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Civil Engineering

WATER SYSTEMS



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(Mr Myron C. Anderson)
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(Col Donald J. Thomas)

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This instruction implements AFR 32-10, *Installations and Facilities*; AFR 32-70, *Environmental Quality*; and DoD Directive 6230.1, *Safe Drinking Water*, April 24, 1978. It provides guidelines for managing water and wastewater systems at US Air Force bases. Users should send comments and suggested improvements on AF Form 847, **Recommendation for Change of Publication**, through major commands (MAJCOM) and HQ AFCESA/ENC, 139 Barnes Drive, Tyndall AFB FL 32402-5319 to HQ USAF/CEO, 1260 Air Force Pentagon, Washington DC 20330-1260. **Attachment 1** lists the references, abbreviations, and acronyms used in this instruction.

SUMMARY OF REVISIONS

Combined AFRs 91-9 and 91-10, and updated references and organization designators.

1. Purpose. This instruction defines responsibilities and provides guidelines to help Base Civil Engineering operate and maintain water and wastewater systems. Specific technical guidance on water and wastewater treatment is in the joint regulation AFR 91-26, *Maintenance and Operation of Water Supply, Treatment, and Distribution Systems* and AFM 91-32, *Operation and Maintenance of Domestic and Industrial Wastewater Systems*, respectively. Also refer to AFI 32-1066, *Plumbing Systems* (formerly AFR 91-13), and AFI 32-7041, *Water Quality Compliance* (formerly AFP 19-5).

2. Objective. The overall objective is to efficiently and effectively operate and maintain potable water systems and domestic and industrial wastewater systems while protecting the environment. Systems must comply with Public Law 95-190, *Safe Drinking Water Act*, Section 1447, and Public Law 95-217, *Clean Water Act*, Section 313, requirements, environmental regulations, and discharge permit requirements. Use municipal or regional water supply and wastewater systems where feasible. A life cycle cost analysis will be performed to determine the most cost effective approach.

3. Complying with Statutory Requirements. In the United States, environmental and health authorities at Federal, state, and local levels set standards and criteria for drinking water, and collecting, treating and discharging domestic and industrial wastewater. This instruction, along with AFI 32-7041 and AFI 32-7047, *Compliance Reporting and Tracking*, establish requirements. Base Civil Engineering and bioenvironmental engineering organizations must cooperate to ensure compliance. Responsibility for operational compliance begins at the operator level, while higher levels give management support and guidance. Policies and responsibilities for Air Force environmental programs are defined in AFPD 32-70.

3.1. US Installations. The Environmental Protection Agency (EPA) sets specific requirements for public drinking water systems (PDWS). EPA defines a PDWS as any collection, treatment, storage, or distribution system that pipes water for human consumption to at least 15 service connections or that regularly serves at least 25 persons daily for a total of at least 60 days per year. Air Force PDWS must meet public drinking water requirements in addition to other drinking water standards and criteria. Air Force drinking water monitoring requirements are addressed in AFI 48-119, *Environmental Pollution Monitoring* (formerly AFR 19-7). Discharge from wastewater treatment plants in the United States and its territories must have National Pollution Discharge Elimination System (NPDES) permits or Underground Injection Control (UIC) permits which regulate the discharges. Each plant must operate according to its permit conditions.

3.2. Foreign Installations. International agreements, host country substantive standards, and AFI 32-7006, *Environmental Program in Foreign Countries* (formerly AFR 19-9) , establish treatment requirements in foreign countries.

4. Responsibilities:

4.1. HQ AFCESA:

- Issues water and wastewater system design, operations and maintenance guidance.
- Provides technical assistance to the MAJCOMs and bases.

4.2. MAJCOM:

- Develops programs to support base water and wastewater systems.
- Gives administrative and technical support to help bases comply with Air Force policies and regulatory requirements.

4.3. Base Civil Engineering:

- Operates and maintains water and wastewater systems.
- Ensures system operations personnel are properly trained and have required certification before assuming plant operations responsibility.
- Ensures all water and wastewater plants have required regulatory permits and sufficient resources to operate in compliance.
- Develops local operating instructions to include operational monitoring for process control, sampling and testing procedures, emergency operations, maintenance, and regulatory compliance requirements.
- Corrects system deficiencies identified through internal assessment, monitoring, or inspection by regulatory agencies and keeps records of corrective actions.

- Maintains facility operating logs, records, drawings, and plant-specific operations and maintenance manuals.

4.4. Bioenvironmental Engineering Service (BES):

- Maintains surveillance over potential environmental contamination from Air Force facilities including water supplies (see AFI 48-119).
- Monitors compliance of drinking water with applicable standards. BES provides reporting and public notification assistance as required. The BES gives results of monitoring and suggestions for improving water quality to Base Civil Engineering.
- May assist Base Civil Engineering with compliance monitoring and design review of water and wastewater treatment facilities.
- Conducts periodic evaluations of pollution control facilities' compliance with applicable standards. Gives a copy of monitoring and evaluation reports to Base Civil Engineering.

5. Acquisition and Sales of Utility Services. AFI 32-1061, *Utilities Services* (formerly AFR 91-5), covers the contracting and sales of utility services.

6. Design Requirements for Water and Wastewater Facilities. AFM 88-10, volume 1, *Water Supply Sources and General Considerations*; volume 3, *Water Supply, Water Treatment*; volume 4, *Water Supply, Water Storage*; and volume 5, *Water Supply, Water Distribution*; and AFM 88-11, volume 1, *Sanitary and Industrial Wastewater Collection--Gravity Sewers and Appurtenances*; volume 2, *Sanitary and Industrial Wastewater Collection--Pumping Stations and Force Mains*; and volume 3, *Domestic Wastewater Treatment*, cover the design of projects involving the construction, repair and alteration of water and wastewater facilities. Operations Flight personnel must review designs for adequacy and to help minimize excessive operations and maintenance requirements. The current Engineering Technical Letter (ETL) 88-4, *Reliability and Maintainability Design Checklist*, is a convenient guide for design reviews. Consider fire protection requirements in all reviews. The BES also reviews the designs for health and safety considerations. Each separate water supply source must have a water meter and a raw water sampling point for water quality monitoring. Each active well should have an air line or electric depth gage to measure drawdown, static level, and pumping level.

7. Facility Operation and Maintenance (O&M):

7.1. Water Treatment. Installations must operate and maintain water treatment facilities according to AFR 91-26 and this instruction. Installations also must use the manufacturer's operations and maintenance manuals for specific treatment components. Disinfect and fluoridate water supplies when necessary to comply with federal, state, and local requirements. Additional treatment is normally required for specialized uses, such as food handling, heating and cooling systems, dental and photo labs, and for aircraft thrust augmentation.

7.2. Scale and Corrosion Control. AFI 32-1054, *Corrosion Control* (formerly AFR 91-27) outlines the corrosion control program. AFR 91-26 contains scale and corrosion control methods.

7.3. Pollution Control:

7.3.1. Operate and maintain water pollution control facilities according to AFM 91-32 and plant-specific O&M manuals which are required for each major facility. Domestic and industrial wastewater treatment plants are the primary facilities covered by this instruction. Activities that

require special attention include metal finishing and electroplating; vehicle and aircraft wash facilities; aircraft maintenance (paint stripping, nondestructive inspection, painting, solvent cleaning); battery shops; photo labs; hospitals; aircraft deicing; and fire training. Proper operation and maintenance of oil/water separators and lift stations must also be addressed.

7.3.2. A base standard wastewater treatment procedure is required to govern the discharge of industrial and nondomestic waste to the sanitary system by generating activities. Base Civil Engineering outlines procedures for discharging industrial wastes to the sanitary system and generators must follow these instructions. Instructions should describe pretreatment requirements, discharge procedures, and limitations for industrial waste. The base commander or municipal wastewater authority can impose these requirements. Within each generating organization, the activity commander is responsible for controlling industrial discharges. Generators must use pollution control techniques in AFI 32-7080, *Pollution Prevention Programs* (formerly AFR 19-15) , to minimize pollutant discharges. Hazardous waste may not be discharged to the collection system.

7.3.3. Disinfect effluents when necessary to comply with Federal, state and local requirements for water pollution control. Dechlorinating the effluent also may be required at some locations.

7.4. Manning. Air Force Manpower Standard (AFMS 44EO) for the operations flight establishes manning criteria for the water and wastewater systems. The infrastructure support element standard includes manning for maintenance and operational tasks. If specific regulatory manning requirements do not exist, general guidelines are in AFM 91-32. The plant-specific manuals should also contain manning information.

8. Training and Certification:

8.1. Operator Training. New operators must receive classroom training and extensive supervised on-the-job training before being assigned to critical tasks. Experienced personnel must also receive technical refresher courses and upgrade training. Training requirements may be met by one of the following means:

- Air Force training available through technical schools, career development correspondence courses, and on-the-job training.
- Civilian training courses available at educational institutions, government agencies, and professional and technical associations.
- Correspondence courses from accredited institutions for operators in areas that don't have local resident courses.

8.2. Operator Certification. Executive Order 12088, *Federal Compliance With Pollution Control Standards*, October 13, 1978, the *Clean Water Act*, and the *Safe Drinking Water Act* establish certification requirements. These rules require operating personnel to comply with state and local operator certification requirements for water and wastewater treatment plant operations. Job descriptions should require state certification or that the certification be obtained and maintained, as appropriate. Proper certification can be a condition of employment for new civilians.

8.3. Association of Boards of Certification (ABC) Uniform Program for Reciprocity. Supervisors should encourage operators anticipating transfer to another state to obtain an ABC Certificate of Registration and listing on the ABC Reciprocity Register. Many states recognize the ABC Certificate of Registration as evidence of qualification. Participating states will issue the operator a certificate for that state without a written examination or other long delays. Contact the base education office for

more information about the ABC program in the *Defense Activity for Nontraditional Educational Support (DANTES) Examination Program Handbook*.

9. Safety and Occupational Hazards. Supervisors must be sure all employees are familiar with the safety instructions in AFR 91-26; AFM 91-32; and AFOSH Standards 127-10, *Civil Engineering*, 127-25, *Confined Spaces*, and 161-21, *Air Force Hazard Communication Standard*, as applicable. Supervisors must maintain current BES baseline and annual industrial hygiene survey reports, and should use the reports to train workers on occupational health hazards. Supervisors must make safety instructions readily available to all operating personnel; train facility personnel on safety procedures and equipment; and enforce their proper use at all times. Once trained, individual workers are personally responsible for following safe procedures.

10. Logs, Records, and Drawings:

10.1. Operating Logs. Prepare daily operating logs and laboratory records for in-plant use. Computer files and printouts like the WIMS (Work Information Management System) operating logs are acceptable if they have the same information as the forms. Keep permanent records of the printouts as if they were forms. Maintain backup copies of the active computer files to protect them against accidental loss. Additionally:

- Post operating logs or computer files daily (covering one month's operation) in neat, legible form.
- Keep the original form or computer printout for the Base Civil Engineering permanent file.
- Dispose of operational records according to AFI 37-138, *Records Disposition--Responsibilities and Procedures* (formerly AFR 12-50, volume 1), except when unusual circumstances such as litigation dictate otherwise.

10.1.1. Water Treatment Logs:

10.1.1.1. AF Forms 1460 and 1461. Operators at every installation must prepare AF Form 1461, **Water Utility Operating Log (General)**. If the water requires more than minor treatment, prepare AF Form 1460, **Water Utility Operating Log (Supplemental)**. Instructions for filling out the monthly forms are on the back of each form. Base Civil Engineering may delegate final review and signature of water operating logs to an appropriate engineer.

10.1.1.2. Daily Well and Pumping Station Activity Records. Maintaining daily operating records for wells and pumping stations is a necessary part of the operation and maintenance of water supply systems. The following forms are available for use:

- AF Form 997, **Daily Well Activity Record**. Use this form to record operational information about the well. This information helps when evaluating the performance of the well and pumping system. Records showing trends such as an increase in drawdown or decreased yield help to detect existing problems and to prevent future ones.
- AF Form 998, **Daily Pumping Station Activity Record - Water**. Use this form to record pertinent operational information such as pumping times and rates. Entries on this record are good performance indicators.

10.1.2. Pollution Control Logs. Operators must prepare AF Form 1462, **Water Pollution Control Utility Operating Log (General)**, and AF Form 1463, **Water Pollution Control Plant**

Operating Log - Supplementary. Base Civil Engineering may delegate final review and signature of the wastewater operating logs to an appropriate engineer.

10.1.3. Compliance Monitoring Reports. Federal, state, and local regulatory agencies require monitoring reports. Prepare and submit these reports according to agency instructions. Each facility also should establish local procedures for preparing, coordinating, reviewing and approving logs and reports. Include procedures for wastewater treatment monitoring in the base wastewater instruction where appropriate.

10.2. Physical Facility Information. Develop, maintain, and keep available at the treatment facilities the following information:

- Required plant-specific O&M manuals and applicable Air Force publications for each treatment system.
- System operating instructions with single-line drawings. Include operational and compliance monitoring procedures.
- Up-to-date system as-built drawings along with other system plans and blueprints. The plans should include hydraulic water elevation profiles and a drawing of the entire collection and distribution systems.
- AF Form 996, **Well Data.** Complete and keep a file for each well beginning with initial construction. Update the information after completing a repair, redeveloping a well, or conducting a performance test.
- Retain shop drawings, catalogue cuts and any other equipment information or literature.

10.3. Maintenance Records. Develop and maintain effective maintenance plans to include:

- A recurring work schedule
- A maintenance history for each major piece of equipment
- An essential spare parts list. Stock essential spare parts at the treatment facility or other accessible location
- A long range maintenance and improvement plan.

11. Water Conservation. Water conservation must be part of a comprehensive water resource management plan. The health and welfare of personnel and the base's mission require an adequate supply of potable water. Follow conservation procedures given in AFR 91-26, wastewater reuse, and other innovative approaches to preserve water supplies and minimize waste. All irrigation systems must comply with installation water management and conservation plan requirements.

12. Safeguarding Water Against Contamination:

12.1. Dual Water Supply Systems. Bases can have dual water supply systems for potable and non-potable water only if:

- Base Civil Engineering can establish and maintain a clearly defined separation of the two systems so that nonpotable water cannot contaminate the potable water system.
- The systems have approved backflow prevention devices to prevent contamination of potable water.

- The MAJCOM approves the dual system before construction and operation. Connections between systems must be avoided.

12.2. Related Reference Publications. Other publications provide rules and guidelines for protection of water supplies.

- AFI 48-119 and AFR 91-26 establish procedures pertaining to the sanitary control of water works, including disinfection of water supplies.
- AFI 32-1066 outlines procedures for maintaining and installing cross-connection control and backflow prevention systems.

12.3. Groundwater Protection Programs. Federal, state, and local regulatory agencies and the Air Force are developing programs to protect well heads and critical aquifers. These programs will help protect groundwater supplies and are applicable to all Air Force facilities. In addition, surface water sources should be protected where possible.

12.4. Water System Lead Content. Repairs to public drinking water systems require the use of lead-free flux and solder (less than 0.2 percent lead). Pipes and pipe fittings must contain less than 8 percent lead.

13. Water for Fire Protection and Emergencies. Adequate, reliable water supply systems are essential for fire protection and other emergencies. The base must develop, publish, and periodically update procedures for operating the water systems during emergencies.

14. Cooperating with Regulatory Authorities on Water Pollution:

14.1. Executive Agent for Federal Enforcement. The *Safe Drinking Water Act* applies to DoD agencies as it applies to any nongovernmental entity. Title 33, United States Code, Section 1323, and E.O. 12088 also require Federal agencies to comply with all Federal, state and local pollution control requirements the same as any nongovernmental entity. This includes the payment of reasonable service charges if applicable. In the United States and its territories, the EPA is the executive agent for compliance with E.O. 12088. Bases outside the United States and its territories must cooperate with foreign regulatory agencies consistent with host nation agreements.

14.2. Cooperation Requirements. Base commanders must cooperate with regulatory authorities in meeting applicable treatment and drinking water quality standards, and preventing pollution of surface or underground waters by wastewater from Air Force installations.

14.3. Regulator Access to Facilities. Agency representatives may inspect treatment facilities, examine facility operating records, and make the tests necessary to verify compliance with water quality standards. Base Civil Engineering must permit authorized representatives of a regulatory authority access to treatment facilities without prior notice if the entry is:

- Consistent with security requirements
- At a reasonable time.

14.4. Inspection. The following guidelines apply to regulatory inspections:

- Technical representatives of Base Civil Engineering and the BES should accompany inspectors. Encourage agencies to coordinate visits in advance to allow proper representation and security clearances.

- Make operating logs and reports available for inspector review, and provide copies, if requested.
- Request a preliminary copy of the inspection report or checklist at the end of the visit. If the inspector collects any water samples, request split samples to verify inspection test results.
- Comply with AFPD 32-70, which requires the reporting of notices of violation and noncompliance, and AFI 32-7047, which identifies compliance tracking and reporting requirements.
- Do not make any major operational changes based on the informal request of a federal, state, or regional regulatory official without MAJCOM approval.

14.5. Release of Information. Base Civil Engineering must submit discharge monitoring reports according to permit instructions. Promptly report any noncompliance to the appropriate regulatory authority. Base Civil Engineering should send plans and specifications for any new or modified water supply or treatment facility, or proposed pollution abatement facility to the appropriate regulatory agency for comment. This is usually a preconstruction requirement under initial facility permitting procedures.

14.6. Forms Prescribed:

- AF Form 996, **Well Data.**
- AF Form 997, **Daily Well Activity Record.**
- AF Form 998, **Daily Pumping Station Activity Record - Water.**
- AF Form 1460, **Water Utility Operating Log (Supplemental).**
- AF Form 1461, **Water Utility Operating Log (General).**
- AF Form 1462, **Water Pollution Control Utility Operating Log (General).**
- AF Form 1463, **Water Pollution Control Plant Operating Log - Supplementary.**

JAMES E. McCARTHY,, Maj General, USAF
The Civil Engineer

Attachment 1

GLOSSARY OF REFERENCES, ABBREVIATIONS, AND ACRONYMS

References

DoD Directive 6230.1, *Safe Drinking Water*, April 24, 1978

Armed Services Procurement Supplement 5, *Procurement of Utility Services*

Defense Activity for Nontraditional Educational Support (DANTES) Examination Program Handbook

AFPD 32-10, *Installations and Facilities*

AFPD 32-70, *Environmental Quality*

AFI 32-1054, *Corrosion Control* (formerly AFR 91-27)

AFI 32-1061, *Utilities Services* (formerly AFR 91-5)

AFI 32-1066, *Plumbing Systems* (formerly AFR 91-13)

AFI 32-7041, *Water Quality Compliance* (formerly AFP 19-5)

AFI 32-7006, *Environmental Program in Foreign Countries* (formerly AFR 19-9)

AFI 32-7047, *Compliance Reporting and Tracking*

AFI 32-7080, *Pollution Prevention Programs* (formerly AFR 19-15)

AFI 37-138, *Records Disposition - Responsibilities and Procedures* (formerly AFR 12-50, Volume 1)

AFI 48-119, *Environmental Pollution Monitoring* (formerly AFR 19-7)

AFR 91-26, *Maintenance and Operation of Water Supply, Treatment, and Distribution Systems*

AFM 91-32, *Operation and Maintenance of Domestic and Industrial Wastewater Systems*

AFM 88-10, Volume 1, *Water Supply Sources and General Considerations*

AFM 88-10, Volume 3, *Water Supply, Water Treatment*

AFM 88-10, Volume 4, *Water Supply, Water Storage*

AFM 88-10, Volume 5, *Water Supply, Water Distribution*

AFM 88-11, Volume 1, *Sanitary and Industrial Wastewater Collection--Gravity Sewers and Appurtenances*

AFM 88-11, Volume 2, *Sanitary and Industrial Wastewater Collection--Pumping Stations and Force Mains*

AFM 88-11, Volume 3, *Domestic Wastewater Treatment*

AFOOSH STD 127-10, *Civil Engineering*

AFOOSH STD 127-25, *Confined Spaces*

AFOOSH STD 161-21, *Air Force Hazard Communication Standard*

Engineering Technical Letter 88-4, *Reliability and Maintainability Design Checklist*

Abbreviations and Acronyms

ABC—Association of Boards of Certification

AFMS—Air Force Manpower Standard

AFOSH—Air Force Occupational Safety and Health

BES—Bioenvironmental Engineering Service

EPA—Environmental Protection Agency

FAR—Federal Acquisition Regulation

NPDES—National Pollution Discharge Elimination System

PDWS—Public Drinking Water Systems

UIC—Underground Injection Control

WIMS—Work Information Management System