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Pamphlet 420-1-3

Facilities Engineering

Transportation Infrastructure and Dams

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SUMMARY of CHANGE

DA PAM 420-1-3

Transportation Infrastructure and Dams

This new Department of the Army pamphlet, dated 9 April 2009--

- o Implements guidance for procedures for project planning and execution, maintenance, repair, minor construction and control of surfaced areas, culverts and other appurtenances, railroad tracks, bridges, and dams in accordance with the policy contained in AR 420-1, chapter 7 (throughout).
- o Makes administrative changes (throughout).

Facilities Engineering

Transportation Infrastructure and Dams

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History. This publication is a new Department of the Army pamphlet.

Summary. This pamphlet provides guidance for project planning and execution, maintenance, repair, minor construction, and control of surfaced areas, culverts and other appurtenances, railroad tracks, bridges, and dams in accordance with the policy contained in AR 420-1, chapter 7.

Applicability. This pamphlet applies to the Active Army, the Army National Guard/Army National Guard of the United States, and the U.S. Army Reserve, unless otherwise stated. This pamphlet does not apply to installations and activities, or

parts thereof, which are owned by, leased for, or licensed or permitted to the District of Columbia or to any state, territory, or commonwealth of the United States for use by the National Guard; single project-owned or leased civil works facilities of the U.S. Army Corps of Engineers; national cemeteries; or facilities occupied by Army activities as tenants when support is provided by another government agency. In areas outside the United States, Status of Forces Agreements or other country-to-country agreements may take precedence over the procedures described in this pamphlet.

Proponent and exception authority. The proponent of this pamphlet is Assistant Chief of Staff for Installation Management. The proponent has the authority to approve exceptions or waivers to this pamphlet that are consistent with controlling law and regulations. The proponent may delegate this approval authority, in writing, to a division chief within the proponent agency or its direct reporting unit or field operating agency, in the grade of colonel or the civilian equivalent. Activities may request a waiver to this pamphlet by providing justification that includes a full analysis of the expected benefits and

must include formal review by the activity's senior legal officer. All waiver requests will be endorsed by the commander or senior leader of the requesting activity and forwarded through their higher headquarters to the policy proponent. Refer to AR 25-30 for specific guidance.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to the Office of the Assistant Chief of Staff for Installation Management (DAIM-ODF), 600 Army Pentagon, Washington, DC 20310-0600.

Distribution. This publication is available in electronic media only and is intended for command levels A, B, C, D, and/or E for the Active Army, the Army National Guard/Army National Guard of the United States, and the U.S. Army Reserve.

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Glossary

Chapter 1 Introduction

1-1. Purpose

This pamphlet provides procedural guidance and information for implementation of the policy provided by AR 420-1, chapter 7 for project planning and execution, maintenance, repair, minor construction, and control of the following:

- a. Paved roads.
- b. Airfields.
- c. Other surfaced areas.
- d. Culverts and other appurtenances.
- e. Railroad tracks.
- f. Bridges.
- g. Dams.

1-2. References

Required and related publications and prescribed and referenced forms are listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and special terms used in this publication are explained in the glossary.

Chapter 2 General

2-1. Civilian community relations

Garrisons should participate in local, municipal, and regional transportation planning and dam safety organizations.

2-2. Coordination

a. Installations with high- and significant-hazard dams are required by AR 420-1, chapter 7 to coordinate with downstream communities. Coordination should include preparing an Emergency Action Plan (EAP), updating emergency telephone numbers annually, and exercising EAPs at least every five years.

b. Open lines of communications must be maintained between all concerned parties (for example, project planners, designers, inspectors, garrison safety officer, recreation officer, and the training officer) to provide information regarding pavement and bridge performance and all planned dam maintenance and repair (M&R) projects. The Directorate of Public Works (DPW) will coordinate with airfield staff for new projects as well as general maintenance and repair requirements. Information obtained by this coordination should be used in developing M&R strategies, scheduling of actual work, and to modify future designs.

Chapter 3 Pavements

3-1. Preventive maintenance

a. The systematic application of preventive maintenance protects pavement investments by prolonging pavement life. Planning should provide for maintenance of pavements and appurtenances at an economical level considering life-cycle costs and traffic through the use of a Pavement Condition Index (PCI) as defined in TM 5-623. The PCI rating is based on a scale of 0 to 100, which is an indication of the pavement's surface operational condition and structural integrity. The PCI is obtained using the Pavement Engineered Management System (PAVER) Sustainment Management System. PCI is the standard for the American Society for Testing and Materials (ASTM), now known as ASTM International.

b. An effective pavements program requires concerted and continuing efforts directed toward accurate and complete identification, validation, programming, budgeting, and execution of all M&R requirements. Only PAVER shall be used as the management system for Army pavements.

3-2. Levels of performance for pavements and appurtenances

a. *Pavements.* The following PCI levels are the minimum acceptable service levels for pavements (AR 420-1, para 7-9).

- (1) Installation vehicular pavements—

- (a) Primary roads: 60.
- (b) Secondary roads: 50.
- (c) Tertiary roads: 45.
- (2) Installation airfield pavements—
 - (a) All runways: greater than 70.
 - (b) All primary taxiways: greater than or equal to 60.
 - (c) All aprons and secondary taxiways: greater than 55.
 - (d) PCI below these limits may lead to foreign object damage (FOD).

b. Drainage facilities.

(1) Maintain drainage channels, ditches, storm sewers, sub-drains, and culverts to function at full design capacity. As a minimum, maintenance will be done once in the fall and once in the spring. Security grates to prevent access to the installation will be designed in a way to be removable but securable.

(2) Clean catch basins, drop inlets, manholes, and storm sewers by rodding, auguring, flushing, and other non-destructive methods to maintain proper drainage. As a minimum, this will be done once in the fall and once in the spring.

(3) Maintain storm water lift or pump stations and force-mains in a fully operational condition. Implement a progressive preventative maintenance program in accordance with manufacturers' specifications.

(4) Ditches are to be kept clean and well graded. Where erosion is a problem, devices such as silt fences, erosion control fabric, and silt basins may be used to control runoff and allow establishment of vegetation. Paved ditches may be used where vegetation cannot be established or would impede suitable drainage. Paved ditches may also be used when right-of-way is limited and it is more feasible or less costly than curbs, gutters, or storm sewers.

(5) Curbs and gutters may be installed for adequate drainage and to control shoulder erosion where ditches will not suffice. Installation or replacement of curbs through areas that include pedestrian crosswalks must include curb-drops and ramps that conform to the Americans with Disabilities Act (ADA) guidance in design and placement (AR 420-1, chap 7).

c. Shoulders. Shoulders are maintained to design template to allow satisfactory surface drainage and to protect the pavement edge. Edge ruts are repaired bi-annually to prevent hazardous situations for errant vehicles. Shoulders may be paved when necessary for safety, dust or erosion control, or protection of the pavement edge.

d. Traffic control devices. Maintain signs, signals, pavement markings, and other traffic control devices to keep them legible and operating in accordance with the Installation Design Standards (IDS) and the current Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or host criteria, as appropriate, to control and safeguard traffic. Installations will use an assessment or management method to maintain sign retroreflectivity at or above the minimum levels specified in the MUTCD.

e. Snow and ice control. As necessary, erection of snow fences and markers, removal of snow, and application of chemicals and abrasives are methods that may be used to maintain traffic. Guidance on maintenance procedures is provided in TM 5-624. See AR 420-1, chapter 7 for requirements and restrictions related to the use of chemicals.

3-3. Pavement status reporting

a. The following PCI rating ranges, as defined in TM 5-623, Preventive Maintenance Management, are used for the Installation Status Report (ISR) ratings for vehicular pavements:

- (1) PCI rating of 56 or greater results in an ISR Green rating.
- (2) PCI rating of 41 to 55 results in an ISR Amber rating.
- (3) PCI rating of 40 or less results in an ISR Red rating.

b. The following PCI rating ranges, as defined in the ASTM standard D5340-04e1, are used for the ISR ratings for airfield pavements:

- (1) PCI rating greater than 70 results in an ISR Green rating.
- (2) PCI rating greater than 55 and less than or equal to 70 results in an ISR Amber rating.
- (3) PCI rating of 55 or less results in an ISR Red rating.

3-4. Condition inspection of pavement network

a. Reports generated from condition inspections are used for checking problem areas during subsequent or intervening inspections and for project development.

b. The network is divided, using PAVER methodology, into manageable sections for performing pavement inspections to determining M&R needs. The Integrated Facilities System (IFS) numbers and PAVER branch numbers should be the same.

c. See AR 420-1, chapter 7 for required—

- (1) Qualifications of inspection personnel.
- (2) Inspection techniques.
- (3) Minimum inspection frequency.

d. Network level inspections should be accomplished, on a random sampling basis, with an average of not less than ten percent of the total sample units within a section.

e. Requirements for Army airfield pavement condition inspections are addressed in AR 420–1, chapter 7. Additional required surveys and evaluations for Army airfield pavements are addressed below. See AR 95–2 for the definitions of Category I and II airfields. Airfield pavement evaluation procedures and non-destructive test (NDT) procedures for Army airfields are described in the UFC 3–260–03, Design: Airfield Pavement Evaluation.

(1) Category I Army airfields, that are defined as critical by U.S. Army Aeronautical Services Agency (USAASA), shall have a pavement condition survey performed every three years and a structural evaluation including NDT evaluation performed every five years.

(2) Category I airfields not classified as critical, and instrumented heliports, shall have a pavement condition survey every four years and a structural evaluation including NDT performed every eight years.

(3) Category II airfields should have a pavement condition survey every four years. The NDT evaluations for Category II airfields shall be on an as needed basis.

(4) An out of cycle pavement condition survey and/or structural evaluation including NDT shall be performed with each mission change, when the pavement shows signs of structural distress, or after a reconstruction project.

f. See AR 420–1, chapter 7 for inspection requirements for vehicular and airfield traffic signs, signals, pavement markings, and delineators.

3–5. Network-level management

Network-level management encompasses management activities associated with the total pavement network. The following minimum network management activities are necessary for development of the annual work plan (AWP).

a. Use of a priority or optimization scheme to decide when individual pavement sections should be maintained or repaired within budgetary constraints.

b. Development of a program and budget for M&R of the pavements.

3–6. Work planning for maintenance and repair of paved areas

a. *Annual work plan.* The AWP for paved areas identifies the annual recurring requirement and major M&R planned for accomplishment in the program fiscal year and contains the following:

(1) *Routine pavement maintenance tasks.* These tasks should be accomplished on an annual basis to preserve the integrity of the pavement structure, prevent more costly M&R treatments, and to assure traffic safety. Separate individual job orders (IJOs) that include specific task description and location, the unit of measure, and unit cost are prepared to facilitate orderly planning, review, and analysis.

(2) *Major M&R for pavements.* The major M&R portion of the AWP will be developed based on comparison of major M&R alternatives. Prioritization of major pavement M&R projects should be based upon cost, type of repair, pavement condition, and realistic budget levels. See TM 5–623 for M&R alternatives guidance. All pavement projects, which are beyond the garrison's capacity to program and execute within 1 year of identification of the deficiency should be included and prioritized within the Installation Management Command (IMCOM) Project Priority System (PPS).

b. *Snow removal and ice control plan.* Where appropriate, the installation snow removal and ice control plan should include all roads and airfields identified by priority for clearance; equipment and materials needed (such as snow fences); chemicals; abrasives; arrangement for military troop work; and other emergency planning measures as determined necessary by IMCOM.

3–7. Project-level management

Project-level management encompasses detailed engineering management associated with the M&R of specific pavement sections. Management decisions should be based on:

a. *Pavement inspection.* Detailed pavement inspections (including distress surveys, estimates of remaining life, and records of any safety problem) provide the basis for determining causes of failures and appropriate corrective actions. PAVER is used in these investigations. As part of the pavement inspections, consideration is given to the adequacy of the drainage system since water infiltration is a primary cause of several distresses. NDT evaluation may be warranted to determine structural adequacy.

b. *Development, selection, and analysis of alternatives.* Pavement M&R alternatives are developed for each pavement section (see TM 5–623 for details). Project selection is based on analysis of each feasible alternative to identify the lowest life-cycle costs and overall road serviceability factors. Asphalt or refined coal tar seal coating should be considered as they extend the life of asphalt concrete. Pavement recycling is required for all asphalt concrete pavement projects involving overlays, replacement of asphalt concrete, or corrections in the geometry of the pavement cross-section. Recycling is included in the bid document as a mandatory alternative unless a waiver has been granted by HQIMCOM. See AR 420–1, chapter 7 for required project file documentation.

c. *Pavement engineered management system reports.* Project information relating to pavement sections can easily be retrieved from PAVER reports. PAVER has a life-cycle economic analysis report that can be used to determine the

Equivalent Uniform Annual Cost (EUAC). The family analysis report in PAVER can be used to predict life expectancy for different types of pavements.

d. Pavement load carrying capacity analysis. After pavement inspections, those pavements experiencing load-related distresses are evaluated structurally by field sampling or NDT. Testing and re-inspection should be repeated if there is a change in traffic mission, distress types indicating further load related distresses, or presence of structural distress. Pavements particularly susceptible to frost and spring thaw damage will be posted with load and speed limitations during the spring thaw season. These roads may be temporarily closed to traffic if a structurally adequate alternate route in the area exists.

Chapter 4 Railroads

4-1. Track categories and condition levels

The systematic application of preventive maintenance of railroads and appurtenances provides a safe working environment and protects railroad investments by providing a means for early detection of any apparent deterioration of the facility. As an aspect of preventive maintenance, evaluation of trackage by consideration of assigned track categories and their condition levels provides the means of determining the relative seriousness of defects and establishing priorities of repair work.

a. Track classification by category. Track category is the use of the track not the condition of the track. Track category normally does not change after it is classified. All track is classified by the garrison commander and maintained under one of the categories listed below as established by UFC 4-860-03FA. Track categories should be re-evaluated and updated as necessary whenever a change in an installation's mission affects its railroad track.

(1) *Category A.*

(a) *Active main lines.*

(b) Any track where the operating speed exceeds 10 mph.

(c) Track (both active and inactive) required for mobilization and where the operating speed will exceed 10 mph.

(2) *Category B.*

(a) Active passing tracks, loading tracks, classification yard tracks, and storage tracks.

(b) All other tracks (both active and inactive) required for mobilization and not previously identified as Category A track.

(c) Tracks having an occasional use or a foreseeable need.

(3) *Category C.* Inactive track with no current mission requirements.

b. Track condition levels.

(1) *Full compliance.* Track meeting all of the requirements of the standards. Track at this level has only minor defects and should be capable of handling all train operations. Routine maintenance is required to maintain this condition level and repair work is generally minor.

(2) *10 MPH.* This condition level represents track that has defects serious enough to make it unsuitable for operation greater than 10 mph, essentially 'normal yard speed'. Track at this condition level is considered marginal.

(3) *5 MPH.* This condition level represents track that has defects serious enough to make it unsuitable for operations greater than 5 mph. This level is intended as a warning to indicate track that is approaching a condition that will require removal from service.

(4) *No operation.* Track which has defects serious enough to require removal from service. At this level, the operation of trains over the track is generally considered hazardous and operations are not allowed, except as noted in UFC 4-860-03FA.

c. Minimum required condition level. The minimum required condition level for categories A, B, and C track are as shown below.

(1) A - full compliance.

(2) B - 10 MPH.

(3) C - The minimum level of maintenance for inactive (Category C) track will be consistent with the anticipated future mission of the activity and the particular track involved. (See UFC 4-860-03FA, chapter 15.)

d. Preventive maintenance. Preventive maintenance of railroads and appurtenances should provide a means for early detection of any apparent deterioration of the facility.

4-2. Network-level management

Network-level management systematically develops strategies and priorities for installation track maintenance activities including work identification, prioritization, budgeting, and execution of M&R work. The Rail Engineered Management System (RAILER) will be used for railroad track maintenance management.

4-3. Work planning for maintenance and repair of railroad track

a. Annual work plan. The installation's AWP for railroad track identifies the work planned for accomplishment in the program fiscal year. The AWP includes items of routine maintenance, which should be programmed to maintain acceptable and economical levels of performance, and major M&R projects. Any Railroad M&R Project, that is beyond the garrison's capacity to program and execute within 1 year of identification of the deficiency should be included and prioritized within the IMCOM PPS.

(1) *Minimum routine railroad safety tasks.* Safety checks shall be conducted before use or in accordance with UFC 4-860-03FA, chapter 2. In addition, on the job observations shall be going on at all times when equipment is working. Broken rails and other rail defects, faulty switch point closure, indication of wide gage, poor alignment or surface (profile), loose crossing planks, wheel flanges hitting frog points and joint bars, working spikes and loose joints, rail pull-a-parts, evidence of imminent track buckling, deterioration of cross ties, insufficient ballast, blocked drainage, scour at bridges, and the threat of slides can contribute to train derailments and should be brought to the attention of the responsible person for correction. Safety deficiencies should be corrected immediately or a track restriction placed on the track until the deficiency is corrected.

(2) *Minimum routine railroad maintenance tasks.* Inspections will be made at least semiannually by a qualified inspector on every track segment to identify all routine maintenance tasks. IJOs that include specific task description and location, the unit of measure (track feet, miles, or meters) and unit cost will be prepared to facilitate orderly planning, review, and analysis for each task. Network level inspections could be accomplished with RAILER, on a random sampling basis, but this is not recommended. It is normally recommended that inspection be accomplished on 100% of the active track in order to obtain a more accurate evaluation.

(3) *Prioritization of the list of major M&R project alternatives.* Prioritization of major M&R alternatives should be based upon cost, type of repair, and track condition.

b. Snow removal and ice control plan. Where appropriate, an installation snow removal and ice control plan is prepared by the garrison commander. (See AR 420-1, chap 7.)

4-4. Project-level management

Project-level management consists of determining the most feasible M&R alternative for each track segment. This should be accomplished using RAILER and as defined below.

a. Inspections. Inspections of railroad track and appurtenances will be conducted by a Certified US Army Railroad Track Inspector to identify deterioration. This provides the basis for determining general maintenance, repair, and construction needs at the project level.

b. Safety inspection. Safety inspection is that inspection of track performed in accordance with UFC 4-860-03FA. The purpose of this inspection is to identify defects that require restricted operations or no operations on the track being inspected. Safety inspections will be performed on schedules shown in UFC 4-860-03FA.

c. Detailed inspection and problem definition. Investigate deterioration of railroad track and appurtenances to determine the cause of failure and to provide a basis for corrective action. This will be performed annually.

d. Identification of alternatives. Identify M&R alternatives that will correct the problem and eliminate or reduce the factors that led to the deterioration of the railroad track.

e. Project analysis. Conduct an analysis of identified M&R alternatives to include a life-cycle cost analysis of each feasible alternative developed. See AR 420-1, chapter 7 for required project file documentation.

4-5. Rail traffic engineering

Outloading studies should be performed periodically, since they can be an important planning document. Transportation Capability Studies can be requested from Surface Distribution and Deployment Command - Transportation Engineering Agency (SDDC-TEA).

Chapter 5 Bridges

5-1. General

All bridges, major culverts, retaining walls, and appurtenances shall be maintained in good or fair condition as defined in Federal Highway Administration (FHWA) Bridge Inspector's Reference Manual (BIRM). Debris around bridge piers shall be removed as this debris can cause the loss of the structure.

5-2. Performance standards Installation Status Report ratings

The following bridge condition rating ranges, as defined in the BIRM, shall be used for the Installation Status Report (ISR) ratings:

- a.* Bridge Condition Rating 7-9 equals an ISR Green Rating.

- b. Bridge Condition Rating 5–6 equals an ISR Amber Rating.
- c. Bridge Condition Rating 0–4 equals an ISR Red Rating.
- d. The following load capacity results shall also be used for the ISR ratings:
 - (1) The bridge capacity is sufficient for current and mobilization requirements equals an ISR Green Rating.
 - (2) The bridge can be strengthened to meet current and mobilization requirements with minimal rehabilitation equals an ISR Amber rating.
 - (3) The bridge capacity is not sufficient or able to be rehabilitated to current and mobilization requirements equals an ISR Red Rating. Vehicle bridges shall be closed if the capacity (live load) is less than 3 tons.

5–3. Bridge maintenance management

Results of inspections will be used as the basis for determining maintenance, repair, or improvements needed for each structure based on the specifications and procedures prescribed in the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Condition Evaluation of Bridges.

5–4. Type of bridge inspection

- a. *Source.* Derived from the AASHTO Manual for Maintenance Inspection of Bridges.
- b. *General.*
 - (1) Bridge inspections are conducted to determine the physical and functional condition of the bridge; to form the basis for the evaluation and load rating of the bridge, and for analysis of overload permit applications, to initiate maintenance actions; to provide a continuous record of bridge condition and rate of deterioration; and to establish priorities for repair and rehabilitation programs.
 - (2) Successful bridge inspection is dependent on proper planning and techniques, adequate equipment, and the experience and reliability of the personnel trained and certified to perform the inspection. Inspections should not be confined to searching for defects which may exist, but should include anticipating problems. Thus, inspections are performed in order to develop both preventive as well as corrective maintenance programs.
- c. *Type of inspections.*
 - (1) The type of inspection may vary over the useful life of a bridge in order to reflect the intensity of inspection required at the time of inspection. The five types of inspections listed below will allow a garrison to establish appropriate inspection levels consistent with the inspection frequency and the type of structure and details.
 - (2) Each type of inspection requires different levels of intensity. Such items as the extent of access to structural elements, the level of detail required for the physical inspection, and the degree of testing will vary considerably for each type of inspection.
- d. *Inventory inspections.*
 - (1) An inventory inspection is the first inspection of a bridge as it becomes a part of the bridge file, but the elements of an inventory inspection may also apply when there has been a change in the configuration of the structure (for example, widening, lengthening, supplemental bents, and so forth) or a change in bridge ownership. The inventory inspection is a fully documented investigation performed by persons meeting the required qualifications for inspection personnel and it must be accompanied by an analytical determination of load capacity.
 - (2) The purpose of initial inspection is twofold.
 - (a) Provide all Structure Inventory and Appraisal (SI&A) data required by Federal and State regulations, and all other relevant information normally collected by the Bridge Owner.
 - (b) Determine the baseline structural conditions and the identification and listing of any existing problems or locations in the structure that may have potential problems. Aided by a prior detailed review of plans, it is during this inspection that any fracture critical members or details are noted, and assessments are made of other conditions that may warrant special attention. If the bridge subjected to an inventory inspection is anything other than a newly constructed structure, it may be necessary to include some or all of the elements of an in depth inspection.
- e. *Maintenance inspections.* A maintenance inspection consists of a quick visual observation of the bridge by personnel to ensure that nothing obvious has happened to the bridge that could affect its overall safety. Examples of this are: broken structural members or safety railings; leaning or settling piers or abutments; and major debris drift clogging the bridge hydraulic opening. This inspection has no specific requirements for frequency, inspector qualification, or reporting. It is intended only for in-house records and maintenance concerns.
- f. *Routine inspections.*
 - (1) Routine inspections are regularly scheduled inspections consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from 'initial' or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements.
 - (2) The routine inspection must fully satisfy the requirements of the National Bridge Inspection Standards (NBIS) with respect to maximum inspection frequency, the updating of SI&A data, and the qualifications of the inspection personnel. These inspections are generally conducted from the deck; ground and/or water levels; and from permanent work platforms and walkways, if present. Inspection of underwater portions of the substructure is limited to observations during low-flow periods and/or probing for signs of undermining. Special equipment, such as under-bridge

inspection equipment, rigging, or staging, is necessary for routine inspection in circumstances where its use provides for the only practical means of access to areas of the structure being monitored.

(3) The areas of the structure to be closely monitored are those determined by previous inspections and/or load rating calculations to be critical to load-carrying capacity. In-depth inspection of the areas being monitored should be performed in accordance with Article 3.2.4 of NBIS. If additional close-up, hands-on inspection of other areas are found necessary during the inspection, then an in-depth inspection of those areas should also be performed in accordance with Article 3.2.4 of NBIS.

(4) The results of a routine inspection should be fully documented with appropriate photographs, and a written report that includes any recommendations for maintenance or repair and for scheduling of follow-up in-depth inspections if necessary. The load capacity should be re-evaluated to the extent that changed structural conditions would affect any previously recorded ratings.

g. Damage inspections. A damage inspection is an unscheduled inspection to assess structural damage resulting from environmental factors or human actions. The scope of the inspection should be sufficient to determine the need for emergency load restrictions or closure of the bridge to traffic, and to assess the level of effort necessary to repair the bridge. The amount of effort expended on this type of inspection may vary significantly depending upon the extent of the damage. If major damage has occurred, inspectors must evaluate to see if a fracture has occurred. Inspectors must evaluate fractured members, determine the extent of section loss, make measurements for misalignment of members, and check for any loss of foundation support. The presence of an individual with the capability to make on-site calculations to establish emergency load restrictions is required. This inspection may be supplemented by a timely in-depth inspection, as described below, to document more fully the extent of damage and the urgency and magnitude of repairs. Proper documentation, verification of field measurements and calculations, and perhaps a more refined analysis to establish or adjust interim load restrictions are required follow-up procedures. Properly conducted and appropriately thorough damage inspections serve to avoid potential liabilities that otherwise could result from bridge failure.

h. In-depth inspections.

(1) An in-depth inspection is a close-up, hands-on inspection of one or more members above or below the water level to identify any deficiencies not readily detectable using routine inspection procedures. Traffic control and special equipment, such as under-bridge inspection equipment, staging, and workboats, should be provided to obtain access, if needed. Personnel with special skills such as divers and riggers may be required. When appropriate or necessary to fully ascertain the existence of, or the extent of, any deficiencies, nondestructive field-tests and/or other material tests may need to be performed.

(2) The inspection may include a load rating to assess the residual capacity of the member or members, depending on the extent of the deterioration or damage. Non-destructive load tests may be conducted to assist in determining a safe bridge load-carrying capacity.

(3) This type of inspection can be scheduled independently of a routine inspection, though generally at a longer interval, or it may be a follow-up for damage or inventory inspections.

(4) On smaller bridges, the in-depth inspection, if warranted, should include all critical elements of the structure. For larger and more complex structures, these inspections may be scheduled separately for defined segments of the bridge or for designated groups of elements, connections, or details that can be efficiently addressed by the same or similar inspection techniques. If the latter option is chosen, each defined bridge segment and/or each designated group of elements, connections or details should be clearly identified as a matter of record and each should be assigned a frequency for re-inspection. To an even greater extent than is necessary for initial and routine inspections, the activities, procedures, and findings of in-depth inspections should be completely and carefully documented, to include photographic documentation.

i. Special inspections.

(1) A special inspection is an inspection scheduled at the discretion of the bridge owner. It is used to monitor a particular known or suspected deficiency, such as foundation settlement or scour, member condition, and the public's use of a load-posted bridge, and can be performed by any qualified person familiar with the bridge and available to accommodate the assigned frequency of investigation. The individual performing a special inspection should be carefully instructed regarding the nature of the known deficiency and its functional relationship to satisfactory bridge performance. In this circumstance, guidelines and procedures on what to observe and/or measure must be provided and a timely process to interpret the field results should be in place.

(2) The determination of an appropriate special inspection frequency should consider the severity of the known deficiency. Special inspections usually are not sufficiently comprehensive to meet NBIS requirements for biennial inspections.

5-5. Project-level management

Project-level management decisions will be based on a detailed analysis of the following actions:

a. Bridge and major culvert inspection. The results of bridge and major culvert inspections will be used in

conjunction with additional detailed inspections to determine maintenance, repair, and construction needs at the project level.

b. Problem definition. Deterioration of major culverts and bridge elements shall be investigated to determine the cause and to provide a basis for corrective action.

c. Development and selection of alternatives. M&R alternatives, which will eliminate or reduce the factors that led to the deterioration of the structure, shall be developed. Bridge maintenance and rehabilitation alternatives must be reviewed before replacement is considered as an alternative. Project selection should be based on M&R versus replacement and upon lowest life-cycle costs that meet loading and other serviceability factors. Bridge Safety is required by the Surface Transportation Assistance Act (STA) of 1978 (Public Law (PL) 95–599) and 23 Code of Federal Regulations (CFR) 650.315. Safety deficiencies must be addressed immediately by either closing the bridge or correcting the deficiency. Garrison commanders may be held personally liable for the safety of the bridges under their authority and must fund projects to correct the deficiencies (see HQDA, Office of the Chief of Engineers, memorandum Subject Command Responsibility for Dam Safety, dated 17 Aug 1992; available at HQDA, ACSIM (DAIM–OFD)) . If installation funding is not available to correct the deficiency, funding requests will be forwarded up the chain of command. The bridge will not be re-opened until the safety deficiency is corrected.

d. Project analysis. Conduct an analysis of identified M&R alternatives to include a life-cycle cost analysis of each feasible alternative developed. See AR 420–1, paragraph 7–42b for required project file documentation.

e. Annual work plan. The installation’s AWP for bridges identifies the work planned for accomplishment in the program fiscal year. The AWP includes items of routine maintenance, which should be programmed to maintain acceptable and economical levels of performance, and major M&R projects. Any bridge M&R project, that is beyond the garrison’s capacity to program and execute within one year of identification of the deficiency should be included and prioritized within the IMCOM PPS.

Chapter 6 Dams

6–1. General

The Army manages dams in accordance with Federal Emergency Management Agency (FEMA) documents to include FEMA 64; FEMA 65; FEMA 93; FEMA 94; FEMA 145; FEMA 148; and FEMA 333. The minimum standards for Army dams are the standards for the state or country in which they are emplaced. The International Commission of Large Dams (ICOLD) has determined that the three major categories of dam failure are overtopping by flood, foundation defects, and piping. For earthen dams, the major reason for failure was piping or see page. For concrete dams, the major reasons for failure were associated with foundations. Overtopping was a significant cause of dam failure primarily in cases where there was an inadequate spillway.

6–2. Hazard potential classification

a. General classification. Army dams are classified according to their size and hazard potential. The garrison commander will determine the dam hazard classification in conjunction with the local supporting United States Army Corps of Engineer (USACE) district. The garrison commander will use the USACE supporting districts to verify dam Hazard Classification and determination that a structure is a dam. The USACE supporting district will also assist in EAPs if requested.

b. Size classification. The elements of height and the storage capacity will be considered and the element producing the largest size category shall govern and will be used to establish the size classification (that is, small, intermediate, or large).

(1) *Height.* If the dam is located across a watercourse or a river, the height of the dam should be measured from the natural bed of the river at the downstream end of the dam to the maximum water storage elevation. If the dam is not across a watercourse or river then the height is measured from the lowest elevation at the toe of the dam to the maximum water storage elevation.

(2) *Storage capacity.* In order to determine the storage capacity of a dam, the maximum storage elevation may be considered equal to that of the crest of the dam.

(3) Once the height and the storage capacity are established, then size classification (that is, small, intermediate, or large) can be made by the dam height (small dams < 25 feet in height, medium dams = between 25 and 50 feet in height, and large dams > 50 feet in height), and by the storage volume (small lakes < 150 acre-feet maximum storage, medium lakes = between 151 acre-feet and 1,000 acre-feet maximum storage, and large lakes > 1,000 acre-feet maximum storage).

c. Hazard potential classifications. The hazard potential classification, as accepted by the Interagency Committee on Dam Safety, is based on potential hazard pertaining to the possible loss of human life or property damage in downstream areas of the dam in the event that the dam or its appurtenant facilities fail. The hazard classification for dams is presented as follows:

(1) *Low hazard potential.* Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

(2) *Significant hazard potential.* Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with larger population and significant infrastructure.

(3) *High hazard potential.* Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

6-3. Dam inspections

Dam inspections are conducted in accordance with FEMA 145, "Dam Safety: An Owners Guidance Manual." The inspection program should involve three types of inspections: (1) periodic technical inspections; (2) periodic maintenance inspections; and (3) informal observations by project personnel as they operate the dam. Technical inspections involve specialists familiar with the design and construction of dams and include assessment of structure safety. Maintenance inspections are performed more frequently than technical inspections in order to detect, at an early stage, any detrimental developments in the dam; they involve assessment of operational capability as well as structural stability. The third type of inspection is actually a continuing effort by onsite project personnel (dam tenders, powerhouse operators, maintenance personnel) performed in the course of their normal duties. Visual inspection performed on a regular basis is one of the most economical means a dam owner can use to assure the safety and long life of a dam and its immediate environment. Visual inspection is a straightforward procedure that can be used by any properly trained person to make a reasonably accurate assessment of a dam's condition. Education of new personnel is required to assure the continued effectiveness of these inspections. Dam operating personnel and those working around the dams should have annual training in dam safety using the Training Aids for Dam Safety (TADS).

6-4. Maintenance Program

A good maintenance program will protect a dam against deterioration and prolong its life. A poorly maintained dam will deteriorate and can fail. Nearly all the components of a dam and the materials used for dam construction are susceptible to damaging deterioration if not properly maintained. A good maintenance program provides not only protection for the owner, but for the general public as well. Furthermore, the cost of a proper maintenance program is small compared to the cost of major repairs or the loss of life and property or potential liability for such losses. A garrison commander should develop a basic maintenance program based primarily on systematic and frequent inspections. Dam safety is required by the Water Resources Development Act of 1996's National Dam Safety Program (PL 104-303), National Dam Safety Program Act, and PL 107-310, Dam Safety and Security Act of 2002. Safety deficiencies must be addressed immediately by either lowering the pool or correcting the deficiency. Garrison commanders may be held personally liable for the safety of the dams under their authority and must fund projects to correct the deficiencies (see HQDA, Office of the Chief of Engineers, memorandum Subject Command Responsibility for Dam Safety, dated 17 Aug 1992; available at HQDA, ACSIM (DAIM-OFD)). If funding is not available, they will forward requests up the chain of command, with high priority, to get funding for the projects and the responsibility will shift to the next level of authority. The pool will not be raised until the safety deficiency is corrected. Earthen dams will have vegetation properly controlled and mowed, seepage will be constantly observed and controlled, and erosion repaired. Spillways will be properly maintained and erosion repaired. Outlets will be maintained and controls tested annually.

a. Documentation of project analysis shall be included in the project files for each dam project over \$50,000. Documentation shall consist of data relevant to the project, including an analysis of identified M&R alternatives to include a life-cycle cost analysis of each feasible alternative developed. See AR 420-1, chapter 7 for required project file documentation.

b. The installation's AWP for dams identifies the work planned for accomplishment in the program fiscal year. The AWP includes items of routine maintenance, which should be programmed to maintain acceptable and economical levels of performance, and major M&R projects. Any dam M&R project, that is beyond the garrison's capacity to program and execute within one year of identification of the deficiency should be included and prioritized within the IMCOM PPS.

6-5. Emergency Action Plan

a. On occasion dams fail and often these failures cause loss of life, injuries, and extensive property damage. A garrison commander must prepare for this possibility by developing an emergency action plan which provides a systematic means to—

- (1) Identify emergency conditions threatening a dam.
- (2) Expedite effective response actions to prevent failure.
- (3) Reduce loss of life and property damage should failure occur.

b. A garrison commander is responsible for preparing a plan covering these measures and listings actions that the owner and operating personnel should take. The garrison commander should be familiar with the local government officials and agencies responsible for warning and evacuating the public. The effectiveness of EAPs is enhanced by promoting a uniform format which ensures that all aspects of emergency planning are covered in each plan. EAPs will be prepared for all High and Significant Hazard dams in coordination with the local USACE supporting district and the local community, in accordance with FEMA 64, Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners. EAPs for Low Hazard dams may be accomplished with a local standing operating procedure (SOP) rather than with a full EAP as specified in FEMA 64 unless the release of water impacts the local economy off the military installation.

c. EAPs will be reviewed annually for POC and telephone number update and verification. Garrison Commanders with High and Significant Hazard dams will conduct, as a minimum, an EAP functional exercise, as explained in FEMA 64, at least every five years with actual calling of the POCs and coordinating with local officials.

6-6. Performance standards selection of dam design flood

The design flood of any dam is the flow rate and volume at which the dam must be maintained to allow passage of the design flows (flood) without major deterioration of dam components, damaging erosive undermining action, or loss of stability. The selection of the design flood should be based on an evaluation of the relative risks and consequences of flooding, under both present and future conditions. When flooding could cause significant hazards to life or major property damage, the flood selected for design should have virtually no chance of being exceeded. If lesser hazards are involved, a smaller flood may be selected for design. Regardless, all dams should be designed to withstand a relatively large flood without failure even when there is apparently no downstream hazard involved under present conditions of development.

Appendix A References

Section I Required Publications

AASHTO Manual for Condition Evaluation of Bridges

(Available from https://bookstore.transportation.org/advanced_search.aspx) (Cited in paras 5–3, 5–4.)

AR 95–2

Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational Aids. (Cited in para 3–5e.)

AR 415–28

Real Property Category Codes. (Cited in paras 3–1a(1), 4–1a.)

AR 420–1

Army Facilities Management. (Cited in paras 1–1, 2–1, 3–2, 3–2b, 3–2e, 3–4c, 3–4e, 3–4f, 3–7b, 4–3a, 4–3b, 5–5d.)

ASTM D 5340–04e1

Standard Test Method for Airport Pavement Condition Index Surveys. (Available at <http://www.astm.org/cgi-bin/SoftCart.exe/CONTACT/index.html?E+mystore>) (Cited in para 3–4b.)

23 CFR 650.315

Subpart C: National Bridge Inspection Standards. (Cited in para 5–5c.)

FEMA 64

Federal Guidelines for Dam Safety: Emergency Action Planning Guidelines for Dam Owners. (Cited in paras 6–1, 6–5c.) (Available at <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>)

FEMA 65

Federal Guidelines for Dam Safety: Earthquake Analyses and Design of Dams. (Cited in para 6–1.) (Available at <http://www.fema.gov/plan/prevent/damfailure/publications.shtm#3>)

FEMA 93

Federal Guidelines for Dam Safety. (Cited in para 6–1.) (Available at <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>)

FEMA 94

Federal Guidelines for Dam Safety: Selecting and Accommodating Inflow Design Floods for Dams. (Cited in para 6–1.) (Available at <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>)

FEMA 145

Dam Safety: An Owner’s Guidance Manual. (Cited in paras 6–1, 6–3.) (Available for purchase from the Association of State Dam Safety Officials, 450 Old Vine St, Lexington, KY 40507 or at <http://www.damsafety.org>)

FEMA 148

Federal Guidelines for Dam Safety: Glossary of Terms. (Cited in para 6–1.) (Available at <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>)

FEMA 333

Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams. (Cited in para 6–1.) (Available at <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>)

PL 95–599

Surface Transportation Assistance Act (STA) of 1978. (Cited in para 5–5c.)

PL 104–303

Water Resources Development Act of 1996. (Cited in para 6–4.)

PL 107-310

Dam Safety and Security Act of 2002. (Cited in para 6-4.)

UFC 4-860-03FA

Railroad Track Standards (Cited in paras 4-1a, 4-1b, 4-1c, 4-3a, 4-3b.) (Available at http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4)

Section II**Related Publications**

A related publication is a source of additional information. The user does not have to read a related reference to understand this publication.

DA Pam 415-28

Guide to Army Real Property Category Codes

DA Pam 420-11

Project Definition and Work Classification

IDS

Army Installation Design Standards. (Available at <https://www.idsarmy.hqda.pentagon.mil>)

MUTCD

Manual on Uniform Traffic Control Devices. (Available at <http://mutcd.fhwa.dot.gov/>)

TM 5-623

Pavement Maintenance Management

TM 5-624

Maintenance and Repair of Surface Areas

UFC 3-260-03

Design: Airfield Pavement Evaluation (Available at the Whole Building Design Guide (WBDG) UFC website (<http://dod.wbdg.org/>))

Section III**Prescribed Forms**

This section contains no entries.

Section IV**Referenced Forms**

This section contains no entries.

Glossary

Section I Abbreviations

AASHTO

American Association of State Highway and Transportation Officials

ACSIM

Assistant Chief of Staff for Installation Management

APD

Army Publishing Directorate

AR

Army regulation

ARNG

Army National Guard

ARNGUS

Army National Guard of the United States

ASTM

American Society for Testing and Materials

AWP

annual work plan

BIRM

Bridge Inspector's Reference Manual

CATCD

category code

CFR

Code of Federal Regulations

DA

Department of the Army

DA Pam

Department of the Army pamphlet

DPW

Directorate of Public Works

EAP

emergency action plan

EUAC

equivalent uniform annual cost

FEMA

Federal Emergency Management Agency

FHWA

Federal Highway Administration

FOD

foreign object damage

HQDA

Headquarters, Department of the Army

HQUSACE

Headquarters, U.S. Army Corps of Engineers

HQIMCOM

Headquarters, Installation Management Command

ICOLD

International Commission of Large Dams

IDS

installation design standards

IFS

Integrated Facilities System

IMCOM

Installation Management Command

IJO

individual job order

ISR

installation status report

M&R

maintenance and repair

MUTCD

manual on uniform traffic control devices

NBI

national bridge inventory

NBIS

National Bridge Inspection Standards

NDT

non-destructive testing

O&M

operations and maintenance

OCE

Office, Chief of Engineers

PAVER

Pavement Engineered Management System

PCI

pavement condition index

POC

point of contact

RAILER

Rail Engineered Management System

RPF

real property facility

SDDC-TEA

Surface Distribution and Deployment Command-Transportation Engineering Agency

SI&A

structural inventory and appraisal

SO

service order

SOFA

status of forces agreement

SOP

standing operating procedures

TADS

training aids for dam safety

TM

technical manual

UFC

unified facilities criteria

UFR

unfunded requirement

USAASA

U.S. Army Aeronautical Services Agency

USACE

U.S. Army Corps of Engineers

USAR

U.S. Army Reserve

WBDG

whole building design guide

Section II**Terms****Addition/Expansion/Extension**

A physical increase in the overall external dimensions of a real property facility. This excludes alterations.

Alteration

Change to the interior or exterior facility arrangements to improve use of the facility for its current purpose. This includes installed equipment made a part of the existing facility. Additions, expansions, and extensions are not alterations.

Annual work plan

A planning document, prepared prior to the start of each fiscal year, which identifies and schedules housing facilities work and services according to the resources available and the priorities established by the garrison commander. It must include all maintenance and repair (M&R) work that should be done during the year. M&R work that cannot be done during the year due to lack of funds will be listed as an unfunded requirement (UFR).

Appurtenances

All associated features to the pavement, bridge, or railroad. Pavement and bridge appurtenances consist of such items

as ditches, culverts, and storm sewers; traffic signs, signals, and markings; right of way or snow fencing; unstabilized shoulders; curbs; guard rails; cattleguards; tank crossings; and supporting embankments. Appurtenances for airfields include overrun areas, aircraft arresting gear, and tie downs in addition to the items listed above. Railroad appurtenances include roadbeds, road crossings, tracks, culverts, other drainage structures, signs, signals, switch tafetts, lamps, safety devices, track scales, and all other features and items necessary to meet operational and safety requirements. Railroad communications systems and rolling stock are excluded.

Bridge

A structure (including supports erected over a depression or obstacle such as a river, chasm, road, or the like), carrying a passageway for pedestrians, vehicles, or railway equipment. (see also, "Reportable bridge")

Bridge, Reportable

See "Reportable bridge."

Building

A facility with occupiable space, usually with flooring, covered by a roof, enclosed by walls, and sited on a tract of land. Maintenance, storage, production, administration, health care, family housing, and unaccompanied personnel housing are examples of buildings.

Category code (CATCD)

A series of numerical codes used to classify and categorize Army real property. These code numbers are based on nine basic functional classes directed by the DOD. The Army generally uses a five-digit code to identify, plan, program, budget, design, construct, inventory, and maintain its facilities. Some commands add digits to refine the functional description. A real property facility is assigned one three-digit category code from DA Pam 415–28 based on the primary construction category.

Construction

Any of the following activities:

- a. Erection, installation, or assembly of a new facility.
- b. Addition, expansion, extension, alteration, conversion, or complete replacement of an existing facility.
- c. Relocation of a facility from one garrison to another.
- d. Related site preparation, excavation, filling, landscaping, or other land improvements.

Costs

The acquisition value of capital equipment and real property. Generally, the value of resources consumed, work put in place or in procurement, and/or the value of items procured or produced. The term "costs" as the value of resources consumed during an accounting period is often used interchangeably with the term "expense"; however, under this definition, the terms "costs" and "expense" are not synonymous.

Economic analysis

A systematic method for quantifying the costs and/or benefits of alternative solutions for achieving an objective in order to find the most cost-effective (economical) solution. It provides a structured method to identify, analyze, and compare costs and benefits of the alternatives.

Expansion

See "Addition".

Extension

See "Addition".

Facility

A building, structure, or other improvement to real property. It includes the occupiable space it contains and any interest in land, structure, or complex of structures together with any associated road and utility improvements necessary to support the functions of an Army activity or mission. The class of facility is identified by a five-digit construction CATCD (AR 415–28).

Funded cost

Cost which is charged to the appropriation designated to pay for a project.

Garrison

Organization responsible for providing installation management services and operations.

Garrison commander

Commanding officer of a garrison organization.

Improvement

Alterations, conversions, modernizations, revitalizations, additions, expansions, and extensions for the purpose of enhancing rather than repairing a facility or system associated with established housing facilities or area(s).

Incidental improvements

Minor improvements made within the cost limitations of the Army Family Housing (AFH) operation and maintenance (O&M) program. These are also referred to as alterations and additions by fiscal managers.

Individual job order (IJO)

A work authorization document required for:

- a. All improvements regardless of cost.
- b. M&R beyond the limitation of a service order (SO).

Installation

An aggregation of contiguous, or near contiguous, real property holdings commanded by a centrally-selected commander. An installation may be made of one or more sites.

Installation Design Standards (IDS)

A compilation of all approved Army Standards, Army Facility Standard Designs, Zone Planning Criteria, and Technology Standards maintained on the ACSIM web site.

Integrated Facilities System (IFS)

An automated information evaluation system that encompasses life cycle management of real property resources. It is also the source of the installation real property inventory.

Maintenance

Work required to preserve and maintain a real property facility in such condition that it may be used effectively for its designated functional purpose. Maintenance includes work done to prevent damage which would be more costly to restore than to prevent. Maintenance includes work to sustain components. Examples include renewal of disposable filters, painting, caulking, refastening loose siding, and sealing bituminous pavements.

Maintenance or repair project

Logical plan of work for a single undertaking of finite scope which clearly satisfies a specific maintenance or repair requirement on one or more real property facilities.

Major culvert

All culvert, multi-plate, and arches with an end area equal to or exceeding 200 square feet.

Minor construction

Construction project with a funded cost less than or equal to \$750,000, or if correcting health or life safety deficiencies, less than or equal to \$1,500,000.

Pavement

Surfaced area designed for vehicular or aircraft use.

Pool

The body of water collected and stored as an artificial lake or pond behind a dam. The dam's water reservoir.

Rail

In railroad track maintenance and for the purposes of this pamphlet, the steel component used in a track structure to support the load of a train and guide it. (Note: To railroad train operation personnel, rail means the railroad train operations or the railroad train operation system.)

Real property facility (RPF)

A separate and individual building, structure, utility system, or other real property improvement identifiable in the CATCDs listed in AR 415–28.

Repair

Repair is:

- a.* The restoration of a real property facility (RPF) to such condition that it may be used effectively for its designated functional purpose.
- b.* The correction of deficiencies in failed or failing components of existing facilities or systems to meet current Army standards and codes where such work, for reasons of economy, should be done concurrently with restoration of failed or failing components.
- c.* A utility system or component may be considered “failing” if it is energy inefficient or technologically obsolete.

Replacement

A complete reconstruction of a real property facility destroyed or damaged beyond the point where it may be economically repaired.

Reportable bridge

All Army bridges in the United States. Reportable bridges must be reported to the Federal Highway Administration for inclusion in the National Bridge Inventory (NBI).

Revitalization

Systematic replacement or renovation of Army real property with the goal of modernizing it to current standards. The revitalization program recognizes that facilities have finite lives. In consideration of this fact, its goal is to revitalize annually forever a percentage of the facilities inventory so that no facility will exceed its economic and/or functional life.

Service order (SO)

A work authorization document used for small-scale maintenance and repair work on Government-owned or -leased facilities and equipment. For family housing, improvements (either incidental improvements or construction) may not be accomplished as a SO.

Structure

A facility other than a building, such as bridges, locks and dams, fences, flagpoles, swimming pools, open towers, tent frames and floors, permanent grandstands and bleachers, historical monuments, free standing walls, and underground storage facilities.

Surfaced areas

Structural systems constructed to support and sustain various types of traffic and loadings and normally include drainage features and an established profile or template. Structural systems may consist of compacted sub-grade, improved materials (subbase), interlocking aggregate base course, and flexible or rigid surface or wearing course. Does not include grass, graded areas, or road tracks established by the passage of vehicles.

Track

A structure composed of rail, ties, and ballast that support the loads of railroad cars and locomotives and guides their movements. Crane and tracks on target ranges do not fall under the purview of this pamphlet.

Training Aids for Dam Safety (TADS)

TADS is a Federal/State developed training program designed to train individuals involved with or having responsibility for the safety of dams. Users include: engineers, technicians, dam owners, water resource managers, public officials, and the general public. TADS modules are self-contained, self-paced text supplemented by video presentations.

Unfunded costs

Costs that are neither chargeable to nor included in the project cost which is considered to determine whether or not a project’s cost is within or exceeds statutory or policy thresholds.

Section III**Special Abbreviations and Terms**

This section contains no entries.

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