Appendix A

Louisville Water Company
Revised Drawings and Specifications
If field conditions prevent standard concrete thrust anchors placement as shown detailed in project drawings, the LWC Project Manager must approve any modification. Concrete thrust anchors in solid rock trenches may be modified with LWC Project Manager approval.

The Company Inspector may require forming (plywood or steel) in order to properly locate and position concrete thrust anchors. Company-supplied restrained-joint hardware is not intended to be used in lieu of concrete thrust anchors and counterweights. Such hardware is to be used ONLY when it is necessary to return a water main to service immediately, as when making tie-ins or at the specific instructions of the Company.

Whenever restrained-joint hardware is used to restrain fittings, the Contractor must also pour a concrete thrust block. In no instances, shall restrained-joint hardware alone be accepted as a permanent thrust restraint. See Standard Drawing: 1400 in Appendix of Drawings.

7. BACKFILLING PROCEDURES AND TAMPING

7.1 General

In general, trench dimensioning and backfill materials shall be as follows: six inches (6”) of vertical clearance with the bottom of the trench, and the subsequent layered placement of pit run sand, DGA or manufactured sand bedding along the bottom of the pipe; nine inches (9”) of horizontal clearance with each side of the trench, and the subsequent layered placement of pit run sand, DGA, or manufactured sand backfill along each side of the pipe; the layered placement of pit run sand, DGA, or manufactured sand to the elevation of twelve inches (12”) above the crown of the pipe; and, if in a lawn area, the remainder of the backfill to be common (but acceptable) fill, or, if in a paved and/or a to-be-paved area, the remainder of the backfill to be the layered placement of pit run sand, DGA, manufactured sand, #57 stone or flowable fill up to the bottom elevation of the respective pavement restoration scheme.

All bedding and backfill material shall be uniform and continuous for the entire trench excavation limits.

The total depth of cover (i.e., the vertical distance from crown-of-pipe to ground/pavement surface) shall be at least forty-two inches (42”). The cost of applicable backfill material, backfilling, and required tamping shall be covered in the base bid as shown on the BIDDER'S PROPOSAL form.
All backfill (except flowable fill) shall be properly compacted by pneumatic, vibratory, or other approved compaction equipment. A backhoe bucket is not an approved compaction device. Degree of compaction shall be at least ninety percent (90%) of Modified Proctor (ASTM D-1557), and the compaction effort shall be performed in a uniform and consistent manner. The Company reserves the right to conduct compaction testing and such testing will not relieve the Contractor of any future warranty responsibilities. When instructed by the LWC Project Manager, the Contractor shall excavate backfilled material to a particular grade for testing. Backfilled areas which do not pass this test shall be excavated and re-compacted until they meet compaction specifications. Areas excavated for testing shall be re-compacted in accordance with this compaction specification. The cost of this work shall be included in the base bid.

Appropriate and sufficient backfill material shall be furnished by the Contractor to replace material deemed unsatisfactory by the LWC Project Manager or the Company Inspector.

Unsatisfactory material includes unsuitable soil as described in "FINAL BACKFILLING" (Section 7.6) and frozen or exceptionally wet backfill material, and may include backfill material excavated for testing purposes or backfill material excavated for failure to meet compaction requirements. See Standard Drawing: 4300 in Appendix of Drawings.

7.2 Acceptable Backfill Materials

7.2.1 Pit Run Sand (Natural Sand)

Pit Run Sand is sand resulting from the natural degradation of rock and shall meet the material and gradation requirements of Section 804 Fine Aggregates of the current edition of the Kentucky Department of Highways “Standard Specifications for Road and Bridge Construction”.

7.2.2 Dense Graded Aggregate (Kentucky DGA or Indiana #73)

Dense Graded Aggregate shall meet the material and gradation requirements of Section 805 Coarse Aggregates of the current edition of the Kentucky Department of Highways “Standard Specifications for Road and Bridge Construction”.

7.2.3 Flowable Fill (Controlled Low Strength Cementitious Material).

Flowable fill, a quick-setting, cementitious, self-compacting, shrinkless fill material, may only be used with the prior written approval of the LWC Project Manager.
The mix design must be approved prior to placement by the LWC Project Manager. The 28-day compression strength of said fill shall not exceed 150 psi, and the minimum strength shall be 25 psi. The mix shall include sand, cement, fly ash with water not included as part of the volume mix. Fly ash shall have a ph value of no less than 7.0 and no greater than 12.5. The pipe shall be enveloped with pit run sand, manufactured sand or dense graded aggregate and backfilled in accordance with “Initial Backfilling” (Section 7.5).

7.2.4 Manufactured Sand (Kentucky 3/8” Manufactured Sand)

Manufactured Sand shall be the material resulting from the crushing and classification by screening, or otherwise, of rock and gravel. Manufactured Sand shall be washed and contain no fine particles and or dust.

The Contractor shall be responsible for all dust control associated with the use of Manufactured Sand. Manufactured Sand shall meet the material and gradation requirements of Section 804.08 Pipe Bedding of the current edition of the Kentucky Department of Highways “Standard Specifications for Road and Bridge Construction”.

7.2.5 Kentucky #57 Stone (or Indiana #8 Stone)

Kentucky #57 Stone shall not be used as bedding or initial backfilling for pipe. Kentucky #57 Stone shall meet the material and gradation requirements of Section 805 Course Aggregates of the current edition of the Kentucky Department of Highways “Standard Specifications for Road and Bridge Construction”.

7.2.6 Kentucky #3 Stone (or Indiana #2 Stone)

Kentucky #3 Stone shall only be used for Fire Hydrant Drainage Pits. (See Section 9.2 Drainage Pit). Kentucky #3 Stone shall meet the material and gradation requirements of Section 805 Coarse Aggregates of the current edition of the Kentucky Department of Highways “Standard Specifications for Road and Bridge Construction”.

7.2.7 By-product of trench rock excavator

The by-product of trench rock excavator equipment may be acceptable for pipe bedding and/or backfill material if prior written approval is granted by the LWC Project Manager.
The LWC Project Manager must review the material and be assured of the compaction ability of the material. The Contractor must wash the material thoroughly (i.e., no dust particles); and to sieve the material thoroughly so that no individual rock pieces exceed sieve size of one inch (1”) (25.0mm).

7.3 Un-Acceptable Backfill Materials

Un-washed Manufactured sand, Black sand (coal or coke by-products), slag, or foundry by-products will not be allowed as pipe bedding and / or backfill material.

7.4 Bedding

For the entire length of the trench, the excavation shall provide a six inch (6”) space below the pipe, which shall be placed and firmly compacted with approved backfill materials, pit run sand, manufactured sand or Dense Graded Aggregate, as specified by the Kentucky Transportation Cabinet Department of Highways Standard Specification for Road and Bridge Construction, (latest edition) “Fine Aggregates” or "Coarse Aggregates," to form a bedding for the pipe.

The bedding shall be excavated at bells, valves, and fittings so the barrel of the pipe will have a bearing for its full length.


7.5 Initial Backfilling

Initial backfill should occur as soon as possible after the installation of pipe, so as to prevent the pipe from shifting. After the pipe has been placed on the bedding, pit run sand or Dense Graded Aggregate, shall be deposited in the trench by mechanical equipment and distributed in six inch (6”) layers on both sides of the pipe for the full width of the trench, the trench width having nine inches (9”) of horizontal clearance along each side of the pipe.

The pit run sand or Dense Graded Aggregate shall be tamped in six inch (6”) layers and thoroughly compacted under the centerline and on each side of the pipe. Backfill shall be placed and tamped to a height of at least twelve inches (12”) above the top of the pipe.

7.6 Final Backfilling

When not under paved surfaces or surfaces where paving is intended, the remainder of the trench shall be backfilled with soil free from brush or vegetative matter, rocks larger than fist-size, pieces of concrete larger than fist-size, cinders, or any other matter which could prevent proper consolidation.

When under paved surfaces or surfaces where paving is intended, the remainder of the trench shall be backfilled for the full depth with pit run sand, Dense Graded Aggregate, or #57 stone as specified by the Kentucky Department of Highways Standard Specification for Road and Bridge Construction, (latest edition) “Fine Aggregates” or “Coarse Aggregates.” At pavement crossings, this pavement backfill shall extend five feet (5’) beyond each end of the paving or proposed paving.

Whether under paved or unpaved surfaces, the final backfill shall be tamped by pneumatic or other approved tamping equipment in successive layers of six inches (6”) or less in height to finish grade or pavement restoration as required.

If Hydra-Hammer or Hoe-Pack type compactors are approved by the LWC Project Manager, compaction shall be performed in successive layers eighteen inches (18”) or less in height to finish grade or pavement restoration. Backfill must be a minimum of two feet (2’) above the water main before Hydra-Hammer or Hoe-Pack type compactors may be used. Water jetting will not be allowed except by written approval by the LWC Project Manager.

The total depth of cover (i.e., the vertical distance from crown-of-pipe to ground/pavement surface) shall be at least forty two inches (42”) and no more than fifty-four inches (54”) unless approved prior to installation by the LWC Project Manager.


8. PLACING WATER MAIN IN SERVICE

8.1 General

After a section of main has been properly installed and valved, the main shall be filled, disinfected, pig cleaned, flushed, and pressure and leakage tested before being placed in service.

The Contractor shall provide adequate personnel to assist the Company Inspector on site for placing the water main in service.
### Trench Backfill and Compaction Requirements Beneath Pavements

<table>
<thead>
<tr>
<th>Category</th>
<th>Maximum Loose Lift Thickness (inches)</th>
<th>Minimum Number of Passes</th>
<th>Example Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Lightweight Vibratory Plate Compactors (100 - 220lbs)</td>
<td>8, 8, 6, 8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Wacker-Neuson WP 1540; MBW GP18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Medium Weight Vibratory Plate Compactors (220 - 660lbs)</td>
<td>12, 12, 9, 12</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MultiQuip MVH206GH; MBW GPR77H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Heavyweight Vibratory Plate Compactors (&gt;660lbs)</td>
<td>18, 18, 12, 12</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Wacker-Neuson BPU 4045A; MBW GPR135H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Smooth Drum Vibratory Rollers</td>
<td>12, 12, 9, 12</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Wacker-Neuson RTLx with Smooth Drum Attachment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Equipment Mounted Compactors</td>
<td>24, 24, 24, 24</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allied 1000B; Caterpillar CVP 110</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Weight range provided is the operating weight of the equipment during compaction.
2 The minimum number of passes shall be applied across the full trench width. For example, a 30-inch wide trench compacted with a 22-inch wide lightweight plate compactor will require 6 total passes per lift.
3 Example models listed are not inclusive. Each manufacturer has multiple models that meet the requirements for each weight category, any of which the contractor may utilize.
4 For categories III, IV and V, the manufacturers of both the compactors and the pipe should be consulted to determine the minimum amount of cover required over the pipe to prevent damage.

### Use of Alternate Equipment

The contractor may propose to use alternate compaction equipment and/or lift thicknesses not included in one of these categories shown in the table if documentation is supplied proving that the alternate equipment is adequate to compact the trench backfill material in the proposed lift thickness. LWC shall have the option to deny the use of the proposed alternate if deemed unacceptable for any reason.

### Material Specifications

<table>
<thead>
<tr>
<th>Material Specifications</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Sand (Pit Run Sand)</td>
<td>KYTC Section 804, Fine Aggregates</td>
</tr>
<tr>
<td>Manufactured Sand</td>
<td>KYTC Section 804.08, Pipe Bedding</td>
</tr>
<tr>
<td>Dense Graded Aggregate (DGA)</td>
<td>KYTC Section 805, Gradation for DGA</td>
</tr>
<tr>
<td>No. 57</td>
<td>KYTC Section 805, Gradation for No. 57 Stone</td>
</tr>
</tbody>
</table>
NOTE: FROM POINTS "A" (CONCRETE PAVEMENT) TO NEAREST JOINT OR BREAK IN PAVEMENT MUST BE SIX (6) FEET OR MORE. IF LESS THAN 6, REMOVE PAVEMENT TO JOINT OR BREAK AND REPLACE ENTIRE SLAB. CONCRETE SLAB UNDER BITUMINOUS SURFACE TO EXTEND 12 INCHES ON EACH SIDE OF TRENCH.

PIPE ENCASED IN PIPE OF LARGER DIAMETER, IF SPECIFIED ON JOB DRAWING.

CRUSHED STONE BACKFILL
MATCH EXISTING DEPTH
MECHANICALLY TAMPEP
PIT RUN SAND, D.G.A., OR MANUFACTURED SAND
6" BEDDING
PIPE ENCASED IN PIPE OF LARGER DIAMETER, IF SPECIFIED ON DRAWING.

CONCRETE PAVEMENT

CRUSHED STONE BACKFILL
MATCH EXISTING DEPTH
MECHANICALLY TAMPEP
PIT RUN SAND, D.G.A., OR MANUFACTURED SAND
6" BEDDING
PIPE ENCASED IN PIPE OF LARGER DIAMETER, IF SPECIFIED ON DRAWING.

BITUMINOUS SURFACE 2"+
12" CUTBACK IS NOT REQUIRED WHEN FLOWABLE FILL IS USED.

BITUMINOUS SURFACE LESS THAN 2" AND TRAFFIC BOUND MACADAM
12" CUTBACK IS NOT REQUIRED WHEN FLOWABLE FILL IS USED.

STATE OF KENTUCKY SPECIFICATIONS

1. INITIAL BACKFILL SHALL BE PIT RUN SAND, DENSE-GRADED AGGREGATE, OR MANUFACTURED SAND, MECHANICALLY COMPACTED PER SECTION 7. BACKFILLING PROCEDURES AND TAMING.
2. CONTRACTOR WILL BE HELD RESPONSIBLE DURING THE ENSUING 3 YEARS FOR PROPER BACKFILLING AND REPLACEMENT OF SURFACE. DURING THE 3 YEAR PERIOD AFTER THE DATE OF THE FINAL CONTRACT PAYMENT, ANY PAVEMENT SETTLEMENT SHALL BE IMMEDIATELY REPAIRED IN AN APPROVED MANNER AT THE EXPENSE OF THE CONTRACTOR.
3. BACKFILLING UP TO BOTTOM OF SUBBASE ELEVATION SHALL BE COMPLETED PRIOR TO SECOND PAIR OF SAWCUTS AND EXCAVATION FOR THE ADDITIONAL 12" OF CONCRETE ON EACH SIDE OF THE TRENCH.
4. DELTATE 5551b (OR OTHER APPROVED TACK COAT MATERIAL) SHALL BE APPLIED AT THE RATE OF 0.1 GALLON PER SQUARE YARD OVER THE CONCRETE BASE. ALLOW SUFFICIENT TIME FOR IT TO "BREAK" BEFORE THE FINISHED BITUMINOUS CONCRETE IS PLACED, AND SEAL ALL JOINTS SECURELY AFTER PAVING.

OR No. 57 stone.

TYPICAL RECESSED PLATE

LOUISVILLE WATER COMPANY
500 S. 3RD STREET - LOUISVILLE, KENTUCKY 40202 • (502) 568-5000
GREGORY C. HEITZMAN • PRESIDENT
JAMES L. BRAGMAN • VICE PRESIDENT/CHIEF ENGINEER

STANDARD DRAWING
STATE OF KENTUCKY
BACKFILL AND PAVING
RESTORATION

DATE: MAR. 2008
SCALE: NONE
DRAWING NO.: 4000
PAGE 1 OF 1
NOTE: FROM POINTS "A" (CONCRETE PAVEMENT) TO NEAREST JOINT OR BREAK IN PAVEMENT MUST BE FOUR (4) FEET OR MORE. IF LESS THAN 4 REMOVE PAVEMENT TO JOINT OR BREAK AND REPLACE ENTIRE SLAB. CONCRETE SLAB UNDER BITUMINOUS SURFACE TO EXTEND 12" ON EACH SIDE OF TRENCH.

1. CRITICAL BACKFILL ZONE SHALL CONSIST OF MECHANICALLY TAMPEd PIT RUN SAND, DENSE-GRATED AGGREGATE, OR MANUFACTURED SAND.  
2. SELECT GRANULAR BACKFILL SHALL CONSIST OF NG-57 STONE OR SAND.  
3. BACKFILLING UP TO BOTTOM OF SUBBASE ELEVATION SHALL BE COMPLETED PRIOR TO SECOND PAIR OF SAWCUTS AND EXCAVATION FOR THE ADDITIONAL 12" OF CONCRETE ON EACH SIDE OF THE TRENCH, UNLESS FLOWABLE FILL IS USED.  
4. PLATES MUST BE SECURED AND/OR RECESSD AT ALL TIMES.  
5. CONCRETE CAP MUST BE PLATED UNTIL CONCRETE REACHES STRENGTH REQUIREMENTS (MINIMUM 3500 PSI).  
6. DILUENT SS6 (OR OTHER APPROVED TACK COAT MATERIAL) SHALL BE APPLIED AT THE RATE OF 0.1 GAL. PER SQUARE YARD OVER THE CONCRETE BASE, ALLOW SUFFICIENT TIME FOR IT TO "BREAK" BEFORE THE FINISHED BITUMINOUS CONCRETE IS PLACED, AND SEAL ALL JOINTS SECURELY AFTER PAVING.  
7. PAVEMENT JOINTS SHALL BE SEALED WITH AN APPROVED JOINT SEALER AFTER PLACEMENT OF THE BITUMINOUS CONCRETE SURFACE. SEE SECTION 11.2 AND 11.3.  
8. CONTRACTOR WILL BE HELD RESPONSIBLE DURING THE ENSUING 5 YEARS FOR PROPER BACKFILLING AND REPLACEMENT OF SURFACE. DURING THE 5 YEAR PERIOD AFTER THE DATE OF THE FINAL CONTRACT PAYMENT, ANY PAVEMENT SETTLEMENT SHALL BE IMMEDIATELY REPAIRED IN AN APPROVED MANNER AT THE EXPENSE OF THE CONTRACTOR.

LOUISVILLE WATER COMPANY  
500 S. 3RD STREET • LOUISVILLE, KENTUCKY 40202 • (502) 588-3800  
GREGORY C. HEITZMAN — PRESIDENT  
JAMES E. HMKEL — VICE PRESIDENT/CHIEF ENGINEER  
STANDARD DRAWING  
LOUISVILLE—JEFFERSON COUNTY METRO BACKFILL AND PAVING RESTORATION  
DATE MAR. 2008  
DRAWING NO. 4100  
SCALE, NONE  
SHEET 1 OF 1
CITY OF LOUISVILLE SPECIFICATIONS

1. BACKFILL SHALL BE DENSE- GRADED AGGREGATE OR SAND. DENSE- GRADE OR -
SAND SHALL BE PLACED IN MAXIMUM 6" LOOSE LIFTS OR AS SPECIFIED AND -
MECHANICALLY COMPACTED.

2. CONTRACTOR WILL BE HELD RESPONSIBLE DURING THE ENSUING 5 YEARS FOR -
PROPER BACKFILLING AND REPLACEMENT OF SURFACE. DURING THE 5 YEAR -
PERIOD AFTER THE CUT IS MADE, ANY PAVEMENT SETTLEMENT SHALL BE -
IMMEDIATELY REPAIRED AT THE EXPENSE OF THE CONTRACTOR.

3. BACKFILLING UP TO BOTTOM OF SUBBASE ELEVATION SHALL BE COMPLETED PRIOR TO SECOND PAIR OF -
SAWCUTS AND EXCAVATION FOR THE ADDITIONAL 12" OF CONCRETE ON EACH SIDE OF THE TRENCH.

4. DILUTE SSSM (OR OTHER APPROVED TACK COAT MATERIAL) SHALL BE APPLIED AT -
THE RATE OF 0.1 GAL PER SQUARE YARD OVER THE CONCRETE BASE. ALLOW -
SUFFICIENT TIME FOR IT TO "BREAK" BEFORE THE FINISHED BITUMINOUS -
CONCRETE IS PLACED, AND SEAL ALL JOINTS SECURELY AFTER PAVING.

NOTE: ALL CUTS TO BE SECURELY PLATED DURING -
CONSTRUCTION ACCORDING TO SPECIFICATIONS

NOTE: THE CONCRETE BASE SHALL BE -
FLOAT FINISHED OR BROomed OR -
LIGHTLY RAKED AFTER FLOATING TO A UNIFORM GRADE.

LOUISVILLE WATER COMPANY
500 S. 3RD STREET - LOUISVILLE, KENTUCKY 40202 - (502) 569-3600
GRIGORY C. HUTZMAN - PRESIDENT
JAMES B. SHANKEL - VICE PRESIDENT/CHIEF ENGINEER

STANDARD DRAWING
CITY OF LOUISVILLE
BACKFILL AND PAVING RESTORATION

DATE: MARCH 2008
DRAWING NO.: 4200
NO ROCK IN TOP 6” LAYER OF SOIL

FINAL GRADE (SEE SECTION 11.6 UNPAVED SURFACES)

6”

30”MIN.

COMMON BACKFILL (SEE SECTION 7.6 FINAL BACKFILLING)

12”

PIT RUN SAND, DGA. OR MANUFACTURED SAND (SEE SECTION 7.5 INITIAL BACKFILLING)

or No. 57 Stone

6”

PIT RUN SAND, DGA OR MANUFACTURED SAND (SEE SECTION 7.4 BEDDING)

9”

9”

BELL HOLES MUST BE EXCAVATED AT BELLS, VALVES AND FITTINGS.
PLAN OF SIDEWALK AND DRIVEWAY—FULL WIDTH

NOTES:
ALL SIDEWALKS SHALL BE 5" THICK, ALL DRIVEWAYS SHALL BE 6" THICK.
ALL CONCRETE SHALL BE CLASS "A" (3500 lb. Concrete), Wood float finish
FOR ALL WORK, AN APPROVED TYPE OF LIQUID CURING COMPOUND WILL BE
PERMITTED. EXPANSION JOINTS ACROSS THE LINE OF THE WALK SHALL BE SPACED
NOT MORE THAN 50' APART. EXPANSION JOINTS PARALLEL TO THE LINE OF WALK
WILL BE REQUIRED AT THE BACK OF CURB FOR FULL WIDTH WALKS. AT DRIVEWAYS,
EXPANSION JOINTS SHALL BE USED ON BOTH SIDES AGAINST THE SIDEWALK.
OTHER JOINTS DETERMINED BY THIS LOCATION. AT DRIVEWAYS AND ENTRANCE WALKS
ACROSS GRASS PLOTS, AN EXPANSION JOINT SHALL BE USED AT BACK OF CURB.
ALL EXPANSION MATERIAL SHALL BE APPROVED NON-EXPRESSING PREFORMED STRIPS
1/2" THICK. BLOCKS SHALL BE MARKED OR SCORED IN SUITABLE SIZED BLOCKS,
BUT NOT LESS THAN 4" OR MORE THAN 6" ON A SIDE.
CONTRACTION JOINTS (PLANES OF WEAKNESS) SHALL BE AT EVERY THIRD BLOCK
AND SHALL BE CUT AT LEAST 1 1/2" IN DEPTH (IN LIEU OF A SCORE). AT BACK
OF WALK, TERRACE SHALL BE HAND TRIMMED OR FINISHED TO A 1 TO 1 SLOPE
OR FLATTER.
ALL SIDEWALK AND DRIVEWAY CONSTRUCTION IN THE PUBLIC WAYS OF THE CITY
OF LOUISVILLE SHALL CONFORM WITH THE REQUIREMENTS ON THIS SHEET UNLESS
OTHERWISE APPROVED IN WRITING BY THE CHIEF ENGINEER. MINIMUM WIDTH
OF SIDEWALK SHALL BE 5" EXCEPT WITH PERMISSION OF CHIEF ENGINEER.

RAMP TYPE 1

RAMP TYPE 2

FINAL BACKFILL

INITIAL BACKFILL

DENSE GRADED AGGREGATE (D.G.A.) OR R.I. SAND BACKFILL
COMPACTED IN 6" LAYERS

D.G.A. BACKFILL OR R.I. SAND BACKFILL
OR #57 STONE MECHANICALLY TAMPED

BACKFILL NOT UNDER PAVEMENT

BACKFILL UNDER SIDEWALK

CLASS "A" 3500 B. (6" CONC. FOR DRIVEWAYS)

D.G.A. BACKFILL

6" BEDDING

LOUISVILLE WATER COMPANY
500 S. 3RD STREET • LOUISVILLE, KENTUCKY 40202 • (502) 584-3000
GREGORY C. HEITZMAN — PRESIDENT
JAMES R. HARKIN — VICE PRESIDENT/CHIEF ENGINEER

STANDARD DRAWING
SIDEWALK/BACKFILL
DETAIL

DATE: MAR. 2008
SCALE: NONE
DRAWING NO.: 4400
SHEET: 1 OF 1

placed and compacted per Specification Section 7.6.
Appendix B

Louisville Gas and Electric
Revised Drawings
CONCRETE ENCASED DUCT LAYOUTS
AND TRENCH DIMENSIONS

PREFERRED CONSTRUCTION

TYPICAL DUCT INSTALLATION
USING EB GRADE DUCT IN
CONCRETE ENCAVED BACKFILL

FINAL GRADE OR TOP OF PAVEMENT

SAND OR DGA
UNDER ROADS
COMPACTED
SELECT FILL
FREE OF ROCKS
LARGER THAN
6" ELSEWHERE

MINIMUM
TRENCH
WIDTH

MINIMUM
TRENCH
DEPTH

MINIMUM TRENCH WIDTH AND DEPTH DIMENSIONS ARE BASED ON WORST CASE PVC OUTSIDE DIMENSIONS FOR THE VARIOUS SIZE DUCTS, SEE CHARTS ON PAGE #2.

1. GENERAL NOTES:

1-1/4" ASPHALT
(IF PRESENT ON EXISTING PAVEMENT)

DUCT SPECIFICATIONS

2. CONCRETE ENCASED DUCT; ALL DUCT TO BE NEMA EB GRADE
FILL ENCASED DUCT; ALL DUCT TO BE SCHEDULE 80 GRADE,
NEMA TC-2 AND UL-514.

3. MINIMUM TRENCH WIDTH AND DEPTH DIMENSIONS
ARE BASED ON WORST CASE PVC OUTSIDE DIMENSIONS
FOR THE VARIOUS SIZE DUCTS, SEE CHARTS ON PAGE #2.

4. IF MORE THAN ONE SIZE DUCT IS USED IN A TRENCH
IT WILL BE NECESSARY TO CALCULATE NEW MINIMUM
WIDTH AND DEPTH DIMENSIONS. THESE DIMENSIONS
WILL BE BASED ON A MINIMUM CLEARANCE OF 3" TO SIDES, TOP OR BOTTOM WITH A MINIMUM OF 1 1/2"
BETWEEN DUCTS. SEE CHART ON PAGE #2 FOR TYPICAL
OUTSIDE DIMENSIONS FOR DUCT.

STEEL, REBAR AND TIE WIRES ARE NECESSARY IN
CONCRETE FILL TO KEEP DUCTS FROM FLOATING.
STEEL RODS AND TIES TO BE PLACED NO FURTHER
APART THAN 16".

5. NEUTRAL/GROUNDS ARE REQUIRED AS FOLLOWS:
1-NEUTRAL/GROUND FOR BANKS W/2 OR LESS DUCTS,
2-NEUTRAL/GROUNDS FOR BANKS WITH MORE THAN 2 DUCTS.

6. NEUTRAL/GROUNDS SHALL BE BONDED TOGETHER AT EACH MANHOLE.

7. FOR BACKFILL UNDER PAVEMENTS, PLACE AND COMPACT MATERIAL PER TABLE IN STANDARD DRAWINGS XX XX XX.

ALTERNATE CONSTRUCTION
WHEN APPROVED BY LG&E CO.

TYPICAL DUCT INSTALLATION
USING SCHEDULE 80 PVC IN SELECT BACKFILL

SEE PAGE #2 FOR TRENCH DIMENSIONS
AND ESTIMATES OF CONCRETE REQUIREMENTS

SEE TABLE PAGE #2 THIS STANDARD

MINIMUM TRENCH WIDTH

MINIMUM TRENCH DEPTH

12" MINIMUM BETWEEN
TOP DUCT AND TOP OF SELECT FILL

1-1/2" SPACING BETWEEN DUCTS

3" MINIMUM BETWEEN
BOTTOM DUCT AND BOTTOM OF TRENCH

3" MINIMUM BETWEEN CONDUIT AND EDGE OF TRENCH

1 1/2" SPACING BETWEEN DUCTS

1/2" REBAR & TIE WIRE

SAND OR DGA
UNDER ROADS
COMPACTED
SELECT FILL
FREE OF ROCKS
LARGER THAN
6" ELSEWHERE

MINIMUM
TRENCH
WIDTH

MINIMUM
TRENCH
DEPTH

1/2" REBAR & TIE WIRE

STREET REPAIR DETAIL

NOTES:

1-1/4" MIN. LAP

1-1/4" MIN. LAP

CLASS "A" CONCRETE
STEEL REINFORCEMENT

DEPTH OF CONCRETE SHOULD MATCH THAT OF THE EXISTING
CONCRETE IF GREATER THAN 6". SIDEWALK IS POURED BACK
ONLY 4" DEEP WITH NO REINFORCEMENT.

ALL FILL MATERIAL MUST BE THROUGHLY COMPACTED
PRIOR TO POURING CONCRETE FOR ROAD.
### Concrete Encased Duct Layouts and Trench Dimensions

#### Minimum Trench Dimensions and Concrete Requirements

<table>
<thead>
<tr>
<th>Duct Size</th>
<th>Minimum Trench Cyl. Yds Concrete</th>
<th>Width</th>
<th>Depth</th>
<th>Per 100 Ft. Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 X 1 Duct Stack</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td>3-0'</td>
<td>0.8 C.U. Yd чел</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3&quot;</td>
<td>3-0'</td>
<td>1.8 C.U. Yd чел</td>
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<tr>
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<td>4-0'</td>
<td>3.0 C.U. Yd чел</td>
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<tr>
<td>5&quot;</td>
<td>5-0'</td>
<td>3.7 C.U. Yd чел</td>
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</tbody>
</table>

| 1 X 2 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.3 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.2 C.U. Yd чел  |
| 5"          | 5-0'                             | 3.3 C.U. Yd чел  |

| 1 X 3 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.4 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.7 C.U. Yd чел  |
| 5"          | 5-0'                             | 4.2 C.U. Yd чел  |

| 1 X 4 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 2.5 C.U. Yd чел  |
| 4"          | 4-0'                             | 5.1 C.U. Yd чел  |
| 5"          | 5-0'                             | 7.3 C.U. Yd чел  |

| 2 X 2 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.1 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.2 C.U. Yd чел  |
| 5"          | 5-0'                             | 3.7 C.U. Yd чел  |

| 2 X 3 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.3 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.7 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 2 X 4 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.5 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.3 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 3 X 2 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.3 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.7 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 3 X 3 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.5 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.3 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 3 X 4 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.6 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.5 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 4 X 2 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.5 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.7 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 4 X 3 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.6 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.5 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |

| 4 X 4 Duct Stack |
| 2"          | 3-0'                             | 0.8 C.U. Yd чел  |
| 3"          | 3-0'                             | 1.5 C.U. Yd чел  |
| 4"          | 4-0'                             | 2.7 C.U. Yd чел  |
| 5"          | 5-0'                             | 5.0 C.U. Yd чел  |
Conduit Size O.D.

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<tr>
<td>8&quot;</td>
<td>8.625&quot;</td>
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</tbody>
</table>

A. Trench Depth Depends on OD of Gas Pipe and Conduit. Actual Trench Depth To Be Specified on Construction Drawings.

B. Electric, Telephone And Cable Conduits (Conduit Sizes Vary) Electric Conduits To Be Placed On Property Side Of Trench

C. If Trench Line Is Well Defined And Known To Be At Final Grade, The 3° Grade Change Buffer May Be Omitted. If Existing Grade Is Not Believed To Be Within 3° Of Final Grade, Additional Depth Will Be Required.

For trench backfill under paved roads, use sand or DGA placed and compacted in accordance with the table in Standard Drawing xx xx xx.
RECOMMENDED JOINT ELECTRIC TRENCH

SEE PAGE 1 OF THIS STANDARD FOR JOINT TRENCH CONSTRUCTION WITH GAS

Minimum Trench Dimensions No Rock

NOTE "C" PAGE 1

FINISHED GRADE

GRADE CHANGE BUFFER

MARKER TAPE FOR COMMUNICATIONS AND ELECTRIC ±12" FROM FINAL GRADE

NATIVE FILL WITH NO ROCKS LARGER THAN 4"

BED AND BACKFILL WITH SAND OR SELECT FILL WITH NO ROCK

Electric, Telephone And Cable Conduits (Conduit Sizes Vary) Electric Conduits To Be Placed On Property Side Of Trench Conduits Shown with random separation

LEGEND

FFE PRIMARY ELECTRIC
FFE SECONDARY ELECTRIC
T TELEPHONE
C CABLE TELEVISION

NOTE:

TRENCH DEPTHS LESS THAN THE VALUES SHOWN IN THE TABLE ABOVE MAY BE ALLOWED IF SIGNIFICANT ROCK IS ENCOUNTERED. REDUCTIONS MAY ONLY BE MADE WITH APPROVAL OF CENTER ENGINEER OR CONSTRUCTION TEAM LEADER. SUPPLEMENTAL PROTECTION, SUCH AS HEAVIER WALL CONDUIT AND/OR CONCRETE ENCASEMENT, ETC. MAY BE REQUIRED.

For trench backfill under paved roads, use sand or DGA placed and compacted in accordance with the table in Standard Drawing xx xx xx.
• Manufactured sand mechanically compacted in 6” lifts
• Cutbacks to occur at time of final restoration
• Concrete may be poured to within 2” of existing grade until asphalt patch or milling and paving is completed
• Patches to include markers:
  • 1 per patch
  • 3 per block

accordance with the table provided in Standard Drawing xx xx xx.
Louisville Gas & Electric Company
Gas Pipeline Temporary Trench Restoration Specification – Proposed

- Manufactured sand mechanically compacted in 6” lifts
- Cutbacks to occur at time of final restoration
- 2” cold patch over manufactured sand backfill

Trench

- 6” pad beneath pipe
- 30” cover over pipe (min. 24” without additional protection)
- $2” cold patch

Manufactured Sand

accordance with the table provided in Standard Drawing xx xx xx.
## Trench Backfill and Compaction Requirements Beneath Pavements

<table>
<thead>
<tr>
<th>Category</th>
<th>Maximum Loose Lift Thickness (inches)</th>
<th>Minimum Number of Passes²</th>
<th>Example Models³</th>
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<tr>
<td></td>
<td>Manufactured Sand</td>
<td>Pit Run Sand</td>
<td>Dense Graded Aggregate</td>
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<tr>
<td>I</td>
<td>Lightweight Vibratory Plate Compactors (100 - 220lbs)¹</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>II</td>
<td>Medium Weight Vibratory Plate Compactors (220 - 660lbs)¹</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>III</td>
<td>Heavyweight Vibratory Plate Compactors (&gt;660lbs)¹ ²⁴</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>IV</td>
<td>Smooth Drum Vibratory Rollers⁴</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>V</td>
<td>Equipment Mounted Compactors⁴</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

¹ Weight range provided is the operating weight of the equipment during compaction.
² The minimum number of passes shall be applied across the full trench width. For example, a 30-inch wide trench compacted with a 22-inch wide lightweight plate compactor will require 6 total passes per lift.
³ Example models listed are not inclusive. Each manufacturer has multiple models that meet the requirements for each weight category, any of which the contractor may utilize.
⁴ For categories III, IV and V, the manufacturers of both the compactors and the pipe should be consulted to determine the minimum amount of cover required over the pipe to prevent damage.

### Material Specifications

<table>
<thead>
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<th>Specifications</th>
<th>Source</th>
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<tr>
<td>Natural Sand (Pit Run Sand)</td>
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<tr>
<td>Manufactured Sand</td>
<td>KYTC Section 804.08, Pipe Bedding</td>
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<tr>
<td>Dense Graded Aggregate (DGA)</td>
<td>KYTC Section 805, Gradation for DGA</td>
</tr>
<tr>
<td>No. 57</td>
<td>KYTC Section 805, Gradation for No. 57 Stone</td>
</tr>
</tbody>
</table>

### Use of Alternate Equipment

The contractor may propose to use alternate compaction equipment and/or lift thicknesses not included in one of these categories shown in the table if documentation is supplied proving that the alternate equipment is adequate to compact the trench backfill material in the proposed lift thickness. LWC shall have the option to deny the use of the proposed alternate if deemed unacceptable for any reason.
Appendix C
Louisville Metropolitan Sewer District Revised Drawings and Specifications
3.3.5. Backfill of Trench Excavations

3.3.5.1. General. Backfilling of trenches, and tunnel shaft excavations shall be accomplished as soon as possible after the pipe is placed or the tunnel is completed. The Contractor shall have the option of using flushed and jetted or compacted backfill materials. The Contractor shall notify MSD 48 hours in advance of all flushing and jetting and/or mechanical compaction operations.

3.3.5.1.1. Compaction. Compaction around structures will be performed by a mechanical compactor when flushing and jetting of sand and earth material is not possible or practical, or when required by the Plans.

3.3.5.2. Within Limits of Existing or Proposed Paved Surfaces. At the Contractor's option, with prior approval by MSD (based on the availability of sand which meets the requirements of Section 3.2.2), backfill within the limits of existing or proposed paved surfaces shall consist of: Type I-A Backfill - sand, flushed and jetted, Type I-B Backfill - sand, combination flushed and jetted and mechanically compacted, or Type III Backfill - selected excavated material and/or approved borrow material - mechanically compacted. In special cases and with the approval of MSD, the Contractor may utilize Type I-A sand backfill - flushed and jetted in the lower portion of the excavation and Type III backfill selected excavated materials - mechanically compacted in the upper portion of the excavation.

(A) Sand - Flushed and Jetted (Type I-A). After the trench has been completely backfilled with sand, the backfill shall be densified by thoroughly flushing and jetting with water, beginning at the downstream end of the trench and proceeding upstream. Water to be used for flushing and jetting shall be supplied through hoses and pipes having a minimum diameter of 2 inches. The jet pipe shall have a minimum diameter of 1-1/2 inches. Jet pipes used to penetrate the backfill material shall be equipped with a shut-off valve and be of sufficient length to completely penetrate the sand backfill. The jet pipe shall be inserted into the sand backfill at a maximum spacing along the trench of 6 feet and the spacing shall be staggered along the trench area. The jet pipe shall penetrate the sand backfill to within 12 inches of the crushed stone encasement. Care shall be exercised to prevent the jet pipe from penetrating the crushed stone encasement. When the depth of the trench exceeds the length of the jet pipe the flushing and jetting shall be completed in lifts. The pipe shall remain in place until water is observed rising above the backfill throughout the full width of the trench and over a length of the trench equal to one-half the distance between adjacent jet installations. If this condition is not observed within a reasonable period, the Contractor shall increase the water flow or provide additional jet pipes. If the Contractor fails to flush and jet the sand backfill in accordance with the Specifications, the sand backfill shall be excavated and replaced with properly flushed and jetted sand backfill or material compacted in accordance with Section 3.3.4.2.C., at no additional cost to MSD.
The Contractor shall provide all piping, fittings, etc., necessary to deliver the water along the site of the work and shall arrange with the Louisville Water Company, if applicable, for making the necessary taps and metering. All expenses incurred for installing the pipe and hose, together with the cost of the water, shall be borne by the Contractor. Following flushing and jetting and prior to pavement construction, the surface of the sand subgrade shall be thoroughly compacted following the procedures described in Section 3.3.4.2.(B).

(B) Sand, Combination Flushed and Jetted, and Mechanically Compacted (Type I-B).

The trench shall be completely backfilled with sand, and the backfill shall be densified by thoroughly flushing and jetting with water. Flushing and jetting procedures shall be in accordance with Section 3.3.4.2.(A) above. Next, the sand backfill shall be removed to a depth of 3 feet below the pavement surface and stockpiled for later mechanical compaction. The exposed surface shall then be thoroughly compacted. The remainder of the trench shall be backfilled in two lifts of sand (approximately 12-inches thick) up to the pavement subgrade level with each lift being thoroughly compacted. For compaction, the Contractor shall supply a vibratory plate compactor or smooth drum vibratory roller capable of compacting sands to a minimum effective depth of 16-inches. The Contractor shall submit the manufacturer’s equipment specifications for proof of this required effective compaction depth. The required number of passes of the roller or plate shall be established at the beginning of compaction operations for the Project by taking nuclear density tests to monitor the density increase with increased passes of the roller or plate. The required number of passes shall be set when no further increase in sand backfill density is measured.

(C) Earth Materials - Compacted (Type III-A).

Selected excavated materials or approved borrow materials containing no rock fragments with a maximum dimension larger than 4 inches shall be carefully deposited in uniform, horizontal layers, not exceeding 6 inches in compacted depth, in a zone located from the top of the cradle or encasement up to a horizontal plane located 2 feet above the exterior top of the pipe. Prior to compaction, each layer shall be level and evenly distributed on both sides of the pipe so as to not disturb, displace or damage the pipe. Each layer shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density, at moisture content between plus 2 percent and minus 4 percent of the optimum moisture content, as determined by ASTM D 698, utilizing mechanical compaction. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results.

The remainder of the trench from the horizontal plane located 2 feet above the pipe up to the ground surface or top of the existing subgrade shall be backfilled with selected excavated materials containing no rock fragments with a maximum dimension larger than 4 inches, or approved borrow materials. The backfill shall be placed in uniform horizontal layers not exceeding 12 inches in compacted depth. Each layer shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density and a moisture content between plus 2 percent and minus 4 percent of the optimum moisture content, as determined by ASTM D 698,
utilizing mechanical compaction methods. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results. Follow guidelines set forth in MSD Specifications Section 3.3.9.3. at no additional cost to MSD.

(D) **Combination Sand (Type I-A) and Earth Backfill (Type III-A).** In trench situations where the lower trench dimensions limit the use of mechanical compaction equipment, the existing site conditions limit the effectiveness of the mechanical compaction methods, or where additional backfill material is required to replace unsuitable excavated materials, the Contractor may utilize flushed and jetted sand backfill in the lower portion of the trench and mechanically compacted earth material in the upper portion of the trench with prior approval of MSD. The sand backfill operations shall extend from the top of the cradle or encasement up to a point where mechanical compaction can be properly accomplished in accordance with Section 3.3.4.2.C. The mechanical compaction operations shall extend from the top of the sand backfill up to the ground surface or top of the existing subgrade. Follow guidelines set forth in MSD Specifications Section 3.3.9.3.

(E) **No. 57 Crushed Stone - Compacted.** With prior approval from MSD, No. 57 crushed stone may be used as trench backfill within paved areas. The stone shall be carefully deposited in uniform, horizontal layers not exceeding 12 to 24 inches in compacted depth, depending on the type and size of compaction equipment used. The initial lift(s) of stone immediately above the pipe shall be level and evenly distributed on both sides of the pipe. Each layer shall be thoroughly compacted by making a minimum of two passes using a vibratory plate compactor or smooth drum vibratory roller capable of compacting clean stone to a minimum effective depth of the lift thickness selected. The Contractor shall submit the manufacturer’s equipment specifications for proof of this required effective compaction depth.

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3.3.5.3. **Outside Limits of Existing or Proposed Paved Surfaces.** At the Contractor's option, except as otherwise specified in Section 3.3.4.4., trench backfill outside the limits of existing or proposed paved surfaces shall consist of earth materials (selected excavated or approved borrow materials) which are flushed and jetted or compacted. The upper one foot of the earth backfill shall be essentially free from rock, gravel or other hard, durable fragments.

(A) **Earth Materials - Flushed and Jetted (Type II Backfill).** The lower portion of the trench backfill extending from the top of the cradle or encasement to a horizontal plane located 2 feet above the exterior top of the pipe shall contain no rock or rock fragments with a maximum dimension larger than 1 inch. The remainder of the trench shall be backfilled with selected excavated materials or approved borrow materials containing no rock fragments larger than 1 cubic foot. After the trench has been completely backfilled with selected excavated material or approved borrow material, the backfill shall be densified by thoroughly flushing and jetting with water, beginning at the downstream end of the trench and proceeding upstream. The backfill shall be thoroughly and uniformly sluiced and flooded by introducing water at the top of the trench and by inserting the jet pipe into the backfill at intervals as required.
specified in Section 3.3.4.2. (A) along the trench. This process shall be continued until the backfill is completely saturated and no further settlement is observed. Hoses, jet pipes and the maximum depth of insertion shall be as specified in Section 3.3.4.2.A. After the backfill in the trench has substantially dried and completed any additional settlement, any settlement below the finish grade shall be refilled with additional earth, and compacted in accordance with (B), below.

(B) Mechanical Compaction of Earth Materials (Type III-B). Selected excavated materials or approved borrow materials, containing no rock or rock fragments with a maximum dimension larger than 3 inches, shall be carefully deposited in uniform, horizontal layers, not exceeding 6 inches in compacted depth, in a zone located from the top of the cradle or encasement up to a horizontal plane located 2 feet above the exterior top of the pipe. Prior to compaction, each layer shall be leveled and evenly distributed on both sides of the pipe so as not to disturb, displace or damage the pipe. Each layer shall be thoroughly compacted to a minimum of 85 percent of the Standard Proctor density before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results. Follow guidelines set forth in MSD Specifications Section 3.3.9.3. The remainder of the trench from the horizontal plane located 2 feet above the top of the pipe up to the ground surface shall be backfilled with selected excavated materials or approved borrow material containing no rock fragments larger than 1 cubic foot. The material shall be placed in uniform horizontal layers not exceeding 12 inches in compacted depth. Each layer shall be compacted with a dozer or other heavy, earth-moving equipment traveling back and forth over the material until no further settlement is observed.

3.3.5.4. Between Pipe and Drainage Swale or Ditch. The Contractor shall use Type III - A backfill in pipe trenches where a surface ditch or swale is to be constructed above the pipe. This includes all ditches and swales - paved, sodded, rip-rapped or seeded.

3.3.6. Depositing Backfill Material. All backfilling shall be done in a manner to avoid displacing or damaging the pipe or structure. Any pipe or structure damaged or displaced shall be excavated and repaired or replaced at the Contractor's expense.

3.3.7. Backfill Against Structures

3.3.7.1. Backfill Against Retaining Walls and Box Culverts. Unless shown otherwise on the Plans, backfill shall be selected excavated materials or approved borrow materials. The placement of any backfill shall be delayed until representative test samples of the concrete have attained a compressive strength of 3,500 pounds per square inch and the concrete has been in place at least seven days.

When the back slopes bounding the excavation lie within the slope limits of 6:1 to 1/4:1, the planes of the slopes shall be destroyed by stepping or serrating to prevent wedging action during compaction.
**Table 3.3.5.2 (F) Compaction and Backfill Specifications**

<table>
<thead>
<tr>
<th>Category</th>
<th>Maximum Loose Lift Thickness (inches)</th>
<th>Minimum Number of Passes</th>
<th>Example Models&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Lightweight Vibratory Plate Compactors (100 - 220lbs)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Sand: 8, No. 57 Stone: 8</td>
<td>Wacker-Neuson WP 1540; MBW GP18</td>
</tr>
<tr>
<td>II</td>
<td>Medium Weight Vibratory Plate Compactors (220 - 660lbs)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Sand: 12, No. 57 Stone: 12</td>
<td>MultiQuip MVH206GH; MBW GPR77H</td>
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<tr>
<td>III</td>
<td>Heavyweight Vibratory Plate Compactors (&gt;660lbs)&lt;sup&gt;1,4&lt;/sup&gt;</td>
<td>Sand: 18, No. 57 Stone: 18</td>
<td>Wacker-Neuson BPU 4045A; MBW GPR135H</td>
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<tr>
<td>IV</td>
<td>Smooth Drum Vibratory Rollers&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Sand: 12, No. 57 Stone: 12</td>
<td>Wacker-Neuson RTLx with Smooth Drum Attachment</td>
</tr>
<tr>
<td>V</td>
<td>Equipment Mounted Compactors&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Sand: 24, No. 57 Stone: 24</td>
<td>Allied 1000B; Caterpillar CVP 110</td>
</tr>
</tbody>
</table>

<sup>1</sup> Weight range provided is the operating weight of the equipment during compaction.

<sup>2</sup> The minimum number of passes shall be applied across the full trench width. For example, a 30-inch wide trench compacted with a 22-inch wide lightweight plate compactor will require 6 total passes per lift.

<sup>3</sup> Example models listed are not inclusive. Each manufacturer has multiple models that meet the requirements for each weight category, any of which the contractor may utilize.

<sup>4</sup> For categories III, IV and V, the manufacturers of both the compactors and the pipe should be consulted to determine the minimum amount of cover required over the pipe to prevent damage.

<table>
<thead>
<tr>
<th>Material Specifications</th>
<th>Source</th>
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<tr>
<td>Sand</td>
<td>3.2.2 of MSD Standard Specifications</td>
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<tr>
<td>No. 57</td>
<td>KYTC Section 805, Gradation for No. 57 Stone</td>
</tr>
</tbody>
</table>

**Use of Alternate Equipment**

The contractor may propose to use alternate compaction equipment and/or lift thicknesses not included in one of these categories shown in the table if documentation is supplied proving that the alternate equipment is adequate to compact the trench backfill material in the proposed lift thickness. MSD shall have the option to deny the use of the proposed alternate if deemed unacceptable for any reason.
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<td>ROLL CURB AND GUTTER</td>
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</table>
NOTES

1. The final saw cut shall be made a distance of 12 inches beyond the trench, after trench excavation and backfill are complete, and immediately prior to placing concrete. If the distance from the edge of the trench to an existing break or joint is less than 4 feet, the final saw cut shall be located at the existing break or joint.

2. Concrete cap to be 8 inches. If the existing pavement section is less than 8 inches thick, excavation of underlying stone base or soil subgrade will be required to provide the specified thickness.

3. Use of compacted KTC No. 57 stone in lieu of sand backfill may be allowed on a case-by-case basis with prior approval from MSD.

4. In roadway embankment situations when sand backfill is utilized, compacted earth shall be placed in this zone within 5 feet (horizontal distance) of the embankment slope.

5. The Contractor shall be responsible during the ensuing 5 years for proper backfilling and replacement of the surface. During the 5 year period any pavement settlement shall be immediately repaired by the Contractor at the expense of the Contractor.
NOTES

1. The final saw cut shall be made a distance of 12 inches beyond the trench, after trench excavation and backfill are complete, and immediately prior to placing concrete.
2. Concrete cap to be 8 inches thick. If the existing pavement section is less than 10" thick excavation of underlying stone base or soil subgrade will be required to provide the specified thickness.
3. Use of compacted KTC No. 57 stone in lieu of sand backfill may be allowed on a case by case basis with prior approval of M.S.D.
4. Use of processed coal bottom ash that meets the requirements for Type 1A backfill, as described in section 3.2.2 of MSD Standard Specs, in lieu of sand may be allowed on a case by case basis with prior approval of MSD.
5. In roadway embankment situations, when sand backfill is utilized, compacted earth shall be placed in this zone within 5 feet (horizontal distance) of the embankment slope.
6. Tack material consisting of emulsified asphalt SS-1h shall be placed on the surface of the concrete cap at the rate of 0.1 gallon per square yard, and allowed to "break" prior to the placement of the asphalt surface.
7. Pavement joints shall be sealed with an approved joint sealant after placement of asphalt surface.
8. The Contractor shall be responsible during the ensuing 5 years for proper backfilling and replacement of the surface. During the 5 year period any pavement settlement shall be immediately repaired by the Contractor at the expense of the Contractor.

Backfill Type and Placement shall be in Accordance with Section 3.3.5.2 of MSD Standard Specifications.
NOTES

1. Thickness of compacted DGA base to be 8". If the existing pavement section is less than 10 inches thick, excavation of underlying stone base or soil subgrade will be required to provide the specified thickness.

2. Tack material consisting of emulsified asphalt SS-1h shall be placed on the surface of the existing asphalt surface and the compacted asphalt binder at the rate of 0.1 gallons per square yard, and allowed to “break” prior to placement of the full width asphalt surface.

3. Use of compacted KTC No. 57 stone in lieu of sand backfill may be allowed on a case-by-case basis with prior approval of M.S.D.

4. Use of processed coal bottom ash that meets the requirements for Type 1A backfill, as described in section 3.2.2 of MSD Standard Specs, in lieu of sand may be allowed on a case by case basis with prior approval of MSD.

5. The Contractor shall be responsible during the ensuing 5 years for proper backfilling and replacement of the surface. During the 5 year period any pavement settlement shall be immediately repaired by the Contractor at the expense of the Contractor.

5. Use 2 inch thick binder on Subdivision streets. Use 4 inch thick (2-2 inch thick layers) on County through roads.
Backfill Type and Placement shall be in Accordance with Section 3.3.5.2 of MSD Standard Specifications

TRENCH SECTION PARALLEL TO ROAD

TRENCH SECTION PERPENDICULAR OR SKewed TO ROAD

NOTE
When sand or crushed stone is utilized as trench backfill for pipes crossing a roadway embankment, compacted earth shall be utilized as trench backfill within 5 feet of the embankment sideslope, with a minimum of the embankment sideslope with a minimum
Appendix D

Visual Inspection Sheet for Utility Cut Restoration in Louisville Area
<table>
<thead>
<tr>
<th>Survey No.</th>
<th>Survey Date</th>
<th>Location Sketch</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Name of Road/Intersection</th>
<th>Surveyor</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Sample Size (Area)</th>
<th>Slab Size (LengthWidth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Surface ( )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Surface ( )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Distresses</th>
<th>Restoration Area</th>
<th>Surrounding Area</th>
<th>Quantity</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Alligator/Fatigue cracking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edge cracking</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Block cracking</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Longitudinal cracking</td>
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</tr>
<tr>
<td>Transverse cracking</td>
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<tr>
<td>Potholes</td>
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<tr>
<td>Rutting</td>
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</tr>
<tr>
<td>Raveling and weathering</td>
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</tr>
<tr>
<td>Drop-off</td>
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</tr>
<tr>
<td>Edge separation</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Corner breaks</td>
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</tr>
<tr>
<td>Other Distress 1</td>
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</tr>
<tr>
<td>Other Distress 2</td>
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</tr>
<tr>
<td>Other Distress 3</td>
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</tr>
<tr>
<td>Restoration Overall Condition</td>
<td>Very Good</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
</tr>
<tr>
<td>Recommended Action</td>
<td>Do Nothing</td>
<td>Surface Treatment</td>
<td>Overlay</td>
<td>Reconstruct</td>
</tr>
</tbody>
</table>