***United States Army Alaska Regulation 420-1**

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY ALASKA
Fort Richardson, Alaska 99505-5000

United States Army Alaska Regulation 420-1 **31 August 1996**

Facilities Engineering

Corrosion Control

Summary. This regulation on corrosion control has been revised. This regulation establishes a corrosion control program for the United States Army Alaska (USARAK). This regulation has been updated to reflect the change to USARAK.

Applicability. This regulation is applicable to all installations and activities within the USARAK command.

Impact on New Manning System. This regulation does not contain information that effects the New Manning System.

Supplementation. Supplementation of this regulation is prohibited without prior approval from the Directorate of Public Works, APVR-RPW.

Interim changes. Interim changes to this regulation are not official unless they are authenticated by the director of information management. Users will destroy interim changes on their expiration dates unless sooner superseded or rescinded.

Suggested improvements. The proponent agency of this regulation is the Directorate of Public Works. Users are invited to send comments and suggested improvements on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) directly to APVR-RPW.

1. Purpose

This regulation establishes a corrosion control program for economical real property facility metal component corrosion control within USARAK.

2. References

Specific references to various publications are cited throughout this regulation. Individuals concerned will completely familiarize themselves and comply with pertinent publications that relate to specific corrosion control applications.

a. Required publications.

(1) Army Regulation (AR) 420-49 (Heating, Energy Selection and Fuel Storage, Distribution and Dispensing Systems). Cited in paragraphs 5 and 7a.

(2) American National Standard Institute/American Society of Mechanical Engineers Standard B 31.8 (Gas Transmission and Distributing Piping Systems). Cited in 7d.

(3) Corps of Engineer Guide Specifications 09900. Cited in paragraph 6c.

(4) Technical Manual (TM) 5-650 (Repairs and Utilities: Central Boiler Plants). Cited in paragraph 7a.

***This regulation supersedes 6th Infantry Division (Light) Regulation 420-1, dated 28 February 1990.**

(5) TM 5-670 (Repairs and Utilities for Refrigeration, Air Conditioning, Mechanical Ventilation and Evaporative Cooling). Cited in paragraph 7b.

(6) TM 5-813-3 (Water Supply, Water Treatment). Cited in paragraph 7c(2).

(7) TM 5-813-5 (Water Supply, Water Distribution). Cited in paragraph 7c(2).

b. Referenced publication. (A referenced publication is merely a source of additional information. The user does not have to read it to understand this regulation.) TM 5-653, (Steam, Hot Water, and Gas Distribution Systems: Inspection and Preventive Maintenance Service) is a referenced publication.

c. Referenced form. DA Form 2028 (Recommended Changes to Publications and Blank Forms) is a referenced form. It is cited in the suggested improvements statement.

3. Explanation of abbreviations

a. app ..... appendix

b. AR ..... Army Regulation

c. DA ..... Department of the Army

d. pH ..... potential of hydrogen

e. TM ..... Technical Manual

f. USARAK ..... United States Army Alaska

4. Responsibilities

a. The director of Public Works at Fort Richardson will—

(1) Direct the USARAK program for the economical real property facility metal component corrosion control.

(2) Direct engineering analysis and corrosion control method studies to define and evaluate problem areas.

(3) Review the corrosion control program.

(4) Assist in identifying corrosion and establishing corrective measures.

(5) Initiate appropriate actions, as necessary, to promote effective, economical, facility corrosion control within USARAK.

b. The directors of Public Works at Fort Wainwright and Fort Greely will—

(1) Develop plans, budget, and establish measures that economically control corrosion.

(2) Designate a corrosion control officer, preferably an individual experienced in this work, who has responsibility for establishing and continuing corrosion control measures for all facility components subject to corrosion.

(3) Maintain records of real property facilities subject to corrosion, corrosion control measures, and test data essential for effectiveness evaluation of such measures (see app A).

(4) Include, as appropriate, corrosion control measures in construction, alteration, maintenance, and repair projects. All applicable projects should be reviewed by the corrosion control officer as to the need, if any, for design cathodic protection or other indicated corrosion control measures.

5. Policy

AR 420-49 prescribes the policy, responsibility, guidance, and procedures required for establishing an effective corrosion control program.

6. Ferrous metals in atmospheric exposure

a. General. Periodic cleaning and painting usually provide satisfactory corrosion control for ferrous surfaces in this category. Because surfaces exposed to view are normally are kept well painted but hidden surfaces sometimes are neglected, pay particular attention to hidden surfaces.

b. Repainting interval. Do not allow paint on ferrous surfaces to deteriorate to the point where corrosion is widespread and blast cleaning is required before repainting. The most economical procedures, at intervals dictated by the condition of the coating, are spot cleaning, spot priming, or an overall coat of paint.

c. Paint system. Both interior and exterior exposed ferrous metals should be painted using paint systems described in Corps of Engineer Guide Specifications 09900.

7. Ferrous metals in water or underground exposure

In this environment, ferrous metal replacement costs large sums annually, much of which could be saved by applying knowledgeable corrosion control measures, such as cathodic protection, avoiding dissimilar metal couples, and using durable coatings. Specific guidance for the most common items in this category is:

a. Steam boiler plants. Central heat and power plant boiler water treatment will be based on previously approved plant standing operating procedures and the guidance in AR 420-49, chapter 2 and TM 5-650, chapter 4. Any deviation from these procedures and guidance will be referred to director of Public Works for review and consideration.

b. Heating and cooling systems using water as a heat transfer medium. Treat heating and cooling systems using water as a heat transfer medium per TM 5-670, section 12. Deviation from TM 5-670 is authorized in cases where the prescribed treatment chemicals are of such concentration that, when discharged into open water, the effluent exceeds standards established by local, state, and federal water pollution control agencies. Closed circulation heating or cooling systems will be kept leak free and drained only when absolutely necessary.

c. Water pipes underground.

(1) Mains. Asbestos cement, cast iron, steel, and wrought iron are common materials for water mains. The asbestos cement usage avoids corrosion, but is not suitable in low potential of hydrogen (pH) soil. The relatively thick walls and the electrical discontinuity of cast iron pipe joint account for the long life usually obtained. Wrought iron and steel pipe will afford about equal life for equal wall thickness. Cathodic protection is normally not practicable for ferrous water mains, except for new construction.

(2) Services. Galvanized iron and copper are commonly used for pipe material in service lines. In new construction, or when repairs are made, ferrous pipe threaded joints will be primed and wrapped with coal-tar tape. When installed, copper piping should be isolated from ferrous mains by means of a dielectric fitting, per TM 5-813-5. A protective coating on ferrous surfaces may require that separate ground rods be installed to obtain satisfactory electrical ground. If the ground rods are copper, the water

pipe should have a dielectric fitting in the building riser. For piping internal corrosion, treat domestic water per TM 5-813-3.

d. Gas distribution pipe underground. Coal-tar coated and wrapped steel pipe, polyethylene sheathed steel pipe, or plastic pipe meeting requirements of American National Standard Institute/American Society of Mechanical Engineers Standard B 31.8 will be used for replacements. Steel risers to buildings will have dielectric fittings to electrically isolate the underground gas distribution piping from other underground metal structures, particularly any dissimilar metals, such as copper water service lines and copper grounding systems. Normally, cathodic protection will be applied to existing underground steel gas lines, unless the system piping is generally bare of protective coating.

e. Metal storage tanks underground. Pipes connecting tanks to equipment should have dielectric fittings to electrically isolate the tank from other underground metal structures. Copper pipe should have a dielectric fitting at the entrance to the tank. Where economically justified, which is generally the case for large tanks, sacrificial anode-type cathodic protection should be provided.

f. Water storage tanks above ground. Ferrous metal water tank interior surfaces will be maintained reasonably corrosion-free by either a protective coating and/or cathodic protection, whichever is more economical. Cathodic protection installation maintenance by a service contract with a firm specializing in this work is normally more effective than doing it in-house. Where coatings are determined to be more economical, a vinyl paint system will be used for maintenance painting because it will generally afford satisfactory protection for at least 15 years. Guide specification on surface preparation, vinyl painting, and cathodic protection systems is available, upon request, from the director of Public Works.

g. Heat distribution metal conduit and pipe underground. Where feasible, existing underground systems in good condition should be isolated by installing dielectric flanges in the riser in each building and at the steam plant. Apply cathodic protection to the metal conduit. (Refer to TM 5-811-4.)

8. Other structures subject to serious corrosion

Use appropriate corrosion control tools (coating, isolation, cathodic protection, use of nonmetals or corrosion resistant metals, and changing the environment) for other structures, as appropriate. For example, condensate line interior carbonic acid corrosion will be controlled by means of an amine, normally morpholine, and/or by boiler make-up water treatment. Use stainless steel, glass reinforced epoxy, or other plastic materials where indicated for highly corrosive material storage and transportation. Avoid dissimilar metal corrosion by isolating one from the other or by careful material selection.

FOR THE COMMANDER:

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Appendix A
Typical Data Required for Underground Utility Condition Evaluation

A-1. Show the construction material type (steel, cast iron, asbestos cement, copper, stainless steel), pipeline joint type (welded, mechanical, ball, and spigot), and whether dissimilar metal, such as copper and steel, are electrically isolated from each other on the buried utility maps.

Note: Any missing data should be recorded as it becomes available by observations during repairs and inspections.

A-2. Tabulate the approximate number of linear feet of buried pipe or conduit of each utility type. If known, include the pipe size and approximate age.

A-3. Record leaks in water, gas, oil, air, heat distribution, and other buried utilities mains and service lines.

A-4. Describe in a log book that is keyed to the utility maps:

a. Leak location and date.

b. Pipe burial depth.

c. Leak cause (corrosion, joint failure, mechanical break).

d. Protective coating condition and description, if any.

e. Repair method (clamp-on patch, weld patch, replacement, protective coating applied to replacement, etc.).

f. Approximate age of pipe that failed.

g. Condition of visible portion of pipe adjacent to the section repaired or replaced.

A-5. Tag and retain a sample of corroded pipe removed.

A-6. Maintain underground structure cathodic protection systems drawings that include isolated fitting locations, and for ferrous water tank interior surfaces. Record in a log:

a. Potential test results and other observations indicating degree of protection.

b. Current density on the ferrous metal receiving cathodic current.

c. Current output from typical sacrificial anodes, if used.

d. Current output and voltage of rectifiers, if used.

e. Problems experienced with cathodic systems and corrections made.

A-7. Tabulate the number, size, exterior protection, and approximate location of buried 1,000-gallon or larger capacity ferrous stage tanks. Include data on connecting line type (copper, steel, plastic) and whether dielectric isolation and cathodic protection are provided.

A-8. Maintain a record of boiler water treatment for corrosion control, including: plant number (15 pounds per square inch plus); deaeration temperature and pressure; pH of condensate returned; neutralizing amine added (type, pounds/year); hardness of condensate (part per million as $CaCO_3$); annual average

makeup (percent); scaling (boiler inspection reports); annual number of corrosion leaks in condensate pipe.

A-9. Note the electrical system type (Delta, Wye, combination) and extensive copper ground locations on utility corrosion maps.