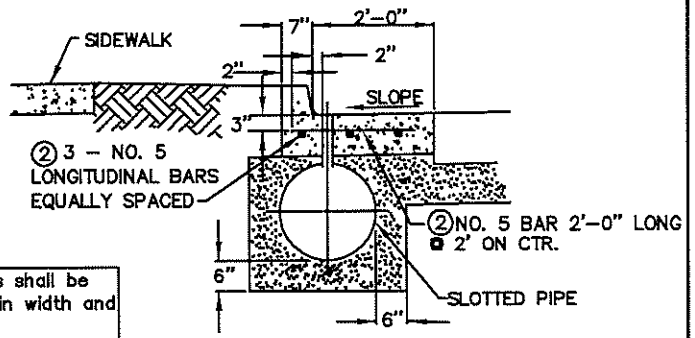
SECTION B-B



FLUSH MEDIAN SECTION



SECTION A-A
LIP CURB SECTION



STD. CURB SECTION

SLOTTED DRAIN PIPE (STM-14)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDI-200 BOONE CO. SUB. DETAIL C.15)

Slotted drain openings shall be between 1.5" - 2.0" in width and 6" in length

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STANDARD DRAWING NO: STM-14

DATE: MAY 2009

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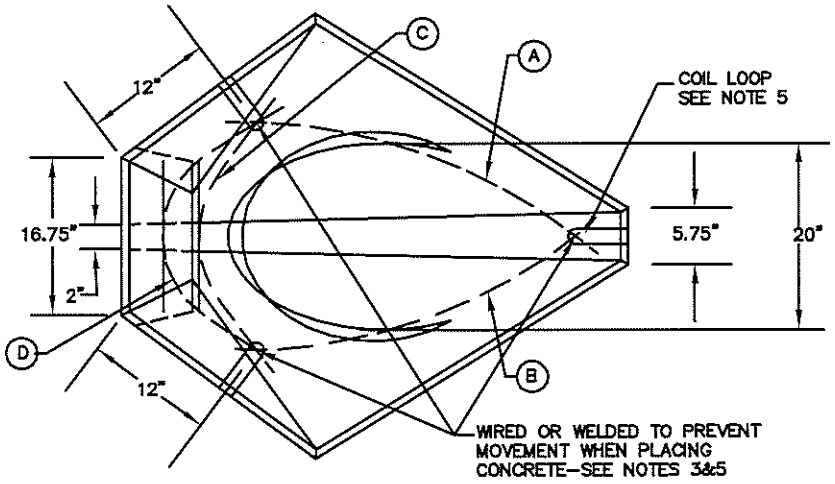
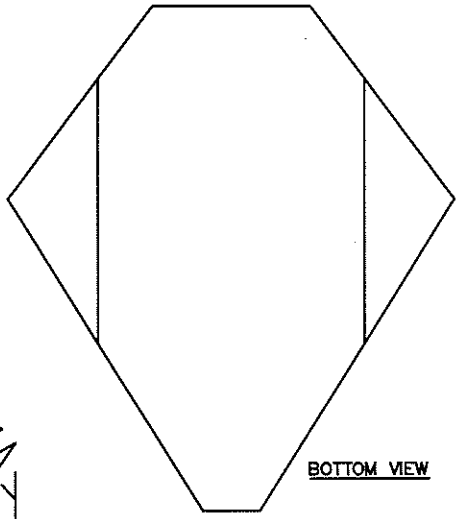
DATE: AUG 2009

STANDARD DRAWING NO: STM-15

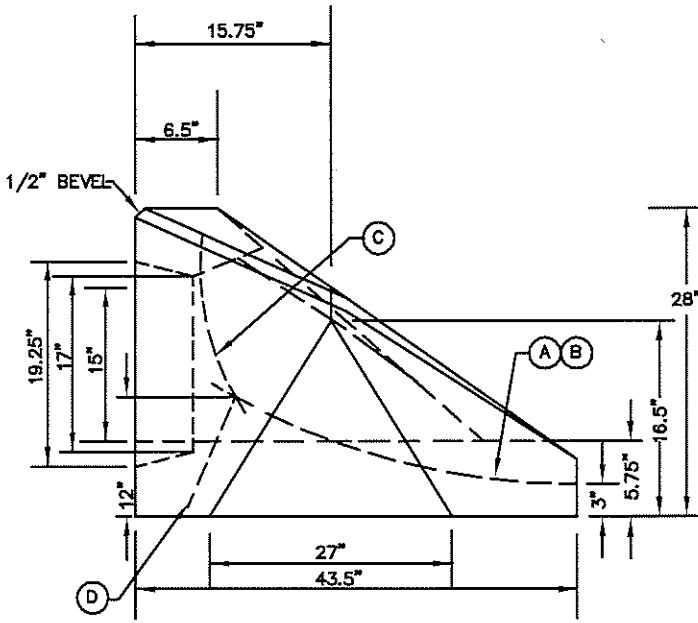


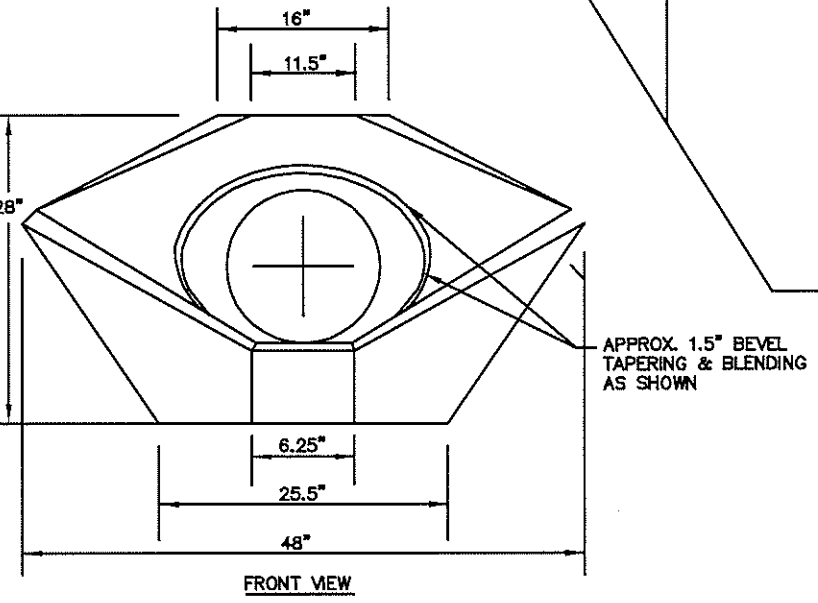
TOP VIEW

1. BOTTOM APRON SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE.
2. DIMESIONS AND QUANTITIES ARE BASED ON STEEL PIPE AND WILL VARY SLIGHTLY FOR CONCRETE PIPE.
3. DIMENSIONS FROM FACE OF CONCRETE TO STEEL SHALL BE 2" CLEAR DISTANCE.
4. HEADWALL LOCATED AT EDGE OF SHOULDER SHALL BE PARALLEL TO CENTERLINE OF ROAD.
5. ENCIRCLED LETTERS, Ⓐ, INDICATE STEEL BAR LOCATIONS. EITHER WIRED OR WELDED AT 3-1"X6" COIL LOOPS AS SHOWN IN TOP & SIDE VIEWS. SEE NOTE 3.
6. USE CLASS "A" CONCRETE (KY)- APPROX. .35 CU. YD.
7. REINF. STEEL APPROX. 13' OR 4.9 LBS. MINIMUM GRADE 40.
8. APPROX. COMPLETE WEIGHT 1365 LBS.



BOTTOM VIEW





LOW PROFILE HEADWALL (STM-15)

N.T.S.

(REFERENCE BOONE CO. SUB. DETAIL D.22)

REVISION	BY	DATE

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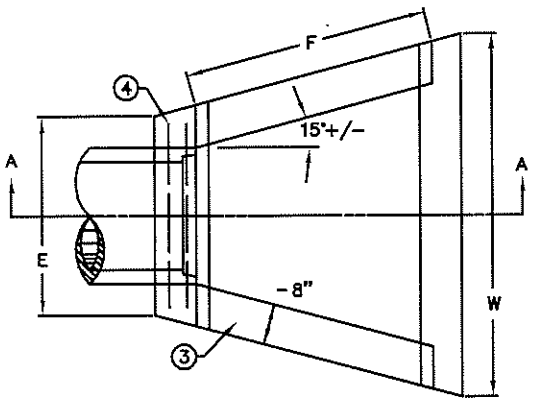
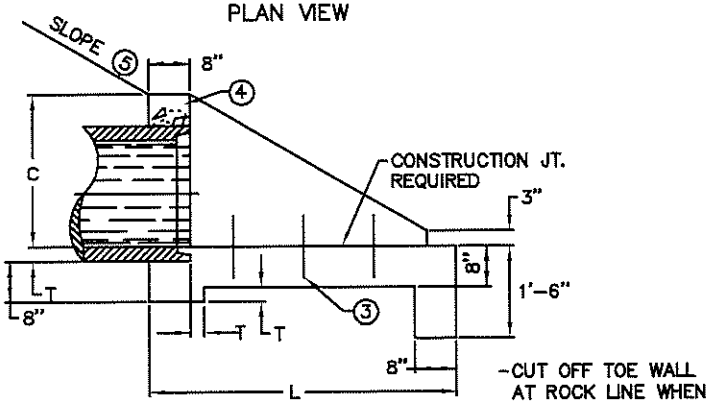
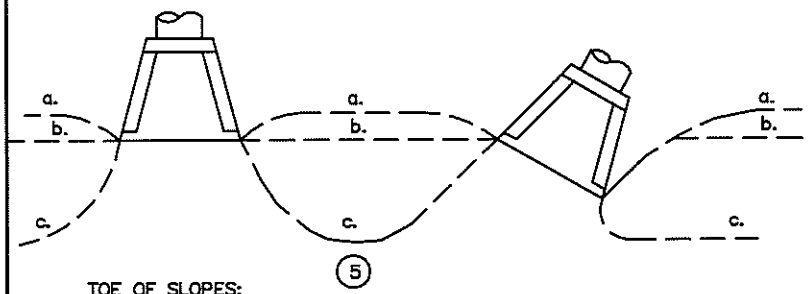


PLAN VIEW



-CUT OFF TOE WALL AT ROCK LINE WHEN ENCOUNTERED.

SECTION A-A



TOE OF SLOPES:
a. STEEPER THAN 2:1
b. 2:1
c. FLATTER THAN 2:1

PIPE		DIMENSIONS						CLASS A CONC	REINF STEEL
DIA. OR EQUIV. DIA.	SHAPE ⑨	C	E	F	L	W	T	C. Y.	LBS.
12"	○	1'-9"	2'-6"	2'-3"	3'-6"	4'-0"	2"	0.58	7
15"	○	2'-0"	2'-9"	2'-9"	4'-0"	4'-9"	2 1/4"	0.75	
	⬭	1'-9"	3'-0"	2'-6"	3'-6"	4'-9"		0.68	8
18"	○	2'-3"	3'-0"	3'-6"	4'-6"	5'-3"	2 1/2"	0.93	
	⬭	2'-0"	3'-6"	3'-0"	4'-0"	5'-6"	2 3/4"	0.89	
	⬭								
21"	○	2'-6"	3'-3"	4'-0"	5'-0"	6'-0"		1.14	
	⬭	2'-3"	3'-0"	3'-6"	4'-6"	6'-0"		1.07	9
24"	○	2'-9"	3'-6"	4'-6"	5'-6"	6'-6"	3"	1.35	8
	⬭	2'-6"	4'-0"	4'-0"	5'-0"	6'-9"	3 1/4"	1.30	9
	⬭								
27"	○	3'-0"	3'-9"	5'-0"	6'-0"	7'-0"		1.57	
	⬭	2'-9"	4'-6"	4'-3"	5'-3"	7'-3"	3 1/2"	1.51	10

NOTES

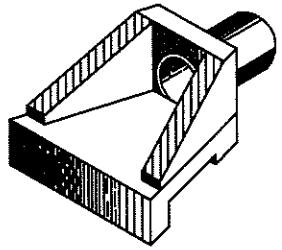
1. DIMENSIONS AND QUANTITIES ARE BASED ON CONCRETE PIPE AND WILL VARY INSIGNIFICANTLY FOR ALTERNATE PIPE MATERIALS.
2. REINFORCING STEEL : MINIMUM GRADE 40, BARS EVENLY SPACED.

③ 6 - NO. 4 x 1'-0" DOWEL BARS.
④ 2 - NO. 4 x (E DIMENSION MINUS 4").
⑤ SLOPES SHALL BE WARPED TO FIT HEADWALL WHEN PIPE IS SKEWED AND/OR NORMAL SLOPE VARIES FROM 2:1.

6. VOLUME DISPLACED BY PIPE COMPUTED USING INSIDE DIAMETER OF PIPE.
7. WING ANGLES AND/OR DIMENSIONS MAY BE ALTERED DURING CONSTRUCTION TO ACCOMMODATE FLOW OF WATER.
8. APRON BETWEEN WINGS SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE. FRONT FACE OF HEADWALL SHALL REMAIN VERTICAL.

⑨ HEADWALLS ARE FOR CIRCULAR, ARCH, AND HORIZONTAL ELLIPTICAL 12"- 27" EQUIVALENT PIPE SIZES. SEE CURRENT KDOT STD. DWG. RDI-016, FOR NON-CIRCULAR PIPE EQUIVALENT SIZES.

10. ENCLOSURE GRATE SHALL BE INSTALLED PER DETAIL STM-19 FOR PIPE SIZES 24 INCHES DIAMETER AND UNDER.



ISOMETRIC VIEW

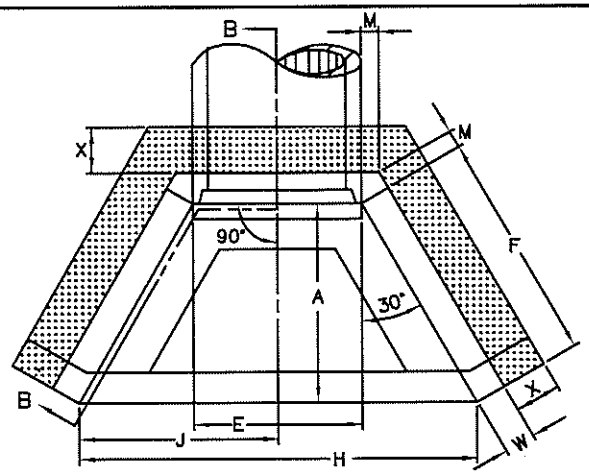
SLOPED & FLARED HEADWALLS (12"-27" PIPE)

(STM-16)

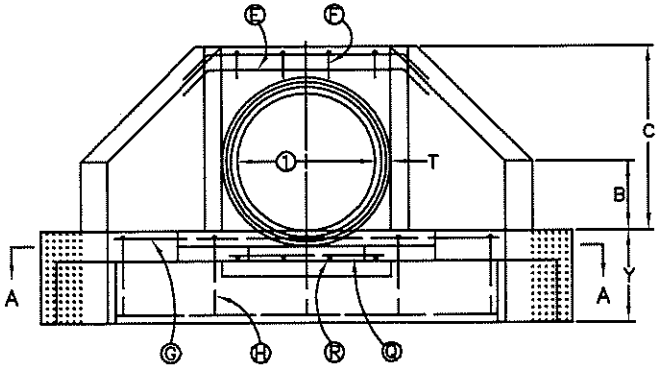
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-020)

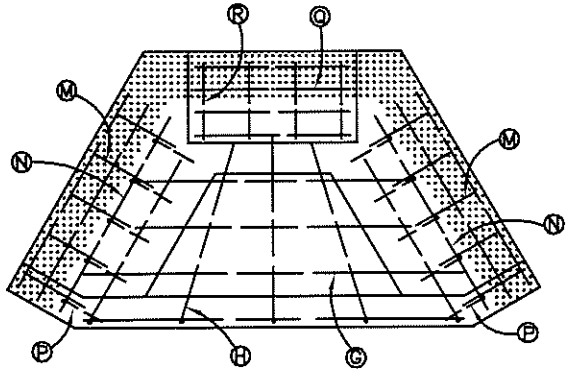
STANDARD DRAWING NO:	DATE:
STM-16	MAY 2010



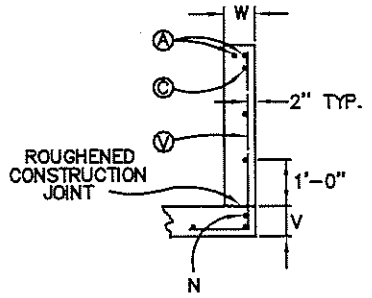
PLAN VIEW



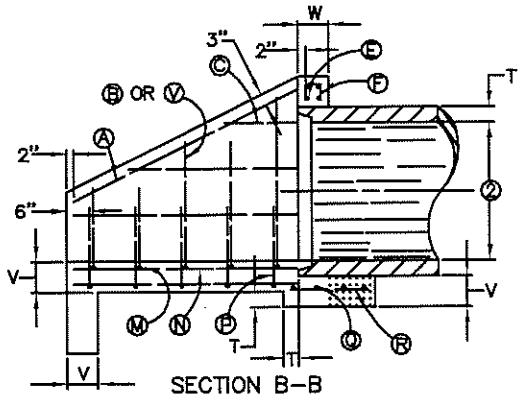
FRONT ELEVATION



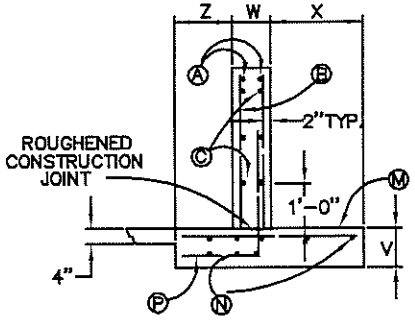
SECTION A–A



WING SECTION
30" TO 60" CIRCULAR PIPE
30" TO 72" NON–CIRCULAR PIPE



SECTION B–B



WING SECTION
66" TO 108" CIRCULAR PIPE

-- 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 DETAILS 216–B AND 216–C 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 B , C , G , P , M , V ARE SPACED 1'–0" O.C. ALL OTHER BARS SHALL BE EVENLY SPACED.
8. BARS B AND V ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE END OF EACH WING.
9. BARS C 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.

SAFETY GUARDS AND RAILINGS

SAFETY GUARDS AND RAILINGS SHALL BE PROVIDED ALONG THE TOP AND SLOPED/WINGED SIDE WALLS ON ALL HEADWALL INLET AND OUTLET STRUCTURES OR OTHER CULVERTS OR BRIDGE STRUCTURES HAVING A VERTICAL DROP OF FORTY EIGHT (48) INCHES OR GREATER. SUCH GUARDS OR RAILINGS SHALL BE AT LEAST FORTY TWO (42) INCHES IN HEIGHT MEASURED VERTICALLY ABOVE THE WALLS. OPENINGS IN GUARDS SHALL HAVE BALUSTERS OR ORNAMENTAL PATTERNS THAT DO NOT PROVIDE OR CREATE A LADDER EFFECT SUCH THAT A SPHERE WITH A DIAMETER OF FOUR (4) INCHES CANNOT PASS THROUGH ANY OPENING, EXCEPT FOR THE TOP EIGHT (8) INCHES. GUARDS AND RAILINGS AND ATTACHMENTS SHALL BE MADE OF MATERIALS THAT ARE WEATHER RESISTANT AND ULTRAVIOLET (UV) LIGHT RESISTANT ADEQUATE IN STRENGTH TO RESIST UNIFORM, CONCENTRATED AND IMPACT LOADS IN ACCORD WITH THE APPLICABLE SECTIONS OF THE KENTUCKY BUILDING CODE, LATEST VERSION. GUARDS AND RAILINGS CONSTRUCTED OF WOOD SHALL BE PROHIBITED. OTHER TYPES OF LANDSCAPING BUFFERS SUCH AS TREES, BUSHES OR SHRUBS MAY SUPPLEMENT, BUT NOT REPLACE GUARDS AND RAILINGS FOR SAFETY (REF. KENTON CO SUB REGS ARTICLE V, SECTION B).

HEADWALLS 0° SKEW (30" – 108" CIRCULAR PIPE)

(STM–17.1)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH–11, KENTON COUNTY SUBDIVISION REGULATIONS)

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STANDARD DRAWING NO: STM–17.1

DATE: MAY 2010

REVISION	BY	DATE

DIMENSION	DIAMETER OF PIPE														DIMENSION
	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	
A	3'–9"	4'–4"	4'–11"	5'–6"	6'–1"	6'–8"	7'–5"	8'–0"	8'–7"	9'–2"	9'–9"	10'–4"	10'–11"	11'–6"	A
B	1'–3"	1'–6"	1'–9"	2'–0"	2'–3"	2'–6"	2'–9"	3'–0"	3'–3"	3'–6"	3'–9"	4'–0"	4'–3"	4'–6"	B
C	3'–6"	4'–0"	4'–7"	5'–1"	5'–8"	6'–2"	7'–0"	7'–5"	8'–0"	8'–6"	9'–1"	9'–7"	10'–2"	10'–8"	C
E	3'–1"	3'–8"	4'–3"	4'–10"	5'–5"	6'–0"	6'–7"	7'–2"	7'–9"	8'–4"	8'–11"	9'–6"	10'–1"	10'–8"	E
F	4'–4"	5'–0"	5'–8"	6'–4"	7'–0"	7'–8"	8'–7"	9'–3"	9'–11"	10'–7"	11'–3"	11'–11"	12'–7"	13'–3"	F
H	7'–6"	8'–8"	10'–0"	11'–2"	12'–6"	13'–8"	15'–2"	16'–6"	17'–8"	19'–0"	20'–2"	21'–6"	22'–8"	24'–0"	H
J	3'–9"	4'–4"	5'–0"	5'–7"	6'–3"	6'–10"	7'–7"	8'–3"	8'–10"	9'–6"	10'–1"	10'–9"	11'–4"	12'–0"	J
M	0'–5"						0'–6"								M
T	0'–3.5"	0'–4.0"	0'–4.5"	0'–5.0"	0'–5.5"	0'–6.0"	0'–6.5"	0'–7.0"	0'–7.5"	0'–8.0"	0'–8.5"	0'–9.0"	0'–9.5"	0'–10.0"	T
V	0'–8"						1'–0"								V
W	0'–8"						0'–10"								W
X	----						2'–0"				2'–6"				X
Y	2'–0"						2'–6"				3'–0"				Y
Z	----						1'–3"				1'–9"				Z
CU.YDS.CONC. 2 HEADWALLS	3.36	4.30	5.35	6.53	7.82	9.22	18.76	20.95	23.25	25.67	31.48	34.31	37.25	40.32	CU.YDS.CONC. 2 HEADWALLS
LBS.STEEL 2 HEADWALLS	281	363	430	496	583	687	1320	1571	1815	2043	2451	2753	3050	3379	LBS.STEEL 2 HEADWALLS

DIMENSIONS AND QUANTITIES ARE BASED ON CONCRETE PIPE AND WILL VARY SLIGHTLY FOR ALTERNATE PIPE MATERIALS.

DIMENSIONS & QUANTITIES
HEADWALLS 0° SKEW (30" – 108" CIRCULAR PIPE)
(STM–17.2)
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH–210)

USE WITH CURRENT SD#1 STANDARD DRAWING NOS. STM 17.1, STM 17.3, & STM 17.4.

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STANDARD DRAWING NO: STM–17.2

DATE: MAY 2010

REVISION	BY	DATE

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
30"						
A	5	4	4	8		
C1	4	2	2	4		
C2	4	2	4	2		
E1	5	2	6	4	3	4
E2	5	2	6	8	3	8
F	4	3	1	3	0	4
G1	4	2	3	10		
G2	4	3	6	2		
H	4	4	5	1	3	5
N	4	6	4	2		
Q	4	2	2	9		
R	4	3	0	8		
V1	5	4	3	1	1	10
V2	5	4	4	1	2	10
36"						
A	5	4	5	5		
C1	4	2	1	7		
C2	4	2	3	8		
C3	4	2	4	10		
E1	5	2	6	11	3	11
E2	5	2	7	3	4	3
F	4	4	1	3	0	4
G1	4	3	5	0		
G2	4	3	7	4		
H	4	5	5	8	4	0
N	4	6	4	10		
Q	4	2	3	4		
R	4	4	0	8		
V1	5	4	3	4	2	1
V2	5	4	4	4	3	1
V3	5	2	5	4	4	1
42"						
A	5	4	6	2		
C1	4	2	2	9		
C2	4	2	4	9		
C3	4	2	5	6		
E1	5	2	7	6	4	6
E2	5	2	7	10	4	10
F	4	4	1	3	0	4
G1	4	3	6	4		
G2	4	3	8	7		
H	4	5	6	3	4	7

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
42" (CONTINUED)						
N	4	6	5	6		
Q	4	2	3	11		
R	4	4	0	9		
V1	5	4	3	6	2	3
V2	5	4	4	6	3	3
V3	5	4	5	6	4	3
48"						
A	5	4	6	11		
C1	4	2	1	10		
C2	4	2	3	10		
C3	4	2	5	10		
C4	4	2	6	2		
E1	5	2	8	1	5	1
E2	5	2	8	5	5	5
F	4	5	1	3	0	4
G1	4	1	4	0		
G2	4	3	7	5		
G3	4	3	9	9		
H	4	6	6	10	5	2
N	4	6	6	2		
Q	4	2	4	6		
R	4	5	0	9		
V1	5	4	3	9	2	6
V2	5	4	4	9	3	6
V3	5	4	5	9	4	6
54"						
A	5	4	7	7		
C1	4	2	0	11		
C2	4	2	3	0		
C3	4	2	5	1		
C4	4	4	6	10		
E1	5	2	8	8	5	8
E2	5	2	9	0	6	0
F	4	6	1	3	0	4
G1	4	1	5	3		
G2	4	3	8	9		
G3	4	3	11	0		
H	4	6	7	5	5	9
N	4	6	6	10		
Q	4	2	5	1		
R	4	6	0	10		
V1	5	4	4	0	2	9
V2	5	4	5	0	3	9

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
54" (CONTINUED)						
V3	5	4	6	0	4	9
V4	5	2	7	0	5	9
60"						
A	5	4	8	4		
C1	4	2	2	1		
C2	4	2	4	2		
C3	4	2	6	3		
C4	4	4	7	7		
E1	5	2	9	3	6	3
E2	5	2	9	7	6	7
F	4	6	1	3	0	4
G1	4	2	6	6		
G2	4	3	10	0		
G3	4	3	12	4		
H	4	7	8	0	6	4
N	4	6	7	7		
Q	4	2	5	8		
R	4	6	0	10		
V1	5	4	4	3	3	0
V2	5	4	5	3	4	0
V3	5	4	6	2	4	11
V4	5	4	7	2	5	11
66"						
A	5	4	9	4		
B1	5	8	2	10		
B2	5	8	3	10		
B3	5	8	4	9		
B4	5	8	5	9		
C1	4	4	1	5		
C2	4	4	3	5		
C3	4	4	5	6		
C4	4	4	7	7		
C5	4	8	8	4		
E1	5	2	11	9	6	10
E2	5	2	12	3	7	4
F	4	7	1	9	0	6
G1	4	3	8	0		
G2	4	3	11	4		
G3	4	3	13	10		
H	4	7	9	3	7	1
M	4	16	3	9		
N	4	14	8	4		
P	5	16	5	0	3	3

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
66" (CONTINUED)						
Q	5	3	6	2		
R	5	7	2	7		
72"						
A	5	4	10	1		
B1	5	8	3	0		
B2	5	8	4	0		
B3	5	8	4	11		
B4	5	8	5	11		
B5	5	4	6	10		
C1	4	4	2	7		
C2	4	4	4	8		
C3	4	4	6	9		
C4	4	4	8	10		
C5	4	8	9	1		
E1	5	2	12	5	7	5
E2	5	2	12	11	7	11
F	4	8	1	9	0	6
G1	4	3	9	2		
G2	4	3	12	6		
G3	4	3	14	10		
H	4	9	9	10	7	8
M	4	18	3	9		
N	4	14	9	1		
P	5	18	5	3	3	6
Q	5	3	6	10		
R	5	7	2	7		
78"						
A	5	4	10	10		
B1	5	8	3	4		
B2	5	8	4	3		
B3	5	8	5	3		
B4	5	8	6	2		
B5	5	8	7	2		
C1	4	4	1	7		
C2	4	4	3	8		
C3	4	4	5	10		
C4	4	4	7	11		
C5	4	12	9	9		
E1	5	2	13	0	8	0
E2	5	2	13	6	8	6
F	4	8	1	9	0	6
G1	4	1	7	1		
G2	4	3	10	6		

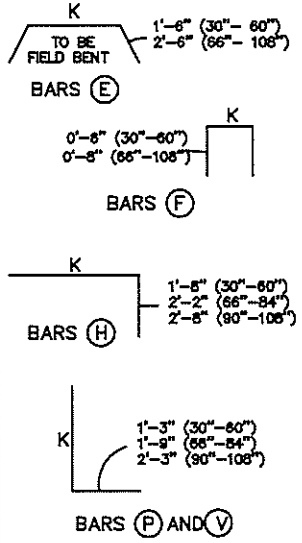
MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
78" (CONTINUED)						
G3	4	3	14	0		
G4	4	3	16	4		
H	4	9	10	5	8	3
M	4	20	3	9		
N	4	14	9	9		
P	5	20	5	6	3	9
Q	5	3	7	5		
R	5	8	2	8		
84"						
A	5	4	11	7		
B1	5	8	3	6		
B2	5	8	4	6		
B3	5	8	5	5		
B4	5	8	6	5		
B5	5	8	7	4		
B6	5	8	8	4		
C1	4	4	2	10		
C2	4	4	4	11		
C3	4	4	7	0		
C4	4	4	9	1		
C5	4	12	10	5		
E1	5	2	13	7	8	7
E2	5	2	14	2	9	2
F	4	9	1	9	0	6
G1	4	1	9	6		
G2	4	3	11	10		
G3	4	3	15	2		
G4	4	3	17	6		
H	4	9	11	0	8	10
M	4	22	3	9		
N	4	14	10	5		
P	5	22	5	9	4	0
Q	5	3	8	0		
R	5	9	2	8		
90"						
A	5	4	12	3		
B1	5	8	3	10		
B2	5	8	4	9		
B3	5	8	5	9		
B4	5	8	6	8		
B5	5	8	7	7		
B6	5	4	8	6		
C1	4	4	1	11		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
90" (CONTINUED)						
C2	4	4	4	0		
C3	4	4	6	1		
C4	4	4	8	3		
C5	4	4	10	4		
C6	4	12	11	1		
E1	5	2	14	2	9	2
E2	5	2	14	8	9	8
F	4	9	1	9	0	6
G1	4	2	9	6		
G2	4	3	13	0		
G3	4	3	16	5		
G4	4	3	18	9		
H	4	10	12	1	9	5
M	4	22	4	9		
N	4	16	11	1		
P	6	22	6	6	4	3
Q	5	4	8	7		
R	5	9	3	3		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWING NOS. STM 17.1, STM 17.2, & STM 17.4.

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-17.3

BILL OF REINFORCEMENT HEADWALLS (30"-90" DIAMETER CIRCULAR PIPE) - 0° SKEW

(STM-17.3)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-310)

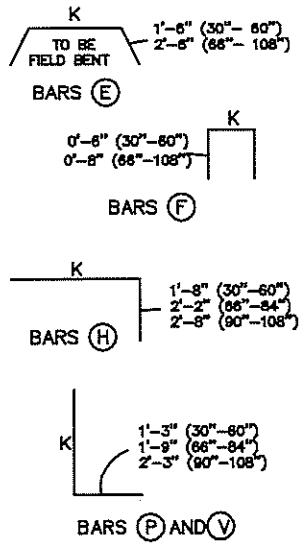
MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
96"						
A	5	4	13	0		
B1	5	8	4	1		
B2	5	8	5	0		
B3	5	8	5	11		
B4	5	8	6	10		
B5	5	8	7	10		
B6	5	8	8	9		
C1	4	4	3	0		
C2	4	4	5	2		
C3	4	4	7	3		
C4	4	4	9	5		
C5	4	4	11	7		
C6	4	12	11	9		
E1	5	2	14	9	9	9
E2	5	2	15	3	10	3
F	4	10	1	9	0	6
G1	4	3	10	9		
G2	4	3	14	3		
G3	4	3	17	9		
G4	4	3	20	0		
H	4	10	12	8	10	0
M	4	24	4	9		
N	4	16	11	9		
P	6	24	6	9	4	6
Q	5	4	9	2		
R	5	10	3	3		
102"						
A	5	4	13	9		
B1	5	8	4	4		
B2	5	8	5	3		
B3	5	8	6	2		
B4	5	8	7	2		
B5	5	8	8	1		
B6	5	8	9	0		
B7	5	4	9	11		
C1	4	4	2	0		
C2	4	4	4	2		
C3	4	4	6	4		
C4	4	4	8	6		
C5	4	4	10	7		
C6	4	16	12	5		
E1	5	2	15	4	10	4
E2	5	2	15	10	10	10
F	4	10	1	9	0	6
G1	4	3	12	1		
G2	4	3	15	8		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
102" (CONTINUED)						
G3	4	3	19	2		
G4	4	3	21	7		
H	4	11	13	3	10	7
M	4	26	4	9		
N	4	16	12	5		
P	7	26	7	0	4	9
Q	5	4	9	9		
R	5	10	3	4		
108"						
A	5	4	14	6		
B1	5	8	4	7		
B2	5	8	5	6		
B3	5	8	6	5		
B4	5	8	7	4		
B5	5	8	8	3		
B6	5	8	9	3		
B7	5	8	10	2		
C1	4	4	3	3		
C2	4	4	5	5		
C3	4	4	7	7		
C4	4	4	9	8		
C5	4	4	11	10		
C6	4	16	13	1		
E1	5	2	15	10	10	10
E2	5	2	16	5	11	5
F	4	11	1	9	0	6
G1	4	1	9	10		
G2	4	3	13	4		
G3	4	3	16	10		
G4	4	3	20	3		
G5	4	3	22	7		
H	4	11	13	10	11	2
M	4	28	4	9		
N	4	16	13	1		
P	7	28	7	3	5	0
Q	5	4	10	4		
R	5	11	3	4		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SDHI STANDARD DRAWING NOS. STM 17.1, STM 17.2, & STM 17.3.

BILL OF REINFORCEMENT HEADWALLS
(96"-108" DIAMATER CIRCULAR PIPE)
0° SKEW
(STM-17.4)
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-312)

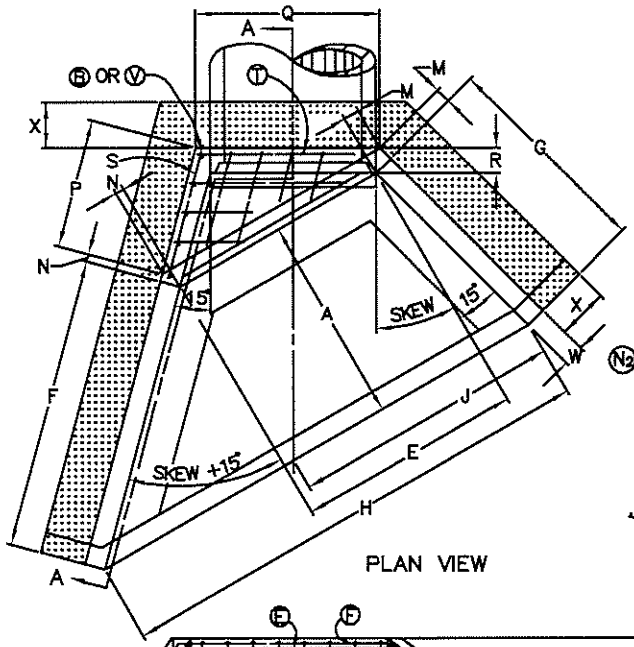
SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

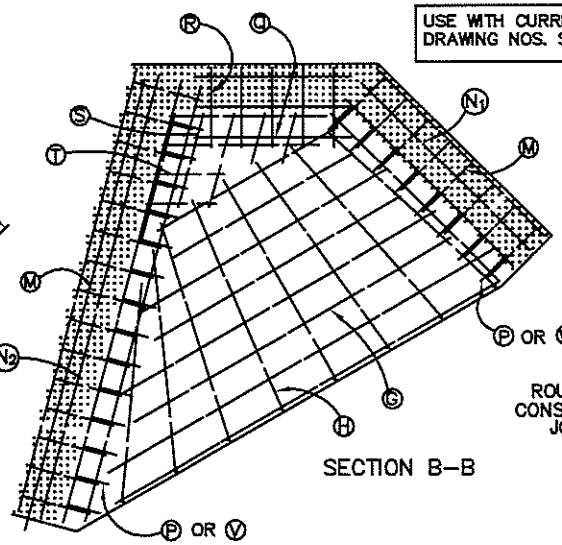
REVISION	BY	DATE

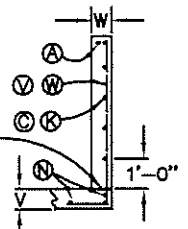
DATE: AUG 2009

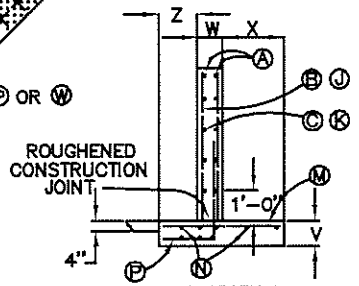
STANDARD DRAWING NO: STM-17.4

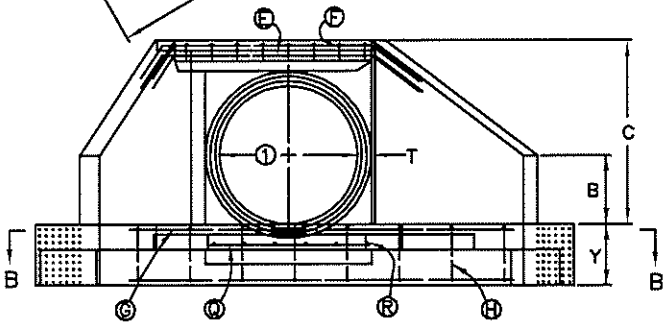
USE WITH CURRENT SD#1 STANDARD DRAWING NOS. STM 18.2 THRU 18.12

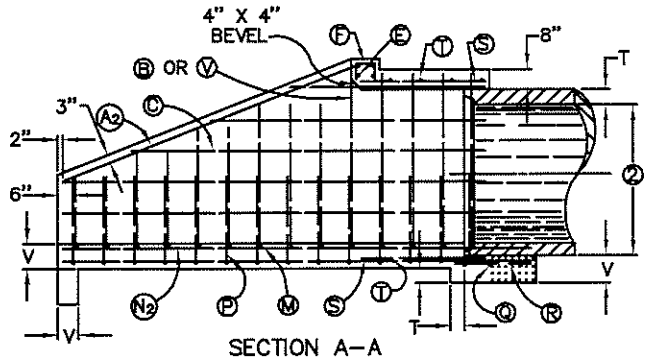


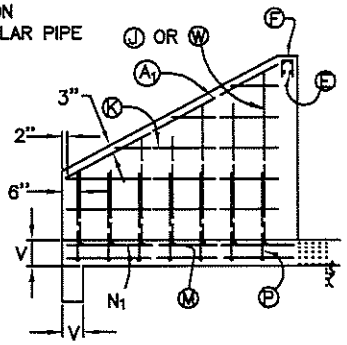












— NOTES —

1. DIAMETER OF CIRCULAR PIPE OR SPAN OF NON–CIRCULAR PIPE.
2. DIAMETER OF CIRCULAR PIPE OR RISE OF NON–CIRCULAR PIPE.
3. [dotted] APPLIES TO 66" DIAMETER AND GREATER (CIRCULAR PIPE).
4. SEE DETAILS 216–B AND 216–C 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 B , C , G , P , M , V ARE SPACED 1'–0" O.C. ALL OTHER BARS SHALL BE EVENLY SPACED.
8. BARS B AND V ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE END OF EACH WING.
9. BARS C 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.

SAFETY GUARDS AND RAILINGS

SAFETY GUARDS AND RAILINGS SHALL BE PROVIDED ALONG THE TOP AND SLOPED/WINGED SIDE WALLS ON ALL HEADWALL INLET AND OUTLET STRUCTURES OR OTHER CULVERTS OR BRIDGE STRUCTURES HAVING A VERTICAL DROP OF FORTY EIGHT (48) INCHES OR GREATER. SUCH GUARDS OR RAILINGS SHALL BE AT LEAST FORTY TWO (42) INCHES IN HEIGHT MEASURED VERTICALLY ABOVE THE WALLS. OPENINGS IN GUARDS SHALL HAVE BALUSTERS OR ORNAMENTAL PATTERNS THAT DO NOT PROVIDE OR CREATE A LADDER EFFECT SUCH THAT A SPHERE WITH A DIAMETER OF FOUR (4) INCHES CANNOT PASS THROUGH ANY OPENING, EXCEPT FOR THE TOP EIGHT (8) INCHES. GUARDS AND RAILINGS AND ATTACHMENTS SHALL BE MADE OF MATERIALS THAT ARE WEATHER RESISTANT AND ULTRAVIOLET (UV) LIGHT RESISTANT ADEQUATE IN STRENGTH TO RESIST UNIFORM, CONCENTRATED AND IMPACT LOADS IN ACCORD WITH THE APPLICABLE SECTIONS OF THE KENTUCKY BUILDING CODE, LATEST VERSION. GUARDS AND RAILINGS CONSTRUCTED OF WOOD SHALL BE PROHIBITED. OTHER TYPES OF LANDSCAPING BUFFERS SUCH AS TREES, BUSHES OR SHRUBS MAY SUPPLEMENT, BUT NOT REPLACE GUARDS AND RAILINGS FOR SAFETY (REF. KENTON CO SUB REGS ARTICLE V, SECTION B).

HEADWALLS–15°/30°/15° SKEW (30" – 108" CIRCULAR PIPE)

(STM–18.1)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH–120, KENTON COUNTY SUBDIVISION REGULATIONS)

REVISION | BY | DATE

SANITATION DISTRICT NO. 1
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STANDARD DRAWING NO: STM–18.1

DATE: MAY 2010

REVISION	BY	DATE

DIMENSION	DIAMETER OF PIPE														DIMENSION
	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	
A	4'–5"	5'–0"	5'–7"	6'–2"	6'–9"	7'–4"	7'–9"	8'–4"	8'–11"	9'–6"	10'–1"	10'–8"	11'–3"	11'–10"	A
B	1'–3"	1'–6"	1'–9"	2'–0"	2'–3"	2'–6"	2'–9"	3'–0"	3'–3"	3'–6"	3'–9"	4'–0"	4'–3"	4'–6"	B
C	3'–10"	4'–4"	4'–11"	5'–5"	6'–0"	6'–6"	7'–1"	7'–7"	8'–2"	8'–8"	9'–3"	9'–9"	10'–4"	10'–10"	C
E	3'–5"	4'–1"	4'–9"	5'–5"	6'–0"	6'–8"	7'–4"	8'–0"	8'–8"	9'–4"	9'–11"	10'–7"	11'–3"	11'–11"	E
F	5'–1"	5'–9"	6'–5"	7'–1"	7'–10"	8'–6"	8'–11"	9'–7"	10'–4"	11'–0"	11'–8"	12'–4"	13'–0"	13'–8"	F
G	4'–7"	5'–2"	5'–9"	6'–5"	7'–0"	7'–7"	8'–0"	8'–8"	9'–3"	9'–10"	10'–5"	11'–1"	11'–8"	12'–3"	G
H	7'–2"	8'–4"	9'–6"	10'–7"	11'–9"	12'–11"	13'–11"	15'–0"	16'–2"	17'–4"	18'–6"	19'–7"	20'–9"	21'–11"	H
J	4'–0"	4'–7"	5'–2"	5'–10"	6'–5"	7'–0"	7'–7"	8'–2"	8'–9"	9'–5"	10'–0"	10'–8"	11'–3"	11'–10"	J
M	0'–6"						0'–8"								M
N	0'–5"						0'–6"								N
P	1'–2"	1'–4"	1'–6"	1'–8"	1'–10"	2'–0"	2'–3"	2'–5"	2'–7"	2'–9"	3'–0"	3'–2"	3'–4"	3'–6"	P
Q	3'–11"	4'–6"	5'–1"	5'–8"	6'–3"	6'–10"	7'–7"	8'–2"	8'–9"	9'–4"	9'–11"	10'–6"	11'–1"	11'–8"	Q
R	0'–9"						1'–0"								R
T	0'–3.5"	0'–4.0"	0'–4.5"	0'–5.0"	0'–5.5"	0'–6.0"	0'–6.5"	0'–7.0"	0'–7.5"	0'–8.0"	0'–8.5"	0'–9.0"	0'–9.5"	0'–10.0"	T
V	0'–8"						1'–0"								V
W	0'–8"						0'–10"								W
X	----						2'–0"				2'–6"				X
Y	2'–0"						2'–6"				3'–0"				Y
Z	----						1'–3"				1'–9"				Z
CU.YDS.CONC. 2 HEADWALLS	3.76	4.89	6.15	7.55	9.07	10.73	21.24	23.75	26.39	29.16	35.43	38.66	42.03	45.54	CU.YDS.CONC. 2 HEADWALLS
LBS.STEEL 2 HEADWALLS	399	470	555	644	753	862	1689	1912	2148	2390	2937	3238	3582	3852	LBS.STEEL 2 HEADWALLS

DIMENSIONS AND QUANTITIES ARE BASED ON CONCRETE PIPE AND WILL VARY SLIGHTLY FOR ALTERNATE PIPE MATERIALS.

DIMENSIONS & QUANTITIES
HEADWALLS (30"–108" CIRCULAR PIPE)
15° SKEW
(STM–18.2)
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH–212)

USE WITH CURRENT SDSI STANDARD DRAWINGS NOS. STM 18.1, 18.3 THRU 18.12

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
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Fax: (859) 331–2436

STANDARD DRAWING NO: STM–18.2

DATE: AUG 2009

REVISION	BY	DATE

DIMENSION	DIAMETER OF PIPE														DIMENSION
	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	
A	4'–5"	5'–0"	5'–7"	6'–2"	6'–9"	7'–4"	7'–9"	8'–4"	8'–11"	9'–6"	10'–1"	10'–8"	11'–3"	11'–10"	A
B	1'–3"	1'–6"	1'–9"	2'–0"	2'–3"	2'–6"	2'–9"	3'–0"	3'–3"	3'–6"	3'–9"	4'–0"	4'–3"	4'–6"	B
C	3'–10"	4'–4"	4'–11"	5'–5"	6'–0"	6'–6"	7'–1"	7'–7"	8'–2"	8'–8"	9'–3"	9'–9"	10'–4"	10'–10"	C
E	4'–3"	5'–0"	5'–10"	6'–7"	7'–5"	8'–2"	9'–0"	9'–9"	10'–7"	11'–5"	12'–2"	13'–0"	13'–9"	14'–7"	E
F	6'–3"	7'–1"	7'–11"	8'–9"	9'–7"	10'–4"	11'–0"	11'–9"	12'–7"	13'–5"	14'–3"	15'–1"	15'–11"	16'–9"	F
G	4'–7"	5'–2"	5'–9"	6'–5"	7'–0"	7'–7"	8'–0"	8'–8"	9'–3"	9'–10"	10'–5"	11'–1"	11'–8"	12'–3"	G
H	9'–10"	11'–4"	12'–11"	14'–5"	15'–11"	17'–6"	18'–10"	20'–4"	21'–11"	23'–5"	25'–0"	26'–6"	28'–0"	29'–7"	H
J	5'–6"	6'–4"	7'–2"	8'–0"	8'–10"	9'–8"	10'–4"	11'–2"	12'–0"	12'–10"	13'–8"	14'–6"	15'–4"	16'–2"	J
M	0'–6"						0'–8"								M
N	0'–3"						0'–4"								N
P	2'–7"	3'–0"	3'–5"	3'–10"	4'–3"	4'–8"	5'–2"	5'–7"	6'–0"	6'–5"	6'–10"	7'–3"	7'–8"	8'–1"	P
Q	3'–8"	4'–3"	4'–10"	5'–5"	6'–0"	6'–7"	7'–4"	7'–11"	8'–6"	9'–1"	9'–8"	10'–3"	10'–10"	11'–5"	Q
R	0'–10"						1'–0"								R
T	0'–3.5"	0'–4.0"	0'–4.5"	0'–5.0"	0'–5.5"	0'–6.0"	0'–6.5"	0'–7.0"	0'–7.5"	0'–8.0"	0'–8.5"	0'–9.0"	0'–9.5"	0'–10.0"	T
V	0'–8"						1'–0"								V
W	0'–8"						0'–10"								W
X	----						2'–0"				2'–6"				X
Y	2'–0"						2'–6"				3'–0"				Y
Z	----						1'–3"				1'–9"				Z
CU.YDS.CONC. 2 HEADWALLS	4.96	6.45	8.12	9.97	12.01	14.22	26.64	29.92	33.37	37.01	44.75	48.98	53.39	58.00	CU.YDS.CONC. 2 HEADWALLS
LBS.STEEL 2 HEADWALLS	474	579	683	795	947	1112	2134	2440	2761	3113	3697	4170	4568	4948	LBS.STEEL 2 HEADWALLS

DIMENSIONS AND QUANTITIES ARE BASED ON CONCRETE PIPE AND WILL VARY SLIGHTLY FOR ALTERNATE PIPE MATERIALS.

DIMENSIONS & QUANTITIES
HEADWALLS (30"–108" CIRCULAR PIPE)
30° SKEW
(STM–18.3)
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH–214)

USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1, 18.2 & 18.4 THRU 18.12

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578–7460
Fax: (859) 331–2436

STANDARD DRAWING NO: STM–18.3

DATE: MAY 2010

REVISION	BY	DATE

DIMENSION	DIAMETER OF PIPE														DIMENSION
	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	
A	4'–5"	5'–0"	5'–7"	6'–2"	6'–9"	7'–4"	7'–9"	8'–4"	8'–11"	9'–6"	10'–1"	10'–8"	11'–3"	11'–10"	A
B	1'–3"	1'–6"	1'–9"	2'–0"	2'–3"	2'–6"	2'–9"	3'–0"	3'–3"	3'–6"	3'–9"	4'–0"	4'–3"	4'–6"	B
C	3'–10"	4'–4"	4'–11"	5'–5"	6'–0"	6'–6"	7'–1"	7'–7"	8'–2"	8'–8"	9'–3"	9'–9"	10'–4"	10'–10"	C
E	5'–11"	7'–1"	8'–3"	9'–4"	10–6"	11'–7"	12'–9"	13'–10"	15'–0"	16'–1"	17'–3"	18'–4"	19'–6"	20'–7"	E
F	8'–10"	10'–0"	11'–2"	12'–4"	13'–6"	14'–8"	15'–6"	16'–8"	17'–10"	19'–0"	20'–2"	21'–4"	22'–6"	23'–8"	F
G	4'–7"	5'–2"	5'–9"	6'–5"	7'–0"	7'–7"	8'–0"	8'–8"	9'–3"	9'–10"	10'–5"	11'–1"	11'–8"	12'–3"	G
H	14'–9"	17'–1"	19'–5"	21'–8"	24'–0"	26'–3"	28'–3"	30'–6"	32'–10"	35'–1"	37'–5"	39'–8"	42'–0"	44'–3"	H
J	7'–9"	8'–11"	10'–1"	11'–3"	12'–5"	13'–6"	14'–6"	15'–8"	16'–9"	17'–11"	19'–1"	20'–3"	21'–5"	22'–7"	J
M	0'–6"						0'–8"								M
N	0'–2"						0'–3"								N
P	4'–10"	5'–8"	6'–6"	7'–4"	8'–2"	9'–0"	9'–11"	10'–9"	11'–7"	12'–5"	13'–3"	14'–1"	14'–11"	15'–9"	P
Q	3'–5"	4'–0"	4'–7"	5'–2"	5'–9"	6'–4"	7'–0"	7'–7"	8'–2"	8'–9"	9'–4"	9'–11"	10'–6"	11'–1"	Q
R	0'–10"						1'–0"								R
T	0'–3.5"	0'–4.0"	0'–4.5"	0'–5.0"	0'–5.5"	0'–6.0"	0'–6.5"	0'–7.0"	0'–7.5"	0'–8.0"	0'–8.5"	0'–9.0"	0'–9.5"	0'–10.0"	T
V	0'–8"						1'–0"								V
W	0'–8"						0'–10"								W
X	----						2'–0"				2'–6"				X
Y	2'–0"						2'–6"				3'–0"				Y
Z	----						1'–3"				1'–9"				Z
CU.YDS.CONC. 2 HEADWALLS	7.19	9.36	11.80	14.52	17.50	20.75	36.82	41.52	46.50	51.74	62.30	68.38	74.74	81.38	CU.YDS.CONC. 2 HEADWALLS
LBS.STEEL 2 HEADWALLS	639	768	965	1132	1353	1525	3046	3545	3963	4447	5261	5910	6537	7150	LBS.STEEL 2 HEADWALLS

DIMENSIONS AND QUANTITIES ARE BASED ON CONCRETE PIPE AND WILL VARY SLIGHTLY FOR ALTERNATE PIPE MATERIALS.

DIMENSIONS & QUANTITIES
HEADWALLS (30"–108" CIRCULAR PIPE)
45° SKEW
(STM–18.4)
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH–216)

USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.3 & 18.5 THRU 18.12

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
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STANDARD DRAWING NO: STM–18.4

DATE: MAY 2010

REVISION	BY	DATE

SANTATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

STANDARD DRAWING NO: STM-18.5

DATE: AUG 2009

30"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	5	0		
A2	5	2	5	6		
C1	4	1	2	7		
C2	4	1	4	8		
C3	4	1	6	3		
E1	5	2	6	9	3	9
E2	5	2	7	0	4	0
F	4	4	1	3	0	4
G1	4	1	3	7		
G2	4	3	4	5		
G3	4	3	6	2		
H	4	4	6	7	4	11
K1	4	1	1	1		
K2	4	1	2	11		
K3	4	1	4	5		
N1	4	3	4	4		
N2	4	3	4	11		
Q	4	2	2	9		
R	4	3	0	9		
S	5	6	1	0		
T	5	4	2	9		
V1	5	2	3	1	1	10
V2	5	2	4	0	2	9
V3	5	3	5	1	3	10
W1	5	2	3	1	1	10
W2	5	2	4	2	2	11
W3	5	1	5	4	4	1

36"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	5	8		
A2	5	2	6	3		
C1	4	1	3	11		
C2	4	1	5	11		
C3	4	1	7	2		
E1	5	2	7	5	4	5
E2	5	2	7	8	4	8
F	4	5	1	3	0	4
G1	4	1	4	0		
G2	4	2	5	7		
G3	4	3	7	3		
H	4	4	7	2	5	6
K1	4	1	2	1		
K2	4	1	3	11		
K3	4	1	5	0		
N1	4	3	5	0		
N2	4	3	5	7		
Q	4	2	3	4		

36" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
R	4	4	0	10		
S	5	6	1	0		
T	5	4	2	10		
V1	5	2	3	4	2	1
V2	5	2	4	3	3	0
V3	5	2	5	3	4	0
V4	5	3	5	7	4	4
W1	5	2	3	4	2	1
W2	5	2	4	5	3	2
W3	5	1	5	6	4	3

42"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	6	4		
A2	5	2	7	0		
C1	4	1	3	2		
C2	4	1	5	2		
C3	4	1	7	3		
C4	4	1	8	0		
E1	5	2	8	1	5	1
E2	5	2	8	4	5	4
F	4	5	1	3	0	4
G1	4	2	5	0		
G2	4	2	6	9		
G3	4	3	8	5		
H	4	5	7	9	6	1
K1	4	1	1	3		
K2	4	1	3	1		
K3	4	1	4	11		
K4	4	1	5	7		
N1	4	3	5	8		
N2	4	3	6	2		
Q	4	2	3	11		
R	4	4	0	10		
S	5	6	1	1		
T	5	4	3	0		
V1	5	2	3	7	2	4
V2	5	2	4	6	3	3
V3	5	2	5	6	4	3
V4	5	3	6	1	4	10
W1	5	2	3	7	2	4
W2	5	2	4	8	3	5
W3	5	2	5	9	4	6

48"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	7	0		
A2	5	2	7	9		
C1	4	1	4	5		
C2	4	1	6	6		
C3	4	1	8	8		
C4	4	1	8	10		
E1	5	2	8	9	5	9
E2	5	2	9	0	6	0
F	4	6	1	3	0	4
G1	4	2	5	5		
G2	4	3	7	11		
G3	4	3	9	8		
H	4	6	8	4	6	8
K1	4	1	2	4		
K2	4	1	4	1		
K3	4	1	6	0		
K4	4	1	6	2		
N1	4	3	6	3		
N2	4	3	7	0		
Q	4	2	4	6		
R	4	5	0	10		
S1	5	4	1	2		
S2	5	4	1	9		
T	5	4	3	1		
V1	5	2	3	10	2	7
V2	5	2	4	9	3	6
V3	5	2	5	9	4	6
V4	5	3	6	8	5	5
W1	5	2	3	10	2	7
W2	5	2	4	11	3	8
W3	5	2	5	11	4	8

54"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	7	9		
A2	5	2	8	5		
C1	4	1	3	9		
C2	4	1	5	10		
C3	4	1	7	11		
C4	4	2	9	8		
E1	5	2	9	4	6	4
E2	5	2	9	7	6	7
F	4	7	1	3	0	4
G1	4	3	6	5		
G2	4	3	8	0		
G3	4	3	10	9		
H	4	6	8	11	7	3
K1	4	1	1	5		

54" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
K2	4	1	3	4		
K3	4	1	5	2		
K4	4	2	6	10		
N1	4	3	6	10		
N2	4	3	7	7		
Q	4	2	5	1		
R	4	6	0	11		
S1	5	4	1	4		
S2	5	4	1	9		
T	5	4	4	0		
V1	5	2	4	0	2	9
V2	5	2	5	0	3	9
V3	5	2	6	0	4	9
V4	5	2	6	11	5	8
V5	5	2	7	2	5	11
W1	5	2	4	0	2	9
W2	5	2	5	1	3	10
W3	5	2	6	2	4	11
W4	5	1	7	2	5	11

60"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	8	4		
A2	5	2	9	2		
C1	4	1	5	1		
C2	4	1	7	2		
C3	4	1	9	3		
C4	4	2	10	6		
E1	5	2	10	0	7	0
E2	5	2	10	3	7	3
F	4	7	1	3	0	4
G1	4	3	7	7		
G2	4	3	10	2		
G3	4	3	11	10		
H	4	6	9	6	7	10
K1	4	1	2	6		
K2	4	1	4	5		
K3	4	1	6	3		
K4	4	2	7	5		
N1	4	3	7	5		
N2	4	3	8	3		
Q	4	2	5	8		
R	4	6	0	11		
S1	5	6	1	3		
S2	5	4	2	3		
T1	5	2	1	8		
T2	5	4	4	3		
V1	5	2	4	3	3	0
V2	5	2	5	3	4	0

60" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
V3	5	2	6	3	5	0
V4	5	2	7	2	5	11
V5	5	3	7	9	6	6
W1	5	2	4	4	3	1
W2	5	2	5	5	4	2
W3	5	2	6	5	5	2
W4	5	2	7	6	6	3

66"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	8	11		
A2	5	2	9	9		
B1	5	4	2	10		
B2	5	4	3	9		
B3	5	4	4	9		
B4	5	4	5	8		
B5	5	6	6	7		
C1	4	2	4	5		
C2	4	2	6	5		
C3	4	2	8	6		
C4	4	2	10	7		
C5	4	4	11	4		
E1	5	2	12	8	7	8
E2	5	2	13	1	8	1
F	4	8	1	9	0	6
G1	4	1	6	3		
G2	4	3	8	7		
G3	4	3	11	2		
G4	4	3	12	10		
H	4	7	10	7	8	5
J1	5	4	2	10		
J2	5	4	3	11		
J3	5	4	5	0		
J4	5	4	6	1		
K1	4	2	1	7		
K2	4	2	3	7		
K3	4	2	5	5		
K4	4	2	7	4		
K5	4	2	7	10		
M	4	19	7	9		
N1	4	7	7	10		
N2	4	7	11	4		
P	5	19	5	0	3	3
Q	5	3	6	3		
R	5	7	2	7		
S1	5	8	1	3		
S2	5	4	2	3		
T1	5	2	1	6		
T2	5	4	5	9		

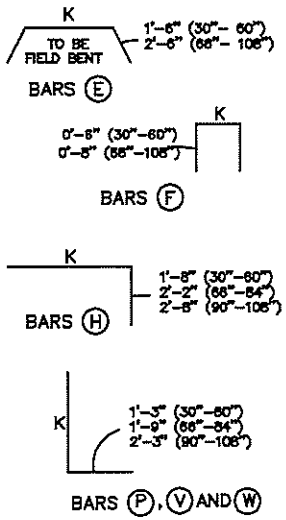
72"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	9	7		
A2	5	2	10	5		
B1	5	4	3	1		
B2	5	4	4	0		
B3	5	4	5	0		
B4	5	4	5	11		
B5	5	4	6	11		
B6	5	4	7	1		
C1	4	2	3	7		
C2	4	2	5	9		
C3	4	2	7	11		
C4	4	2	9	11		
C5	4	2	12	0		
C6	4	4	12	3		
E1	5	2	13	4	8	4
E2	5	2	13	10	8	10
F	4	9	1	9	0	6
G1	4	1	7	5		
G2	4	3	9	9		
G3	4	3	12	4		
G4	4	3	14	0		
H	4	7	11	2	9	0
J1	5	4	3	1		
J2	5	4	4	1		
J3	5	4	5	2		
J4	5	4	6	3		
J5	5	2	7	4		
K1	4	2	2	8		
K2	4	2	4	7		
K3	4	2	6	5		
K4	4	2	8	4		
K5	4	4	8	6		
M	4	21	3	9		
N1	4	7	8	5		
N2	4	7	12	2		
P	5	21	5	3	3	6
Q	5	3	6	10		
R	5	7	2	9		
S1	5	8	1	3		
S2	5	4	2	3		
T1	5	2	1	6		
T2	5	4	6	3		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.4 & 18.6 THRU 18.12

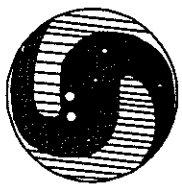
BILL OF REINFORCEMENT HEADWALLS (30"-72" DIAMETER CIRCULAR PIPE) - 15° SKEW

(STM-18.5)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-320)

REVISION	BY	DATE



SANITATION DISTRICT NO. 1
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FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

STANDARD DRAWING NO:	DATE:
STM-18.6	AUG 2009

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
78"						
A1	5	2	10	3		
A2	5	2	11	3		
B1	5	4	3	4		
B2	5	4	4	3		
B3	5	4	5	3		
B4	5	4	6	2		
B5	5	4	7	1		
B6	5	6	7	7		
C1	4	2	4	11		
C2	4	2	7	0		
C3	4	2	9	1		
C4	4	2	11	3		
C5	4	6	13	1		
E1	5	2	14	0	9	0
E2	5	2	14	6	9	6
F	4	9	1	9	0	6
G1	4	2	8	5		
G2	4	3	10	11		
G3	4	3	13	5		
G4	4	3	15	2		
H	4	8	11	9	9	7
J1	5	4	3	4		
J2	5	4	4	4		
J3	5	4	5	5		
J4	5	4	6	5		
J5	5	2	7	7		
K1	4	2	1	9		
K2	4	2	3	8		
K3	4	2	5	7		
K4	4	2	7	5		
K5	4	6	9	1		
M	4	22	3	9		
N1	4	7	9	0		
N2	4	7	13	0		
P	5	22	5	6	3	9
Q	5	3	7	5		
R	5	8	2	8		
S1	5	8	1	3		
S2	5	6	2	3		
T1	5	2	2	3		
T2	5	4	7	0		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
84"						
A1	5	2	10	11		
A2	5	2	12	0		
B1	5	4	3	7		
B2	5	4	4	6		
B3	5	4	5	6		
B4	5	4	6	5		
B5	5	4	7	4		
B6	5	8	8	2		
C1	4	2	4	1		
C2	4	2	6	3		
C3	4	2	8	4		
C4	4	2	10	6		
C5	4	2	12	6		
C6	4	6	13	11		
E1	5	2	14	8	9	8
E2	5	2	15	1	10	1
F	4	10	1	9	0	6
G1	4	2	9	8		
G2	4	3	12	1		
G3	4	3	14	9		
G4	4	3	16	7		
H	4	8	12	4	10	2
J1	5	4	3	7		
J2	5	4	4	7		
J3	5	4	5	8		
J4	5	4	6	9		
J5	5	4	7	9		
K1	4	2	2	9		
K2	4	2	4	8		
K3	4	2	6	7		
K4	4	2	8	6		
K5	4	6	9	8		
M	4	24	3	9		
N1	4	7	9	9		
N2	4	7	14	0		
P	5	24	5	9	4	0
Q	5	3	8	0		
R	5	8	2	10		
S1	5	10	1	3		
S2	5	6	2	3		
T1	5	2	2	3		
T2	5	4	7	6		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
90"						
A1	5	2	11	7		
A2	5	2	12	9		
B1	5	4	3	10		
B2	5	4	4	9		
B3	5	4	5	8		
B4	5	4	6	7		
B5	5	4	7	7		
B6	5	10	8	6		
C1	4	2	5	6		
C2	4	2	7	7		
C3	4	2	9	9		
C4	4	2	11	11		
C5	4	2	14	0		
C6	4	6	14	9		
E1	5	2	15	3	10	3
E2	5	2	15	9	10	9
F	4	11	1	9	0	6
G1	4	3	10	9		
G2	4	3	13	3		
G3	4	3	15	9		
G4	4	3	17	6		
H	4	9	13	6	10	10
J1	5	4	3	10		
J2	5	4	4	11		
J3	5	4	5	11		
J4	5	4	7	0		
J5	5	4	8	0		
K1	4	2	2	0		
K2	4	2	3	11		
K3	4	2	5	10		
K4	4	2	7	9		
K5	4	2	9	8		
K6	4	6	10	3		
M	4	26	4	9		
N1	4	8	10	3		
N2	4	8	14	10		
P	6	26	6	6	4	3
Q	5	4	8	7		
R	5	9	3	3		
S1	5	8	1	3		
S2	5	8	2	6		
T1	5	2	3	3		
T2	5	4	8	3		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
96"						
A1	5	2	12	4		
A2	5	2	13	5		
B1	5	4	4	1		
B2	5	4	5	0		
B3	5	4	5	11		
B4	5	4	6	10		
B5	5	4	7	9		
B6	5	4	8	9		
B7	5	8	9	3		
C1	4	2	4	7		
C2	4	2	6	10		
C3	4	2	8	11		
C4	4	2	11	2		
C5	4	2	13	2		
C6	4	2	15	5		
C7	4	6	15	7		
E1	5	2	15	11	10	11
E2	5	2	16	4	11	4
F	4	11	1	9	0	6
G1	4	3	11	9		
G2	4	3	14	4		
G3	4	3	16	10		
G4	4	3	18	6		
H	4	10	14	0	11	4
J1	5	4	4	1		
J2	5	4	5	2		
J3	5	4	6	2		
J4	5	4	7	3		
J5	5	4	8	3		
J6	5	2	9	3		
K1	4	2	3	1		
K2	4	2	5	0		
K3	4	2	6	11		
K4	4	2	8	9		
K5	4	2	10	8		
K6	4	6	10	10		
M	4	27	4	9		
N1	4	8	10	11		
N2	4	8	15	8		
P	6	27	6	9	4	6
Q	5	4	9	2		
R	5	9	3	5		
S1	5	10	1	3		
S2	5	8	2	9		
T1	5	2	3	3		
T2	5	4	8	9		

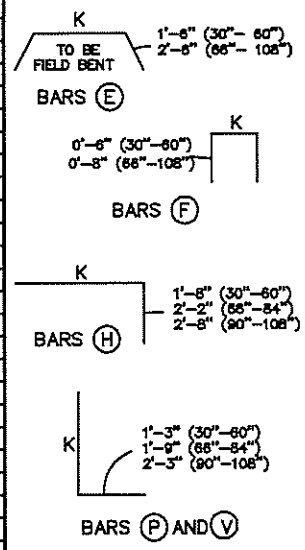
MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
102"						
A1	5	2	12	10		
A2	5	2	14	0		
B1	5	4	4	3		
B2	5	4	5	3		
B3	5	4	6	2		
B4	5	4	7	1		
B5	5	4	8	0		
B6	5	4	8	11		
B7	5	10	9	10		
C1	4	2	6	1		
C2	4	2	8	3		
C3	4	2	10	4		
C4	4	2	12	6		
C5	4	2	14	8		
C6	4	8	16	6		
E1	5	2	16	7	11	7
E2	5	2	17	0	12	0
F	4	12	1	9	0	6
G1	4	1	10	6		
G2	4	3	13	1		
G3	4	3	15	7		
G4	4	3	18	2		
G5	4	3	19	10		
H	4	10	14	8	12	0
J1	5	4	4	4		
J2	5	4	5	4		
J3	5	4	6	4		
J4	5	4	7	5		
J5	5	4	8	5		
J6	5	4	9	6		
K1	4	2	2	1		
K2	4	2	4	0		
K3	4	2	6	0		
K4	4	2	7	11		
K5	4	2	9	10		
K6	4	8	11	6		
M	4	29	4	9		
N1	4	8	12	1		
N2	4	8	16	7		
P	7	29	7	0	4	9
Q	5	4	9	9		
R	5	10	3	5		
S1	5	10	1	6		
S2	5	8	2	9		
T1	5	2	4	0		
T2	5	4	9	3		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
108"						
A1	5	2	13	7		
A2	5	2	14	11		
B1	5	4	4	7		
B2	5	4	5	6		
B3	5	4	6	5		
B4	5	4	7	4		
B5	5	4	8	4		
B6	5	4	9	3		
B7	5	12	10	2		
C1	4	2	5	4		
C2	4	2	7	6		
C3	4	2	9	7		
C4	4	2	11	9		
C5	4	2	13	10		
C6	4	2	16	0		
C7	4	8	17	4		
E1	5	2	17	3	12	3
E2	5	2	17	8	12	8
F	4	13	1	9	0	6
G1	4	1	11	8		
G2	4	3	14	2		
G3	4	3	16	8		
G4	4	3	19	2		
G5	4	3	20	11		
H	4	11	15	2	12	6
J1	5	4	4	7		
J2	5	4	5	7		
J3	5	4	6	8		
J4	5	4	7	9		
J5	5	4	8	9		
J6	5	4	9	10		
K1	4	2	3	3		
K2	4	2	5	2		
K3	4	2	7	1		
K4	4	2	9	0		
K5	4	2	10	11		
K6	4	8	12	1		
M	4	30	4	9		
N1	4	8	12	2		
N2	4	8	17	4		
P	7	30	7	3	5	
Q	5	4	10	4		
R	5	10	3	5		
S1	5	10	1	6		
S2	5	8	2	9		
T1	5	2	4	0		
T2	5	4	10	0		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.5 & 18.7 THRU 18.12

BILL OF REINFORCEMENT HEADWALLS (78"-108" DIAMETER CIRCULAR PIPE) - 15° SKEW

(STM-18.6)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-322)

REVISION	BY	DATE

30"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	5	0		
A2	5	2	6	9		
C1	4	1	4	1		
C2	4	1	6	7		
C3	4	1	8	9		
E1	5	2	7	7	4	7
E2	5	2	7	9	4	9
F	4	5	1	3	0	4
G1	4	1	3	6		
G2	4	2	5	9		
G3	4	3	8	4		
H	4	5	6	4	4	8
K1	4	1	1	1		
K2	4	1	2	11		
K3	4	1	4	4		
N1	4	3	4	5		
N2	4	3	6	0		
Q	4	2	2	9		
R	4	3	0	9		
S1	5	2	1	3		
S2	5	4	2	3		
T1	5	2	1	3		
T2	5	4	2	3		
V1	5	2	3	0	1	9
V2	5	2	3	10	2	7
V3	5	2	4	8	3	5
V4	5	3	4	10	3	10
W1	5	2	3	1	1	10
W2	5	2	4	3	3	0
W3	5	1	5	4	4	1

36"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	5	8		
A2	5	2	7	5		
C1	4	1	6	2		
C2	4	1	8	9		
C3	4	1	10	0		
E1	5	2	8	4	5	4
E2	5	2	8	6	5	6
F	4	6	1	3	0	4
G1	4	1	4	8		
G2	4	2	7	3		
G3	4	3	9	10		
H	4	6	7	2	5	6
K1	4	1	2	2		
K2	4	1	4	0		
K3	4	1	5	0		

36" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
N1	4	3	5	0		
N2	4	3	6	10		
Q	4	2	3	4		
R	4	2	0	10		
S1	5	4	1	3		
S2	5	4	2	3		
T1	5	2	1	6		
T2	5	4	3	3		
V1	5	2	3	3	2	0
V2	5	2	4	1	2	10
V3	5	2	4	10	3	7
V4	5	5	5	7	4	4
W1	5	2	3	4	2	1
W2	5	2	4	5	3	2
W3	5	1	5	6	4	3

42"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	6	4		
A2	5	2	8	3		
C1	4	1	5	3		
C2	4	1	7	10		
C3	4	1	10	4		
C4	4	1	11	2		
E1	5	2	9	2	6	2
E2	5	2	9	4	6	4
F	4	6	1	3	0	4
G1	4	1	5	11		
G2	4	3	8	8		
G3	4	3	11	4		
H	4	7	7	9	6	1
K1	4	1	1	3		
K2	4	1	3	1		
K3	4	1	4	11		
K4	4	1	5	7		
N1	4	3	6	0		
N2	4	3	7	9		
Q	4	2	3	11		
R	4	4	0	10		
S1	5	2	1	3		
S2	5	2	2	4		
T1	5	2	2	0		
T2	5	4	3	6		
V1	5	2	3	6	2	3
V2	5	2	4	4	3	1
V3	5	2	5	1	3	10
V4	5	2	5	10	4	7
V5	5	4	6	0	4	9
W1	5	2	3	7	2	4

42" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
W2	5	2	4	7	3	4
W3	5	2	5	9	4	6

48"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	7	0		
A2	5	2	9	2		
C1	4	1	7	0		
C2	4	1	9	7		
C3	4	1	12	1		
C4	4	1	12	5		
E1	5	2	9	11	6	11
E2	5	2	10	1	7	1
F	4	7	1	3	0	4
G1	4	2	6	7		
G2	4	2	10	2		
G3	4	3	12	11		
H	4	7	8	4	6	8
K1	4	1	2	4		
K2	4	1	4	2		
K3	4	1	6	0		
K4	4	1	6	3		
N1	4	3	6	2		
N2	4	3	8	6		
Q	4	2	4	6		
R	4	5	0	10		
S1	5	4	1	6		
S2	5	4	2	9		
T1	5	2	2	0		
T2	5	4	3	9		
V1	5	2	3	9	2	6
V2	5	2	4	6	3	3
V3	5	2	5	4	4	1
V4	5	2	6	1	4	10
V5	5	5	6	8	5	5
W1	5	2	3	10	2	7
W2	5	2	4	11	3	8
W3	5	2	6	0	4	9

54"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	7	8		
A2	5	2	10	0		
C1	4	1	6	4		
C2	4	1	8	11		
C3	4	1	11	6		
C4	4	2	13	9		

54" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
E1	5	2	10	9	7	9
E2	5	2	10	11	7	11
F	4	8	1	3	0	4
G1	4	3	7	11		
G2	4	3	11	7		
G3	4	3	14	5		
H	4	8	8	11	7	3
K1	4	1	1	6		
K2	4	1	3	5		
K3	4	1	3	5		
K4	4	2	6	10		
N1	4	3	6	10		
N2	4	3	9	4		
Q	4	2	5	1		
R	4	6	0	11		
S1	5	6	1	6		
S2	5	4	3	2		
T1	5	4	2	3		
T2	5	4	4	6		
V1	5	2	4	0	2	9
V2	5	2	4	9	3	6
V3	5	2	5	7	4	4
V4	5	2	6	4	5	1
V5	5	2	7	1	5	10
V6	5	4	7	2	5	11
W1	5	2	3	1	2	10
W2	5	2	4	2	3	11
W3	5	2	6	3	5	0
W4	5	1	7	4	6	1

60"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	8	5		
A2	5	2	10	11		
C1	4	1	8	2		
C2	4	1	10	9		
C3	4	1	13	5		
C4	4	2	14	11		
E1	5	2	11	6	8	6
E2	5	2	11	8	8	8
F	4	9	1	3	0	4
G1	4	3	9	4		
G2	4	3	13	3		
G3	4	3	16	0		
H	4	9	9	8	8	0
K1	4	1	2	6		
K2	4	1	4	5		
K3	4	1	6	3		
K4	4	2	7	5		

60" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
N1	4	3	7	5		
N2	4	3	10	2		
Q	4	2	5	8		
R	4	6	0	11		
S1	5	6	1	5		
S2	5	6	3	8		
T1	5	4	2	10		
T2	5	4	5	9		
V1	5	2	4	3	3	0
V2	5	2	5	0	3	9
V3	5	2	5	10	4	7
V4	5	2	6	7	5	4
V5	5	2	7	4	6	1
V6	5	5	7	9	6	6
W1	5	2	4	4	3	1
W2	5	2	5	4	4	1
W3	5	2	6	5	5	1
W4	5	2	7	5	6	2

66"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	8	11		
A2	5	2	11	6		
B1	5	4	2	9		
B2	5	4	3	6		
B3	5	4	4	4		
B4	5	4	5	1		
B5	5	4	5	11		
B6	5	12	6	6		
C1	4	2	7	7		
C2	4	2	10	1		
C3	4	2	12	8		
C4	4	2	15	1		
C5	4	4	16	1		
E1	5	2	14	4	9	4
E2	5	2	14	8	9	8
F	4	10	1	9	0	6
G1	4	1	9	0		
G2	4	3	11	0		
G3	4	3	14	10		
G4	4	3	17	3		
H	4	9	10	6	8	4
J1	5	4	2	9		
J2	5	4	3	10		
J3	5	4	4	11		
J4	5	4	6	0		
K1	4	2	1	7		
K2	4	2	3	5		
K3	4	2	5	4		

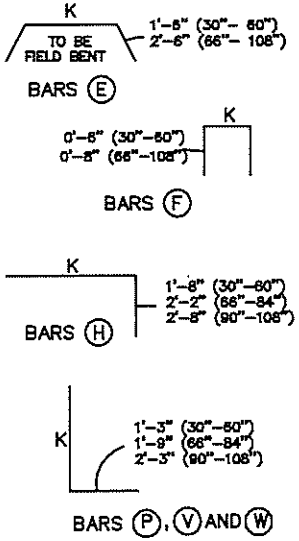
66" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
K4	4	2	7	1		
K5	4	4	7	10		
M	4	24	3	9		
N1	4	7	7	10		
N2	4	7	16	1		
P	5	24	5	0	3	3
Q	5	3	6	3		
R	5	7	2	7		
S1	5	4	1	3		
S2	5	4	2	8		
S3	5	4	4	2		
T1	5	4	3	3		
T2	5	4	5	3		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE 0. TO 0. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.6 & 18.8 THRU 18.12

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-18.7

BILL OF REINFORCEMENT HEADWALLS (30"-66" DIAMETER CIRCULAR PIPE) - 30° SKEW

(STM-18.7)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-330)

REVISION	BY	DATE

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
72"						
A1	5	2	9	6		
A2	5	2	12	6		
B1	5	4	3	1		
B2	5	4	3	10		
B3	5	4	4	7		
B4	5	4	5	4		
B5	5	4	6	2		
B6	5	14	7	1		
C1	4	2	6	11		
C2	4	2	9	5		
C3	4	2	11	10		
C4	4	2	14	7		
C5	4	2	17	1		
C6	4	4	17	4		
E1	5	2	15	2	10	2
E2	5	2	15	6	10	6
F	4	10	1	9	0	6
G1	4	1	8	8		
G2	4	3	12	5		
G3	4	3	16	4		
G4	4	3	18	9		
H	4	10	11	5	9	3
J1	5	4	3	1		
J2	5	4	4	1		
J3	5	4	5	2		
J4	5	4	6	3		
J5	5	2	7	4		
K1	4	2	2	7		
K2	4	2	4	4		
K3	4	2	6	5		
K4	4	2	8	3		
K5	4	4	8	5		
M	4	26	3	9		
N1	4	7	8	5		
N2	4	7	17	3		
P	5	26	5	3	3	6
Q	5	3	6	10		
R	5	7	2	9		
S1	5	4	1	9		
S2	5	4	3	3		
S3	5	4	4	6		
T1	5	2	1	6		
T2	5	4	3	3		
T3	5	4	6	3		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
78"						
A1	5	2	10	3		
A2	5	2	13	4		
B1	5	4	3	3		
B2	5	4	4	0		
B3	5	4	4	9		
B4	5	4	5	7		
B5	5	4	6	4		
B6	5	4	7	1		
B7	5	14	7	7		
C1	4	2	8	7		
C2	4	2	11	1		
C3	4	2	13	9		
C4	4	2	16	3		
C5	4	6	18	7		
E1	5	2	15	11	10	11
E2	5	2	16	3	11	3
F	4	11	1	9	0	6
G1	4	2	10	3		
G2	4	3	14	0		
G3	4	3	17	9		
G4	4	3	20	5		
H	4	11	11	8	9	6
J1	5	4	3	4		
J2	5	4	4	5		
J3	5	4	5	5		
J4	5	4	6	6		
J5	5	2	7	7		
K1	4	2	1	10		
K2	4	2	3	9		
K3	4	2	5	7		
K4	4	2	7	6		
K5	4	6	9	0		
M	4	28	3	9		
N1	4	7	9	0		
N2	4	7	18	9		
P	5	28	5	6	3	9
Q	5	3	7	5		
R	5	8	2	8		
S1	5	2	1	3		
S2	5	4	2	3		
S3	5	4	3	6		
S4	5	4	5	0		
T1	5	4	2	3		
T2	5	4	4	3		
T3	5	4	6	6		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
84"						
A1	5	2	10	10		
A2	5	2	14	2		
B1	5	4	3	6		
B2	5	4	4	3		
B3	5	4	5	1		
B4	5	4	5	10		
B5	5	4	6	7		
B6	5	4	7	4		
B7	5	16	8	1		
C1	4	2	7	10		
C2	4	2	10	6		
C3	4	2	13	1		
C4	4	2	15	7		
C5	4	2	18	3		
C6	4	6	19	10		
E1	5	2	16	9	11	9
E2	5	2	17	1	12	1
F	4	12	1	9	0	6
G1	4	2	11	9		
G2	4	3	15	6		
G3	4	3	19	5		
G4	4	3	22	0		
H	4	12	12	8	10	6
J1	5	4	3	7		
J2	5	4	4	7		
J3	5	4	5	8		
J4	5	4	6	9		
J5	5	4	7	9		
K1	4	2	1	0		
K2	4	2	2	9		
K3	4	2	4	9		
K4	4	2	6	7		
K5	4	2	8	6		
K6	4	6	9	7		
M	4	30	3	9		
N1	4	7	9	8		
N2	4	7	19	10		
P	5	30	5	9	4	0
Q	5	3	8	0		
R	5	8	2	10		
S1	5	4	1	3		
S2	5	4	3	3		
S3	5	4	4	3		
S4	5	4	5	6		
T1	5	4	2	3		
T2	5	4	5	3		
T3	5	4	7	3		

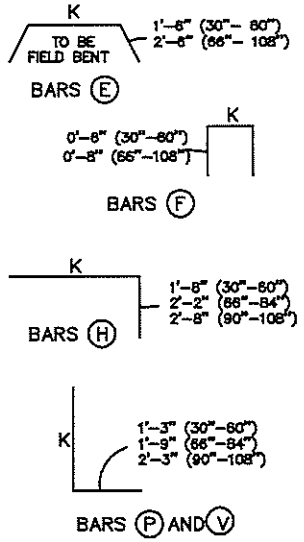
MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
90"						
A1	5	2	11	7		
A2	5	2	15	1		
B1	5	4	3	8		
B2	5	4	4	6		
B3	5	4	5	4		
B4	5	4	6	1		
B5	5	4	6	9		
B6	5	4	7	7		
B7	5	4	8	4		
B8	5	14	8	8		
C1	4	2	9	8		
C2	4	2	12	2		
C3	4	2	14	10		
C4	4	2	17	6		
C5	4	2	20	1		
C6	4	6	21	1		
E1	5	2	17	6	12	6
E2	5	2	17	10	12	10
F	4	13	1	9	0	6
G1	4	3	13	3		
G2	4	3	17	0		
G3	4	3	20	10		
G4	4	3	23	5		
H	4	12	13	8	11	0
J1	5	4	3	10		
J2	5	4	4	10		
J3	5	4	5	11		
J4	5	4	6	11		
J5	5	4	7	0		
K1	4	2	2	0		
K2	4	2	3	10		
K3	4	2	5	9		
K4	4	2	7	8		
K5	4	2	9	7		
K6	4	6	10	3		
M	4	31	4	9		
N1	4	8	10	3		
N2	4	8	21	1		
P	6	31	6	6	4	3
Q	5	4	8	7		
R	5	9	3	3		
S1	5	4	1	6		
S2	5	4	3	3		
S3	5	4	4	3		
S4	5	4	5	9		
T1	5	4	2	3		
T2	5	4	5	3		
T3	5	4	7	9		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
96"						
A1	5	2	12	3		
A2	5	2	15	11		
B1	5	4	4	0		
B2	5	4	4	9		
B3	5	4	5	6		
B4	5	4	6	3		
B5	5	4	7	1		
B6	5	4	7	10		
B7	5	4	8	7		
B8	5	18	9	3		
C1	4	2	8	11		
C2	4	2	11	6		
C3	4	2	14	2		
C4	4	2	16	9		
C5	4	2	19	5		
C6	4	2	21	11		
C7	4	6	22	3		
E1	5	2	18	4	13	4
E2	5	2	18	8	13	8
F	4	14	1	9	0	6
G1	4	3	14	9		
G2	4	3	18	7		
G3	4	3	22	4		
G4	4	3	25	0		
H	4	13	14	2	11	6
J1	5	4	4	1		
J2	5	4	5	1		
J3	5	4	6	2		
J4	5	4	7	2		
J5	5	4	8	2		
J6	5	2	9	3		
K1	4	2	3	1		
K2	4	2	4	11		
K3	4	2	6	10		
K4	4	2	8	9		
K5	4	2	10	7		
K6	4	6	10	10		
M	4	34	4	9		
N1	4	8	10	10		
N2	4	8	22	3		
P	6	34	6	9	4	6
Q	5	4	9	2		
R	5	9	3	5		
S1	5	4	2	3		
S2	5	4	3	3		
S3	5	4	5	3		
S4	5	4	6	3		
T1	5	4	3	3		
T2	5	4	5	6		
T3	5	4	8	3		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.7 & 18.9 THRU 18.12

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-18.8

BILL OF REINFORCEMENT HEADWALLS (72"-96" DIAMETER CIRCULAR PIPE) - 30° SKEW

(STM-18.8)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-332)

REVISION	BY	DATE

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
102"						
A1	5	2	12	11		
A2	5	2	16	10		
B1	5	4	4	3		
B2	5	4	5	0		
B3	5	4	5	9		
B4	5	4	6	6		
B5	5	4	7	4		
B6	5	4	8	1		
B7	5	4	8	10		
B8	5	4	9	7		
B9	5	16	9	9		
C1	4	2	10	10		
C2	4	2	13	5		
C3	4	2	15	11		
C4	4	2	18	7		
C5	4	2	21	3		
C6	4	8	23	5		
E1	5	2	19	1	14	1
E2	5	2	19	5	14	5
F	4	15	1	9	0	6
G1	4	1	12	8		
G2	4	3	16	5		
G3	4	3	20	3		
G4	4	3	24	0		
G5	4	3	26	7		
H	4	14	14	6	11	10
J1	5	4	4	4		
J2	5	4	5	4		
J3	5	4	6	5		
J4	5	4	7	5		
J5	5	4	8	6		
J6	5	4	9	6		
K1	4	2	2	2		
K2	4	2	4	1		
K3	4	2	6	0		
K4	4	2	8	0		
K5	4	2	9	11		
K6	4	8	11	5		
M	4	36	4	9		
N1	4	8	11	5		
N2	4	8	23	7		
P	7	36	7	0	4	9
Q	5	4	9	9		
R	5	10	3	5		
S1	5	4	2	3		
S2	5	4	3	6		
S3	5	4	5	3		
S4	5	4	6	6		
T1	5	4	3	3		
T2	5	4	6	3		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
102" (CONTINUED)						
T3	5	4	8	9		
108"						
A1	5	2	13	6		
A2	5	2	17	8		
B1	5	4	4	6		
B2	5	4	5	3		
B3	5	4	6	0		
B4	5	4	6	9		
B5	5	4	7	6		
B6	5	4	8	3		
B7	5	4	9	0		
B8	5	4	9	9		
B9	5	18	10	4		
C1	4	2	9	10		
C2	4	2	12	6		
C3	4	2	15	2		
C4	4	2	17	9		
C5	4	2	20	6		
C6	4	2	23	1		
C7	4	8	24	9		
E1	5	2	19	11	14	11
E2	5	2	20	3	15	3
F	4	15	1	9	0	6
G1	4	1	15	5		
G2	4	3	18	0		
G3	4	3	21	10		
G4	4	3	25	7		
G5	4	3	28	3		
H	4	15	15	2	12	6
J1	5	4	4	6		
J2	5	4	5	7		
J3	5	4	6	7		
J4	5	4	7	7		
J5	5	4	8	8		
J6	5	4	9	9		
K1	4	2	3	2		
K2	4	2	5	1		
K3	4	2	7	0		
K4	4	2	8	11		
K5	4	2	10	9		
K6	4	8	12	0		
M	4	37	4	9		
N1	4	8	11	11		
N2	4	8	24	9		
P	7	37	7	3	5	0
Q	5	4	10	4		
R	5	10	3	5		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
108" (CONTINUED)						
S1	5	4	2	0		
S2	5	4	3	9		
S3	5	4	5	0		
S4	5	4	6	3		
S5	5	2	7	0		
T1	5	2	2	3		
T2	5	4	4	6		
T3	5	4	6	9		
T4	5	4	9	9		

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

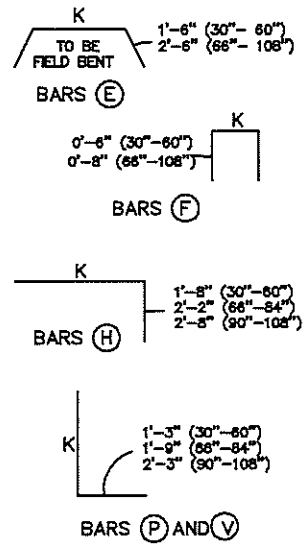
STANDARD DRAWING NO: STM-18.9

DATE: MAY 2010

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2. DIMENSIONS ARE O. TO O. OF BARS.
3. ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.8 & 18.10 THRU 18.12

BILL OF REINFORCEMENT HEADWALLS
(102"-108" DIAMETER CIRCULAR PIPE) - 30° SKEW
(STM-18.9)
N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-334)

REVISION	BY	DATE

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
30"						
A1	5	2	5	0		
A2	5	2	8	11		
C1	4	1	7	1		
C2	4	1	10	6		
C3	4	1	13	7		
E1	5	2	9	4	6	4
E2	5	2	9	6	6	6
F	4	7	1	3	0	4
G1	4	1	6	5		
G2	4	2	8	5		
G3	4	3	12	5		
H	4	7	6	7	4	11
K1	4	1	1	0		
K2	4	1	2	10		
K3	4	1	4	5		
N1	4	3	4	5		
N2	4	3	8	8		
Q	4	2	2	9		
R	4	3	0	9		
S1	5	2	1	6		
S2	5	4	3	6		
T1	5	2	1	6		
T2	5	4	2	9		
V1	5	2	3	0	1	9
V2	5	2	3	7	2	4
V3	5	2	4	1	2	10
V4	5	2	4	9	3	6
V5	5	6	5	0	3	9
W1	5	2	3	1	1	10
W2	5	2	4	3	3	0
W3	5	1	5	3	4	0
36"						
A1	5	2	5	8		
A2	5	2	10	2		
C1	4	1	9	8		
C2	4	1	13	2		
C3	4	1	15	6		
E1	5	2	10	4	7	4
E2	5	2	10	7	7	7
F	4	8	1	3	0	4
G1	4	1	8	8		
G2	4	2	10	8		
G3	4	3	14	9		
H	4	8	7	2	5	6
K1	4	1	2	0		
K2	4	1	3	10		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
36" (CONTINUED)						
K3	4	1	4	11		
N1	4	3	5	0		
N2	4	3	9	10		
Q	4	2	3	4		
R	4	4	0	10		
S1	5	2	2	3		
S2	5	4	4	3		
T1	5	4	1	6		
T2	5	4	3	0		
V1	5	2	3	3	2	0
V2	5	2	3	9	2	6
V3	5	2	4	4	3	1
V4	5	2	4	11	3	8
V5	5	2	5	6	4	3
V6	5	6	5	7	4	4
W1	5	2	3	3	2	0
W2	5	2	4	5	3	2
W3	5	1	5	7	4	4
42"						
A1	5	2	6	5		
A2	5	2	11	5		
C1	4	1	9	2		
C2	4	1	12	8		
C3	4	1	16	3		
C4	4	1	17	6		
E1	5	2	11	6	8	6
E2	5	2	11	9	8	9
F	4	9	1	3	0	4
G1	4	1	8	3		
G2	4	3	12	5		
G3	4	3	16	11		
H	4	9	7	8	6	0
K1	4	1	1	3		
K2	4	1	3	1		
K3	4	1	5	0		
K4	4	1	5	7		
N1	4	3	5	7		
N2	4	3	11	0		
Q	4	2	3	11		
R	4	4	0	10		
S1	5	2	1	9		
S2	5	2	3	3		
S3	5	4	5	3		
T1	5	4	1	3		
T2	5	4	2	3		
T3	5	4	3	6		
V1	5	2	3	6	2	3

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
42" (CONTINUED)						
V2	5	2	4	0	2	9
V3	5	2	4	7	3	4
V4	5	2	5	2	3	11
V5	5	2	5	9	4	6
V6	5	8	6	3	5	0
W1	5	2	3	6	2	3
W2	5	2	4	8	3	5
W3	5	2	5	9	4	6
48"						
A1	5	2	7	1		
A2	5	2	12	6		
C1	4	1	11	10		
C2	4	1	15	4		
C3	4	1	18	11		
C4	4	1	19	6		
E1	5	2	12	7	9	7
E2	5	2	12	10	9	10
F	4	10	1	3	0	4
G1	4	2	10	0		
G2	4	3	14	6		
G3	4	3	19	4		
H	4	11	8	3	6	7
K1	4	1	2	4		
K2	4	1	4	2		
K3	4	1	6	1		
K4	4	1	6	3		
N1	4	3	6	2		
N2	4	3	12	2		
Q	4	2	4	6		
R	4	5	0	10		
S1	5	4	2	9		
S2	5	4	5	6		
T1	5	4	1	6		
T2	5	4	2	9		
T3	5	4	4	3		
V1	5	2	3	8	2	5
V2	5	2	4	3	3	0
V3	5	2	4	10	3	7
V4	5	2	5	5	4	2
V5	5	2	5	11	4	8
V6	5	2	6	6	5	3
V7	5	8	6	8	5	5
W1	5	2	3	10	2	7
W2	5	2	4	11	3	8
W3	5	2	6	0	4	9

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
54"						
A1	5	2	7	9		
A2	5	2	13	10		
C1	4	1	11	0		
C2	4	1	14	8		
C3	4	1	18	3		
C4	4	2	21	5		
E1	5	2	13	9	10	9
E2	5	2	14	0	11	0
F	4	11	1	3	0	4
G1	4	3	11	7		
G2	4	3	16	11		
G3	4	3	21	7		
H	4	11	8	11	7	3
K1	4	1	1	5		
K2	4	1	3	3		
K3	4	1	5	2		
K4	4	2	6	10		
N1	4	3	6	10		
N2	4	3	13	4		
Q	4	2	5	1		
R	4	6	0	11		
S1	5	2	1	9		
S2	5	4	3	6		
S3	5	4	6	8		
T1	5	2	1	3		
T2	5	4	2	6		
T3	5	4	3	3		
T4	5	4	4	9		
V1	5	2	3	11	2	8
V2	5	2	4	6	3	3
V3	5	2	5	1	3	10
V4	5	2	5	7	4	4
V5	5	2	6	1	4	10
V6	5	2	6	8	5	5
V7	5	10	7	3	6	0
W1	5	2	4	0	2	9
W2	5	2	5	1	3	10
W3	5	2	6	2	4	11
W4	5	1	8	2	6	11
60"						
A1	5	2	8	4		
A2	5	2	15	0		
C1	4	1	13	11		
C2	4	1	17	6		
C3	4	1	21	2		
C4	4	1	23	8		

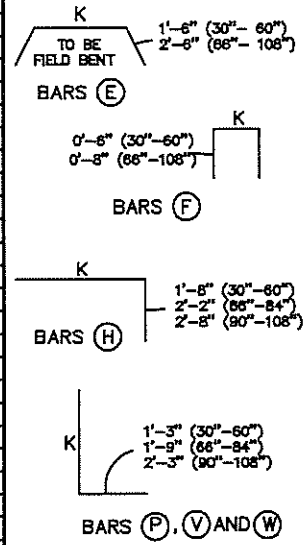
MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
60" (CONTINUED)						
E1	5	2	14	10	11	10
E2	5	2	15	1	12	1
F	4	12	1	3	0	4
G1	4	3	13	0		
G2	4	3	19	0		
G3	4	3	23	10		
H	4	13	9	5	7	9
K1	4	1	2	7		
K2	4	1	4	5		
K3	4	1	6	4		
K4	4	2	7	5		
N1	4	3	7	5		
N2	4	3	14	6		
Q	4	2	5	8		
R	4	6	0	11		
S1	5	4	1	9		
S2	5	4	4	6		
S3	5	4	7	9		
T1	5	4	1	6		
T2	5	4	2	6		
T3	5	4	4	0		
T4	5	4	5	6		
V1	5	2	4	3	3	0
V2	5	2	4	9	3	6
V3	5	2	5	4	4	1
V4	5	2	5	10	4	7
V5	5	2	6	5	5	2
V6	5	2	6	11	5	8
V7	5	2	7	6	6	3
V8	5	10	7	9	6	6
W1	5	2	4	4	3	1
W2	5	2	5	5	4	2
W3	5	2	6	6	5	3
W4	5	1	7	7	6	4
66"						
A1	5	2	8	11		
A2	5	2	15	11		
B1	5	4	2	9		
B2	5	4	3	4		
B3	5	4	3	10		
B4	5	4	4	5		
B5	5	4	5	0		
B6	5	4	5	6		
B7	5	4	6	1		
B8	5	24	6	8		
C1	4	2	13	5		
C2	4	2	17	0		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
66" (CONTINUED)						
C3	4	2	20	6		
C4	4	2	24	1		
C5	4	4	25	3		
E1	5	2	18	0	13	0
E2	5	2	18	5	13	5
F	4	13	1	9	0	6
G1	4	1	11	8		
G2	4	3	15	6		
G3	4	3	21	5		
G4	4	3	25	9		
H	4	14	10	7	8	5
J1	5	2	2	10		
J2	5	2	3	11		
J3	5	2	5	0		
J4	5	2	6	1		
K1	4	2	1	8		
K2	4	2	3	6		
K3	4	2	5	5		
K4	4	2	7	3		
K5	4	4	7	10		
M	4	34	3	9		
N1	4	7	7	10		
N2	4	7	25	4		
P	5	34	5	0	3	3
Q	5	3	6	3		
R	5	7	2	7		
S1	5	4	3	3		
S2	5	4	6	3		
S3	5	4	8	0		
T1	5	4	2	3		
T2	5	4	3	9		
T3	5	4	5	3		
T4	5	4	6	3		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.9 & 18.11 THRU 18.12

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

STANDARD DRAWING NO: STM-18.10

DATE: MAY 2010

BILL OF REINFORCEMENT HEADWALLS (30"-66" DIAMETER CIRCULAR PIPE) - 45° SKEW

(STM-18.10)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-340)

REVISION	BY	DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

STANDARD DRAWING NO: STM-18.11

DATE: MAY 2010

72"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	9	7		
A2	5	2	17	1		
B1	5	4	3	0		
B2	5	4	3	6		
B3	5	4	4	1		
B4	5	4	4	8		
B5	5	4	5	3		
B6	5	4	5	9		
B7	5	4	6	4		
B8	5	4	6	10		
B9	5	24	7	1		
C1	4	2	12	0		
C2	4	2	16	0		
C3	4	2	19	8		
C4	4	2	23	3		
C5	4	2	26	9		
C6	4	4	27	3		
E1	5	2	19	1	14	1
E2	5	2	19	6	14	6
F	4	15	1	9	0	6
G1	4	1	14	2		
G2	4	3	18	2		
G3	4	3	24	2		
G4	4	3	28	2		
H	4	16	11	4	9	2
J1	5	4	3	0		
J2	5	4	4	1		
J3	5	4	5	2		
J4	5	4	6	3		
J5	5	2	7	4		
K1	4	2	2	7		
K2	4	2	4	5		
K3	4	2	6	3		
K4	4	2	8	2		
K5	4	4	8	6		
M	4	37	3	9		
N1	4	7	8	6		
N2	4	7	27	3		
P	5	37	5	3	3	6
Q	5	3	6	10		
R	5	7	2	9		
S1	5	4	3	6		
S2	5	4	6	6		
S3	5	4	8	9		
T1	5	4	2	3		
T2	5	4	4	0		
T3	5	4	5	6		
T4	5	4	6	6		

78"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	10	2		
A2	5	2	18	3		
B1	5	4	3	2		
B2	5	4	3	9		
B3	5	4	4	4		
B4	5	4	4	11		
B5	5	4	5	5		
B6	5	4	6	0		
B7	5	4	6	6		
B8	5	4	7	1		
B9	5	28	7	8		
C1	4	2	15	4		
C2	4	2	19	0		
C3	4	2	22	8		
C4	4	2	26	2		
C5	4	6	29	3		
E1	5	2	20	3	15	3
E2	5	2	20	8	15	8
F	4	15	1	9	0	6
G1	4	1	16	5		
G2	4	3	20	5		
G3	4	3	26	5		
G4	4	3	30	6		
H	4	16	11	8	9	6
J1	5	4	3	4		
J2	5	4	4	5		
J3	5	4	5	5		
J4	5	4	6	6		
J5	5	2	7	6		
K1	4	2	1	8		
K2	4	2	3	9		
K3	4	2	5	6		
K4	4	2	7	5		
K5	4	6	9	0		
M	4	39	3	9		
N1	4	7	9	0		
N2	4	7	29	1		
P	5	39	5	6	3	9
Q	5	3	7	5		
R	5	8	2	8		
S1	5	1	2	6		
S2	5	4	4	6		
S3	5	4	7	6		
S4	5	4	9	9		
T1	5	4	1	9		
T2	5	4	3	3		
T3	5	4	5	3		
T4	5	4	6	6		
T5	5	4	7	3		

84"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	10	10		
A2	5	2	19	6		
B1	5	4	3	6		
B2	5	4	4	0		
B3	5	4	4	6		
B4	5	4	5	1		
B5	5	4	5	8		
B6	5	4	6	2		
B7	5	4	6	9		
B8	5	4	7	3		
B9	5	4	7	10		
B10	5	28	8	3		
C1	4	2	14	2		
C2	4	2	18	10		
C3	4	2	21	7		
C4	4	2	25	1		
C5	4	2	28	9		
C6	4	6	31	3		
E1	5	2	21	4	15	4
E2	5	2	21	9	15	9
F	4	17	1	9	0	6
G1	4	2	16	8		
G2	4	3	22	8		
G3	4	3	28	8		
G4	4	3	32	8		
H	4	17	12	4	10	2
J1	5	4	3	6		
J2	5	4	4	7		
J3	5	4	5	8		
J4	5	4	6	8		
J5	5	4	7	9		
K1	4	2	2	9		
K2	4	2	4	8		
K3	4	2	6	6		
K4	4	2	8	6		
K5	4	6	9	8		
M	4	42	3	9		
N1	4	7	9	8		
N2	4	7	32	4		
P	5	42	5	9	4	0
Q	5	3	8	0		
R	5	8	2	10		
S1	5	4	2	6		
S2	5	4	5	3		
S3	5	4	7	6		
S4	5	4	10	4		
T1	5	4	2	0		
T2	5	4	3	3		
T3	5	4	5	3		
T4	5	4	6	3		

84" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
T5	5	4	7	9		

90"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	11	7		
A2	5	2	20	8		
B1	5	4	3	8		
B2	5	4	4	3		
B3	5	4	4	10		
B4	5	4	5	4		
B5	5	4	5	11		
B6	5	4	6	5		
B7	5	4	7	0		
B8	5	4	7	6		
B9	5	4	8	1		
B10	5	30	8	8		
C1	4	2	17	1		
C2	4	2	20	10		
C3	4	2	24	5		
C4	4	2	28	2		
C5	4	2	31	10		
C6	4	6	33	6		
E1	5	2	22	6	17	6
E2	5	2	22	11	17	11
F	4	18	1	9	0	6
G1	4	3	18	6		
G2	4	3	24	6		
G3	4	3	30	6		
G4	4	3	35	0		
H	4	14	13	5	10	9
J1	5	4	4	0		
J2	5	4	5	0		
J3	5	4	6	1		
J4	5	4	7	1		
J5	5	4	8	2		
K1	4	2	2	0		
K2	4	2	3	10		
K3	4	2	5	9		
K4	4	2	7	8		
K5	4	2	9	8		
K6	4	6	10	3		
M	4	45	4	9		
N1	4	8	10	3		
N2	4	8	33	3		
P	6	45	6	6	4	3
Q	5	4	8	7		
R	5	9	3	3		
S1	5	4	2	6		
S2	5	4	5	6		

90" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
S3	5	4	8	4		
S4	5	4	11	3		
T1	5	4	2	6		
T2	5	4	4	0		
T3	5	4	5	5		
T4	5	4	6	9		
T5	5	4	8	3		

96"

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
A1	5	2	12	3		
A2	5	2	21	11		
B1	5	4	4	0		
B2	5	4	4	6		
B3	5	4	4	1		
B4	5	4	5	7		
B5	5	4	6	1		
B6	5	4	6	8		
B7	5	4	7	2		
B8	5	4	7	9		
B9	5	4	8	4		
B10	5	4	8	10		
B11	5	30	9	3		
C1	4	2	16	4		
C2	4	2	20	0		
C3	4	2	23	9		
C4	4	2	27	5		
C5	4	2	31	1		
C6	4	2	34	1		
C7	4	6	35	2		
E1	5	2	23	7	18	7
E2	5	2	24	0	19	0
F	4	19	1	9	0	6
G1	4	3	21	0		
G2	4	3	27	0		
G3	4	3	33	0		
G4	4	3	37	6		
H	4	19	14	0	11	4
J1	5	4	4	1		
J2	5	4	5	1		
J3	5	4	6	2		
J4	5	4	7	2		
J5	5	4	8	3		
J6	5	2	9	3		
K1	4	2	2	11		
K2	4	2	4	10		
K3	4	2	6	10		
K4	4	2	8	8		
K5	4	2	10	8		

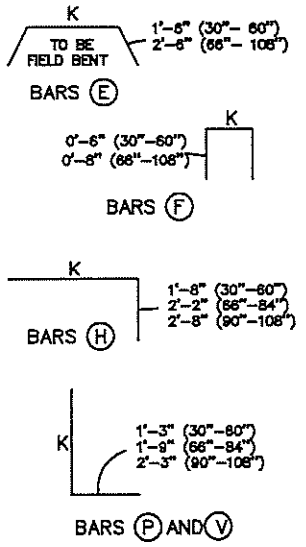
96" (CONTINUED)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
K6	4	6	10	10		
M	4	47	4	9		
N1	4	8	10	11		
N2	4	8	35	4		
P	6	44	6	9	4	6
Q	5	4	9	2		
R	5	9	3	5		
S1	5	4	4	4		
S2	5	4	7	5		
S3	5	4	9	5		
S4	5	4	12	2		
T1	5	4	1	6		
T2	5	4	3	6		
T3	5	4	5	9		
T4	5	4	6	6		
T5	5	4	7	6		
T6	5	4	9	0		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.10 & 18.12

BILL OF REINFORCEMENT HEADWALLS (72"-96" DIAMETER CIRCULAR PIPE) - 45° SKEW

(STM-18.11)

N.T.S.

(REFERENCE KYTC STANDARD DRAWING RDH-342)

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
102"						
A1	5	2	12	9		
A2	5	2	23	4		
B1	5	4	4	3		
B2	5	4	4	9		
B3	5	4	5	4		
B4	5	4	5	10		
B5	5	4	6	4		
B6	5	4	6	11		
B7	5	4	7	5		
B8	5	4	8	0		
B9	5	4	8	6		
B10	5	4	9	0		
B11	5	34	9	7		
C1	4	2	19	0		
C2	4	2	22	9		
C3	4	2	26	5		
C4	4	2	30	0		
C5	4	2	34	0		
C6	4	8	37	3		
E1	5	2	24	9	19	9
E2	5	2	25	2	20	2
F	4	20	1	9	0	6
G1	4	1	20	6		
G2	4	3	24	0		
G3	4	3	29	0		
G4	4	3	35	0		
G5	4	3	39	6		
H	4	21	14	5	11	9
J1	5	4	4	3		
J2	5	4	5	4		
J3	5	4	6	4		
J4	5	4	7	5		
J5	5	4	8	5		
J6	5	4	9	5		
K1	4	2	2	0		
K2	4	2	4	0		
K3	4	2	6	0		
K4	4	2	8	0		
K5	4	2	10	0		
K6	4	8	11	6		
M	4	49	4	9		
N1	4	8	11	6		
N2	4	8	37	3		
P	7	49	7	0	4	9
Q	5	4	9	9		
R	5	10	3	5		
S1	5	4	2	6		
S2	5	4	5	3		
S3	5	4	8	6		
S4	5	4	10	6		

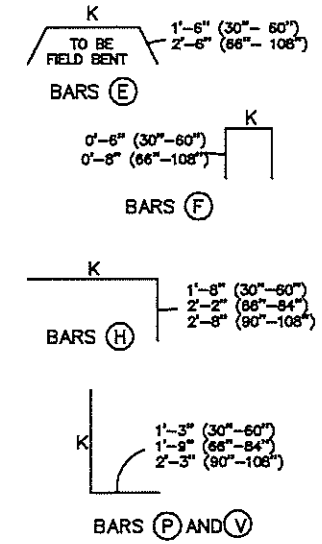
MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
102" (CONTINUED)						
S5	5	4	13	6		
T1	5	4	2	9		
T2	5	4	4	3		
T3	5	4	5	3		
T4	5	4	6	6		
T5	5	4	8	6		
T6	5	4	9	6		
108"						
A1	5	2	13	7		
A2	5	2	24	3		
B1	5	4	4	5		
B2	5	4	5	0		
B3	5	4	5	5		
B4	5	4	6	0		
B5	5	4	6	6		
B6	5	4	7	1		
B7	5	4	7	7		
B8	5	4	8	2		
B9	5	4	8	8		
B10	5	4	9	3		
B11	5	4	9	9		
B12	5	34	10	3		
C1	4	2	18	2		
C2	4	2	22	1		
C3	4	2	25	5		
C4	4	2	29	3		
C5	4	2	33	0		
C6	4	2	36	7		
C7	4	8	39	2		
E1	5	2	25	7	20	7
E2	5	2	26	2	21	2
F	4	21	1	9	0	6
G1	4	1	19	9		
G2	4	3	25	8		
G3	4	3	31	10		
G4	4	3	37	9		
G5	4	3	41	9		
H	4	21	15	1	12	5
J1	5	4	4	6		
J2	5	4	5	7		
J3	5	4	6	7		
J4	5	4	7	6		
J5	5	4	8	7		
J6	5	4	9	7		
K1	4	2	2	11		
K2	4	2	4	11		
K3	4	2	6	10		

MARK	SIZE	NO ①	LGTH FT	LGTH IN	K FT	K IN
108" (CONTINUED)						
K4	4	2	8	11		
K5	4	2	10	9		
K6	4	8	12	0		
M	4	51	4	9		
N1	4	8	16	0		
N2	4	8	44	0		
P	7	51	7	3	5	0
Q	5	4	10	4		
R	5	10	3	5		
S1	5	4	3	5		
S2	5	4	6	0		
S3	5	4	8	6		
S4	5	4	11	6		
S5	5	4	13	6		
T1	5	4	2	3		
T2	5	4	3	6		
T3	5	4	5	0		
T4	5	4	6	3		
T5	5	4	7	9		
T6	5	4	9	3		
T7	5	4	10	3		

NOTES

① NUMBER OF BARS IN ONE HEADWALL.
2 DIMENSIONS ARE O. TO O. OF BARS.
3 ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES



USE WITH CURRENT SD#1 STANDARD DRAWINGS NOS. STM 18.1 THRU 18.11

BILL OF REINFORCEMENT
HEADWALLS
(102" TO 108" DIAMETER CIRCULAR PIPE)
45° SKEW
(STM-18.12)

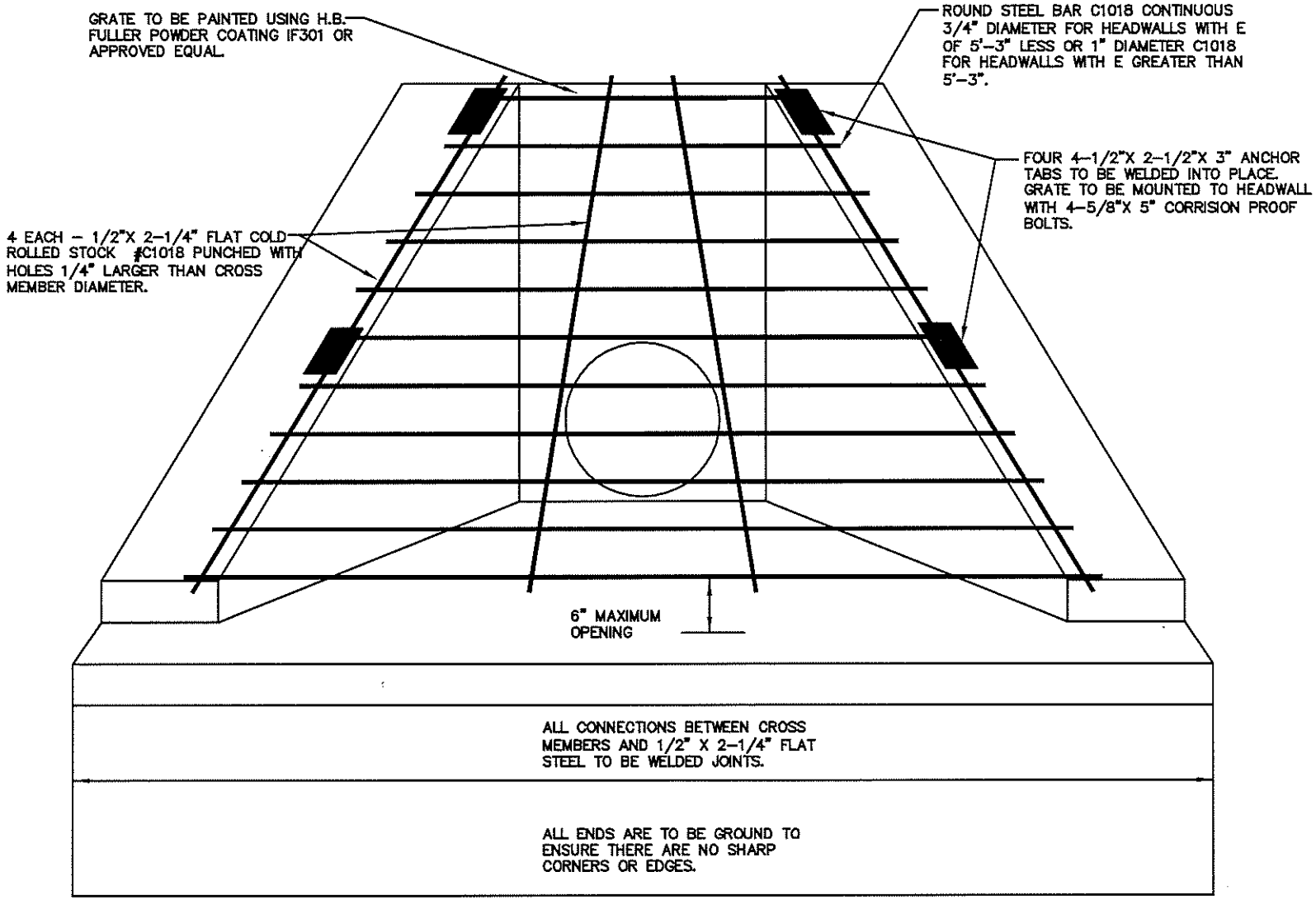
(REFERENCE KYTC STANDARD DRAWING RDH-344)

REVISION BY DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-18.12



ENCLOSURE GRATE FOR INLET HEADWALL
(24" DIAMETER PIPE OR LESS)
(STM-19)

N.T.S.

(REFERENCE KENTON CO. SUB. DETAIL C.26)

REVISION	BY	DATE

SANITATION DISTRICT NO. 1
1045 Eaton Drive
Ft. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE: MAY 2010

STANDARD DRAWING NO: STM-19