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## 4A-1 General Information

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### A. Concept

The important design requirements of water main systems are they supply each user with sufficient volume of water for a particular designated use plus required fire flows at adequate pressure, and the system maintains the quality of the potable water delivered by the treatment plant. It is important that maintenance considerations are constantly addressed in the design of water main systems. The performance of a water main system for health and fire-flow purposes depends on the Jurisdiction's ability to maintain the system at an affordable cost.

Certain planning considerations related to a new system development or system expansion requires the designer to consider factors such as future growth, cost, and system layout. For system layout, all major demand areas should be serviced by an arterial-loop system. High demand areas are served by distribution mains tied to an arterial-loop system to form a grid without dead-end mains. Areas where adequate water supply must be maintained at all times for health and fire control purposes should be tied to two arterial mains where possible. Minor distribution lines or mains that make up the secondary grid system are a major portion of the grid since they supply the fire hydrants and domestic and commercial consumers.

### B. Conditions

1. **General.** Numerous agencies, besides local Jurisdictions, may stipulate conformance to water main requirements. These agencies consist of water boards, benefited water districts, rural water associations, and the Iowa Department of Natural Resources (IDNR). For the purpose of uniformity, the Project Engineer should contact the Jurisdictional Engineer if there are questions on where to submit reports, plans, and specifications for conformance to specific requirements and approvals. The Project Engineer should also contact the Jurisdictional Engineer to identify local requirements. It is necessary all water main projects meet the requirements of IDNR and the evidence of approval be provided to the Jurisdiction in charge. In case of conflict between the above design standards, the most restrictive requirement applies.
2. **Plans.** The plans for water mains and appurtenances should show all appropriate physical features adjacent to the proposed water mains along with horizontal and vertical controls and hydrant coverages. Other utilities, such as sanitary and storm sewers, manholes, etc., should be shown on the plans with horizontal and vertical separation distances. Design details for other utilities that do not affect the water main may not be shown on water main plans. Traffic control criteria should also be included with the plans and should follow the latest edition of the Manual on Uniform Traffic Control Devices.

3. **Iowa Department of Natural Resources (IDNR) project submittals.** This section is taken from the 2003 edition of the Recommended Standards for Water Works (the Iowa Water Supply Design Standards by reference). The Project Engineer is responsible to obtain any revisions, memorandums, and interpretations to the IDNR rules and regulations.
- a. **“General.** All reports, final plans specifications, and design criteria should be submitted at least 60 days prior to the date on which action by the reviewing authority is desired. Environmental assessments and permits for construction, to take water, for waste discharges, for stream crossings, etc., may be required from other federal, state, or local agencies. Preliminary plans and the engineer's report should be submitted for review prior to the preparation of final plans. No approval for construction can be issued until final, complete, detailed plans and specifications have been submitted to the reviewing authority and found satisfactory. Documents submitted for formal approval include, but not limited to:
- 1) Engineer's report, where pertinent
  - 2) Summary of the design criteria
  - 3) Operation requirements, where applicable
  - 4) General layout
  - 5) Detailed plans
  - 6) Specifications
  - 7) Cost estimates
  - 8) Water purchase contracts between water supplies, where applicable
  - 9) Other information as required by reviewing authority

Where the design/build construction concept is to be utilized, special consideration must be given to: designation of a project coordinator; close coordination of design concepts and submission of plans and necessary supporting information to the reviewing authority; allowance for project changes that may be required by the reviewing authority; and reasonable time for project review by the reviewing authority.

- b. **Plans.** Plans for water works improvements should, where pertinent, provide the following:
- 1) General layout, including:
    - a) Suitable title
    - b) Name of municipality or other entity or person responsible for the water supply
    - c) Area or institution to be served
    - d) Scale
    - e) North point
    - f) Datum used
    - g) Boundaries of the municipality or area to be served
    - h) Date, name, and address of the designing engineer
    - i) Imprint of professional engineer's seal or conformance with engineering registration requirements of the individual state
    - j) Legible prints suitable for reproduction
    - k) Location and size of existing water mains
    - l) Location and nature of existing water works structures and appurtenances affecting the proposed improvements, noted on one sheet
  - 2) Detailed plans, including:
    - a) Stream crossings, providing profiles with elevations of the stream bed and the normal and extreme high and low water levels
    - b) Profiles having a horizontal scale of no more than 100 feet to the inch and a vertical scale of no more than 10 feet to the inch, with both scales clearly indicated
    - c) Location and size of the property to be used for the groundwater development with respect to known references such as roads, streams, section lines, or streets
    - d) Topography and arrangement of present or planned wells or structures, with contour intervals no greater than 2 feet
    - e) Elevations of the highest known flood level, floor of the structure, upper terminal of protective casings, and outside surrounding grade, using United States Coast and Geodetic Survey, United States Geological Survey, or equivalent elevations, where applicable, as reference
    - f) Plat and profile drawings of well construction, showing diameter and depth of drill holes, casing, and liner diameters and depths, grouting depths, elevations and designation of geological formations, water levels, and other details to describe the proposed well completely
    - g) Location of all existing and potential sources of pollution that may affect the water source or underground treated water storage facilities
    - h) Size, length, and materials of proposed water mains
    - i) Location of existing or proposed streets; water sources, ponds, lakes, and drains; storm, sanitary, combined and house sewers; septic tanks, disposal fields, and cesspools
    - j) Schematic flow diagrams and hydraulic profiles showing the flow through various plant units
    - k) Piping in sufficient detail to show flow through the plant, including waste lines
    - l) Locations of all chemical storage areas, feeding equipment, and points of chemical application
    - m) All appurtenances, specific structures, equipment, water treatment plant waste disposal units, and points of discharge having any relationship to the plans for water mains and/or water works structures
    - n) Locations of sanitary or other facilities, such as lavatories, showers, toilets, and lockers, when applicable or required by the reviewing authority
    - o) Locations, dimensions, and elevations of all proposed plant facilities
    - p) Locations of all sampling taps
    - q) Adequate description of any features not otherwise covered by the specifications

- c. **Specifications.** Complete, detailed, technical specifications should be supplied for the proposed project, including:
- 1) A program for keeping existing water works facilities in operation during construction of additional facilities to minimize interruption of service
  - 2) Laboratory facilities and equipment
  - 3) The number and design of chemical feeding equipment
  - 4) Procedures for flushing, disinfection, and testing, as needed, prior to placing the project in service
  - 5) Materials or proprietary equipment for sanitary or other facilities including any necessary backflow or back-siphonage protection”

See the Iowa Department of Natural Resources Rules and Regulations for more detail on submittal of reports, plans, and specifications.

- d. **Local project submittals.** Some Jurisdictions or water boards have been delegated by IDNR to issue permits for minor water main extensions. Permits for all other projects must be submitted to IDNR, and evidence of approval is to be provided to the Jurisdiction in charge.