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WATER PLAN DRAFTING STANDARDS

8-07.0.0 WATER PLAN DRAFTING STANDARDS

8-07.1.0 General

1.1 Purpose
This section describes water construction plan standards and requirements for public water projects.

1.2 Definitions
Refer to Section 8-18 for definitions, abbreviations, and acronyms.

1.3 Applicability
These requirements apply to all water plans, including the plans for CIP, system modifications, and developer-financed projects. Additional requirements may be contained in other water design standards for various types of projects.

8-07.2.0 Content Requirements, Water Plan Sheets

This subsection on water plan drafting standards contains the following major topics:

- Content Requirements, All Plan Sheets
- Content Requirements, Cover Plan Sheet
- Content Requirements, Second Plan Sheet
- Content Requirements, Standard Plan Sheets
- Content Requirements, Section and Detail Plan Sheets
- Content Requirements, Survey Control Plan Sheets
- Content Requirements, Landscape Plan Sheets

For purposes of this section, the name “Water Construction Plan” refers to the complete set of sheets or drawings that together show the work to be constructed. The information required as part of the water plan submittal will be shown graphically or provided by notes on the plan.

2.1 Content Requirements, All Plan Sheets

All sheets shall contain or meet the following requirements:

A. Project Title Block

See Exhibit 7-1, Block A and Exhibit 7-1A. The title block, "A," shall be horizontally divided into three equal subsections and shall include:

1. First Subsection: Project name, centered, in bold Roman typeface (sized according to project name), as follows:

“PROJECT NAME”

2. Second Subsection: Second subsection of title block A, "sheet title block," centered, identifying all contents of the specific sheet. Examples include:
   a. First sheet title shall read "Cover Sheet."

   b. Second sheet title shall read "Notes, Legend, Abbreviations and Sheet Index.”

   c. See Exhibit 7-1B. Remaining plan sheets sheet titles shall read specific contents of plan sheets including; the location, street name and station number and can include Sections and Details, Corrosion Details, Survey Control Line, Landscape and Irrigation, and other sheet descriptions as needed.

3. Third Subsection:
   a. Names, Designed by dates, Drawn by, and Checked by

   b. Scale: Vertical, Horizontal

   c. Field book number and page, NAVD 88 datum

   d. Sheet number and total number of sheets

   e. Plan Number
   See Exhibit 7-1 Block B and Exhibit 7-1A.
   - A plan number must be obtained for each project from the Tucson Water Mapping/GIS Section, 791-2631.

   - All project documents shall include a reference to the project using the Tucson Water project plan number.

   - System modifications plans shall use the controlling agency's project plan number. The Tucson Water project plan number will be applied in the margin by the Tucson Water Modifications Unit.

   System modifications plans shall include all of the above information but use the controlling agency's standard title block.

B. Tucson Water Logo and Engineer's Seal
See Exhibit 7-1 Block C and Exhibit 7-1C. (Optional for system modifications plans)
1. The Engineer's seal and signature shall appear on each sheet of drawings or maps.

2. The Engineer shall sign, date, and seal a professional document before the document is submitted to Tucson Water or any other regulatory agency, unless the document is marked "preliminary," "draft," or "not for construction."

3. Refer to AAC Rule R4-30-304. Use of Seals, to assure compliance with all requirements of this rule.

C. Consultant's Logo
See Exhibit 7-1 Block D and Exhibit 7-1C. Consultant's logo with clear identification of the firm responsible for design, if applicable. (Optional for system modifications plans.)

D. North Arrow
See Exhibit 7-1 Block E and Exhibit 7-1D. The north arrow shall be located in the upper right corner of the plan view whenever possible.

E. Sheet Revision Block
See Exhibit 7-1 Block F and Exhibit 7-1D. Sheet revision block, including space for sequential numbers, designer's name and date, description, and "approved by" name and date.

F. Bluestake Logo
See Exhibit 7-1 Block G.

G. Notes
Applicable sheet specific notes

2.2 Content Requirements, Cover Plan Sheet
See Exhibit 7-2. The cover sheet is the first sheet of the water plan. For system modifications plans it may not be the first sheet of the overall plans, but it will be the first sheet of the system modifications portion of the overall plans. It shall include all requirements of paragraph 2.1 of this section and shall also include:
- Project Name Block
- Signature Block
- Other approval signatures
- Physical Site Address (Tucson Water Plant Design plans only)
- Location Map Requirements
- Sheet Index Plan Content Requirements
- Record Drawing Block

- Plan Number
- System Schematics (Tucson Water Plant Design plans only)

A. Project Name Block
See Exhibit 7-2 Block A. The project name shall be located top center

B. Signature Block
See Exhibit 7-2 Block B and Exhibit 7-2A. If a signature is not required for a particular project, the signature space shall be omitted.

1. Approval signatures
Approval signatures are acquired from the P&E Administrator and Deputy Director to authorize proceeding with CIP construction projects. Also, approval signatures are acquired from the fire suppression authority for fire flow rates and duration and hydrant locations. Approval signatures are located in the signature block.

2. Acceptance signatures
Acceptance signatures are acquired for system modifications plans and developer-financed plans from Section Supervisors for substantial concurrence with standard specifications and details. Acceptance signatures are located in the signature block.

C. Other approval signatures
See Exhibit 7-2 Block C and Exhibit 7-2B. Other approval signatures are acquired from other regulatory agencies including but not limited to Pima County Wastewater Management, Pima County Department of Transportation, Arizona Department of Transportation, etc. These approval signatures are located adjacent to the top of the title block. For system modifications plans, other approval signatures are obtained by the controlling agency and will appear on the plan cover sheet, not necessarily on the system modifications cover sheet.

D. Physical Site Address (Tucson Water Plant Design plans only)
The physical site address is the official assigned address by Pima County Development Services.

E. Location Map Requirements
See Exhibit 7-2 Block E and Exhibit 7-2C. The location map, (also known as the vicinity map) shall be located in a dedicated area in the top right corner of the cover sheet and shall be labeled “Location Map.” The Location Map shall cover a minimum of one square mile at a scale of 3” = 1 mile or shown on a dedicated area on the cover, not to exceed 7” (H) x 6” (W) at an appropriate scale, and shall include:

- “This Project” arrow showing the project centered in the map
- Existing conditions such as major streets, watercourses, and surroundings that may affect the project

- Section, township, range, section corners, north arrow, and scale

- A text label identifying the political subdivision, such as City of Tucson ward, County Supervisor district, Town of Marana, Oro Valley, South Tucson

- Latitude and longitude at the beginning of construction and at the approximate center of construction for system modifications plans

F. Sheet Index Plan Content Requirements
See Exhibit 7-2 Block F. Content requirements of the Sheet Index Plan shall include:

1. Sheet Index Plan
A sheet index plan shall be included on the cover sheet that shows a plan view (overhead, bird's eye view) of the entire project on one sheet.

2. General Items
General items, all to be labeled, include:
   a. North arrow, scale. (typically up or left direction)

   b. Water service area boundary, if near the project area

   c. Sheet index number arrows

   d. Project boundary line

   e. Project beginning and ending location

   f. Project phase lines

   g. Section, township, range; and section corners and quarter section corners

   h. Legend, if unique to the site plan

3. Existing and Proposed Mains and Structures
Where the existing system is within or affected by the new project, show the location and size of existing and proposed water mains including protected mains, labeled as such. Also include valves and fire hydrants, and the location and name of existing and proposed waterworks structures.

4. Major Streets, Water Courses
Show existing or proposed major streets and all watercourses including the 100-year flood limit contour.

5. Pressure Zone Boundaries

Show pressure zone boundaries, with closed valves, if within the water sheet index plan sheet.

G. Record Drawing Block
The record drawing block shall contain space for the Engineer's seal and inspector's as-built (record drawing) information consisting of details relating to the project such as Contractor's name, inspector's name, project completion date, pipe materials, valve types, etc.

H. Plan Number
1. Source
A plan number will be assigned for each project by the Tucson Water Mapping/GIS Section, 791-2631.

2. Usage
All project documents shall include a reference to the project using the Tucson Water project plan number.

3. Location
The Plan number shall be located on the upper right-hand corner, vertically, inside the border of the plan so that the number terminates at the upper right corner of the sheet.

4. System Modifications Plans
For system modifications plans, the plan number will be obtained by the Tucson Water Modifications Unit and applied to the record set of plans retained by Tucson Water.

I. System Schematics (Tucson Water Plant Design plans only)
1. Water System Schematic
A water system schematic diagram will be shown on the cover sheet. The schematic diagram shall show the water service areas adjacent to the new facility, including the High Water elevations of these water service areas. In addition, it will show the new facility and site elevation schematically linked to the adjacent water service areas.

2. Pump and Motor Requirement Table
A pump and motor requirement table will be shown on the cover sheet. This table will include the following information for each pumping unit of the new facility:
- Design Capacity
- Design Total Dynamic Head
- Minimum Shut-Off Head
- Voltage
- Phase
- Minimum Horsepower

3. Pump Settings
   A table of pump settings will be on the cover sheet for applicable projects and will show the pressure setting in pounds per square inch for the on and off point for each pump of the new facility.

2.3 Content Requirements, Second Plan Sheet

The second sheet contains requirements of paragraph 8-07.2.1 and includes:

- Construction Notes
- Sheet Index List
- Legend
- Abbreviations List
- Section Indicator - Detail Number Cross Referencing System
- Content Requirements (Tucson Water Plant Design plans only)

A. Construction Notes

1. General Construction Notes
   General construction notes found in Tucson Water SD-105, 11 pages, apply to all projects and are not to be included on the plans, other than those required herein.

2. Additional Construction Notes
   Additional construction notes shall be located to the left side of the sheet, and labeled “Additional Construction Notes.”
   a. Include, as the first note, the entire text contents of Note No. 1, found in Tucson Water SD-105, General Construction Notes.

   b. Do not include construction notes that are already in the General Construction Notes, other than those required above.

   c. Do not include notes that are not applicable to this project.

3. Developer-Financed Projects
   For general construction notes on developer-financed plans, see Exhibit 7-10. Approved notes may be placed on the cover sheet.

4. System Modifications Projects
   For General Construction notes on system modifications plans, see Exhibit 7-11. Notes may be placed on the cover sheet. Any special notes unique to the project shall be included.

B. Sheet Index List

The purpose of the sheet index list is to provide a comprehensive list of all content to quickly facilitate finding any topic of interest.

1. Sheet Index List
   The Sheet Index List, sometimes referred to as the Plan or Drawing Index List, is a list containing sheet numbers and corresponding sheet subtitles used in the plans. This list shall be labeled “Sheet Index List.”

2. Group Categories
   The Index should be categorized into groups with headings and sheet subtitles such as:
   a. General
      - Cover Sheet
        - Location Map, Site Plan
      - Second Sheet (Additional Construction Notes, Boundary and Marker Symbols, Legend, Sheet Index, Abbreviations, Culture Symbols)

   b. Civil Sheets
      - Plan Sheets
      - Plan Sections & Details Sheets
        - Structural (Concrete, Anchorage Bolt Support, Grating)
        - Miscellaneous (Corrosion, Pipe trench, Air Release, Valve Assembly, Blow-Off Assembly, Lifting Lug)
      - Survey Control Sheet

   c. Landscape Sheets
      - Landscape Restoration Key Plan (Site Plan) Sheets
      - Landscape Restoration Template Sheets (Plan)
      - Irrigation Plan Sheets (Plan)
      - Sections & Details Sheets
      - Landscape and Irrigation Sheet

C. Legend
   The legend is a list containing symbols and corresponding features used in the project plans. This list shall be labeled “Legend.”
   1. Symbols
      Include all symbols used on the plans for this project. See Exhibits 7-3A through 7-3D.

   2. Symbol Sources
      Use only symbols that are in the Symbols section of the Tucson Water Standard Specifications and Details and the Pima Co. / City of Tucson Standard Details for Public Improvements

   3. Symbol Limitations
      Do not include symbols that are not applicable to this project.

   4. Symbol Groups
      Symbols should be in groups with a heading, such as:
      - utility
      - boundary and marker
      - survey
      - culture

D. Abbreviations List
The Abbreviations List is a list containing letters and corresponding definitions used in the plans and shall be labeled "Abbreviations List."
- Include all abbreviations used on the plan sheets for this project.
- Use only abbreviations that are in the Abbreviations section of the Tucson Water Standard Specifications and Details and the Pima County / City of Tucson Standard Specifications and Details for Public Improvements
- Do not include abbreviations that are not applicable to this project.

E. Section Indicator and Detail Number Cross-Referencing System
A graphical representation of the section indicator cross-referencing system and the detail number cross-referencing system shall be shown as defined and explained in subsection 5.3.

F. Content Requirements (Tucson Water Plant Design plans only)
The second sheet of the water plans for plant design projects shall be a Site Grading and Enclosure Plan. This sheet shall be named "Site Grading and Enclosure Plan" and shall include the following:
- General Site Layout
- Facility Tie-in to Existing Distribution System
- Property Boundaries
- Existing Topography
- Site Final Grade
- Perimeter Enclosure Location and Grade
- Drainage
- Site Access

2.4 Content Requirements, Standard Plan Sheets
The detailed plan sheets show a plan view of the work to be constructed. These sheets consist of much more detail than in the water site plan in order to show what the project is and where it is to be constructed and what may affect construction. This subsection contains:
- Plan Sheets Content
- Profile View Content

A. Plan Sheets Content
The plan sheets shall not include an aerial photographic survey background but will include the following:
1. Right-of-way dimensions and names, existing and proposed. State the recordation information, location, width and purpose, with street names labeled public or private. Also, comply with Tucson Water SD-340, System Installation Outside Public right-of-way. (Not applicable for system modifications plans.)

2. Survey control line, including bearing and distance between control points, control point, and stationing.

3. Survey benchmarks relative to NAVD 88 datum.

4. Property lines, lot addresses, block numbers, subdivision names, parcel numbers, sidewalks, driveways, edge of pavement, and curb lines.

5. All appurtenances, structures or equipment and any utilities that may be found to exist having any connection with this project that will assist the Contractor in properly evaluating the obstructions he will encounter when installing the project. Examples include:
   - Corrosion test stations, air release valve assemblies, drain valve assemblies, fire hydrants, all existing and future water main tie-overs, renewals, and abandonments,
   - Service taps, water meters, and water service lines,
   - Natural gas mains and gas services, gasoline lines,
   - Power and telephone poles to include lights and transformers,
   - Underground traffic signal loops, electric, telephone and television cables, fiber optics and conduits,
   - Sewers with base map number and manholes with invert elevations and house connection to sewer (if obtainable), and
   - Storm sewers.

6. Materials including fittings, valves, & appurtenances which shall be called out in a suitable area near their location on the drawing and boxed with a tapered leader to the location on the drawing. Call out shall include stationing, offset, quantities and sizes.

STA 10+23.84, 10’ RT
1 – 12” Gate Valve, B&C
1 – 45º Bend
Δ = 2º 30’ 15”, RT

   System modifications plans shall be stationed to the nearest foot followed by a plus/minus sign. Similar to: STA 10+24$\pm$; 10'$\pm$ RT.

7. Any utility proposed in the area of construction that will not be in place but will affect the water project installation and will be marked “Proposed.”

8. Sheet specific sections and details labeled as “Sheet Notes.”

   a. Any main to be abandoned will be marked with a boxed note showing the size, material, and “abandon” in various suitable locations. For example: The note shall be boxed with a tapered leader to the station location of the cut.

Sta. _____” “Cut and Plug Abandon existing 6” steel pipe” according to TW SD-350

   System modifications plans shall include within the boxed note a beginning station to ending station with a quantity of pipe to be abandoned. Reference shall be to Standard Detail W-350.

   b. Section arrows will be in the direction of the abandoned main.

9. Water main horizontal alignment design deflections.

STA 10+23.84, 10’ RT Horizontal Deflection $\Delta = 2^{o}$ 30’ 15”, RT

10. Match lines when more than one sheet is used.

11. Butterfly valve actuator stem placement south or west of main.

12. Call out box with pipe diameter lengths on each sheet, i.e.

Total 24” Pipe Material Length This Sheet = XXXX ft

B. <u>Profile View Content</u>

1. <u>All Pipe Widths</u>
   Two lines will depict all pipe widths (diameter).

2. <u>Thick Walled Pipe, Larger Than Forty-Eight Inches</u>
   The wall thickness will be drawn for thick walled pipelines (i.e., concrete cylinder pipe) larger than forty-eight inches in diameter.

3. <u>Profile Stationing</u>
   a. Negative stationing is not allowed.

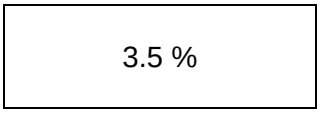
   b. Station labels are to read from left to right on the sheet. System modifications plans shall read the same as the paving and drainage plans of the agency's project plans.

c. Stationing shall begin at above ground, permanently identifiable survey points, such as section corners, ¼ corners, 1/8 corners, 1/16 corners, centerline intersections, or other acceptable survey monuments. System modifications plans shall use the same stationing as the agency's project plans.

d. The stations in a profile view must line up vertically with the stations in a plan view.

e. Grade breaks call outs shall be on the respective station.

f. Label the main profile slope between each profile grade break:



4. Material Call Outs
Material call outs, including fittings, valves, and appurtenances, shall include stationing, quantity, size, and invert or centerline elevations on the respective station.

2.5 Content Requirements, Section and Detail Plan Sheets

Section and detail sheets contain only project specific sections and details. Section and detail sheets can contain numerous project specific sections of top (plan) views and side (section) views and/or additional details that are not included as part of any department Standard Details.

Section and detail sheets provide a location to put any sections and details that may apply by reference to more than one sheet. This is in contrast to a section or detail that applies only to one specific plan sheet located on that sheet.

Section and detail sheets are usually created when it is determined necessary to clarify or make specific requirements on the construction item. These sheets shall be labeled as “Section and detail sheets.“

2.6 Content Requirements, Survey Control Plan Sheets

(Not required for system modifications plans. Agency project plans may include a Survey Control Plan Sheet)

The survey control sheets show the results of the field surveys performed during the design phase of the project. This information should be used during construction of the project and to include:

- Legend
- North arrow
- Abbreviations
- Signed Registered Land Surveyor seal

- Survey control line, right-of-way or easement lines, stations, bearings, length, bench marks, calculated and controls points, and streets
- Temporary project construction, utility, and private easements, including docket and page numbers
- For subdivisions, include Book and Page numbers
- Notes for basis of bearing and basis of elevation
- Survey data table: project title, prepared by name and date, control and calculated point numbers, northing, easting, elevations, and descriptions
- Curve data (curve number, delta, radius, arc, chord, tangent, etc.)
- Line data to include the line number, bearing, and distance
- Point files with points on CD converted to ASCII or .CR5 files and in Arizona State plane coordinates

2.7 Content Requirements, Landscape Plan Sheets

A. Landscape Plan Sheets

(Not required for system modifications plans)
If required by the Native Plant Preservation Ordinance, plan sheets shall meet all municipal or local jurisdiction requirements. In Pima County and the City of Tucson these include but are not limited to:

1. Pima County Native Plant Preservation Ordinance and resulting Procedures for the Issuance of Right-of-Way Permits and Regulations of Work Under Permit.

2. City of Tucson Development Standards:
   - No. 2-06.0, Landscaping and Screening
   - No. 2-07.0, Landscape Plan Content and Specification
   - No. 2-15.0, Native Plant Preservation
   - No. 9-06.0, Landscape Plant Materials

B. Landscape Sheets Signed and Sealed

Landscape sheets, including irrigation details, shall be included when they are a part of the project and shall be signed and sealed by a Registered Landscape Architect. Sheet types shall generally conform to these standards, such as:

1. Landscape Restoration Key Plan (Site Plan)

2. Landscape Restoration Template Sheets (Plan)

3. Irrigation Plan Sheets (Plan)

4. Sections & Details (Landscape and Irrigation)

8-07.3.0 Content Requirements, Standard Plan Sheets, Pipelines

This subsection contains the following major topics:

- Plan Sheet Content, Pipelines
- Profile Sheet Content, Pipelines
- Stationing, Pipelines

3.1 Plan Sheet Content, Pipelines

A. Protected Mains

All the requirements in Tucson Water Departmental Procedures, Protected Main Policy, No. IV.B.03, must be met. These include showing existing and proposed participating properties, the protected main, the water supply connection location, and each water service connection location.

B. Stationing

1. Alignment

Show stationing at each tie-in/connection location, valve, service connection, fire hydrant (at the tee), blow-off assembly, air relief valve, fitting, tee, horizontal deflection/ bend, corrosion test station, station equation, grade break, outlet, intersection centerline, etc.

2. Location - Intervals

Control survey lines and stationing shall be along street or right of way centerlines when there are no section lines; along quarter, half, and full section lines, or centerline of easements, when there are no streets.

3. Location - Other

Show stationing at 100-foot intervals along the survey control line, identified at every station.

C. Surveying

1. Scale

- horizontal scale shall be 1” = 40’
- vertical scale shall be 1”= 4’.

2. Surveying Services

Surveying services shall include identifying all physical obstructions which may influence the location of the new pipeline such as fences, curbs, sidewalks, street lighting, major vegetation, and traffic control devices; and locations and elevations at inverts of sanitary sewers, storm sewers and other similar underground structures where applicable.

The surveying services shall meet the following requirements:

a. All survey services will be performed by qualified Arizona registered land surveyors.

b. Field surveys shall be properly indexed and recorded in field book(s) and CDs. Showing all work performed in the field with the date, name of crewmembers, and type of equipment used.

c. The horizontal control shall meet Second Order, Class I standards. The control survey shall tie all existing survey monuments in cross streets within seventy-five feet of the control line. The final adjusted survey with all items shall be shown on a separate plat and be made a part of the final package of construction drawings.

3.2 Profile Sheet Content, Pipelines

A. Profiles Required

In addition to plan views, pipeline profile views are required for all pipelines twelve inches in diameter or larger.

At Tucson Water's request, pipeline profile views may be required:

1. for pipelines located in existing Pima County right-of-way

2. in hilly terrain to verify the proper location of blow off assemblies or air release and vacuum relief valves, and

3. for profiles to depict stream, railroad, highway crossings, drainage structures, and congested areas.

B. Survey Benchmarks

Survey benchmarks, relative to NAVD 88 datum only, shall be shown at 1,000-foot intervals/each design sheet. Profile stations will also be required at one hundred feet intervals and at all major street or wash crossings on all potable water mains.

The bench mark(s) that are the basis of each survey must be called out in the data disk or in the field book(s).

Benchmarks shall not exceed 1,000-foot intervals with supplemental elevation established on all survey monuments along the entire bench circuit. The control line shall be the center of street, section line, 1/4 section line, etc., when possible, with benchmarks on each sheet.

C. Restrained Joints

Show all restrained joints and required lengths in the profile view or in a properly labeled table.

D. Subgrade Elevation

In the profile view, show existing subgrade elevation directly or in proximity over pipe design alignment.

E. Stationing
Repeat the label information from the plan view in the profile view. Include the pipe invert elevation to the nearest hundredth of a foot, such as "INV. EL. 2,548.77." Include the steel pipe (concrete cylinder pipe and welded steel pipe) centerline/springline elevation to the nearest hundredth of foot, such as "CL. EL 2,548.77".

F. Slope
Show the slope of grade breaks in each pipe section to two decimal places, such as "+45.07%," calculated relative to the horizontal distance along the survey control line, not the true length of the pipe.

3.3 Stationing, Pipelines

A. Show stationing at each valve, service connection, fire hydrant (at the tee), blow-off assembly, horizontal and vertical fitting, tee, bend, grade break, outlet, and intersection centerline, etc.

B. Control survey line and stationing shall be along section line, 1/4 section line, or portions of section line, when possible, or along street or easements centerline, when no section lines are involved.

C. Show stationing at 100-foot intervals identified at every station.

8-07.4.0 Content Requirements, Water Plan Sheets, System Modifications

4.1 Formats and Layouts
Formats and layouts for system modifications plans shall follow the requirements of the Supplemental documents issued by Tucson Water.

4.2 Water System Information
Water system information shown on the system modification plans shall use, but not be limited to, these sources of information:

- available water records at Tucson Water,
- field surveys,
- water pot holes if required, and
- plan review comments from Tucson Water.

4.3 Water Plan Submittals
Water plan submittals to Tucson Water shall include all information related to producing an acceptable plan to Tucson Water and shall include, but not be limited to:

- Engineer's estimate of probable construction cost,
- special provisions for water work and
- other project documentation as may be required by Tucson Water.

4.4 Materials List

For system modifications projects, provide a materials list for items such as crosses, tees, bends, valves, fire hydrants, service connections, etc. If applicable, include a reference to a standard detail.

8-07.5.0 Drafting Requirements, Water Plan Sheets

This subsection contains the following major topics:

- Drafting Requirements, General
- Drafting Requirements, Plan Symbols, Pipelines

5.1 Drafting Requirements, General

A. Sheet Size

(Not applicable for system modifications plans. Sheet size shall be as required by the controlling agency.)

The drawings shall be on standard 24" x 36" (+/- 1/32 inch) Mylar or vellum sheets, or eighteen-pound translucent bond, including a minimum one-half inch margin. This standardizes material for more efficient record keeping and assures legibility when microfilmed.

B. Plan Symbols

See Exhibits 7-3A through 7-3D.

C. Lettering and Line Weights

The purpose of this requirement is to assure that all lettering is legible when reviewed and will maintain that legibility when reproduced and photographically reduced (microfilmed) for record-keeping purposes. See Exhibits 7-3A and 7-3D.

All lettering shall be clear, not congested, and readable when converted to half-size and microfilms size.

1. Lettering and dimensions size shall be equal to or greater than twelve point (0.125" to 0.12" or 3.175 mm to 3.048 mm). Letter line weight thickness shall be a minimum of 0.125" (3.175mm).

2. Line weight thickness shall be a minimum of 0.0075" (0.1905 mm).

3. Profile stationing numbers size shall be 0.1875" to 0.25" (4.7625 mm to 6.35 mm). Profile stationing numbers line weight thickness shall be 0.01969" to 0.125" (0.50 mm to 3.175mm).

4. Profile grid lines are: major grid solid line (100 foot horizontal and 10 foot vertical) weight is 0.0100, mid grid solid line (50 foot horizontal and 5 foot vertical) weight is 0.004, and minor grid dotted line (10 foot horizontal and 1 foot vertical) weight is 0.0004.

D. Engineering Scale

1. The Engineering scale on plan sheets shall have no more than forty feet to the inch, 1" = 40 feet (horizontal), 1" = 4 feet (vertical where applicable). The sheet index plan scale and location map (cover sheet) will vary depending on the scope of the project.

   This scale is the minimum for detailed information required to show compliance. It also affords greater clarity after photographic reduction (microfilming) for record keeping purposes.

2. The scale chosen must produce clearly legible, uncluttered drawings when microfilmed.

3. The scale chosen must have room for "record drawing" information that will be hand applied by the field inspector.

E. Cross-Hatching

1. Shading or "zip-a-tone" will not be accepted.

2. Intermittent cross-hatching shall show edge of pavement and shall be removed from behind all street names, dimensions, etc.

F. Location Format

The location of the following items applies to all sheets: See Exhibit 7-1A through Exhibit 7-1D. (System modifications plans may use the agency title block format.)

1. Project Title block, in the bottom right corner of the sheet.

2. PE seal, to the left of the project title block. On the cover sheet, it shall be located left of the approval signatures.

3. Tucson Water logo, in the upper portion of the PE seal block.

4. Sheet revision block, to the left of the PE seal block

5. Design Consultant's "logo," to the left of the Revision block.

6. Bluestake logo, left of the Revision block.

G. North Arrow

The north arrow shall point to the left or top of the sheet and shall never point to the bottom of the sheet. For system modifications plans, the system modifications sheets shall be oriented in the same direction as the paving and drainage plan sheets.

H. Plan Layout, Conventional
Conventional plan layout shall begin on the left-hand side of the top half of the sheet and continue on the left-hand side of the bottom half, with match lines and a note about where the continuation can be found. No more than two lines of layout shall be used per sheet.

I. Plan Layout
PipesThe plan layout shall be drawn in a manner such that all pipes shown in plan view to be shown in a profile view if it were required.

J. Main Dimensions
The mains will be dimensioned from the centerline of the street at least twice in each half of the street.

K. Pipelines Larger Than Thirty-Six Inches
For pipelines larger than thirty-six inches in diameter, two lines shall be drawn to depict pipe width in the plan view.

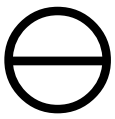
5.2 Drafting Requirements, Plan Symbols, Pipelines

A. Plan Symbols, Standard Details
Plan symbols used in the preparation of the water plan shall be according to the Pima Co. / City of Tucson Standard Details for Public Improvements, Detail No. 100 – Plan Symbols, 8 pages.

B. Allowable Exceptions
Allowable exceptions and additions are listed in Tucson Water SD-1850, Plan Symbols (2 pages), Standard Water Details section, Tucson Water Standard Specifications and Details.

C. Section Indicator or Detail Number Cross Referencing System
For the purposes of this subsection of this standard, a section is a cross-section, or imaginary cut or slice, through a pipe, structure or appurtenance that is illustrated on the same or another sheet. The section indicator cross-referencing system shall be:

1. A circle with a horizontal line through the center shall be the basic symbol for the section or detail cross-reference.



2. For the sheet on which the section is cut:

   a. In the upper half of the circle identify the section with a single letter.

b. In the lower half of the circle, the sheet page number on which the section appears shall be identified. If it is the same page, a dash (-) shall be used.

3. For the sheet on which the section appears:
   a. In the upper half of the circle identify the section with a single letter.

   b. In the lower half of the circle, the sheet page number on which the section is cut shall be identified. If it is the same page, a dash (-) shall be used.

   c. A descriptive name shall accompany the drawing.

4. The letters “I” and “O” are not to be used in section labels to avoid confusion with numbers.

5. The detail number cross-referencing system is identical to that described above, except that a number, not a letter, is used.

8-07.6.0 Exhibits

Exhibit 7-1, Plan Sheet
Exhibit 7-1A, Project Title Block
Exhibit 7-1B, Plan Sheet Title Block
Exhibit 7-1C, Logo Blocks
Exhibit 7-1D, Sheet Revision Block
Exhibit 7-2, Cover Sheet
Exhibit 7-2A, Signature Block
Exhibit 7-2B, Other Signatures Block
Exhibit 7-2C, Location Map
Exhibit 7-2D, As-Built (Record Drawing) Block
Exhibit 7-3A, Plan Symbols
Exhibit 7-3B, Plan Symbols
Exhibit 7-3C, Plan Symbols and Details
Exhibit 7-3D, Plan Symbols and Details
Exhibit 7-4A, Drafting, Water Mains
Exhibit 7-4B, Symbols, Water Mains
Exhibit 7-5A, Drafting, Gate Valves
Exhibit 7-5B, Symbols, Gate Valves
Exhibit 7-6A, Drafting, Butterfly Valves
Exhibit 7-6B, Symbols, Butterfly Valves
Exhibit 7-7A, Drafting, Tees and Crosses
Exhibit 7-7B, Symbols, Tees and Crosses
Exhibit 7-8A, Drafting, Bends
Exhibit 7-8B, Symbols, Bends
Exhibit 7-9, Drafting, Rotated Bends
Exhibit 7-10, General Construction Notes, New Development
Exhibit 7-11, General Construction Notes, System Modifications

Exhibit 7-1, Plan Sheet

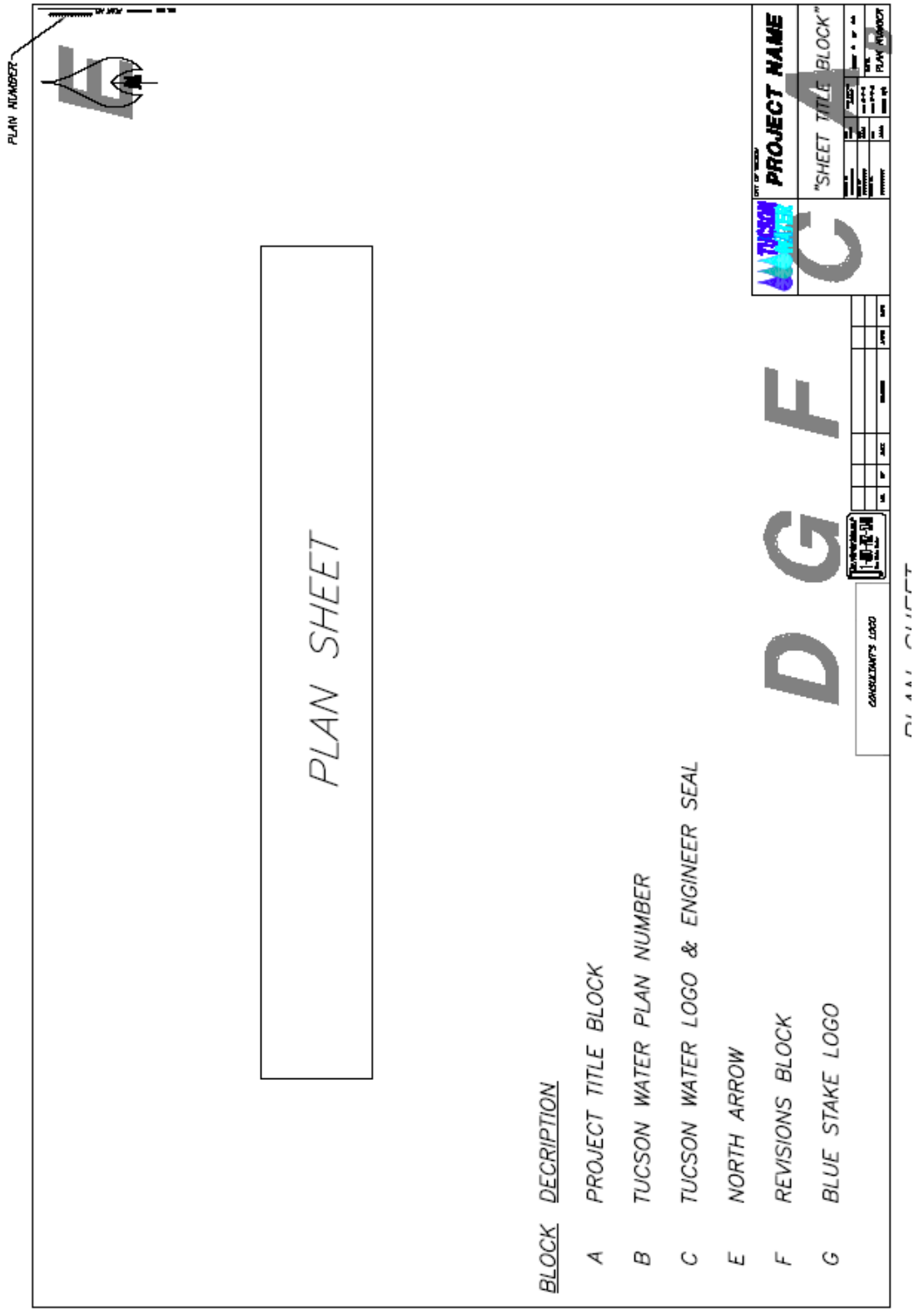


Exhibit 7-1A, Project Title Block

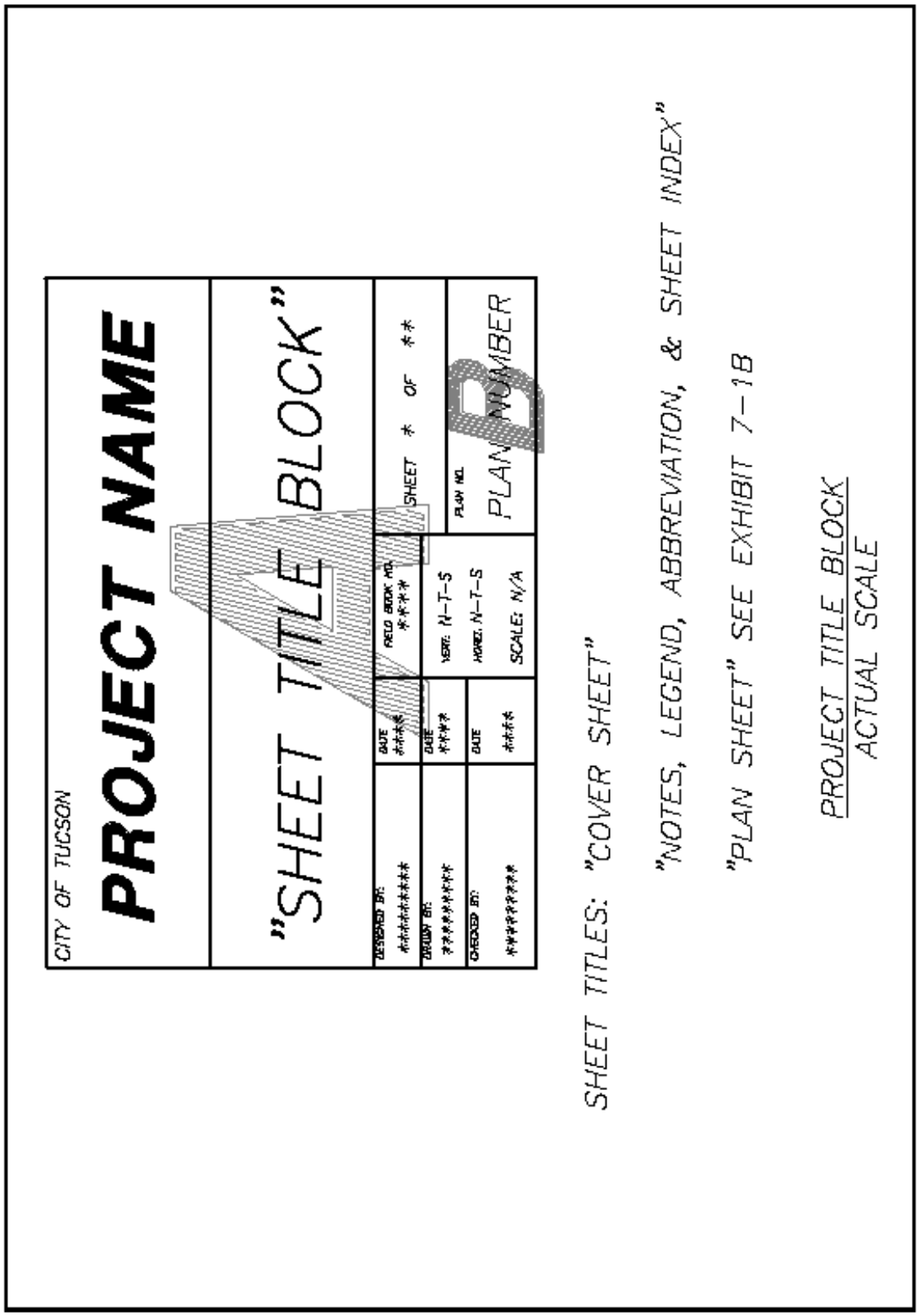


Exhibit 7-1B, Plan Sheet Title Block

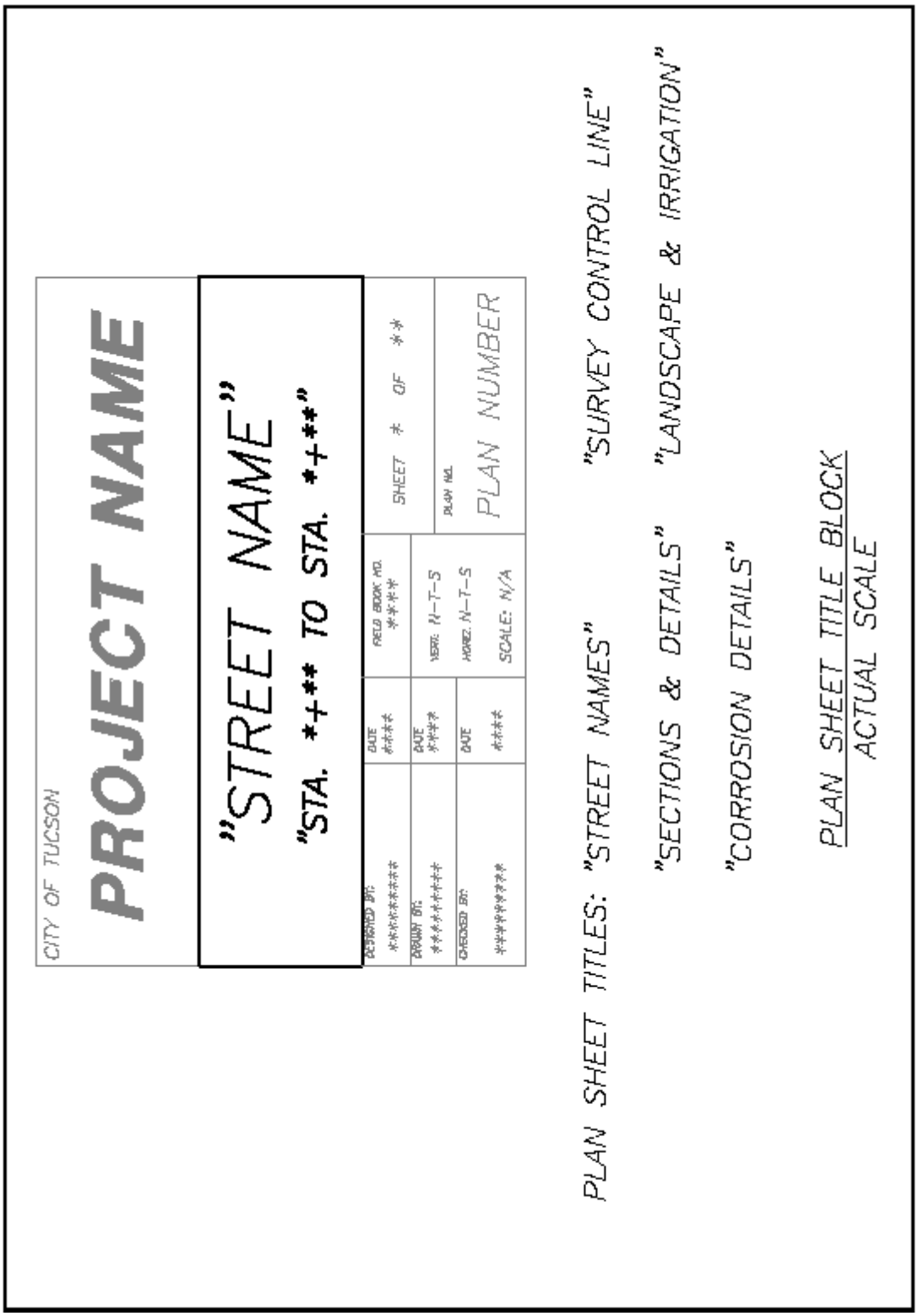


Exhibit 7-1C, Logo Blocks

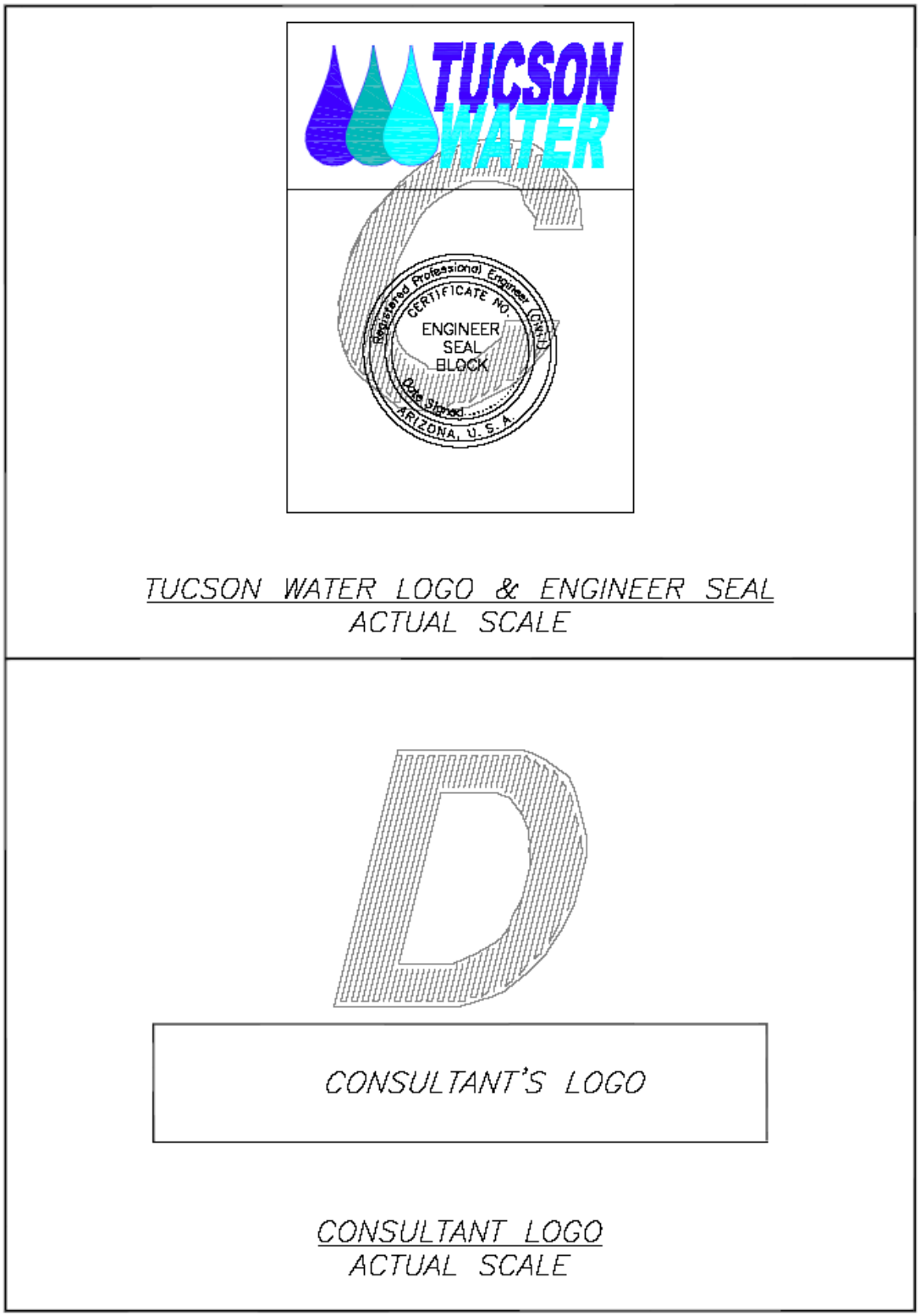
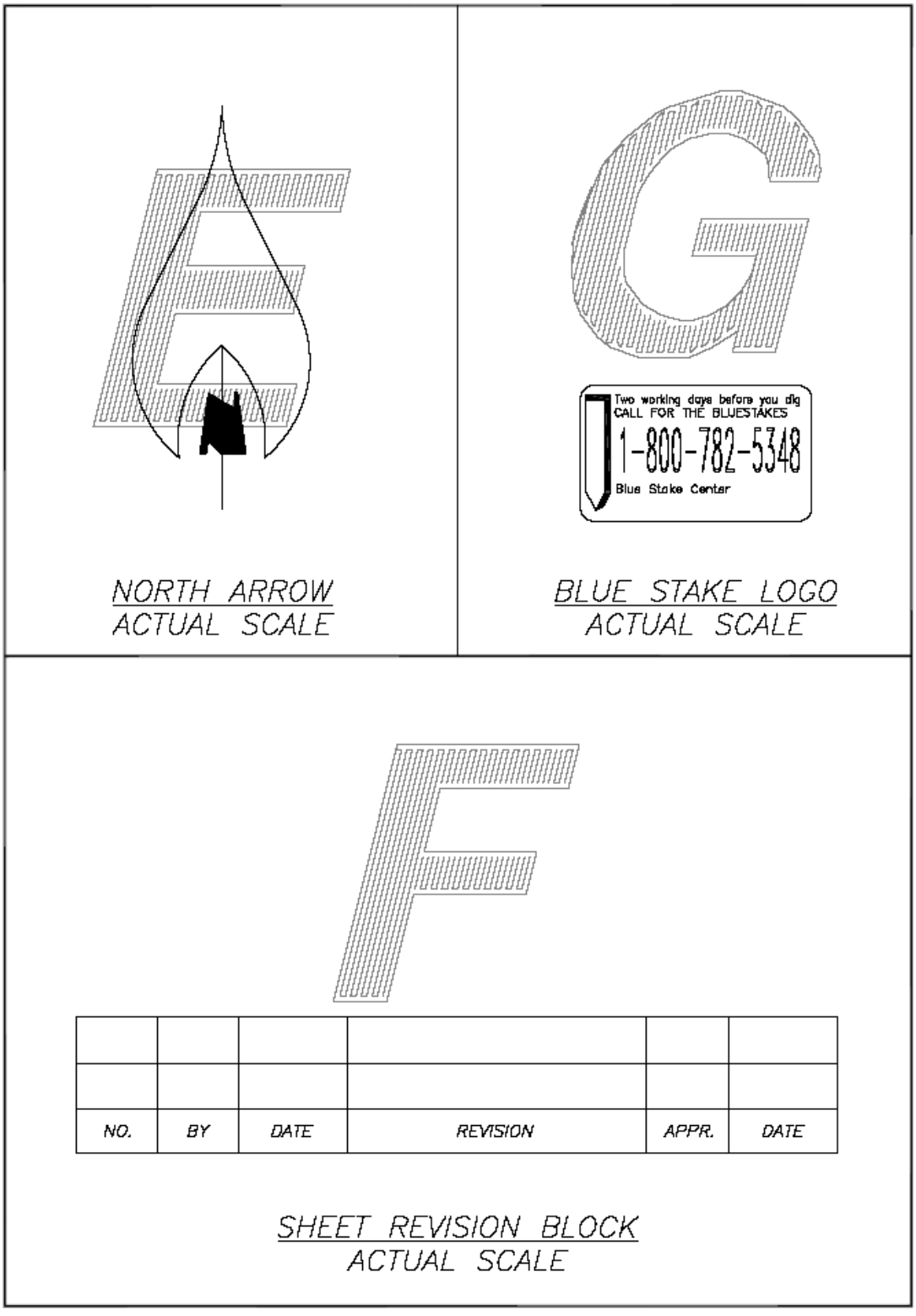


Exhibit 7-1D, Sheet Revision Block



NORTH ARROW
ACTUAL SCALE

BLUE STAKE LOGO
ACTUAL SCALE

SHEET REVISION BLOCK
ACTUAL SCALE

Exhibit 7-2, Cover Sheet

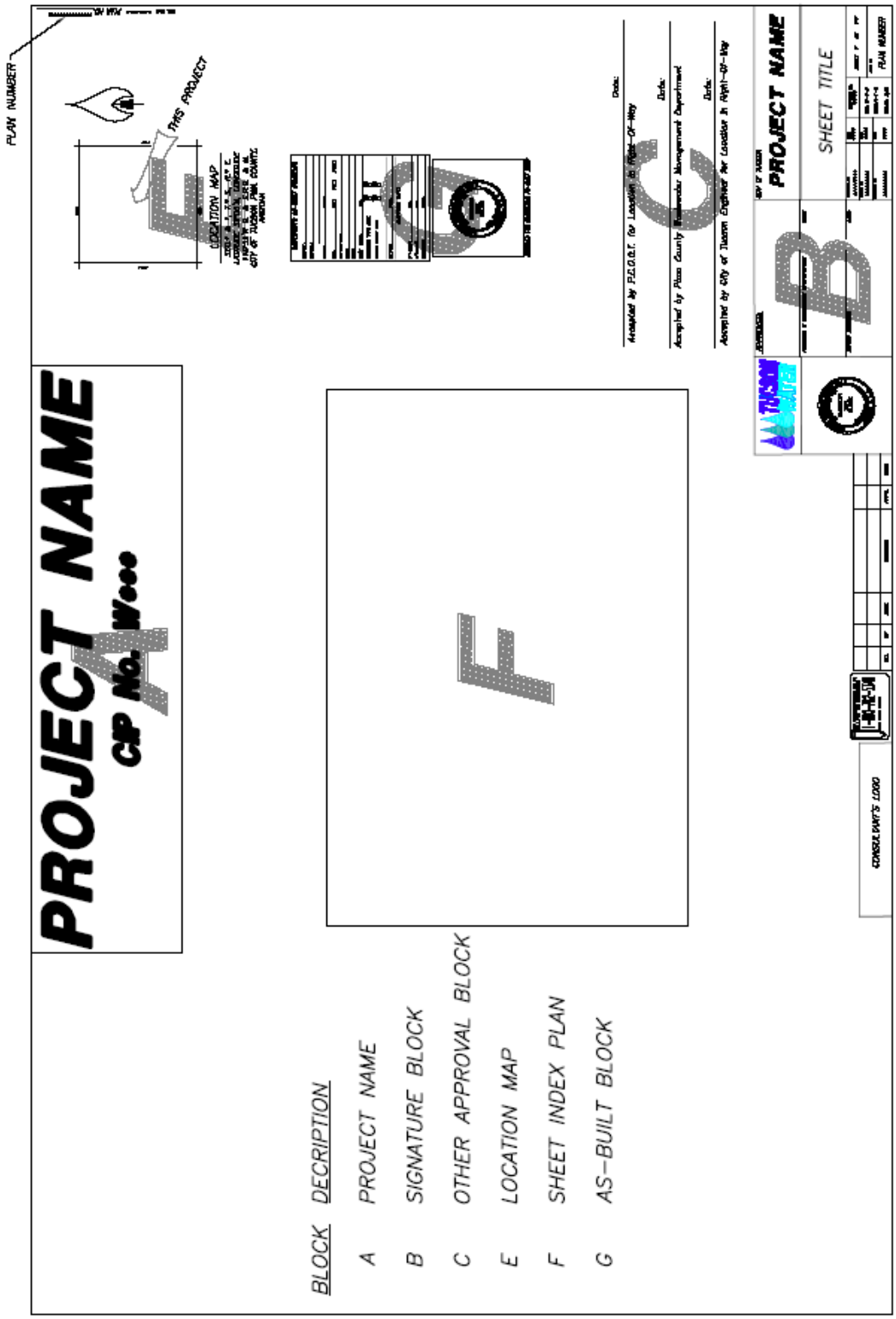


Exhibit 7-2A, Signature Block

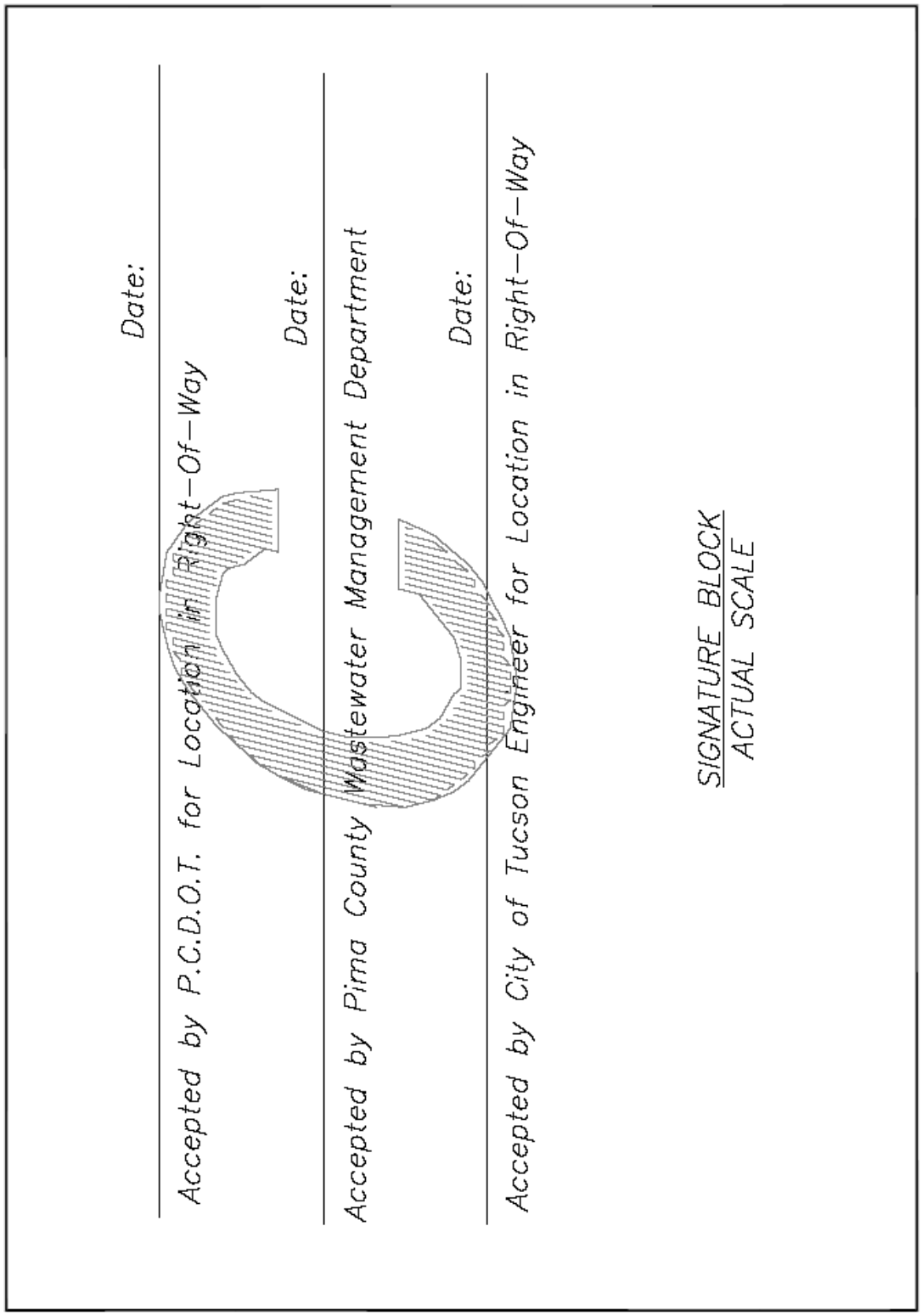
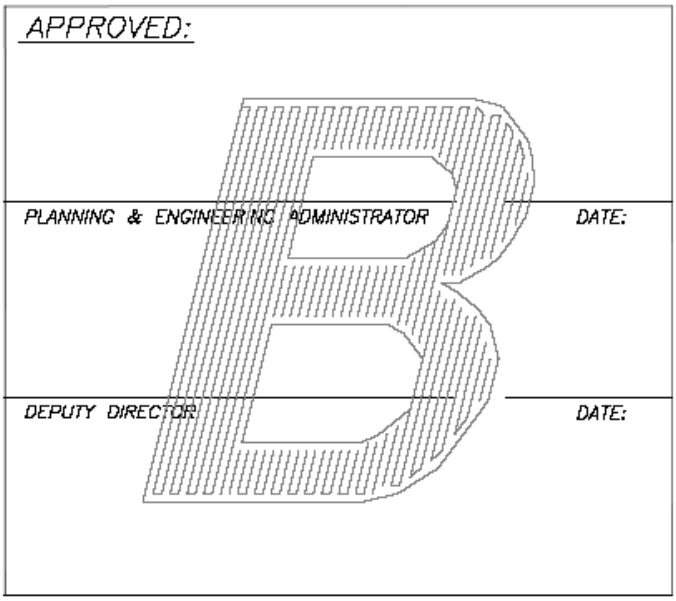


Exhibit 7-2B, Other Signatures Block



OTHER SIGNATURES
ACTUAL SCALE

Exhibit 7-2C, Location Map

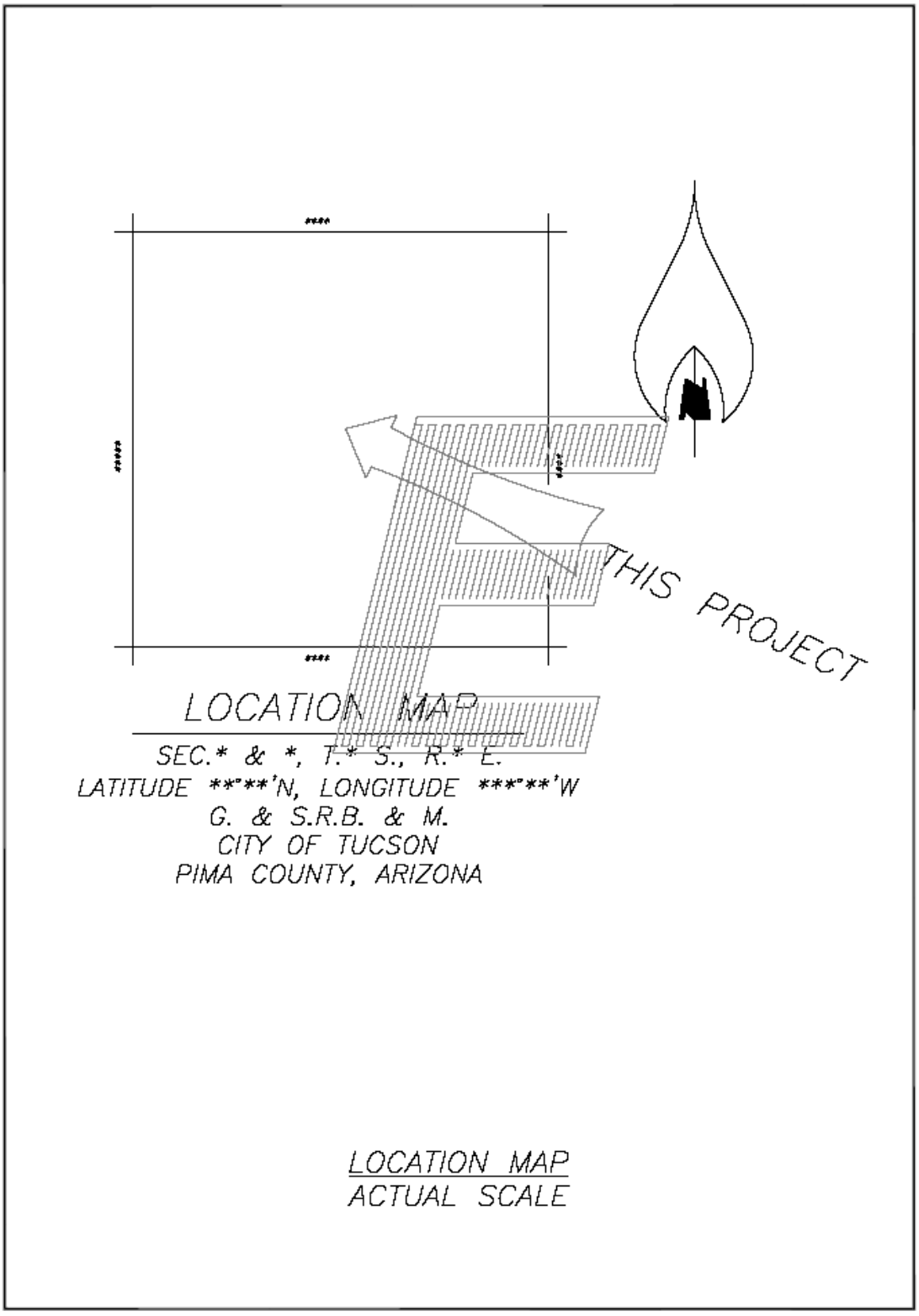
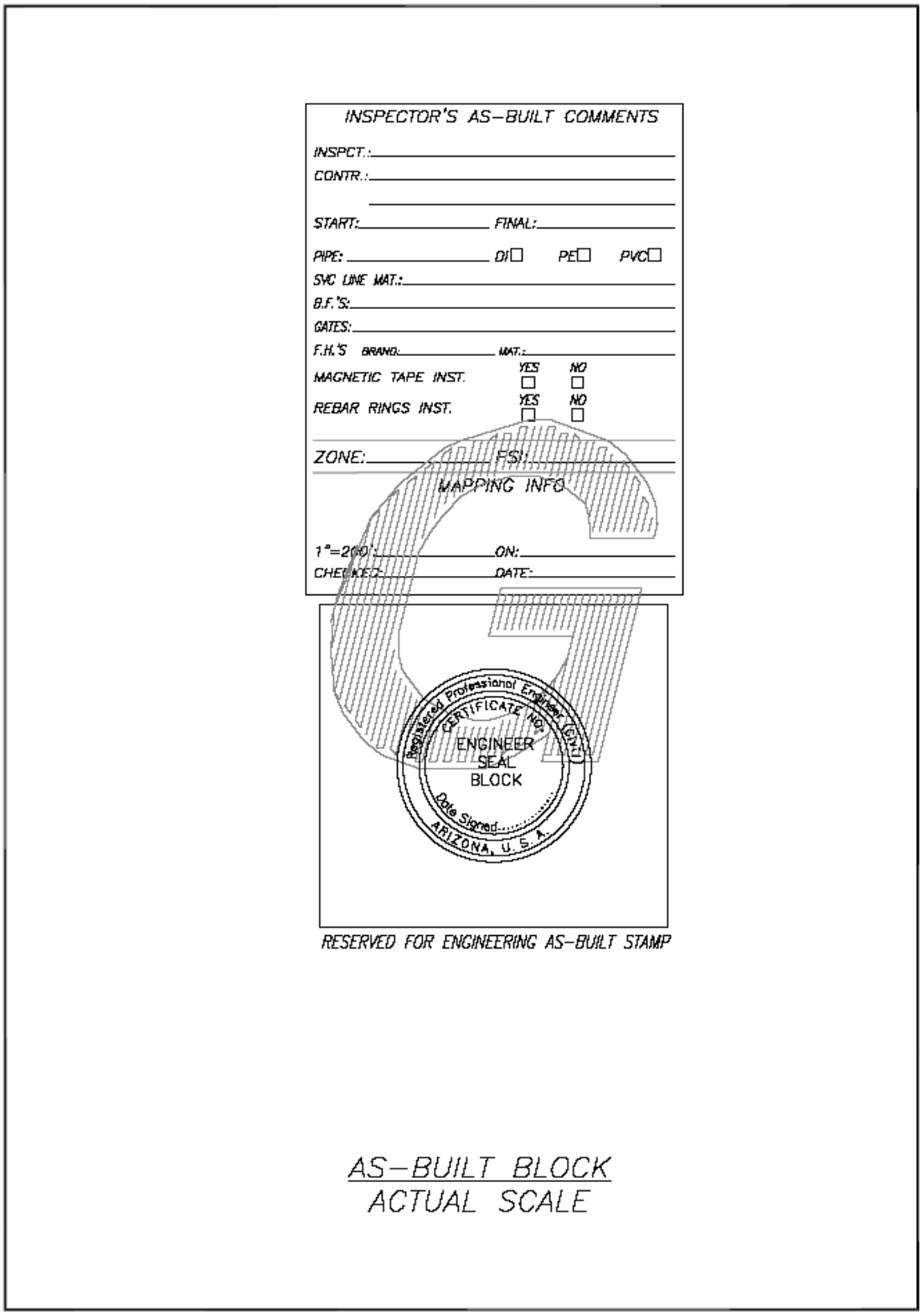


Exhibit 7-2D, As-Built (Record Drawing) Block



AS-BUILT BLOCK
ACTUAL SCALE

Exhibit 7-3A, Plan Symbols

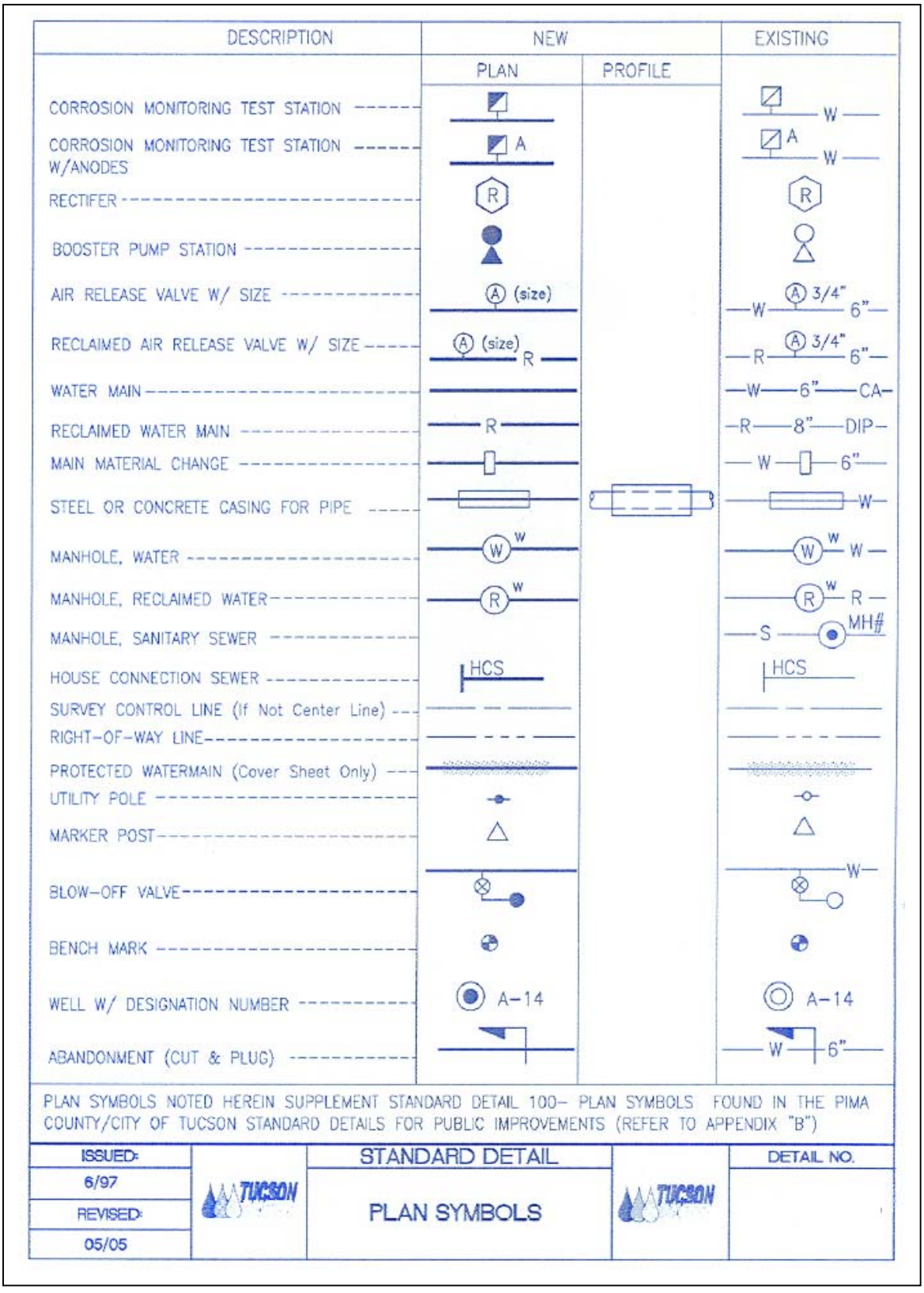


Exhibit 7-3B, Plan Symbols

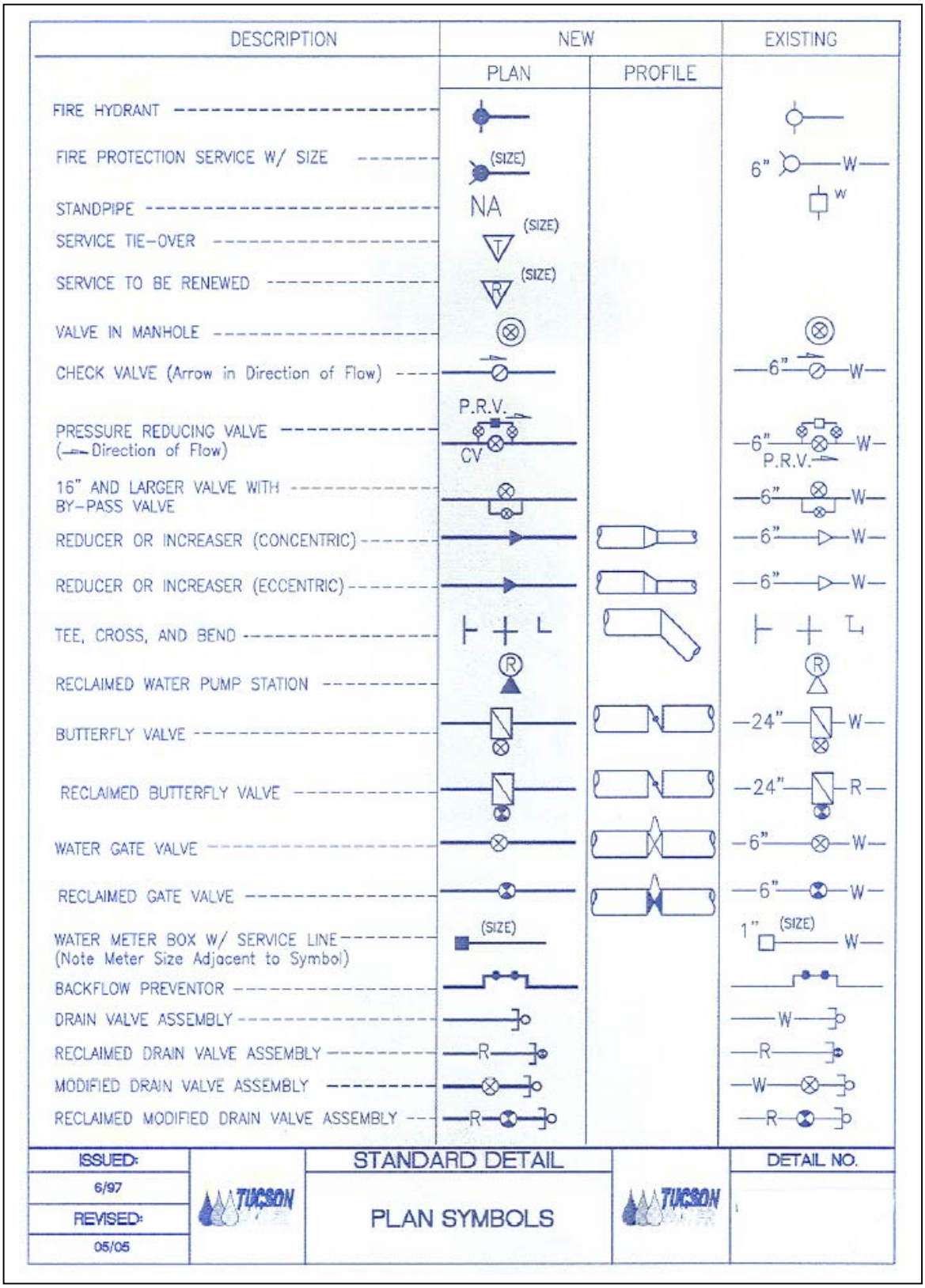


Exhibit 7-3C, Plan Symbols and Details

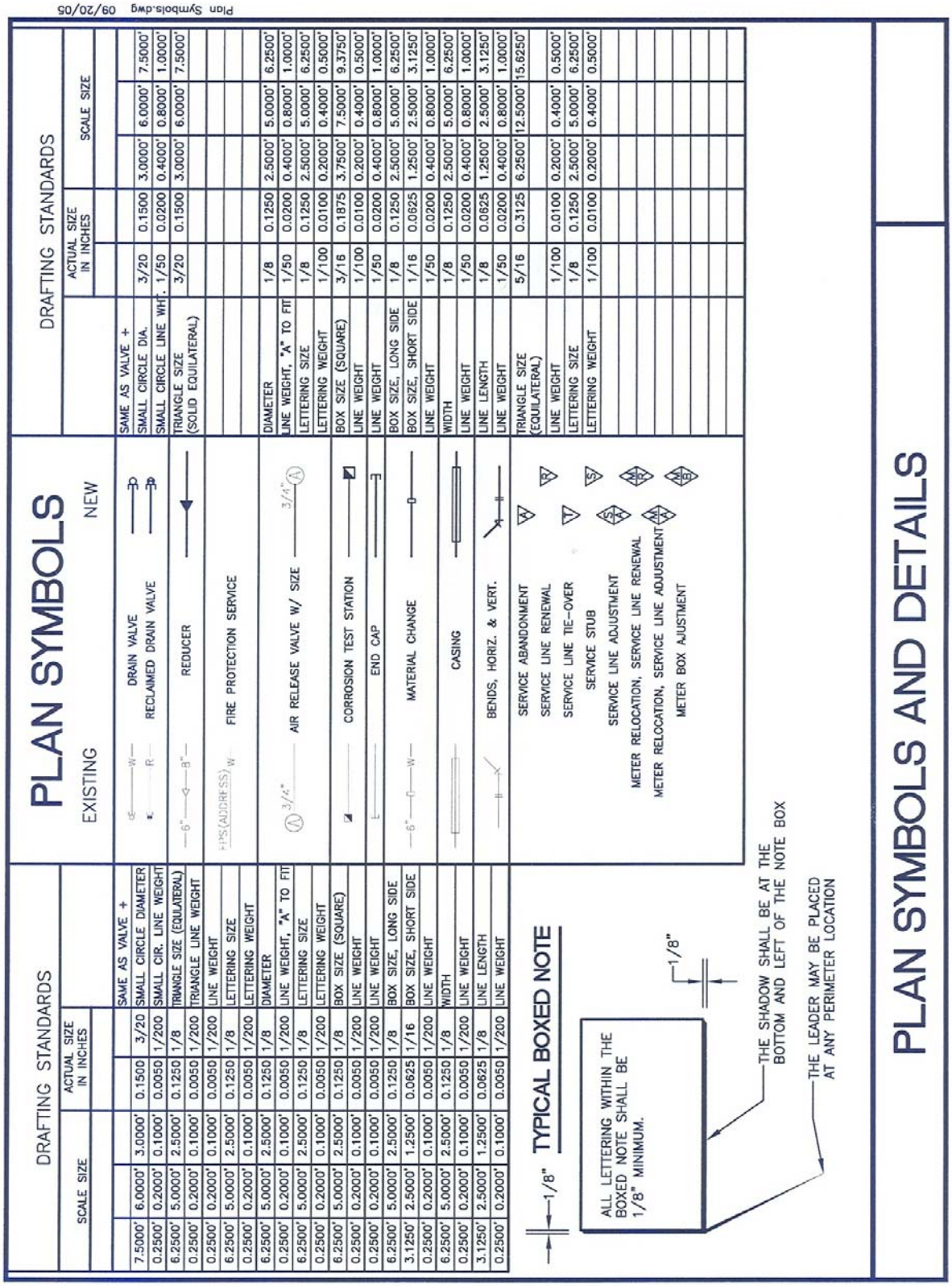


Exhibit 7-3D, Plan Symbols and Details

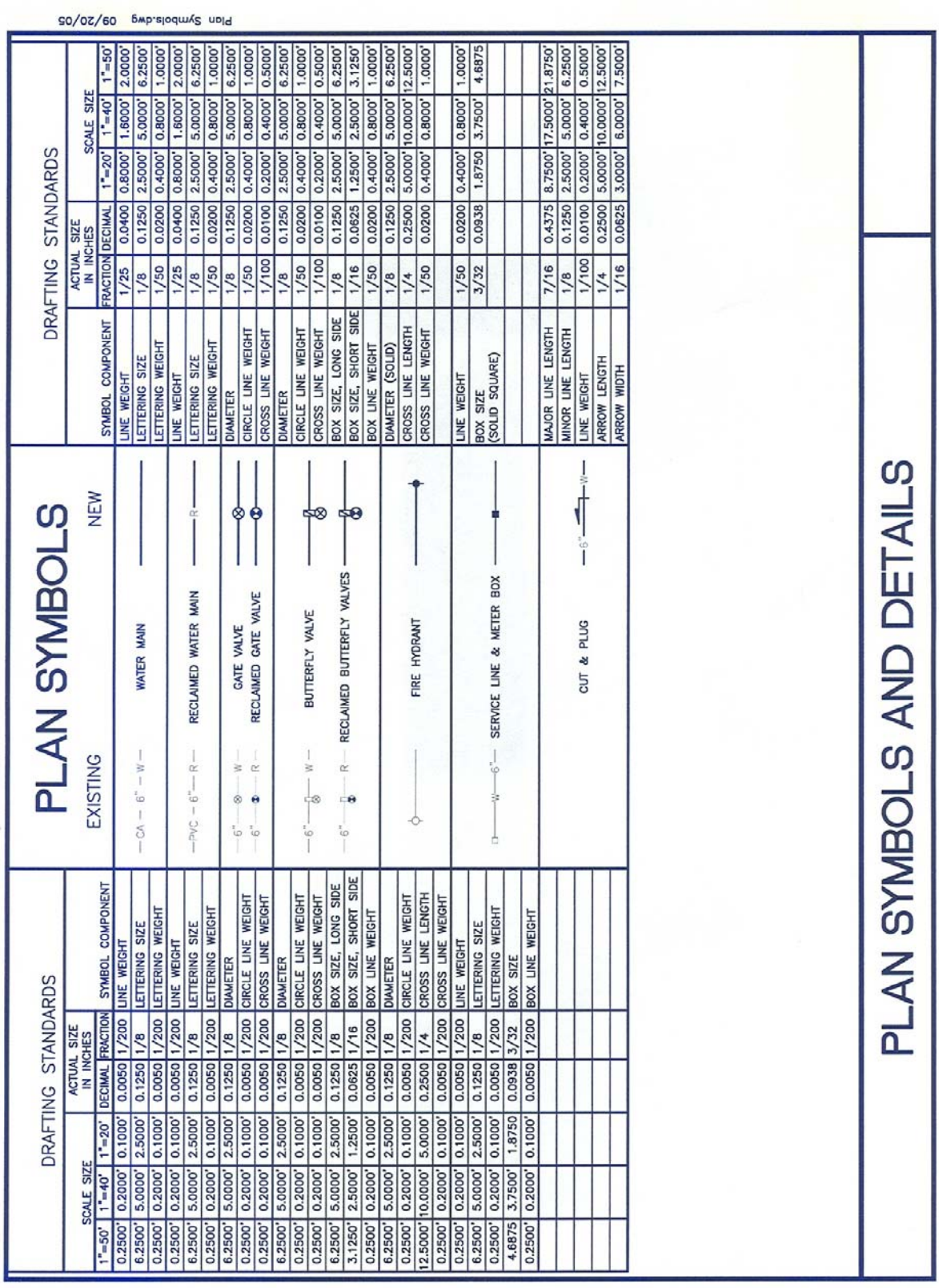


Exhibit 7-4A, Drafting, Water Mains

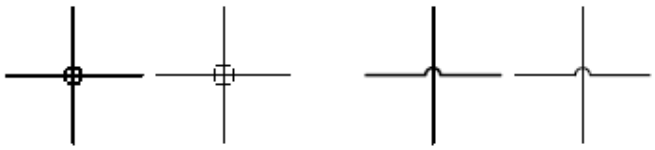
WATER MAINS

DESIGN USAGE

WATER MAINS ARE OF VARIOUS MATERIALS DEPENDING ON THE SIZE, LOCATION AND FIELD CONDITIONS.

DRAFTING CONVENTIONS

ALL MAINS ARE SHOWN IN PLAN AS A SINGLE LINE. IN PROFILE WATER MAINS ARE SHOWN AS TWO PARALLEL LINES SPACED ACCORDING TO THEIR SIZE.



CONNECTED NOT CONNECTED

PARTIAL LIST OF PIPE MATERIAL ABBREVIATIONS

CA	CEMENT ASBESTOS	GALV	GALVANIZED
CC	CONCRETE CYLINDER	PE	POLYETHYLENE
CI	CAST IRON	PVC	POLYVINYL CHLORIDE
DI	DUCTILE IRON	STL	STEEL

DESIGN AND DRAFTING STANDARDS

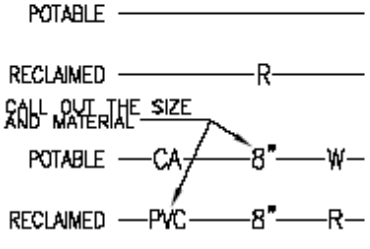
Sym-Water-Mains.dwg 11/16/04

Exhibit 7-4B, Symbols, Water Mains

WATER MAINS

DESIGN DRAFTING DRAWING SYMBOLS

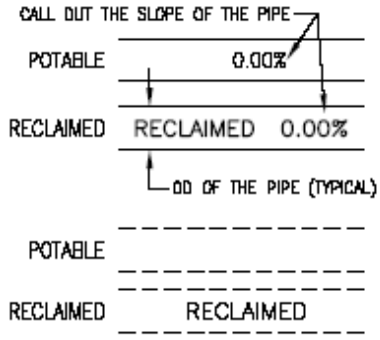
PLAN



	ACTUAL SIZE IN INCHES		SCALE SIZE		
NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE WEIGHT	1/25	0.0400	0.8000	1.6000	2.0000
LETTERING SIZE	1/8	0.1250	2.5000	5.0000	6.2500
LETTERING WEIGHT	1/50	0.0200	0.0400	0.0800	1.0000

EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE WEIGHT	1/200	0.0050	0.1000	5.0000	6.2500
LETTERING SIZE	1/8	0.1250	2.5000	5.0000	6.2500
LETTERING WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

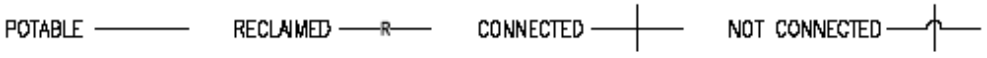
PROFILE



	ACTUAL SIZE IN INCHES		SCALE SIZE		
NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE WEIGHT	1/25	0.0400	0.8000	1.6000	2.0000
LETTERING SIZE	1/8	0.1250	2.5000	5.0000	6.2500
LETTERING WEIGHT	1/50	0.0200	0.0400	0.0800	1.0000

EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
DASH LENGTH	1/10	0.1000	2.0000	4.0000	5.0000
SPACE BETWEEN DASHES	1/20	0.0500	1.0000	2.0000	0.2500
LETTERING SIZE	1/8	0.1250	2.5000	5.0000	6.2500
LETTERING WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

QUARTER SECTION VALVE MAP SYMBOLS



DESIGN AND DRAFTING STANDARDS

Sym-Water-Mains.dwg 11/16/04

Exhibit 7-5A, Drafting, Gate Valves

VALVES, GATE

DESIGN USAGE

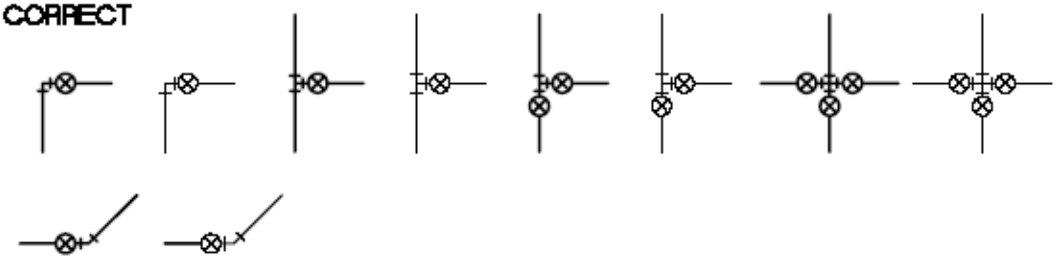
GATE VALVES ARE DEVICES TO CONTROL THE FLOW OF WATER THROUGH A WATER MAIN. THEY MOST OFTEN OCCUR NEXT TO OR NEAR A TEE OR CROSS. GATE VALVES ARE CURRENTLY USED IN 16" AND SMALLER WATER MAINS.

THEY ARE CALLED OUT ON CONSTRUCTION PLANS IN BOXED NOTES WITH A SIZE AND THE NOTE B&C. THE B&C REFERS TO THE BOX AND COVER. IF ONLY THE EXISTING SURFACE IS TO BE CHANGED, ONLY THE BOX AND COVER MAY NEED TO BE ADJUSTED TO FINISHED GRADE. SEE PAGE X-X FOR SUPPLEMENTAL DETAILS FOR RAISING VALVE BOXES.

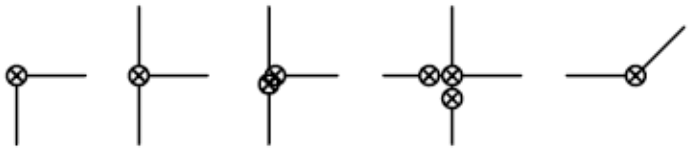
DRAFTING CONVENTIONS

IF VALVES ARE NEXT TO A TEE OR CROSS, EACH VALVE SHOULD BE DRAWN TO ILLUSTRATE THE WATER MAIN IT CONTROLS. EACH VALVE SHOULD BE DRAWN DISTINCT FROM ANY ADJACENT FITTINGS OR VALVES. EXAMPLES OF CORRECT AND INCORRECT DEPICTIONS ARE SHOWN BELOW.

CORRECT



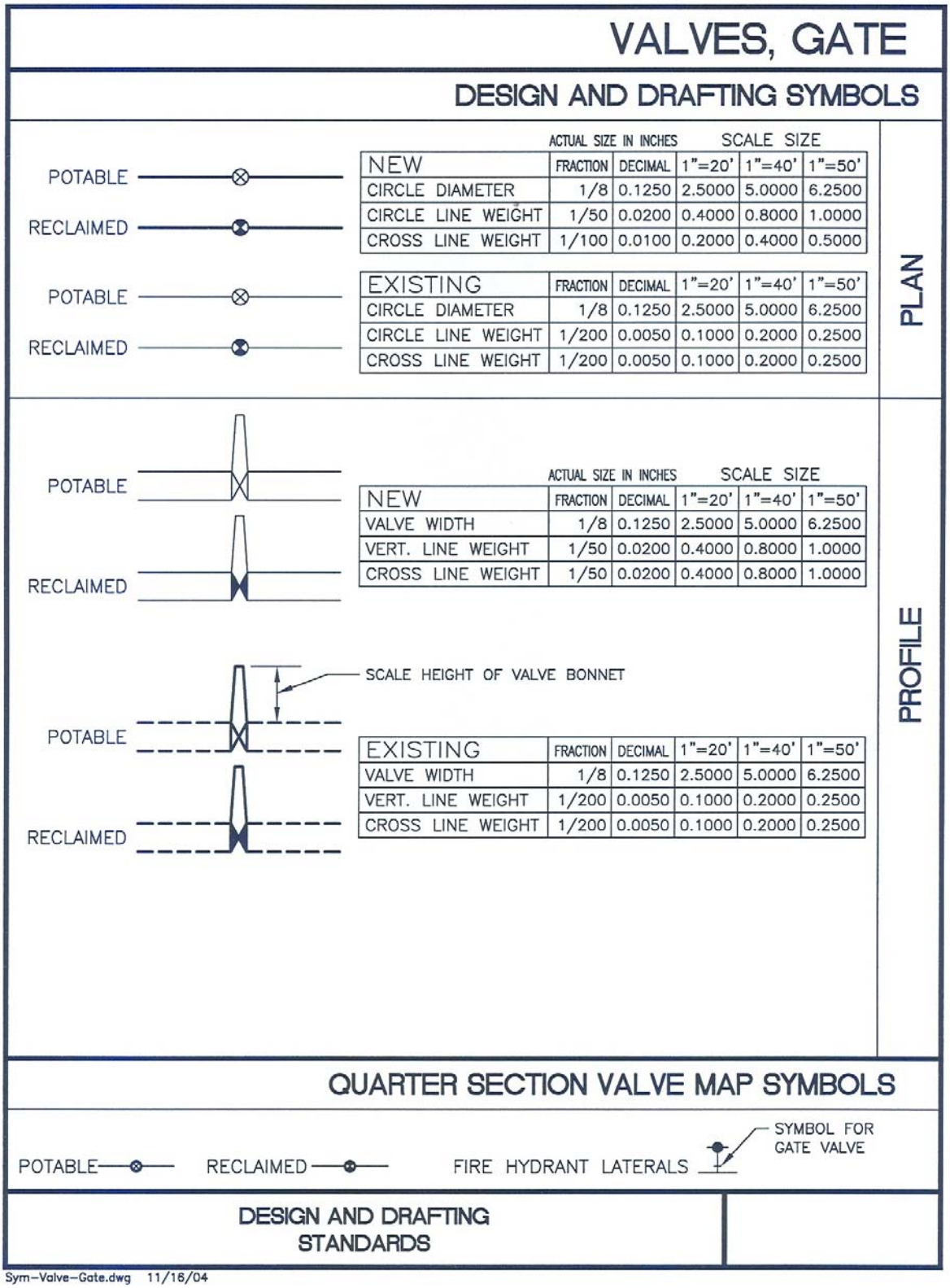
INCORRECT



DESIGN AND DRAFTING STANDARDS

Sym-Valve-Gate.dwg 11/16/04

Exhibit 7-5B, Symbols, Gate Valves



	ACTUAL SIZE IN INCHES		SCALE SIZE		
NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
CIRCLE DIAMETER	1/8	0.1250	2.5000	5.0000	6.2500
CIRCLE LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000
CROSS LINE WEIGHT	1/100	0.0100	0.2000	0.4000	0.5000

EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
CIRCLE DIAMETER	1/8	0.1250	2.5000	5.0000	6.2500
CIRCLE LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
CROSS LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

	ACTUAL SIZE IN INCHES		SCALE SIZE		
NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
VALVE WIDTH	1/8	0.1250	2.5000	5.0000	6.2500
VERT. LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000
CROSS LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000

EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
VALVE WIDTH	1/8	0.1250	2.5000	5.0000	6.2500
VERT. LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
CROSS LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

Exhibit 7-6A, Drafting, Butterfly Valves

VALVES, BUTTERFLY

DESIGN USAGE

BUTTERFLY VALVES ARE DEVICES TO CONTROL THE FLOW OF WATER THROUGH A WATER MAIN. THEY MOST OFTEN OCCUR NEXT TO OR NEAR A TEE OR CROSS. IN OLDER SMALL DIAMETER MAINS, I.E. 12" AND SMALLER, THEY WERE OFTEN USED WHEN THE DEPTH WAS SHALLOW. BUTTERFLY VALVES ARE CURRENTLY USED ONLY IN LARGE DIAMETER MAINS, I.E. 24" AND LARGER.

THEY ARE CALLED OUT ON CONSTRUCTION PLANS WITH A SIZE AND THE NOTE B&C. THE B&C REFERS TO THE BOX AND COVER. IF ONLY THE EXISTING SURFACE IS TO BE CHANGED ONLY THE BOX AND COVER MAY NEED TO BE ADJUSTED TO FINISHED GRADE. SEE PAGE X-X FOR SUPP.EMENTAL DETAILS FOR RAISING VALVE BOXES.

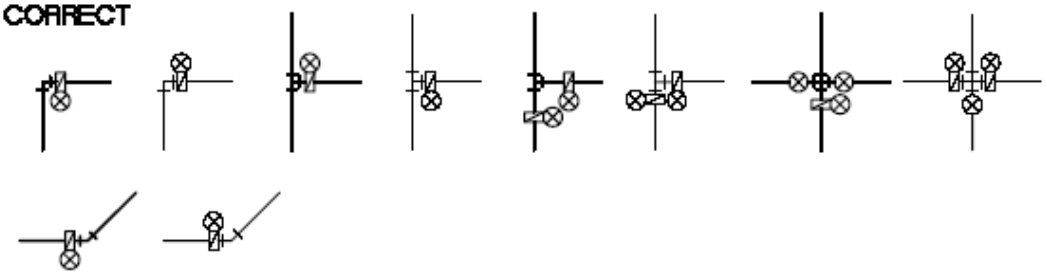
DRAFTING CONVENTIONS

IF VALVES ARE NEXT TO A TEE OR CROSS, EACH VALVE SHOULD BE DRAWN TO ILLUSTRATE THE WATER MAIN IT CONTROLS. THE ORIENTATION OF THE OPERATOR NUT SHOWN ON THE PLAN SHOULD RELFECT THE ACTUAL INSTALLATION OF EXISTING VALVES AND DIRECT THE INSTALLATION OF NEW VALVES. EACH VALVE SHOULD BE DRAWN DISTINCT FROM ANY ADJACENT FITTINGS OR VALVES.

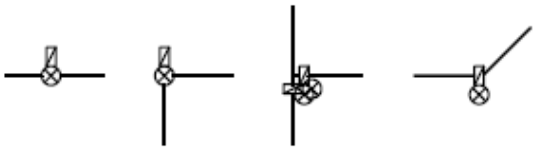
VALVES MAY NOT ALWAYS BE DRAWN AT THEIR EXACT STATION. CONSIDERATIONS MUST BE GIVEN FOR CLAIRITY WHEN PLOTTING NEW AND EXISTING VALVES. VALVE ACTUATOR STEM PLACEMENT SHALL FOLLOW THE SOUTH OF THE MAIN AND WEST OF MAIN LOCATION CONVENTION.

EXAMPLES OF CORRECT AND INCORRECT DEPICTIONS ARE SHOWN BELOW.

CORRECT



INCORRECT



DESIGN AND DRAFTING STANDARDS

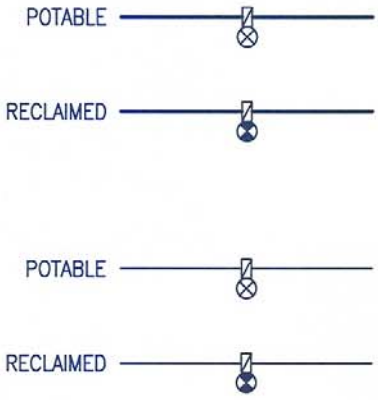
Sym-Valves-Butterfly.dwg 11/15/04

Exhibit 7-6B, Symbols, Butterfly Valves

VALVES, BUTTERFLY

DESIGN AND DRAFTING SYMBOLS

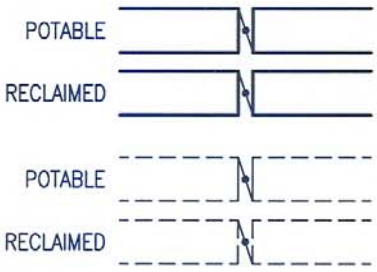
PLAN



NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
	ACTUAL SIZE IN INCHES		SCALE SIZE		
CIRCLE DIAMETER	1/8	0.1250	2.5000	5.0000	6.2500
CIRCLE LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000
CROSS LINE WEIGHT	1/100	0.0100	0.2000	0.4000	0.5000
BOX SIZE, LONG SIDE	1/8	0.1250	2.5000	5.0000	6.2500
BOX SIZE, SHORT SIDE	1/16	0.0625	1.2500	2.5000	3.1250
BOX LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000

EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
CIRCLE DIAMETER	1/8	0.1250	2.5000	5.0000	6.2500
CIRCLE LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
CROSS LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
BOX SIZE, LONG SIDE	1/8	0.1250	2.5000	5.0000	6.2500
BOX SIZE, SHORT SIDE	1/16	0.0625	1.2500	2.5000	3.1250
BOX LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

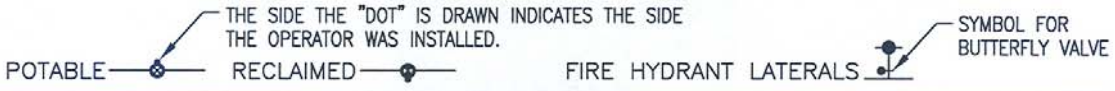
PROFILE



NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
	ACTUAL SIZE IN INCHES		SCALE SIZE		
VALVE WIDTH	1/8	0.1250	2.5000	5.0000	6.2500
VERTICAL LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000
CROSS LINE WEIGHT	1/50	0.0200	0.4000	0.8000	1.0000

EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
VALVE WIDTH	1/8	0.1250	2.5000	5.0000	6.2500
VERT. LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
CROSS LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

QUARTER SECTION VALVE MAP SYMBOLS



DESIGN AND DRAFTING STANDARDS

Sym-Valves-Butterfly.dwg 11/16/04

Exhibit 7-7A, Drafting, Tees and Crosses

TEES + CROSSES

DESIGN USAGE

TEES AND CROSSES ARE FITTINGS TO ADD OUTLETS TO A PIPE. THESE FITTINGS ARE MANUFACTURED FROM DUCTILE IRON (DI) FOR POLYVINYL (PVC) AND DI PIPE. THE WATER DEPARTMENT ONLY USES MANUFACTURED TEES AND CROSSES THAT INTERSECT AT 90° FOR PVC AND DI PIPE. THE "BRANCH" OF ANY TEE MAY NOT BE LARGER THAN THE "RUN" OF THE TEE.

TEES AND CROSSES FOR CONCRETE CYLINDER PIPE (CCP) ARE FABRICATED AS REQUIRED AND MAY BE ANY DEGREE OF INTERSECTION THAT MAY BE REQUIRED.

DRAFTING CONVENTIONS

EACH FITTING SHOULD BE DRAWN DISTINCT FROM ANY ADJACENT FITTING OR VALVE.

TEES AND CROSSES MAY NOT ALWAYS BE DRAWN AT THEIR EXACT STATION. CONSIDERATIONS MUST BE GIVEN FOR CLARITY WHEN PLOTTING NEW AND EXISTING FITTINGS.

DESIGN AND DRAFTING
STANDARDS

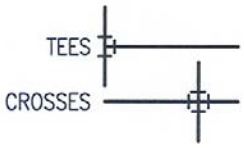
Exhibit 7-7B, Symbols, Tees and Crosses

TEES + CROSSES

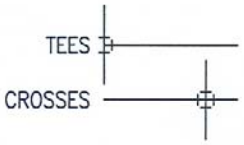
DESIGN AND DRAFTING SYMBOLS

PLAN

SYMBOLS ARE THE SAME FOR BOTH POTABLE AND RECLAIMED

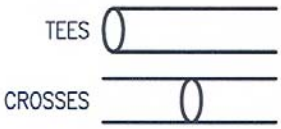


	ACTUAL SIZE IN INCHES		SCALE SIZE		
NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE LENGTH	8/100	0.0800	1.6000	3.2000	4.0000
LINE WEIGHT	1/100	0.0100	0.2000	0.4000	0.5000
SPACING FROM INTERSECTION	1/16	0.0625	1.2500	2.5000	3.1250

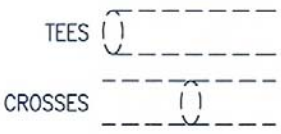


EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE LENGTH	1/16	0.0625	1.2500	2.5000	3.1250
LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
SPACING FROM INTERSECTION	1/20	0.0500	1.0000	2.0000	2.5000

PROFILE



	ACTUAL SIZE IN INCHES		SCALE SIZE		
NEW	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
ELLIPSE LINE WEIGHT	1/100	0.0100	0.2000	0.4000	0.5000
ELLIPSE WIDTH	1/8	0.1250	2.5000	5.0000	6.2500
ELLIPSE HEIGHT SHALL BE EQUAL TO THE PIPE SIZE					



EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
ELLIPSE LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
ELLIPSE WIDTH	1/8	0.1250	2.5000	5.0000	6.2500
ELLIPSE HEIGHT SHALL BE EQUAL TO THE PIPE SIZE					

QUARTER SECTION VALVE MAP SYMBOLS

NO SYMBOLS FOR TEES OR CROSSES ARE USED IN THE QUARTER SECTION VALVE MAPS

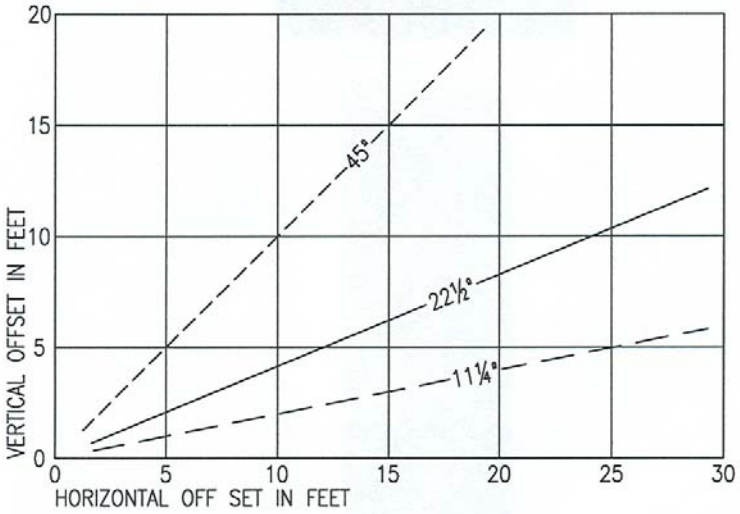
DESIGN AND DRAFTING STANDARDS

Exhibit 7-8A, Drafting, Bends

BENDS

DESIGN USAGE

BENDS ARE FITTINGS USED TO CHANGE THE DIRECTION OF PIPE. MANUFACTURED BENDS ARE USED FOR DUCTILE IRON (DI) AND POLYVINYL (PVC) PIPE. THESE BENDS ARE AVAILABLE IN 90°, 45°, 22½° AND 11¼°. BENDS FOR CONCRETE CYLINDER PIPE (CCP), AND WELDED STEEL PIPE (WSP) ARE FABRICATED AS REQUIRED AND ARE AVAILABLE IN ANY DEGREE OF BEND REQUIRED.



45° BENDS MAY BE USED IN PAIRS FOR VERTICAL OFFSETS GREATER THAN TWO FEET (2') WHERE THE AVAILABLE RUN LENGTH IS LIMITED.

22½° BENDS MAY BE USED IN PAIRS FOR VERTICAL OFFSETS GREATER THAN ONE FOOT (1'). PAIRS OF THIS DEGREE BEND ARE THE MOST COMMON AND DESIRABLE.

11¼° BENDS ARE NOT NORMALLY USED FOR VERTICAL OFFSETS. THEY MAY BE USED IN SERIES TO CREATE A LARGE RADIUS OF IN COMBINATION WITH OTHER BENDS TO FORM NON STANDARD ANGLES.

DRAFTING CONVENTIONS

EACH BEND SHOULD BE DRAWN DISTINCT FROM ANY ADJACENT FITTINGS OR VALVES.

BENDS MAY NOT ALWAYS BE DRAWN AT THEIR EXACT STATION. CONSIDERATIONS MUST BE GIVEN FOR CLARITY WHEN PLOTTING NEW AND EXISTING BENDS.

WHEN BENDS ARE "ROTATED", I.E. INSTALLED IN SO THE DIRECTION CHANGE IS NOT VERTCAL, THEY SHALL BE SHOWN IN PROFILE AS A HORIZONTAL BEND WITH A VERTICAL LINE AT THE STATION OF THE BEND.

DESIGN AND DRAFTING STANDARDS	

Sym–Bends.dwg 11/16/04

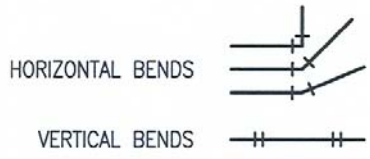
Exhibit 7-8B, Symbols, Bends

BENDS

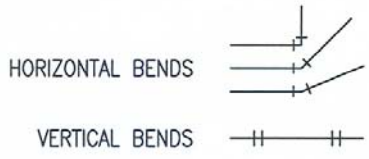
DESIGN DRAFTING SYMBOLS

PLAN

SYMBOLS ARE THE SAME FOR BOTH POTABLE AND RECLAIMED

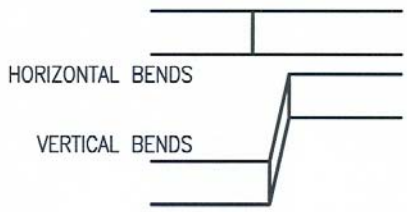


NEW	ACTUAL SIZE IN INCHES FRACTION	DECIMAL	SCALE SIZE 1"=20'	1"=40'	1"=50'
LINE LENGTH	8/100	0.0800	1.6000	3.2000	4.0000
LINE WEIGHT	1/100	0.0100	0.2000	0.4000	0.5000
SPACING FROM INTERSECTION	1/16	0.0625	1.2500	2.5000	3.1250

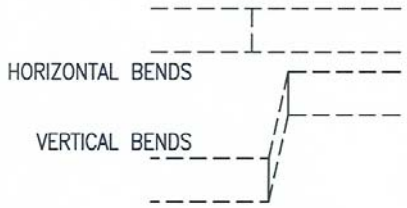


EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
LINE LENGTH	1/16	0.0625	1.2500	2.5000	3.1250
LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500
SPACING FROM INTERSECTION	1/20	0.0500	1.0000	2.0000	2.5000

PROFILE



NEW	ACTUAL SIZE IN INCHES FRACTION	DECIMAL	SCALE SIZE 1"=20'	1"=40'	1"=50'
VERTICAL LINE WEIGHT	1/100	0.0100	0.2000	0.4000	0.5000



EXISTING	FRACTION	DECIMAL	1"=20'	1"=40'	1"=50'
VERTICAL LINE WEIGHT	1/200	0.0050	0.1000	0.2000	0.2500

QUARTER SECTION VALVE MAP SYMBOLS

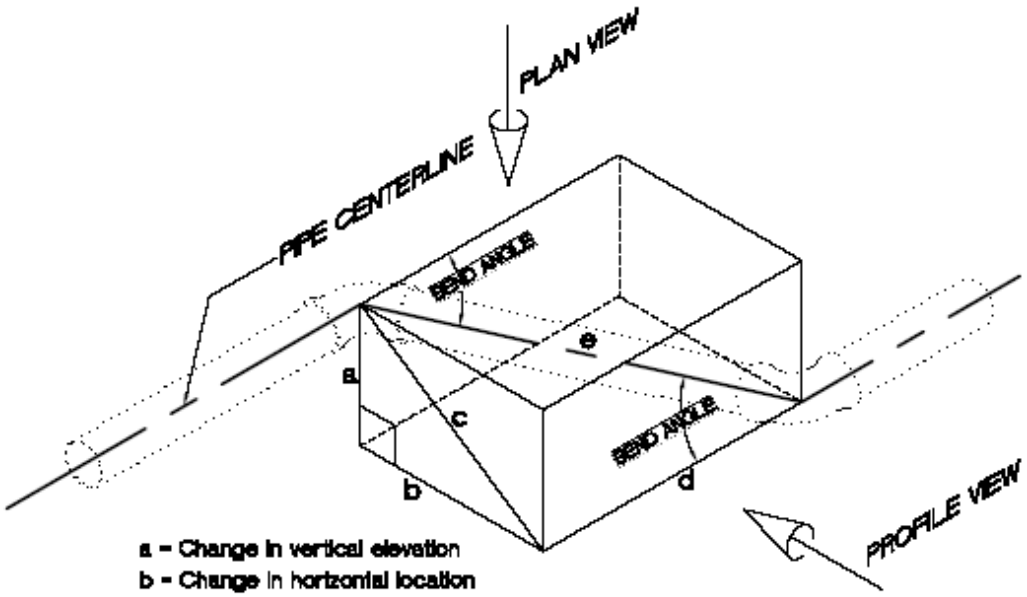
NO SYMBOLS FOR BENDS ARE USED IN THE QUARTER SECTION VALVE MAPS

DESIGN AND DRAFTING STANDARDS

Sym-Bends.dwg 11/16/04

Exhibit 7-9, Drafting, Rotated Bends

ROTATED BENDS



a = Change in vertical elevation
b = Change in horizontal location
c = The hypotenuse of a and b
d = The horizontal run length
e = The true pipe length

1. Calculate c using
$\sqrt{a^2+b^2}$

2. Calculate d, the horizontal run length using:
tan(90?-Bend Angle) x c

3. Calculate e, the true pipe length using
$\sqrt{c^2+d^2}$

90° - 45° = 45°	tan = 1.000
90° - 22½° = 67½°	tan = 2.414
90° - 11¼° = 78¾°	tan = 5.027

For use with 12" and smaller pipe where the upper an lower pipe has less than 4% slope.

DESIGN AND DRAFTING STANDARDS

Exhibit 7-10, General Construction Notes, New Development

GENERAL CONSTRUCTION NOTES
(For Developer-financed Projects)

All Cases:

- 1/8" minimum lettering, typical.
- General contract notes included in S.D. 105 shall not be duplicated on the plan.
- Notes 1 through 12, as shown below, shall be included on all water plans.
- Notes 13 through 33, as shown below, shall be included on water plans to which they apply.
- Additional notes may be required.

1. Tucson Water SD-105, "General Contract Notes," shall apply to and become an integral part of this contract. All design standards, materials, and workmanship are to be according to Tucson Water Standard Specifications and Details, latest Edition.

2. Construction water for pressure testing, chlorinating and flushing shall be provided through the existing water system and shall cost $_____, plus tax. Construction water for trench backfill and compaction and other construction needs shall be through an approved metered water source obtained from Tucson Water Customer Service Division under a separate permit/agreement.

3. All PVC pipe installed for this project shall be class 200, unless otherwise specified.

4. Water service will be provided as shown on this plan. Any changes to parcel configuration may necessitate additional requirements.

5. This water system is designed to accommodate _____gallons per minute fire flow.

6. All fire hydrant laterals shall be ductile iron pipe.

7. At the time of plan approval, this development is located within _____ zone. Minimum design pressures for this development are as follows:
   1. Static pressure:_____pounds per square inch.
   2. Peak day pressure: pounds per square inch.
   3. Peak day + fire flow: pounds per square inch.

   Due to water system operational variances pressure will vary as much as 10 pounds per square inch +/-.

   (The pressures provided should be the lowest pressures developed through the project site).

8. This plan meets the minimum pressure and storage requirements in AAC R18-5-502 & 503.

9. _____ linear feet of new pipeline (excluding water service line) will be installed according to this project. A pipeline inspection fee of $5.00 per linear foot of pipeline to be installed will be assessed prior to issuance of "notice to proceed."

10. It will be the responsibility of the developer to provide and install meter boxes on all services. Services installed will be in compliance with Tucson Water SD-309 and SD-310. Meter boxes will comply with Tucson Water SD-318.

11. Payment of the Water System Equity Fee is required at the time of water meter application, according to Ordinance No. 9842, amending the Tucson Code, Chapter 27, Section 27-36.

12. Construction shall not commence prior to issuance of an Approval to Construct by ADEQ or the delegated authority, and operation of the line shall not commence prior to issuance of the Approval of Construction by ADEQ or the delegated authority.

13. The responsible party for fire service billing is the owner/developer as called out on the plan.

14. This water system is designed to accommodate _____ gallons per minute fire flow. Indemnification agreement required due to insufficient fire flow, according to Agreement for Construction of Water Facilities Under Private Control**,** Note No. 5, Residential/Commercial sprinklers may be required in accordance with local fire department authority.

15. For service protection backflow prevention requirements, contact Tucson Water Reclaimed/Backflow Prevention Section at 791-2650. A pressure drop is anticipated across the backflow device.

16. Plan review and acceptance by Tucson Water, New Development Unit does not constitute approval of private plumbing. Private plumbing includes all backflow protection and plumbing from the water meter to the premise, and fire services beyond the right-of-way or easement lines. Contact the appropriate backflow prevention, city, or county officials for private plumbing review.

17. This development falls within an isolated water service area (New Services information only).

18. This project is within the Midvale Park service area. A Midvale Park reimbursement may apply. Contact Tucson Water New Development at 791-4718 for processing requirements.

19. This project is within the Continental Ranch service area. A Continental Ranch reimbursement may apply. Contact Tucson Water New Development at 791-4718 for processing requirements.

20. New water main shall be installed with _____ inches of minimum cover according to S.D. 105, unless otherwise indicated on these plans.

21. Any construction across lots _____, including walls, is prohibited in the public water or public utility easement.

22. All fittings shall be restrained according to Tucson Water SD-600 or approved Engineer's calculation.

23. Separate meters will be required for irrigation systems. Domestic and irrigation service shall not be interconnected.

24. This project may receive higher than normal pressure and may require individual pressure reducers as part of the private plumbing: The installation of a pressure reducer may create a closed system. Consult local plumbing codes for pressure relief and thermal expansion requirements.

25. This project may receive lower than normal pressure and may require individual pressure pumping stations as part of the private plumbing.

26. The new water main designated in this plan as protected will be protected for a period of 15 years according to Section 27-38 of the Tucson Code starting on _____ ___ and terminating on _____.

27. This project will not be finaled until payment has been received by Tucson Water for protected main fees, as established by Plan No. _____.

28. This project will not be finaled until the finalization of _____, Plan No. _____.

29. The _____ new _____ inch pipeline will be oversized by Tucson Water to _____ inch pipeline. The project applicant will be eligible for an oversize refund according to Tucson Water Code Section 27-37 and Section 27-38.

30. This project will not be finaled until the owner of the well (Registry #) located on this property has filed a waiver with ADWR allowing Tucson Water to exceed 10 feet of additional cumulative draw-down over a 5-year period. Documentation verifying ADWR waiver must be submitted to Tucson Water Hydrology Division before project finalization. In addition, all Tucson Water metered connections will require backflow protection.

31. This project will not be finaled until the well (Registry No. _____) located on this property has been properly abandoned according to provisions of ADWR Regulation R-12-15-816. Documentation of well abandonment must be submitted to Tucson Water Hydrology Division before project finalization.

32. Twenty-four hour emergency access for Tucson Water shall be the same as for City of Tucson Fire Department (24-Hour Emergency access) consisting of a key to the gate padlock in a fire box permanently secured to _____ *(proper description filled in here)* _____ _____.

33. According to the Tucson Code, Section 27-37, this project will not be finaled until the protected facility fees for _____ have been paid. The fee for this project is $ _____.

34. Any reclaimed water service shall not be turned on until it has been inspected and approved by the Tucson Water Reclaimed/Backflow Prevention Section.

Rev. 10/1/05

Exhibit 7-11, General Construction Notes, System Modifications

SYSTEM MODIFICATIONS NOTES

1. All system modifications construction work shall conform to the following standards and special provisions:

   a. The Pima County / City of Tucson Standard Specifications for Public Improvements, current Edition.

   b. The system modifications special provisions for this project.

2. System modifications preconstruction procedure:

   a. The Contractor shall contact the City of Tucson Water Department, Construction Section (791-2665), a minimum of three (3) days prior to any water work. The Contractor shall refer to the City of Tucson Water Department plan no. _____.

   b. The City of Tucson Water Department construction section will schedule the time and place for the meeting.

   c. No water system construction shall begin until a “notice to proceed” has been issued by the City of Tucson Water Department.

   d. Any water work installed prior to the notice to proceed date shall be removed by the Contractor at the Contractor’s expense.

3. Construction on the _____ inch (___") main(s) shall take place only in the off peak season between October 1 and March 30. The Contractor shall be allowed a maximum of _____ (___) days down time for any one shut-down. Multiple shut-downs will be allowed with a minimum of _____ (___) days between shut-downs.

4. All dimensions, slopes and grades of existing water lines are taken from "as built" drawings. It shall be the Contractor's responsibility to determine exact information before ordering any special fittings or equipment.

5. Shut-down of the existing water system requiring the operation of Tucson water valves shall be coordinated through a City of Tucson Water Department Construction Inspector.

6. New water mains shall be installed at a minimum depth of three feet (3.0’) from the bottom of any excavation or scarification to the top of the new pipe. This depth shall be maintained for five feet (5.0') beyond any excavation, measured perpendicular to the proposed structure or edge of the proposed roadway. In no case shall new water mains be installed less than three and sixty seven hundredths feet (3.67’) deep from the finished grade to the top of the new pipe.

These minimums shall apply to all water mains unless otherwise noted on the plans.

7. New service lines, two inch (2") and smaller, shall be installed at a minimum depth of two feet (2.0') from the bottom of any excavation or scarification to the top of the new service line. This depth shall be maintained for five feet (5.0') beyond any excavation, measured perpendicular to the proposed structure or edge of the proposed roadway. In no case shall new service lines be installed less than three feet (3.0') deep from the finished grade to the top of the new service line. These minimums shall apply to all service lines unless otherwise noted on the plans.

8. The Contractor shall be responsible for all water meters and meter boxes in the construction area. This will include but not be limited to:

   a. Removal and installation:
      during this operation meters shall be tagged with the correct address to ensure their reinstallation at the same location.

   b. Protection of meters:
      at all times the Contractor shall take precautions to avoid any damage to the meters. The Contractor shall provide for their safe storage and the proper equipment for their handling.

   c. Access to meters:
      the Contractor shall maintain access to all in service meters during construction. At the close of the project the Contractor shall ensure that all meters are left accessible and that all meter boxes are adjusted to final grade.

9. Forty-eight (48) hours prior to shut-down of any fire hydrants or fire protection service lines the Contractor shall provide the City of Tucson Water Department construction inspector with a written report indicating the location and duration of any fire hydrant or fire protection service shut-downs. The Contractor shall notify the City of Tucson Water Department Construction Inspector when fire hydrants or fire protection services are back in service.

10. The Contractor shall be responsible for maintaining service to all water customers during construction. It shall be the Contractor's responsibility to determine which services will be effected by this project. It may be necessary to accomplish tie-overs, re-connections, etc. While business customers are closed. If interruption of service is unavoidable the Contractor shall notify the water inspector a minimum of forty-eight (48) hours in advance to coordinate shut-downs. Every effort shall be made to minimize disruption to the customer. If the Contractor chooses to abandon any portion of the existing water supply system without concurrent new construction as called for on the plans, the Contractor shall provide any and all materials and construction of a temporary or permanent water system to maintain continued water service to customers at no additional cost.

11. Prior to commencing work, the Contractor shall apply for two (2) special water use permits from the City of Tucson Water Department Commercial Section.

a. Construction water special permit:
   there will be no charge for this permit, but the Contractor must pay the sum of $_____ plus tax as the estimated cost of the water to be used. This water may only be used for trench settling, disinfection and testing.

b. Metered fire hydrant only permit:
   this non-transferable permit will entitle the Contractor to use water through a meter from existing fire hydrants at approved locations. Water used under this permit is for general construction purposes such as dust control, site preparation, etc.

12. All materials, fittings, and appurtenances called for on the plans, or required for a complete installation, shall be new. No refurbished items or materials will be allowed.

13. The Contractor shall be responsible for adjusting all new and existing water valve boxes to the finished grade per Standard Detail W-300.

14. The Contractor shall use mechanically restrained joints at all changes of direction in the water mains. The lengths of restrained pipe on both sides of the restrained joint shall be as called for on the plans or as per Standard Detail W-600. With the approval of the Engineer, the Contractor may use concrete thrust blocking in lieu of mechanically restrained joints. Concrete thrust blocking shall comply with Standard Detail W-610.

15. If any existing detectable marking tape is disturbed or destroyed during construction, the Contractor shall furnish and install appropriate new tape. There shall be no additional charge for this reinstallation.

16. This project has corrosion control/monitoring work included as part of the contract. The Contractor shall provide all submittals, components and reports of the corrosion work as called for on these plans and in the special provisions.