



Your Authority. Hard at Work Serving You.

815 Bustleton Pike  
Richboro, PA 18954

Service Calls & Emergencies:

**Call:** 215-357-8515

**Fax:** 215-357-5315

**Email:** [info@nbcma-pa.org](mailto:info@nbcma-pa.org)

# ENGINEERING DESIGN GUIDELINES

*(Original adopted 11/14/89 #444 &*

## 1. GENERAL

The following are minimum requirements for the design of potable water lines and sanitary sewers for the Northampton, Bucks County, Municipal Authority. These Guidelines are incorporated with other Authority Guidelines, contracts, agreements, and Rates, Rules, and Regulations and their use is mandatory.

Circumstances may require special design features which shall be determined at the time of the Design Review. Authority reserves the right to require additional features other than those listed below or to delete or modify any of the requirements listed below. Final approval of all designs shall be made by Authority.

- 1.1** All plans shall be on 24" x 36" good quality paper. Title block shall be located in the lower right-hand corner of each drawing. Development name shall be included in the title block of each drawing below the name of Authority.
- 1.2** A plot plan showing the entire development or each particular section of the development at a scale of 1" = 100' shall be provided. Should the entire development not fit on one sheet, an extra plot plan (at an optional scale) showing the entire plan shall be provided. This sheet shall be the index sheet for the 1" = 100' plot plans of the sections of the development.
- 1.3** A vicinity map shall be provided on the same sheet as the plot plan of the entire development showing the development in relation to existing streets or other developments. The scale of the vicinity map is optional.
- 1.4** All plan and profile drawings shall be drawn to a 1" = 50' horizontal and 1" = 5' vertical scale. Scale shall be shown in the title block.
- 1.5** A title sheet shall be provided with Authority's name, the name of the development, and the date, all shown on the top half of the drawing along with the name of the Design Engineer or Surveyor. The bottom half of the title sheet shall be divided into thirds: one third shall show the legends used on the drawings; the middle third shall be the index of drawings (indexed by drawing number and actual location showing street, manhole or station numbers); and the last third shall be a vicinity map showing Northampton Township.
- 1.6** A north arrow shall be shown on each drawing.

- 1.7 All drawings shall be signed and sealed by the Registered Professional Engineer and/or Land Surveyor, as appropriate, who is responsible for the design. Drawings without the proper seal shall not be accepted or reviewed.
- 1.8 Water and sanitary sewer lines shall be prominently shown on the same drawings. Storm sewers shall be shown in lighter lines on all drawings.
- 1.9 The elevations used for design shall be based on U. S. Geological Survey or U. S. Coast and Geodetic Survey data.
- 1.10 The profile section on all drawings shall show the existing grade in dotted lines and the proposed final grade in solid lines.
- 1.11 All creeks, streams and waterways shall have arrows indicating the direction of flow. Plan views of proposed sewers shall have flow arrows shown for each manhole run.
- 1.12 Authority has standard Specifications covering water and sewer construction. The Design Engineer or Surveyor shall comply fully with these Specifications. A note shall appear on all plans submitted that the Engineer or Surveyor has designed the proposed public water and/or sanitary sewer system in accordance with Authority's most recent Specifications.
- 1.13 All drawings submitted to Authority for review shall be blue line prints on paper. The number of prints required varies according to type of submission and shall be as follows:
  - 1.13 A. – Feasibility Review – one (1) copy
  - 1.13 B. – Design Review three (3) copies
  - 1.13 C. – Approved Final Design – three (3) copies
- 1.14 Drawings shall show road restoration details, traffic control details, hydrant installation details, meter pit details, manhole construction details, and any other details that shall be necessary for clarity or understanding of proposed work.
- 1.15 Final Design Drawings shall show all existing and proposed buildings, driveways, water mains and house services, and sewer lines and laterals. *(See paragraphs 2.12 and 3.18 for method of stationing and identifying house services and sewer laterals.)*
- 1.16 Developer shall allow at least three (3) weeks for any engineering reviews by Authority.
- 1.17 Developer shall perform construction work ONLY from plans marked "APPROVED" and signed or initialed by appropriate Authority personnel or by Authority's Engineer. A copy of approved plan shall be kept on the job site at all times work is in progress. Of the six (6) approved Final Plans, two (2) shall be returned to Developer.
- 1.18 All comments and questions concerning plans and Specifications shall be submitted to Authority in writing.
- 1.19 Developer shall be responsible for preparing all applications and securing any and all permits from appropriate regulatory agencies. PennDOT Highway Occupancy Permits (for road openings) shall be in Authority's name.
- 1.20 Authority reserves the right to make field changes when deemed necessary. Developer shall make no field changes without the written approval of Authority.
- 1.21 Responsibility for recording actual location of pipes, manholes, valves, valve boxes, and all other appurtenances lies solely with Developer as well as the preparation of Record Drawings.

- 1.22 Prior to dedication, Developer shall submit to Authority, three (3) sets of approved Record Plans on paper, one (1) \*.pdf and (1) \*.dwg file (For further information on dedication procedures - see Authority's "Dedication Requirements Exhibit :D").
- 1.23 Space for Authority's drawing file number shall be provided below the Title Block, outside of Border Line, but within the Trim Line. The words "NBCMA DRAWING NO. \_\_\_\_\_" shall be placed in block letters one-quarter (1/4) inch high in this space.
- 1.24 Any time a plan is revised, a revision note must be shown in or near the Title Block. The date of revision, initials of person responsible, and reason for change must be shown. "Authority Requirements" or other non-specific terms are not acceptable. Authority letter dated \_\_\_\_\_ will be acceptable.  
\_\_\_\_\_

## 2. SANITARY SEWER

- 2.1 All sanitary sewers shall be designed in accordance with Pennsylvania Department of Environmental Protection's Sewerage Manual, latest edition.
- 2.2 Pipe diameters shall be designed to handle maximum flow from the development together with any possible future flow from the drainage area. Minimum slopes shall be avoided wherever possible and shall be subject to special review by Authority. Design flow calculations shall be submitted with the plans.
- 2.3 Manholes shall be numbered from the downstream manhole or point of connection. Manhole numbers shall be preceded by no more than four (4) letters indicating the name of the development. (Example: TV-1 for Timber Valley.)
- 2.4 All lines shall be designed to be deep enough to serve all lots without pumping. Basement service shall be required.
- 2.5 The invert of the sewer main serving each lot shall be deep enough to serve the basement or lowest floor of each house while allowing a lateral slope of one-quarter (1/4) inch per foot.
- 2.6 Any sanitary sewer crossing another utility shall have eighteen (18) inches of vertical clearance or shall be encased in concrete a distance of ten feet on either side of the crossing.
- 2.7 Watertight, bolted, manhole covers shall be provided in all easements, and where manholes are subject to flooding. Manholes within easements shall be constructed so that top of manhole is one (1) foot above finished grade. If easement is on mowed lawn or otherwise maintained on a weekly basis, manholes shall be set flush with grade.
- 2.8 The profile drawings at each manhole location shall list the number of the manhole, the existing grade, the proposed grade, the invert, the cut, the manhole depth, and the station number. Also, the sewer from manhole to manhole shall be labeled with the pipe size, the pipe material, the horizontal distance between manholes, and the slope of the pipe expressed in feet of drop per foot.
- 2.9 The entire profile portion of the drawing shall have a background grid system of both horizontal and vertical lines. The horizontal lines shall be 1/10" apart or 1/2 foot at a scale of 1" = 5'. The vertical lines shall be 1/2" apart or twenty-five feet at a scale of 1" = 50'. The grid lines shall be lighter than the object lines of the drawing.

- 2.10** Maintenance access roads shall have a paved width minimum of fifteen (15) feet and shall be required for siphon chambers, metering stations, or sewage lift stations. Access roads shall be within a thirty (30) foot easement.
- 2.11** Any development having a connection directly to the Neshaminy Interceptor shall install a metering station on each outfall line in accordance with requirements of the Bucks County Water and Sewer Authority.
- 2.12** For Record Plans, sanitary sewer lines shall be stationed between each manhole run. The downstream manhole shall be marked as "STA 0+00" and stationing shall proceed upstream to the next manhole. The next manhole shall then be marked as "STA 0+00" for the next run. This shall be continued for each run. Stationing shall be along the centerline of each sewer line and shall NOT be taken from base lines, street centerlines, or any other reference.
- All laterals shall be stationed from the sewer line stationing. The lateral connection (TEE or WYE) shall be marked and stationed along the sewer line. If the end of the lateral is more than one (1) foot, when projected at a right angle from the sewer line, from the connection, then the end of the lateral shall be stationed and marked at the end of the lateral.
- In all cases the end of the lateral shall be marked by the abbreviation "LAT" with the length of the lateral from the centerline of the sewer to the end placed after LAT. The depth of the end of the lateral below finished grade shall be shown in parentheses below length of lateral figure.
- 2.13** Sewer mains shall extend to all boundaries of developments and all mains shall terminate with a manhole. Clean-outs and/or lampholes shall not be permitted. Long laterals in excess of fifty (50) feet shall be discouraged. Laterals shall be straight, with no bends. Laterals shall be six (6) inch minimum diameter.
- 2.14** Sanitary sewers shall be of Class 52 ductile iron pipe, cement lined and asphalt coated. The class of pipe may be increased if unusual conditions are found.
- 2.15** All sanitary sewer lines shall be tested by the Air Test Method and all manholes shall be tested by the Vacuum Test Method. Should the lines fail the Air Test and a subsequent retest, the lines must be tested using the Water Test Method.
- 2.16** All sanitary sewer lines shall be flushed after passing the Air Test. Flushing shall be accomplished by starting at the highest manhole and working on each manhole section towards the downstream manhole. The lower manhole shall be plugged and the upper manhole filled with water two (2) feet over the top of the pipe. Water may be released into the next section immediately after the proper depth in the upper manhole is reached. Flushing is not required if lines have been water tested. Extreme care must be used when plugging pipes, especially if pneumatic plugs are used. Excessive pressure on plugs can cause the pipe to crack.
- 2.17** Authority discourages sewage pump stations (lift stations). Design of lift stations shall be based on the wet well/dry well configuration. Approval for construction of pump stations shall be subject to special review by the Authority and may require approval by the Board of the Authority. When pump stations are permitted, the following are minimum standards that must be met. Pump stations shall be designed to handle the entire drainage area in which they are located. Pumps must be designed to handle minimum and maximum flows, paying strict attention to startup low flows and retention times in force mains. Pumps must be capable of easy change of impellers to increase capacity and also the change of pump size without structural changes to handle larger pumps. This shall include electrical service, transformers, controls, etc. All must be designed to permit upgrading. Cycling times and capacities of wet wells shall be carefully considered for all ranges of flows.

Motor generator sets must be supplied, keeping in mind all conditions of flows and future requirements. Pump stations must be enclosed in an aboveground building. The building shall be aesthetically harmonious with the surrounding development. Ease of maintenance shall be designed into the station. Baskets to collect trash and other large objects shall be installed in the open flow to the wet well. Basket design shall permit easy removal and emptying. A complete set of all calculations shall be supplied at time of design review. Without calculation sheets, drawings shall not be accepted or reviewed.

- 2.18** Minimum sewer depths shall provide six (6) feet of cover. When topographic conditions indicate the need for less than six (6) feet of cover, Authority shall make a special review of all factors. Manhole depths shall be no less than the full depth of the corbel section.

Sewer depths greater than fourteen (14) feet shall be subject to specific review and could require a permanent maintenance escrow account.

- 2.19** All manholes shall be epoxy coated inside and outside with epoxy suitable for application on concrete with burial conditions. Color to be white.

### **3. WATER**

- 3.1** Minimum diameter of water mains shall be eight (8) inches. Special circumstances may allow the use of a six (6) inch diameter line, such as extending an existing six (6) inch line, or in short, dead-end cul-de-sacs. Authority must approve use of six (6) inch lines for each special circumstance. Authority may require larger diameter mains to serve future developments.
- 3.2** Water lines shall extend to all boundaries of developments and shall terminate with a fire hydrant.
- 3.3** Authority shall place great emphasis on alternate supply routing methods (looping) into given areas, including interior lines within the development. Design shall include a minimum of two (2) off-site connections. Additional connections shall be required by Authority in accordance with the proximity of existing water mains.
- 3.4** Water mains shall be installed six (6) feet behind the face of the curb whenever possible. All lines shall have a four (4) foot minimum cover. Lines shall be located in road right-of-way and not in easements whenever possible. Lines shall NOT be installed beneath sidewalks. House services shall not be installed under driveways and curb stops shall NOT be installed in sidewalks or walkways.
- 3.5** Three (3) main line gate valves shall be shown at each "Tee" junction and four (4) gate valves at each "Cross." No valves are to be installed deeper than five (5) feet. Valves shall be "clustered" at junctions for ease in locating them.
- 3.6** No water main shall extend for more than 1,000 feet without a gate valve for isolation. Within the development, gate valves shall be installed at least every 500 feet.
- 3.7** Gate valves shall be provided at the end of any mains that may be extended in the future. One (1) length of pipe shall be extended beyond the valve. A plug or cap shall be placed at the end of the pipe. No services may be permitted past the valve.
- 3.8** Fire hydrants shall be provided at the end of all lines as covered by item 3.7 above, but always before the terminal gate valve, to act as a blow-off.
- 3.9** Fire hydrants shall be installed as blow-offs on all dead-end lines. No other types of blow offs shall be permitted.

- 3.10** Each hydrant shall be capable of delivering a minimum of 1,500 gallons per minute plus local flow as required by the Insurance Services Office (ISO) or other appropriate authorities.
- 3.11** Fire hydrants shall be spaced so that every proposed house or other building is within 500 feet of a hydrant as measured along a street. Hydrants should be located at or near street intersections. Final approval of fire hydrant locations shall be made by the Township Fire Marshall or his designated representative. Hydrants not located at intersections shall be located on property lines.
- Fire hydrants shall be located at least ten (10) feet from any driveway or access way.
- All fire hydrants shall be supplied with two (2) reflective stainless steel hydrant collars as manufactured by Lordon, Inc. of Hackettstown, New Jersey. Collars shall be reflective blue and shall be 1.75" wide by 28" long. Collars shall be installed after final hydrant painting.
- 3.12** Pressure reducing valves shall be required at all connections between high pressure and low-pressure zones. Authority must approve any proposed connection. Alternate feed lines may be required to avoid interconnections between zones.
- 3.13** When a choice of fittings is available, the fitting with the lowest all-around pressure drop shall be required.
- 3.14** Any water main crossing another utility shall have eighteen (18) inches of vertical clearance or shall be encased in concrete a distance of ten (10) feet on either side of the crossing.
- 3.15** Particular attention shall be paid in the design of water mains located on curves to insure that maximum allowable deflection of joints does not occur. Should curvature require the use of fittings, these fittings shall be called out and stationed on the plans.
- 3.16** The Authority has a Well Development Program and each development plan shall be reviewed for potential well sites. Developer may be required to donate a well site to Authority in order to assure an adequate supply of water or required degree of chlorination for the demands of the development.
- 3.17** Air release valves in manholes may be required to be installed at appropriate locations within the development or, if applicable, on an off-site connector main. Every effort shall be made to avoid high points in the mains. Fire hydrants may be located at high points to reduce the need for air release valves.
- 3.18** For the purposes of recording the location of the water main on the drawings, the water main shall be stationed continuously along the centerline of the main and shall not relate to centerline of street, base line or profile stationing. "HSE. SERV." shall indicate the location of the water service connection for each house or lot. The station shall be projected at a right angle from the centerline of the main to the curb box or the end of the service behind the curb.
- 3.19** All manholes and pits shall be epoxy coated on the inside and outside with epoxy suitable for application on concrete with burial conditions. Color shall be white.
- 3.20** Maintenance access roads shall have a paved width minimum of fifteen (15) feet and shall be required for pump stations, wells or other structures. Access roads shall be within a thirty (30) foot easement.

## 4. EASEMENTS

- 4.1 Authority discourages the construction of sanitary sewers and water mains in off-street easements. Approval for construction of sanitary sewers or water mains in easements shall require special review by Authority. Manhole, valve box, and pipe line accessibility for Authority maintenance equipment shall be considered in this review as well as future maintenance requirements.
- 4.2 Sanitary sewer lines in all easements shall be as direct as possible with minimum changes in direction.
- 4.3 The minimum width of any easement shall be thirty (30) feet. For pipe depths greater than twelve (12) feet, wider easements shall be required. The widths of easements for deep lines shall be decided by Authority after reviewing the topography and all physical obstructions.
- 4.4 Pipe lines shall be centered in the easement. If centering is not possible, the edge of easement shall be no less than fifteen (15) feet from the centerline of pipe.
- 4.5 If sanitary sewers and water lines are constructed in the same easement, there shall be a ten (10) foot separation between the pipes. The edges of easements shall be fifteen (15) feet from the centerline of the pipes. Benching may be required for sanitary sewer and water lines in the same easement.
- 4.6 If other utilities are within the same easement as a sanitary sewer or water main, Authority shall determine the width of the easement required. The minimum standard of fifteen (15) feet from centerline of pipe to edge of easement shall apply.
- 4.7 Off-street easements, if not paved, shall have a base of eight (8) inches of crushed stone placed under four (4) inches of topsoil. Surface shall be sodded unless due to special circumstances, Authority authorizes select seeding. The full width of the easement shall be constructed in accordance with this section.
- 4.8 Legal descriptions of easements shall be accompanied by 8-1/2" by 11" paper and one (1) \*.pdf file, of the easements. Each easement shall have a separate drawing and shall be sealed by the Professional Engineer or Land Surveyor responsible. Larger size drawings may be used for large easements but the sheet size shall conform to standard drawing sizes.
- 4.9 All drawings, including easement drawings, shall have a note, stating that no plantings, buildings, fences, or other structures may be placed in or on easements.

## 5. RECORD PLANS

- 5.1 In accordance with the agreements Developer has signed with Authority, preparation of Record Plans is an obligation of Developer. Authority will assist using inspector's field surveys. Authority shall charge Developer for this work.
- 5.2 When construction is completed, an approved set of Final Plans will be marked-up in felt-tip pen by Authority or Authority's Consulting Engineer with as-built corrections prepared from field survey information supplied by the Authority's inspectors. NOTE: Final Plans are not Record Plans. Record Plans refer to those that are marked-up from actual field measurements. Approved Record Plans refer to those that have been reviewed and approved by Authority and filed at the completion of all corrections.

- 5.3 One set of marked-up plans shall remain at the Main Office and the other set shall be kept at the Maintenance Office.
- 5.4 The Administrative Assistant shall be notified when Record Plans have been completed.
- 5.5 The Developer, or his Engineer, may request to borrow a set of the marked-up Record Plans so that he can submit permanent Record Plans. Only one set may be given out. The other set must be retained at the Maintenance Office.
- 5.6 A deposit of \$250.00 is required to lend a set of Authority's marked-up Record Plans to a Developer, or his Engineer. An acknowledgement shall be signed by borrower to Authority confirming receipt of the marked-up set of Record Plans as well as the deposit given.
- 5.7 When the marked-up set of Record Plans is returned to the Authority, said deposit shall be returned to borrower and a receipt shall be given to evidence the return of the deposit and marked-up Plans.
- 5.8 If Developer, or his Engineer, fails to return the Plans, the full cost of preparing a replacement set shall be borne by the Developer.
- 5.9 Developer shall then submit two (2) sets of revised paper Record Plans incorporating the Authority's mark-ups for review and approval.
- 5.10 Authority shall check the Developer's Record Plans against Authority's marked-up set of Record Plans.
- 5.11 If corrections are necessary, Authority shall advise Developer and his Engineer in writing, detailing the necessary corrections.
- 5.12 Developer shall re-submit three (3) revised sets of Record Plans.
- 5.13 When approved, Authority shall notify Developer and his Engineer and request three (3) sets of approved paper Record Plans one (1) \*.pdf file and one (1) \*.dwg file.
- 5.14 Authority shall check plans to make sure they agree with approved Record Plans. Any further changes will require Developer to revise and re-submit three (3) sets of approved paper Record Plans, one (1) \*.pdf and one (1) \*.dwg file.

