

City of Houston

Design Manual

Chapter 3

GRAPHIC REQUIREMENTS

Chapter 3

GRAPHIC REQUIREMENTS

3.01 CHAPTER INCLUDES

- A. Graphic requirements for engineering drawings.

3.02 REFERENCES

- A. City of Houston monument ties in compliance with Article IV, Chapter 33, City Surveys, of the Code of Ordinances.

3.03 DEFINITIONS

- A. Computer Aided Drafting Design (CADD) - Preparation of drawings, plans, prints, and other related documents through the use of computer equipment and software programs.

3.04 DESIGN REQUIREMENTS

- A. Provide a cover sheet for projects involving three or more design drawings (excluding standard City of Houston detail sheets). Drawing sheet numbers and titles shall be listed on the cover sheet. Include an area key map and vicinity map to identify project location.
- B. Drawings shall be prepared on 23" x 36" Federal Aid Sheets, 22" x 34" ANSI standard drawing sheets, or nominal 24" x 36" drawing sheets, as appropriate.
- C. Show service area on cover sheet or area map.
- D. Final design drawings shall be India ink on mylar, or produced by CADD on mylar using non-water based ink. Do not use adhesive-backed material on final drawings. Stick-ons may be allowed with approval of the City Engineer for a minor correction during the final review process.
- E. Details of special structures (not covered by approved standard drawings, such as stream or gully crossings, special manholes, or junction boxes) shall be drawn with vertical and horizontal scales equal to each other.
- F. Each set of engineering drawings shall contain paving and utility key drawings indexing specific plan and profile sheets. City Standard Details, where applicable, shall be included. All sheets shall have standard title blocks. Where applicable, show HCFCD key drawings and numbers.
- G. Draw key overall layouts to a minimum scale of 1" = 200'.

- H. Plan stationing must run from left to right, except for short streets or lines originating from a major intersection, where the full length can be shown on one sheet.
- I. A north arrow is required on all sheets and should be oriented either toward the top or to the right. This requirement is waived under the following conditions:
1. A storm water or sanitary sewer with flow from west to east or from south to north.
 2. A primary outfall drainage ditch with flow from west to east or from south to north.
 3. Stationing is intended to start from the cardinal points of the compass and proceed in the direction of construction.
- J. Standard scales permitted for plans and profiles of paving and utility construction drawings are as follows:
1. Major thoroughfares, streets with esplanades over 400 feet in length, or special intersections/situations.
 $1" = 20'$ Horizontal, $1" = 2'$ Vertical
 2. Minor or residential single-family streets.
 $1" = 20'$ Horizontal, $1" = 2'$ Vertical
 $1" = 50'$ Horizontal, $1" = 5'$ Vertical, or
 $1" = 40'$ Horizontal, $1" = 4'$ Vertical
 3. Scales of Paragraph 3.04J.2 above are minimum; larger scales may be used to show details of construction.
 4. Deviation from specified scales can only be permitted with the special approval of the City Engineer, project manager on Design Contracts with the City.
 5. Single-banked plan-and-profile drawings are acceptable; double-banked plan-and-profile sheets are allowed in certain situations such as off-site utility lines in undeveloped areas.
- K. Show ties on drawings to City monuments when applicable; otherwise, make a statement on the cover sheet referencing assumed control coordinates.
- L. Each sheet of the plan and profile shall have a benchmark elevation and description defined.
- M. The seal, date, and original signature of the Professional Engineer responsible for the drawings is required on each sheet developed by the design engineer. The design engineer

- may use stamped seal or embossed imprint; however, the embossed imprint must be shaded so that it will reproduce on prints.
- N. A copy of the final plat for new development shall be included with the final design drawings when submitted for final approval.
- O. If a roadway exists where drawings are being prepared to improve or construct new pavement or a utility, label the existing roadway width, surfacing type, and thickness.
- P. Show all street and road alignments on drawings.
- Q. Develop drawings to accurate scale showing proposed pavement, typical cross sections, details, lines and grades, and existing topography within street right-of-way, and any easement contiguous with the right-of-way. At the intersection, the cross street details shall be shown at sufficient distance (20-foot minimum distance outside the primary roadway right-of-way) in each direction along cross street for designing adequate street crossings.
- R. Match lines between plan and profile sheets shall not be placed or shown within cross street intersections including cross street right-of-way.
- S. Show natural ground profiles as follows:
1. For privately-funded projects, centerline profiles are satisfactory except where a difference of 0.50 feet or more exists from one right-of-way or easement line to the other, in which case, dual profiles are required.
 2. For City projects, provide natural ground profiles for each right-of-way line. Easement profiles shall conform to Paragraph 3.04T.1.
- T. Basic plan and profile sheets shall contain the following information:
1. Identify lot lines, property lines, easements, rights-of-way, and HCFCD outfalls.
 2. Label each plan sheet as to street/easement widths, pavement widths, pavement thickness where applicable, type of roadway materials, curbs, intersection radii, curve data, stationing, existing utilities (type and location), and any other pertinent feature affecting design.
 3. Show utility lines 4 inches in diameter or larger within the right-of-way or construction easement in profile view. Show utility lines, regardless of size, in the plan view, including communication and fiber optic cables.
 4. Graphically show flow line elevations and direction of flow for existing ditches.

5. Label proposed top of curb grades except at railroad crossings. Centerline grades are acceptable only for paving without curb and gutters.
 6. Show in profile curb return elevations for turnouts.
 7. Gutter elevations are required for vertical curves, where a railroad track is crossed.
 8. For street reconstruction projects, show in profile the centerline elevation at the property line of existing driveways.
 9. Show both existing and proposed station esplanade noses or the centerline of esplanade openings, including esplanade width.
 10. The design of both roadways is required on paving sections with an esplanade.
 11. Show in plan view station PCs, PTs, and radius returns. Show in profile station radius returns and grade change PIs with their respective elevations.
 12. All existing and proposed utilities and pavement shall be on the same plan and profile sheet for a given section unless approved otherwise by Project Manager.
 13. Plan view and profile view shall be on the same sheet whenever practical.
- U. For plant work, use a grid system to locate proposed work.

3.05 GRAPHIC STANDARDS

- A. The following graphic standards for plan and profile shall apply to drawings of 1" = 20' scale. For smaller scale drawings, use proportionally smaller line sizes.
- B. Existing Improvements: The standards shown in Figure 3.1, Existing Improvements, are required for depicting existing improvements on base drawings. Use lower case letters with a No. 0 reprographic pen or equal line weight unless otherwise shown in the pen/line weight table, Figure 3.3, Line Code Definitions. Smaller pen sizes for lettering may be used for clarity.
- C. Proposed Improvements: The standards shown in Figure 3.2, Proposed Improvements, are required for depicting proposed improvements on base drawings. Use upper case letters with a No. 3 reprographic pen or equal line weight unless shown otherwise in the pen/line weight table, Figure 3.3, Line Code Definitions. Smaller pen sizes for lettering may be used for clarity.
- D. Signature Block: Use latest edition of Signature Blocks issued by the Engineering and Construction Division for private and City projects.

END OF CHAPTER

FIGURE 3.1
 EXISTING IMPROVEMENTS
 PLAN VIEW
 TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

| | | WT | LC |
|-------------------------------------|--|----|----|
| ROW LINE | | 3 | 0 |
| PROPERTY LINE | | 3 | 0 |
| THEORETICAL PROPERTY LINE | | 3 | 0 |
| LOT LINES | | 1 | 0 |
| EASEMENT LINE | | 0 | 2 |
| CENTER LINE OF ROW | | 0 | 4 |
| TRANSIT LINE | | 0 | 0 |
| EDGE OF DITCHES | | 0 | 0 |
| CENTER LINE OF DITCHES | | 0 | 2 |
| EDGE OF DITCHES | | 0 | 0 |
| FENCE LINE, WOOD | | 0 | 0 |
| FENCE LINE, CHAIN LINK | | 0 | 0 |
| FENCE LINE, BARBED WIRE | | 0 | 0 |
| FENCE LINE, HOG WIRE | | 0 | 0 |
| EDGE OF CONCRETE | | 0 | 0 |
| CURB LINE | | 0 | 0 |
| EDGE OF ASPHALT | | 0 | 0 |
| EDGE OF SHELL OR GRAVEL | | 0 | 2 |
| DIMENSION LINE | | 0 | 0 |
| CENTERPOINT ENERGY AERIAL LINE | | 0 | 0 |
| CENTERPOINT ENERGY UNDERGROUND LINE | | 0 | 6 |
| GAS LINE | | 0 | 1 |
| MISC UNDERGROUND LINES | | 0 | 8 |

| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.1 (CONTINUED)
 EXISTING IMPROVEMENTS
 PLAN VIEW
 TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

| | | WT | LC |
|---|------------------------------------|----|----|
| PIPELINE OR WESTERN UNION CONDUIT | (IDENTIFY CONDUIT) | 0 | 1 |
| AT & T CONDUIT | | 0 | 2 |
| CABLE TV | | 0 | 2 |
| MATCH LINE | | 3 | 0 |
| RAILROAD LINE | | 0 | 0 |
| WATER LINE | 20" (AND SMALLER) WATER | 0 | 7 |
| | 24" (AND LARGER) WATER | | |
| WASTEWATER SEWER LINE | 24" (AND SMALLER) WASTEWATER SEWER | 0 | 3 |
| | 30" (AND LARGER) WASTEWATER SEWER | | |
| STORM SEWER LINE | 24" (AND SMALLER) STORM SEWER | 0 | 0 |
| | 30" (AND LARGER) STORM SEWER | | |
| IRON PIPE OR IRON ROD MONUMENTS | 3/4" IP | 0 | 0 |
| POINT OF INTERSECTION (PI) | | 0 | 0 |
| POINT OF CURVE (PC) POINT OF TANGENCY (PT) | | 0 | 0 |
| POWER POLE | | 0 | 0 |
| POWER POLE W/DOWN GUY | | 0 | 0 |
| GAS METER | GM | 0 | 0 |
| GAS VALVE | GV | 0 | 0 |
| MISC UNDERGROUND PIPELINE LABEL | A2 | 0 | 0 |

| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.1 (CONTINUED)
 EXISTING IMPROVEMENTS
 PLAN VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

| | | WT | LC |
|--|--|----|----|
| PAVING HEADER | | 0 | 0 |
| BUILDING, RESIDENTIAL | | 0 | 0 |
| BUILDING COMMERCIAL | | 0 | 0 |
| TREE | | 0 | 0 |
| HEDGE | | 0 | 0 |
| WATER METER | | 0 | 7 |
| WATER VALVE (GATE) | | 0 | 7 |
| WATER VALVE (BUTTERFLY) | | 0 | 7 |
| FIRE HYDRANT/FLUSHING VALVE | | 0 | 7 |
| TAPPING SLEEVE & VALVE | | 0 | 7 |
| REDUCER | | 0 | 7 |
| ROUND CONNECTION | | 0 | 7 |
| WASTE WATER SEWER CLEANOUT AND MANHOLE | | 0 | 0 |
| STORM SEWER MANHOLE | | 0 | 0 |
| STORM SEWER INLETS | | 0 | 0 |
| CULVERT PIPE AND HEADWALL | | 0 | 2 |
| TOP OF CURB OR GUTTER LINE ELEV. | | 0 | 2 |
| CONTOUR LINE | | 0 | 0 |

| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.1 (CONTINUED)
 EXISTING IMPROVEMENTS
 PROFILE VIEW

TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY

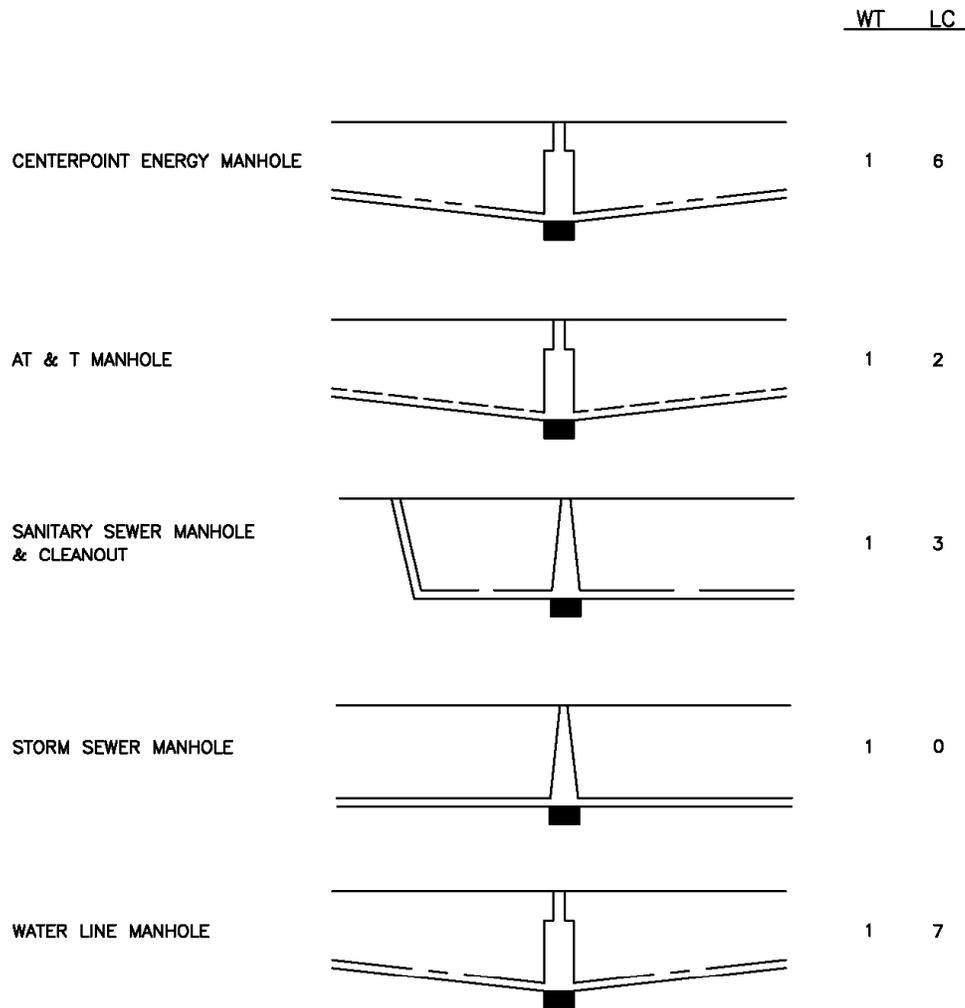
| | | WT | LC |
|-----------------------------|--|----|----|
| NORTH OR EAST PROPERTY LINE | ----- | 1 | 5 |
| SOUTH OR WEST PROPERTY LINE | ----- | 1 | 6 |
| NORTH OR EAST CURB | ----- | 1 | 7 |
| SOUTH OR WEST CURB | ----- | 1 | 3 |
| NORTH OR EAST DITCH | ----- | 1 | 7 |
| SOUTH OR WEST DITCH | ----- | 1 | 3 |
| NORTH OR EAST CULVERT | [-----CULVERT-----] | 1 | 2 |
| SOUTH OR WEST CULVERT | [-----CULVERT-----] | 1 | 2 |
| CENTERLINE OF ROW | ----- | 1 | 0 |
| CENTERPOINT ENERGY CONDUIT | [-----CENTERPOINT ENERGY CONDUIT-----] | 1 | 6 |
| | [-----CENTERPOINT ENERGY CONDUIT-----] | 1 | 0 |
| GAS LINE | [-----GAS LINE-----] | 1 | 1 |
| | [-----GAS LINE-----] | 1 | 0 |
| WESTERN UNION | [-----WESTERN UNION-----] | 1 | 1 |
| | [-----WESTERN UNION-----] | 1 | 0 |
| AT & T CONDUIT | [-----AT & T CONDUIT-----] | 1 | 2 |
| | [-----AT & T CONDUIT-----] | 1 | 0 |
| WATER LINE | [-----WATER LINE 20" (AND SMALLER)-----] | 1 | 7 |
| | [-----WATER LINE 24" (AND LARGER)-----] | 1 | 0 |
| | [-----WATER LINE 24" (AND LARGER)-----] | 1 | 3 |
| WASTEWATER SEWER LINE | [-----SANITARY SEWER 24" (AND SMALLER)-----] | 1 | 0 |
| | [-----SANITARY SEWER 30" (AND LARGER)-----] | 1 | 3 |
| | [-----SANITARY SEWER 30" (AND LARGER)-----] | 1 | 0 |
| STORM SEWER LINE | [-----STORM SEWER 24" (AND SMALLER)-----] | 1 | 0 |
| | [-----STORM SEWER 24" (AND SMALLER)-----] | 1 | 0 |
| | [-----STORM SEWER 30" (AND LARGER)-----] | 1 | 0 |

| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.1 (CONTINUED)
 EXISTING IMPROVEMENTS
 PROFILE VIEW

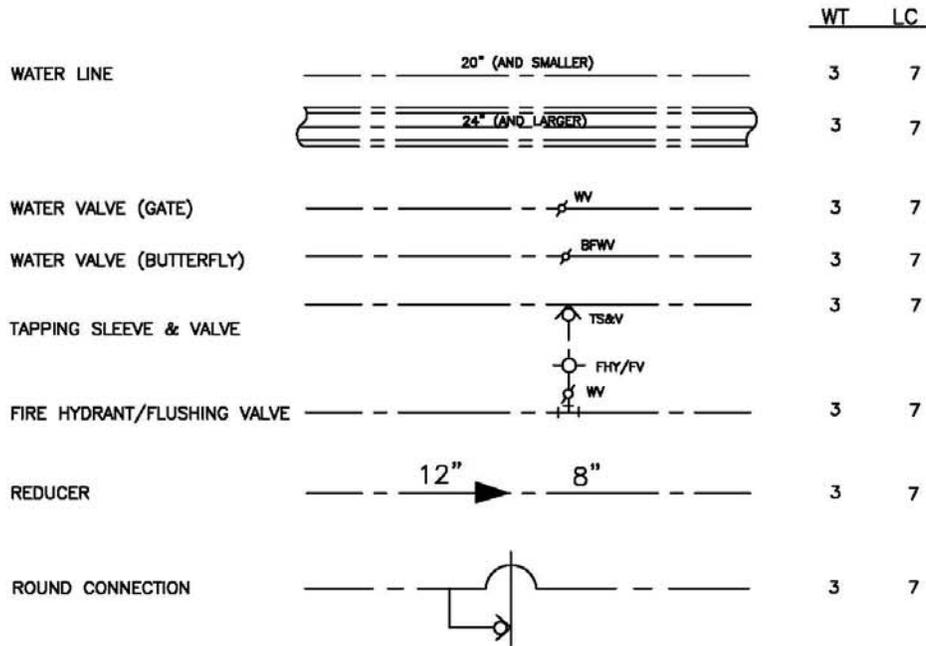
TEXT FOR EXISTING IMPROVEMENTS SHALL NOT BE SMALLER THAN 60 LEROY



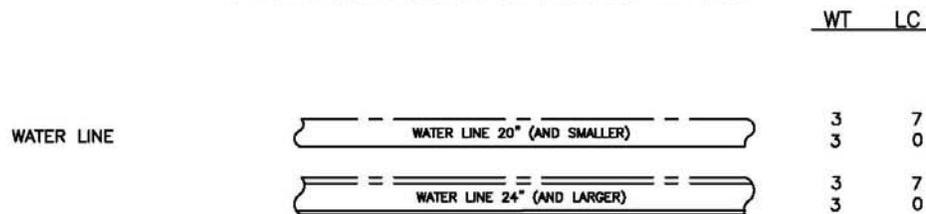
| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.2
 PROPOSED IMPROVEMENTS – WATER LINES
 PLAN VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY



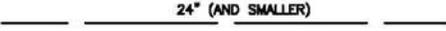
PROPOSED IMPROVEMENTS – WATER LINES
 PROFILE VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY



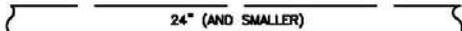
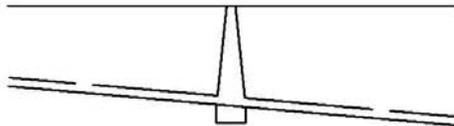
| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.2 (CONTINUED)
 PROPOSED IMPROVEMENTS – SANITARY SEWER LINES
 PLAN VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

| | | <u>WT</u> | <u>LC</u> |
|---------------------|---|-----------|-----------|
| SANITARY SEWER LINE |  24" (AND SMALLER) | 3 | 3 |
| |  30" (AND LARGER) | 3 | 3 |
| MANHOLE |  | 3 | 3 |

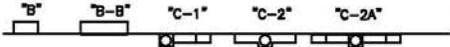
PROPOSED IMPROVEMENTS – SANITARY SEWER LINES
 PROFILE VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

| | | <u>WT</u> | <u>LC</u> |
|---------------------|---|-----------|-----------|
| SANITARY SEWER LINE |  24" (AND SMALLER) | 3 | 3 |
| |  30" (AND LARGER) | 3 | 3 |
| MANHOLE |  | 3 | 3 |

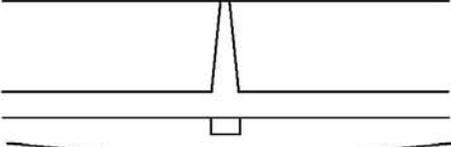
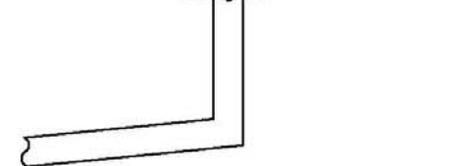
| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.2 (CONTINUED)
 PROPOSED IMPROVEMENTS – STORM SEWER LINES
 PLAN VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

| | | <u>WT</u> | <u>LC</u> |
|-------------------|--|-----------|-----------|
| STORM SEWER LINES | 24" (AND SMALLER) | 3 | 0 |
| | 30" (AND LARGER) | 3 | 0 |
| MANHOLE |  | 3 | 0 |
| INLETS |  | 3 | 0 |

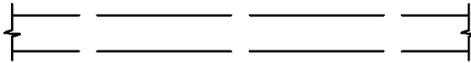
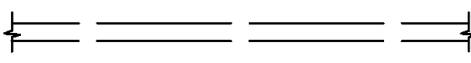
PROPOSED IMPROVEMENTS – STORM SEWER LINES
 PROFILE VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

| | | <u>WT</u> | <u>LC</u> |
|-------------------|--|-----------|-----------|
| STORM SEWER LINES | 24" (AND SMALLER) | 3 | 0 |
| | 30" (AND LARGER) | 3 | 0 |
| MANHOLE |  | 3 | 0 |
| INLETS |  | 3 | 0 |

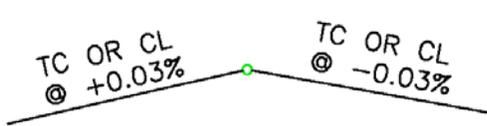
| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.2 (CONTINUED)
 PROPOSED IMPROVEMENTS – PAVEMENTS
 PLAN VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

| | | <u>WT</u> | <u>LC</u> | | |
|---|---|-------------|-------------|---|---|
| FACE OF CURB | _____ | 6 | 3 | | |
| EDGE OF PAVEMENT | _____ | 6 | 0 | | |
| CONCRETE WALK |  | 3 2 3 | 3 0 3 | | |
| CONCRETE HEADER |  | 3 | 3 | | |
| TOP OF CURB OR GUTTER LINE ELEVATION | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="padding: 2px;">TC=76.56</td></tr> <tr><td style="padding: 2px;">G=76.06</td></tr> </table> | TC=76.56 | G=76.06 | 2 | 0 |
| TC=76.56 | | | | | |
| G=76.06 | | | | | |

PROPOSED IMPROVEMENTS – PAVEMENTS
 PROFILE VIEW
 TEXT FOR PROPOSED IMPROVEMENTS SHALL NOT BE SMALLER THAN 100 LEROY

| | | <u>WT</u> | <u>LC</u> |
|--|--|-----------|-----------|
| TOP OF CURB OR CENTERLINE FOR OPEN DITCH PAVING |  | 2 3 | 3 0 |

| WT | K & E PEN NO | LINE WEIGHT/WIDTH | METRIC |
|----|--------------|-------------------|--------|
| 0 | 0 | 0.014" | 0.35mm |
| 1 | 1 | 0.020" | 0.50mm |
| 2 | 2 | 0.024" | 0.60mm |
| 3 | 3 | 0.031" | 0.80mm |
| 6 | 6 | 0.055" | 1.40mm |

LEGEND:
 WT LINE WEIGHT
 LC LINE CODE

FIGURE 3.3
LINE CODE DEFINITIONS
ALL LENGTHS IN INCHES

