

Army Regulation 420-72

Facilities Engineering

Surfaced Areas, Bridges, Railroad Track and Associated Appurtenances

Headquarters
Department of the Army
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Unclassified

SUMMARY of CHANGE

AR 420-72

Surfaced Areas, Bridges, Railroad Track and Associated Appurtenances

This revision--

- o Replaces the term "facilities engineer" with "Director of Engineering and Housing."
- o Provides a complete reference and terminology listing (paras 1-2 and 1-3).
- o Establishes a triennial on-site review of the installation's pavement maintenance program (para 2-2).
- o Establishes minimum acceptable pavement service levels (para 2-5).
- o Includes guidance concerning the use of PAVER pavement maintenance management system (paras 2-6, 2-8, 2-9, and 2-11).
- o Provides guidance on use of state highway specifications concerning local construction materials and practices (para 2-14).
- o Establishes required performance service levels for bridges (paras 3-5 and 3-7).
- o Revises minimum condition levels for railroad track at all CONUS installations (para 4-5).
- o Establishes railroad track inspection standards and a railroad track inspector's certification program (para 4-5).

Facilities Engineering

Surfaced Areas, Bridges, Railroad Track and Associated Appurtenances

By Order of the Secretary of the Army:

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History. This UPDATE printing publishes a revision of this publication. Because the publication has been extensively revised, the changed portions have not been highlighted. This publication has been reorganized to make it compatible with the Army electronic publishing database. No content has been changed.

Summary. This regulation establishes policy, criteria, procedures, and standards for the operation, maintenance and repair of surfaced

areas, bridges, railroad track, and associated appurtenances.

Applicability. This regulation applies to the Active Army and the U.S. Army Reserve. In areas outside the continental United States, it applies to other Federal departments and agencies that are tenants on an Army installation regardless of Service. This includes foreign official organization under joint use agreements, and any governmental or private organization licensed to operate within an Army installation. It does not apply to the Army National Guard, national cemeteries, Corps of Engineers civil works functions, and where the Army is a tenant of another Government agency.

Proponent and exception authority. Not applicable.

Army management control process. This regulation is subject to the requirement of AR 11-2. It contains an internal control review checklist. The checklist is contained in Department of the Army Circular 11-86-3.

Supplementation. Supplementation of this regulation and the establishment of command and local forms are prohibited without prior

approval from HQDA (DAEN-ZA), WASH DC 20314-1000.

Interim changes. Interim changes to this regulation are not official unless they are authenticated by the Administrative Assistant to the Secretary of the Army. Users will destroy interim changes on their expiration dates unless sooner superseded or rescinded.

Suggested Improvements. The proponent agency of this regulation is the Office of the Chief of Engineers. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Director, U.S. Army Engineering and Housing Support Center, Fort Belvoir, VA 22060-5516.

Distribution. Distribution of this publication is made in accordance with the requirements on DA Form 12-09-E, block number 3489, intended for command level C and D for Active Army and the U.S. Army Reserve, and none for the Army National Guard.

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Chapter 1 General

1-1. Purpose

a. This regulation prescribes administrative policies, procedures, and responsibilities necessary for the Director of Engineering and Housing (DEH) to plan, program, and perform maintenance, repair, minor construction, quality assurance, and control of the following:

- (1) Paved roads, airfields, and other surfaced areas.
- (2) Bridges.
- (3) Railroad tracks.
- (4) Culverts and other appurtenances.

b. Policies are intended to ensure that maintenance and repair (M&R) work is completed in an efficient and cost effective manner.

1-2. References

Required and related references are listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and special terms used in this regulation are listed in the glossary.

1-4. Responsibility

a. The Deputy Chief of Staff for Personnel (DAPE-HRE) has the overall responsibility for motor vehicle traffic supervision in accordance with AR 190-5.

b. Maintenance, repair, minor construction of pavements, bridges, and railroad tracks on Army installations, together with the performance of related services are DEH activities and responsibilities. (See AR 415-35 for new construction guidance.)

c. Staff, command, and technical responsibilities for M&R of pavements, bridges, railroad tracks and appurtenances will conform to assignments set forth in AR 420-10. Responsibilities for maintenance of facilities at continental United States (CONUS) and outside continental United States (OCONUS) installations is generally defined as follows:

(1) Within the 50 States, District of Columbia, and U.S. possessions.

(a) *Installation facilities.* The DEH will accomplish M&R of installation facilities and provide services to support these facilities using appropriated funds.

(b) *Public facilities.* According to Department of Defense (DOD) policy, military installations or activities will not accept responsibility nor provide funds for maintenance of any off-post public road. A road on a military reservation which is opened to public traffic by permit is not a public road and Army ownership is retained.

(c) *Joint-use facilities.* The extent and nature of Army maintenance of joint-use facilities will be governed by the terms of the controlling lease, permit, easement, or other agreement.

(d) *Leased facilities.* Maintenance responsibility for facilities on leased land will be governed by the terms of the lease, permit, easement, or other action conveying property rights and by the provisions of AR 420-17.

(e) *Test roads and proof facilities.* An installation commander having roads and other surfaced areas used exclusively for research and development activities or for development or testing of vehicles or equipment, when such tests require unusual surfaced areas, will assign operation and maintenance of such facilities to the research or test agency. The DEH may provide the needed operation and maintenance functions on a reimbursable basis.

(2) Outside the 50 States, District of Columbia, and U.S. possessions.

(a) *Installation and joint-use facilities.* The M&R of these facilities will be in accordance with the terms of the agreements or treaties with host countries.

(b) *Public or private facilities.* M&R of these facilities will be funded by the Army only when the work is necessary to satisfy U.S.

requirements and an agreement has been executed with the owner of the facility authorizing right of U.S. entry and use of the facility.

Chapter 2 Pavements

Section I Policies and Procedures

2-1. Introduction

a. The general policy is to manage pavements by periodically assessing the condition of the pavement network, establishing work plans to reach and maintain predetermined facility conditions, and developing maintenance strategies to make the best use of available maintenance dollars. Preventive maintenance will be systematically applied to protect pavement investments.

b. Concerted and continuing efforts will be directed toward accurate and complete identification, validation, programming, budgeting, and execution of all M&R requirements.

2-2. Pavement policies

a. A triennial on-site review of the installation's pavement maintenance program by the major Army command's (MACOM) engineer staff is required.

b. 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. New and rehabilitated pavements will be maintained at a good to excellent condition (PCI above 55) through an effective preventive maintenance program. All preventive and safety related pavement maintenance shall be identified as an Annual Recurring Requirement (ARR).

2-3. Work classification

a. *General.* M&R is defined in AR 420-10; minor construction is defined in AR 415-35 for facilities other than family housing; and AR 415-15 covers the Military Construction Army (MCA) program. DA pamphlet 420-8 and the definitions that follow, provide guidance for determining work classifications.

(1) *Roads and streets.* In accordance with Army facility classes and construction categories found in AR 415-28, all real property improvements contained in the installation real property records under the three digit category codes 851 (roads) or 852 (sidewalks and other pavements) will each be considered a single real property facility (RPF) for the purpose of work classification.

(2) *Airfield pavements.* For airfield pavements, Category 110, all adjoining airfield pavements represent a single RPF, and items such as runways (Category 111), taxiways (Category 112), and aprons (Category 113) may be considered as component parts of this RPF. Real property accounting will be in accordance with AR 405-45 and AR 420-17.

b. *Work classification categories.*

(1) *Maintenance.* This classification of work is usually performed on paved areas with a PCI greater than 70. The maintenance of roads, airfields, and other surfaced areas encompasses primarily the day-to-day routine and/or preventive work. Maintenance includes items such as sealing cracks and joints, repairing potholes, patching, repairing spalls, applying pavement rejuvenators, and other normal day-to-day operations. Removal of debris and silt, and blading and seeding of drainage ditch side slopes are also examples of maintenance. The types of work which are classified as maintenance are listed under the work designation codes in figure 2-1.

(2) *Repair.* The repair of roads, airfields, and other surfaced areas is the restoration of a failed or rapidly deteriorating section to a good or excellent condition or at least to such a condition that it may be utilized for its designated purpose. Repair is normally applied to pavements with a PCI less than 70. Repair work includes

recycling, applying overlays, slab replacement, and repairing drainage systems. Paving of the invert only of an open drainage ditch and placement of erosion control measures such as riprap and gabions are properly classified as repair. The types of work which are classified as repair are listed under the work designation codes in figure 2-1.

(3) *Construction.* Construction of roads, airfields, and other surfaced areas relates to the alteration, extension, replacement, or upgrading of an existing single RPF. Work includes that which increases base data by widening or lengthening a surfaced area; relocating a road or other facility in its entirety; strengthening a pavement to support a new mission; replacement of an entire facility; and installation of additional appurtenances such as drainage structures, and curb and gutter, unless accomplished as part of major repairs. However, an increase in roadway lane width is properly classified as repair if it is accomplished incident to major repairs of the pavement segment and is required to meet geometric design provisions in TM 5-822-2. Any extensions to storm drainage systems to accommodate curbs and gutters is classified as construction, as is the improvement of an unimproved area with subbase, base, wearing surface, and drainage or the overlay of an unsurfaced pavement with bituminous or portland cement concrete. Paving of sidewalls only of an open drainage ditch is construction. When paving sidewalls and the invert in one project, the entire undertaking is properly classified as construction. If a roadway segment is repaired by replacement, localized changes in alignment is properly classified as repair in order to correct safety deficiencies, accommodate current geometric design standards (curvature, sight, distance) or improve traffic flow. The types of work which are classified as construction are listed under the work designation codes in figure 2-1.

Section II Levels of Performance for Pavements

2-4. Introduction

TM 5-623 explains pavement condition survey and rating procedures, M&R guidelines, and procedures for performing economic analysis. Methods of maintaining, repairing, and improving pavements and appurtenances are described in TM 5-624. Guidance pertaining to construction is contained in TM series 5-600 and 5-800. The following basic standards will be observed in achieving the goals of pavement management.

2-5. Performance standards

a. Pavements. The following PCI levels establish minimum acceptable pavement service levels.

(1) Installation vehicular pavements shall be maintained to at least the following PCI ranges:

- (a) Primary roads—55 to 70.
- (b) Secondary roads—45 to 60.
- (c) Tertiary roads—35 to 50.

(2) Installation airfield pavements shall be maintained to at least the following PCI ranges:

- (a) All runways and primary taxiways—65 to 75.
- (b) All aprons and secondary taxiways—40 to 55.

b. Drainage facilities.

(1) Drainage channels, ditches, storm sewers, subdrains, and culverts will be maintained to function at full design capacity.

(2) Catch basins, drop inlets, manholes, and storm sewers will be cleaned to properly function. Rodding, augering, flushing, and other nondestructive cleaning methods may be used as shown in TM 5-665.

(3) Storm water lift or pump stations and force mains will be maintained in a fully operational condition. Operation and maintenance guidance is provided in TM 5-665 and TM 5-666.

(4) Ditches will 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.

(5) Curb and gutter may be installed where required for adequate drainage and to control shoulder erosion where ditches will not suffice. Where curbs are to be replaced through an area that includes a pedestrian crosswalk, curb-drops and ramps will be constructed for access by the physically handicapped.

c. Shoulders. Shoulders will be maintained to design template, to allow satisfactory surface drainage and to protect the pavement edge. Edge ruts will be repaired 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. Signs, signals, pavement markings, and other traffic control devices will be kept legible and operating in accordance with the current Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or host criteria, as appropriate, to control and safeguard traffic.

e. Snow removal and ice control. Erection of snow fences and markers, removal of snow, and application of chemicals and abrasives for ice control will be performed as necessary to maintain traffic. Guidance on maintenance procedures is provided in TM 5-624.

Section III Pavement Management Procedures

2-6. Introduction

The PAVER pavement management system described in TM 5-623 provides engineering analysis tools for development of short and long range maintenance programs and for project development. Upward communication (installation, Major Subordinate Command (MSC), MACOM, Department of the Army (DA)), including program presentation, backlog of maintenance repair (BMAR) validation, and project justification, will utilize the standard terminology and pavement management concepts contained in TM 5-623.

2-7. Facilities inventory of pavement network

a. The installation pavement network consists of all surfaced areas which provide accessways for ground or air traffic, including roadways, parking areas, hardstands, storage areas, and airfield pavements. The network will be inventoried and divided into manageable sections for performing pavement inspections and determining M&R needs. The Integrated Facility System (IFS) numbers and PAVER branch numbers should be the same.

b. Installations shall maintain an inventory map showing all traffic control signs and signals.

2-8. Condition inspection of pavement network

a. Inspections of pavements and appurtenances will be made by qualified technical personnel for determination of maintenance, repair, and construction requirements. Inspection techniques and distress identification described in TM 5-623 will be used for this purpose. The frequency is to be based on individual section condition and rate of deterioration, but in no case will the time between inspections exceed 3 years. Network level inspections should be accomplished on a random sampling basis with an average of not less than ten percent of the sample units inspected. Airfield evaluations performed under the airfield evaluation program in TM 5-826-6 may be used to satisfy the inspection requirements for airfields. Reports generated from these inspections shall be used for checking problem areas during subsequent or intervening inspections and for project development.

b. MACOM's will program for re-inspections and this should be funded as part of the ARR. Resources for inspections and re-inspections should be derived from the surfaced areas operations and maintenance account.

c. Army airfield runways and primary taxiways should have a condition survey performed every 3 years and a non-destructive test (NDT) evaluation performed every 5 years or with each mission change. All aprons and secondary taxiways should have a condition survey and NDT evaluation performed every 5 years.

d. U.S. Army airfield pavement evaluations are performed by the U.S. Army Engineer Waterways Experiment Station (USAEWES). Information concerning aircraft inventory, aircraft passes and aircraft operations, including portions of the airfield pavement evaluation reports containing references to aircraft inventory, passes and operations, shall not be released outside U.S. Government agencies.

e. Traffic signs, signals, pavement markings, and delineators will be inspected at least twice per year to ensure conformance with the latest edition of the MUTCD or with host country standards for OCONUS installations.

2-9. Network level management

Network level management encompasses management activities associated with the total pavement network. The following minimum network management activities will be accomplished in development of both the 5 year and 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.

2-10. Work planning

The installation Resources Management Plan (RMP) (DA Pam 420-6), is a consolidation of all DEH developed plans into a single integrated plan that reflects all major requirements, initiatives, actions and objectives at least 5 years into the future. Routine pavement M&R shall be incorporated into the installation RMP.

a. AWP. The AWP for paved areas shall identify the ARR and major M&R planned for accomplishment in the program fiscal year and contain the following:

(1) The ARR includes the routine pavement maintenance tasks shown in table 2-1. These tasks should be accomplished on an annual basis to preserve the integrity of the pavement structure, delay more costly M&R treatments, and to assure traffic safety. Tasks identified within the ARR should be fully funded on an annual basis. Separate Individual Job Orders (IJO's) which include specific task description and location, the unit of measure and unit cost, will be prepared to facilitate orderly planning, review, and analysis.

**Table 2-1
Routine Pavement Maintenance Tasks**

<i>Bituminous pavements</i>	<i>Concrete pavements</i>	<i>Unsurfaced area</i>	<i>Drainage</i>	<i>Traffic control</i>	<i>Inspection</i>
Crack sealing	Crack sealing	Grading	Cleaning culverts	Pavement striping	Network level inspection.
Pothole repair	Joint sealing	Dust control	Ditch maintenance	Sign maintenance	Detailed project level inspection.
Partial depth patch	Partial depth patch (bonded)	Snow removal and ice control	Catch basin cleaning	Signal maintenance	Nondestructive testing and/or laboratory testing.
Full depth patch	Full depth patch		Erosion control	Guardrail maintenance	
Lane/Shoulder drop-off	Snow removal and ice control		Slope protection	Impact attenuator maintenance	
Surface seals			Storm drains		
Surface treatment					
Snow removal and ice control					

(2) The major M&R portion of the AWP will be developed based on comparison of major M&R alternatives. Prioritization of major 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.)

b. *Five-year long range plan.* Long range plans will be developed for a 5 year period by year and consist of the level of anticipated ARR work requirements and a network level M&R project list.

c. *Snow removal and ice control plan.* At installations where snow and ice accumulate on roads or airfields, a snow removal and ice control plan will be prepared. The plan should include all roads and airfields identified by priority for clearance, equipment and materials needs such as snow fences, chemicals, abrasives, and arrangement for military troop work and other emergency planning measures as determined necessary by the DEH.

d. *Conformance to master plan.* Minor construction projects for roads, airfields, and other surfaced areas will conform to the Master Plan for the installation in accordance with AR 210-20.

2-11. 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.* A detailed pavement inspection should

be completed which involves a distress survey, estimating remaining life, and noting any safety problems. The inspections should determine the cause of failure and appropriate corrective actions. PAVER can be used to assist in this investigation. Consideration should be 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 and selection of alternatives.* Pavement M&R alternatives should be developed for each pavement section (See TM 5-623 for details.) Project selection should be based on the lowest life cycle costs and overall road serviceability factors. Pavement recycling should be considered for all asphalt concrete pavement projects involving overlays, replacement of asphalt concrete, or corrections in the geometry of the pavement cross-section. Recycling will be included in the bid document as an optional alternative unless it has been determined to be an unacceptable repair/construction alternative. USAEWES and U.S. Army Corps of Engineers (USACE) districts can assist in the planning, testing, and successful application of the various recycling techniques.

c. *Project analysis.* Documentation of project analysis shall be included in the project files for each pavement project over \$50,000. Documentation should consist of a record of data relevant to the project, including a life-cycle cost analysis of each feasible alternative developed. Relevant data should include the following:

(1) Project title/description.

- (2) Project location.
- (3) Facility/branch/section number(s).
- (4) Category code (5–digit).
- (5) Facility/branch use(s).
- (6) Surface type(s).
- (7) Pavement rank(s).
- (8) Pavement dimensions/area.
- (9) Pavement age(s).
- (10) Pavement condition/index (PCI).
- (11) Type and quantity of pavement distress.
- (12) Repair alternatives considered.
- (13) Life–cycle economic analysis for each alternative.

d. *PAVER reports.* Project information relating to pavement sections can easily be retrieved from the 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.

e. *Pavement load carrying capacity analysis.*

(1) After pavement inspections, those pavements experiencing load–related distresses should be 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 as to 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.

(2) Airfield pavement evaluation procedures and NDT procedures for Army airfields are described in the TM 5–826 series. Condition surveys using the PCI procedure should be completed at 3–year intervals. Structural evaluations including NDT, should be completed at 5–year intervals and with each mission change, or when the pavement shows signs of structural distress.

f. *Preliminary design.* A qualified civil engineer with pavement experience will develop maintenance, repair, and construction projects using the AWP as the source for work requirements.

2–12. Project validation

a. All M&R projects submitted to U.S. Army Engineering and Housing Support Center (USAEHSC)(CEHSC–FB) for DA approval will be thoroughly reviewed by the MACOM/operating agency commanders to validate work classification and scope of work. Project documentation will include that prescribed in AR 420–10 and DD Form 1391 (Decision Analysis and Statement of Operational Necessity). For a single undertaking involving more than one classification of work, costs applicable to each classification of work are to be considered separately with reference to limitations and approval authority.

b. For all pavement projects, a project folder should be maintained by the DEH and include a cost estimate with life cycle cost analysis, PCI data, an analysis of alternatives, justification for project selection, a completed DA Form 4283, and rationale for classification of the project.

2–13. Project approval

Projects will be approved in accordance with AR 420–10, AR 415–35, and MACOM and MSC policies.

2–14. Project plans and specifications

a. *Personnel qualifications.* A qualified engineer with experience in pavement and drainage shall be used for all pavement and drainage design.

b. *Design Criteria.* The DEH will use current USACE design criteria and guide specifications for the design of M&R projects involving pavements and appurtenances, unless otherwise stated below.

(1) *Vehicular pavements.* USACE pavement thickness design criteria shall be used for all pavement structural design. With the

exception of pavement thickness design, local state highway specifications may be substituted for Corps of Engineers Guide Specifications (CEGS) for those pavements having a design index of four or less. (See TM 5–822–2 for details.)

(2) *Airfield pavements.* Evaluation, engineering, and thickness design procedures for Army airfield pavements shall be accomplished in accordance with TM 5–800 series. Airfield material requirements and mix designs will be in accordance with appropriate CEGS and technical manuals. State highway specifications shall not be used for airfield pavements.

(3) *Drainage facilities.* Design of drainage facilities will be in accordance with the TM 5–820 series. Design of drainage facilities will not be based on pure judgment.

c. *Materials and specifications.* Materials and specifications used in the performance of maintenance, repair and minor construction work will conform to the applicable Federal, military, State, American Association of State Highway and Transportation Officials (AASHTO), American Society for Testing and Materials (ASTM), and other recognized national or host nation industry and technical society specifications and standards. Aggregates or other materials found in local deposits and proven acceptable by laboratory tests and with established history of acceptable performance should be used in pavement maintenance, repair, and construction whenever feasible as long as the local materials meet requirements of appropriate CEGS and technical manuals.

(1) *Materials.*

(a) *Highway pavements.* For a design index of four or less (TM 5–822–2), materials conforming to state highway specifications may be used in vehicular pavements to permit the use of local materials and practices. At OCONUS sites, use of host country specifications is acceptable.

(b) *Airfield pavements.* Design of heliports and airfields shall conform to CEGS. Materials conforming to state highway department specifications shall NOT be used in the design of airfield pavements. Because of the heavy wheel loads and high tire pressures imposed on airfield pavements, a more stringent asphalt concrete design mix is required for airfields than for vehicular pavements. State highway standard specifications do not meet density and stability requirements for aircraft traffic, and the use of such specifications may result in poor pavement performance.

(c) *Materials.* Materials will be inspected, tested, or certified to the degree necessary to ensure compliance with authorized specifications and standards. Asphalt concrete material to be recycled shall be tested to determine recycling feasibility and optimal design mix.

(d) *Quality control.* All M&R projects exceeding \$100,000 shall contain Contractor quality control plans that address materials specification and use, specifically stating required testing and certification. The Contractor's quality control plan should provide for Contractor inspection and certification that materials incorporated in the works meet specifications.

(2) Not used.

2–15. Traffic engineering

The day–to–day management of traffic and the enforcement of traffic laws and regulations is the responsibility of the Provost Marshal/Security Officer (PMO). Planning, design, and erection of signs, signals, pavement markings, and other traffic control devices should be based upon traffic engineering studies and are the responsibility of the DEH. The PMO will provide the DEH with Accident Record Reports on a routine basis.

a. *Accident reduction program.* The DEH shall develop an accident monitoring and reduction program to include filing accident records by location, determining high accident locations and patterns, determining probable causes, and development of projects to eliminate accidents.

b. *Studies.* Traffic engineering studies will be performed in accordance with guidance given in FM 19–5 and the Institute of Transportation Engineers publication, Manual of Traffic Engineering Studies. Traffic engineering measures and techniques shall be used to reduce the number and severity of traffic accidents in accordance

with AR 55–80. The DEH will develop traffic engineering capabilities in-house, through contractors, or through MTMC conducting formal traffic engineering studies. Assistance in performing traffic studies will be requested through MACOMs to MTMC using DA Form 1948 (Traffic Engineering Needs Report). MTMC can also assist in the selection of a contractor.

c. Standards and criteria. Surfaced areas on Army installations will have regulatory, warning, and guidance signs; signals, pavement marking, islands, and delineators which meet MUTCD or host nation standards and criteria. At CONUS installations, approval to use non-standard devices must be obtained from MTMC prior to use. Requests must contain full justification and rationale for waiver from criteria in the MUTCD.

d. OCONUS installations. OCONUS installation streets and roads are to be considered an extension of the road system of the host country and shall use traffic control device standards and criteria of the host country.

e. Traffic control devices. The DEH is responsible for the purchase, installation, maintenance, and repair of all traffic signs, signals, and pavement markings except those associated with new construction. Provision for traffic control devices in new construction projects should be included in the construction contract. Signs, signals, pavement markings, and other traffic guide and control devices will be kept legible and/or operating as necessary to regulate and safeguard daytime and nighttime traffic. All signs on CONUS installations must conform to the MUTCD. Design of new or replacement traffic signal systems will be reviewed, through the MACOM, by MTMC-TEA, Newport News, VA 23602.

f. Pavement markings. The titles discussed below are two types of pavement markings.

(1) *Thermoplastic markings.* Thermoplastic materials are recommended only when economically justified and the pavement does not require overlaying in the foreseeable future. Raised markers, metal and plastic inserts, and small metal or plastic studs with inserted reflectors which conform to CEGS are recommended only where safety dictates. Where these devices cause interference with snow removal operations or cause a maintenance problem as a result of snow removal operations, their use should be restricted to the most critical areas. When reflectors are required in common snow areas, recess reflectors should be used.

(2) *Army airfield and heliport pavement marking.* Design of airfield and heliport pavement marking patterns and materials used will conform to provisions of TM 5–823–4. Thermoplastic materials, metal and plastic inserts, and small metal or plastic studs with inserted reflector buttons shall not be used since they may become dislodged.

2–16. Snow removal and ice control

The DEH will develop a snow removal and ice control plan as described in paragraph 2–10(c). Occupants of family quarters, barracks, and operators of nonappropriated fund facilities are responsible for the removal of snow and ice from walks, steps, landings, private drives and parking areas, and similar areas adjacent to the building or activity.

a. Snow removal policy. Installations may implement a snow removal policy where warranted, that maintains specific pavements free of snow or ice accumulation. This high level of service is normally obtained by the heavy use of chemicals and frequent plowing and may be required for the following locations:

- (1) Airfield pavements.
- (2) Primary entrance roads.
- (3) Intersections with high accident rates.
- (4) Railroad crossings.
- (5) Long or steep grades.
- (6) Bridges.
- (7) High volume pedestrian walks.

b. Materials.

(1) Calcium chloride, sodium chloride, and abrasives may be used on roads and other vehicular surfaced areas for snow and ice control. Use of chemicals will be kept to a minimum in order to

reduce environmental impacts. Covered storage will be provided for all chemicals to prevent loss to the environment. Neither calcium chloride nor sodium chloride will be used on airfield or heliport pavements.

(2) Urea meeting provisions of military specification MIL-U–10866C, Class 2, or U.S. Air Force aircraft deicing fluid meeting the provisions of military specification MIL-D–83411 may be used on airfield and heliport pavements. These materials are non-corrosive to aircraft materials, however, urea is highly destructive to some concrete pavements. Therefore, the application rate for urea should not be exceeded.

2–17. Safety

a. Work zone traffic control. Necessary safety measures will be taken on roads and airfields to safely control and provide for traffic during M&R. These measures will be taken during all condition inspections, maintenance, repair, and construction operations by both in-house and contract forces.

b. Safety hazards. Hazardous features such as transverse ridges, speedbumps, or dips on pavement surfaces will not be installed or maintained as a means of controlling or reducing the speed of traffic. Roadside obstacles or high embankments will be evaluated for safety. Roads with substandard geometric will have an engineering analysis performed to determine the need for correction.

2–18. Quality assurance

The inspection of maintenance, repair and construction work in progress, whether by in-house forces, or architect/engineer (A/E) services will be on a timely basis with special attention to quality assurance. Quality assurance inspections will be made on surfaced area work and will be commensurate with the work performed. Random monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper maintenance, repair and construction procedures.

2–19. Recordkeeping and project close-out

In addition to retaining the project folder items listed in paragraph 2–12, the following steps will be followed when closing a project upon completion of work and maintaining a permanent record for every project:

a. The PAVER database will be updated to reflect changes in network inventory, pavement condition, and unit cost figures.

b. Real property records and IFS-M database will be updated.

c. A final project warranty inspection will be conducted before the warranty on the work expires. A record of this inspection will be retained in the project folder.

2–20. Coordination

Open lines of communications should be maintained between project planners, designers, and inspectors at the network and project levels to provide information regarding pavement performance. This information should be used in development of preliminary M&R strategies at the network level and to modify future designs at the project level.

2–21. Disposal

Action will be taken to dispose of pavements and appurtenances for which there is no foreseeable need in accordance with AR 405–90.

Surfaced Area Maintenance

- (SM-1) Blading, dragging stabilized surfaces
- (SM-2) Cleaning and seeding open drainage ditches, culverts, inlets, and manholes
- (SM-3) Cleaning and sealing cracks and joints.
- (SM-4) Slab undersealing
- (SM-5) Snow removal and ice control ("M account")
- (SM-6) Snow fence erection or removal ("M account")
- (SM-7) Vegetation control
- (SM-8) Erosion control
- (SM-9) Repainting pavement markings
- (SM-10) Cleaning, refacing, and maintaining traffic signs
- (SM-11) Dust palliative application
- (SM-12) Seal coat, asphalt rejuvenation, or surface treatment on paved surfaces
- (SM-13) Scarifying, reshaping, compacting and adding new material to stabilized areas
- (SM-14) Spot or localized milling
- (SM-15) Grinding PCC pavements
- (SM-16) Maintenance of retaining walls

Surfaced Area Repair

- (SR-1) Surface recycling
- (SR-2) Restoration of load transfer across joints and cracks in PCC pavements
- (SR-3) Overlays to improve skid resistance (TM-823)
- (SR-4) Milling to remove surface or re-establish profile
- (SR-5) Recycling
 - A. Surface
 - B. Hot-Mix
 - C. Cold-In-place
- (SR-6) Overlays to improve surface roughness or profile
- (SR-7) Structural overlays to accommodate normal growth and evolution of mission, equipment and facilities (DOD 4270.1M)
- (SR-8) Replacement of failed drainage systems, failed curb and gutter
- (SR-9) Paving of the invert only of an open drainage ditch and placing riprap and gabions
- (SR-10) Placement of new PCC curbs and gutters which are added incidental to major street and parking lot repairs and required for protection of the pavement edge and reduced pavement/shoulder maintenance.
- (SR-11) Patching paved surfaces
- (SR-12) Replacement of traffic signal lights

Surfaced Area Construction

- (SC-1) Replacement of an entire facility (see para 2-3a for definition of "single real property facility")
- (SC-2) Widening/lengthening a surfaced area (see exception, para 2-3b (3))
- (SC-3) Relocating a roadway (see exception, para 2-3b (3))
- (SC-4) Strengthening of pavement to accommodate a new mission (but, see SR-7 above)
- (SC-5) Installation of additional appurtenances (see exception, SR-9 above)
- (SC-6) Any extension of storm drainage systems to accommodate new curbs and gutters
- (SC-7) Improving an area from its natural condition by mechanical compaction, addition to subbase, base course, and/or a flexible or rigid wearing course.
- (SC-8) Paving of sidewalks only or paving sidewalks and the invert in one project as one undertaking

This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair and construct surfaced areas.

Figure 2-1. Work designation codes

Chapter 3 Bridges

Section I Policies

3-1. Introduction

The general policy is to manage bridges by periodically assessing condition of all bridges, establishment of work plans to reach and maintain predetermined facility condition, and development of maintenance strategies to make best use of available maintenance funds. Preventive maintenance will be systematically applied to protect the investment in bridges.

3-2. Bridge policies

a. Installation bridges, major culverts and retaining walls, referred to as structures for the purpose of this regulation, will be maintained and repaired systematically to achieve effective and efficient bridge maintenance with limited resources.

b. Bridge maintenance management includes adopting an inventory system, performing inspections, and developing work plans.

c. Preventive maintenance of bridges, major culverts, and retaining walls should provide a means for early detection of any deterioration of the structure. All preventive maintenance work will be included as an ARR and should be fully funded.

3-3. Work classification

a. *General.* M&R work is defined in AR 420-10; minor construction is defined in AR 415-35 for facilities other than family housing; and AR 415-15 covers the MCA program. For purposes of reviewing projects for determination of appropriate work classification, the above referenced regulations in conjunction with DA Pam 420-8 and the definitions that follow provide guidance for making work classifications. DA Pam 420-8, explains in detail accepted interpretations of what is a maintenance, repair, or minor construction project and the classification of work. Bridges are a part of the roadway or rail track network. Therefore, the definitions of "single real property facility", paragraph 2-3a(1) and 4-3c apply for the purpose of work classification.

b. *Work classification categories.*

(1) *Maintenance.* Maintenance work for structures consists of cyclic or preventive work which will prolong the life of the structure. The types of work which are classified as maintenance are listed under the Work Designation Codes in figure 3-1.

(2) *Repair.* Replacement of a portion of a structure or the structure in its entirety is considered to be repair provided the structure is in a failed or failing condition and the new structure is in the same location as the initial structure, an adjacent location which improves the alignment of the adjoining roadway or track, or a location adjacent to the existing location in cases where access must be maintained during repairs and no feasible detour exists. Replacement does not have to be of the same material as the previous construction. If a bridge is replaced in its entirety, in the same location as the previous structure, any increase in load capacity (other than that related to a normal growth and evolution of mission, equipment, and facilities) or increase in surface area is normally considered to be upgrading or new construction. Lane width of vehicular bridges may be increased in conjunction with bridge replacement to meet current geometric standards (AASHTO bridge design manual). However, addition of new traffic lanes is properly classified as construction. Cost will be allocated to repair and construction classifications of work, taking into account structural consideration as well as increases in surface area. The types of work which are classified as repair are listed under the Work Designation Codes in figure 3-1.

(3) *Construction.* Replacement of a bridge, trestle, or major culvert or retaining wall in a new location is considered to be construction. The types of work which are classified as construction are listed under the work designation codes in figure 3-1.

Section II Levels of Performance for Bridges

3-4. Introduction

Methods of maintaining, repairing, and improving bridges, major culverts, and retaining walls are described in TM 5-624.

3-5. Performance standards

All bridges, major culverts, retaining walls, and appurtenances shall be maintained such that the daily allowable loading (inventory rating) and the absolute maximum allowable loading (operating rating) meet current mission needs.

Section III Bridge Management Procedures

3-6. Bridge inventory

Bridges and major culverts will be inventoried and updated after each triennial inspection to reflect current information. The current inventory will be maintained by the DEH. Inventory and inspection procedures are based on national standards set forth by the U.S. Department of Transportation, Federal Highway Administration.

3-7. Inspection

a. All bridges and major culverts on all Army installations will be thoroughly inspected (substructure and superstructure) and a structural analysis performed once every 3 years. In addition, one detailed maintenance inspection of each bridge will be made annually. More frequent inspections will be made if significant changes have occurred as a result of floods, loadings, other physical forces, or accumulated deterioration. Where changes are apparent, a new structural analysis of the load carrying capacity will be made.

b. Inspections and analyses will be made by engineers qualified in bridge design, capacity, and characteristics.

c. Bridges constructed by military troop units which are to be accepted as a RPF will be inspected and analyzed and the load carrying capacity determined prior to being placed in the installation real property inventory. Bridges constructed by military troop units for training purposes, which are not going to be accepted as real property, are not a DEH responsibility and cannot be included in the installation real property inventory records. They shall be removed as a safety measure by military troop units when their use has been completed.

d. A bridge inspection report shall be prepared for each bridge investigation, including maintenance inspections. This report shall address the causes of deficiencies and recommendations for both urgent and programmed repairs. Photographs and a completed bridge inspection checklist form shall also be included.

e. The specifications and procedures prescribed in the AASHTO Manual for Maintenance Inspection of Bridges shall be used for determining the maximum safe inventory and operating live load capacities of existing bridges. When classifying load-carrying capacities:

(1) For vehicular bridges, the AASHTO system of loadings will be used, except at OCONUS locations where host nation standards shall be applied. Military loading data will also be obtained so allowable military classifications can be determined for each bridge in accordance with TM 5-312.

(2) For railroad bridges, the Cooper series of loading will be used, except at OCONUS locations where host nation loading standards will be used.

f. Deck overlays are prohibited unless designed by a structural engineer.

3-8. Bridge maintenance management

The results of the annual and triennial inspections will be used to determine maintenance, repair, or improvements needed for each structure.

a. M&R. Structures will be included in a systematic maintenance program that emphasizes preventive and routine maintenance.

b. Posting. Bridges and major culverts not capable of carrying maximum foreseeable operating loads will be posted showing safe load limits. Necessary remedial measures will be taken to repair or replace bridges which are grossly under the required capacity for normal traffic and are required for continued use. All bridges with military traffic will be posted with the military class number.

3-9. Work planning

a. The installation RMP is a consolidation of all DEH developed plans into a single integrated plan that reflects all major requirements, initiatives, actions and objectives at least 5 years into the future. Minimum routine M&R tasks and major projects for structures shall be incorporated into the installation RPM as outlined in DA pamphlet 420-6. Installation site road maps should be used as a visual aid to help depict and present the structures annual and long range work plans portion of the RMP.

b. Preparation and periodic updating of work plans for bridges, major culverts and retaining walls will comply with the following guidance. All work identified as a result of comparing the inspection reports with the performance standards will be used for the ARR and Unconstrained Requirement Reports (URR) in accordance with AR 420-16.

c. The AWP for structures shall identify the ARR and the major M&R projects planned for accomplishment in the program fiscal year and contain the following:

(1) The ARR portion of the AWP includes the minimum for routine bridge maintenance tasks, outlined in table 3-1, that should be accomplished at least once annually for basic preventive and safety/functional needs. Each of the maintenance tasks in table 3-1 may not necessarily be accomplished annually at every installation or for every bridge; nor is the list all inclusive. However, this list includes routine maintenance which should be programmed annually, to maintain acceptable and economical levels of performance. These tasks collectively should be identified as the ARR (AR 420-16) and be fully funded. Separate IJOs which include specific task description and location, the unit of measure and unit cost, will be prepared to facilitate orderly planning, review, and analysis for each of the tasks listed on table 3-1.

(2) The major M&R portion of the AWP will identify work based on comparison of major M&R alternatives. Prioritization of major M&R projects should be based upon cost, type of repair, structure type and condition, local conditions, and realistic budget levels.

d. Long range plans will be developed for a 5 year period, year by year and consist of the level of anticipated ARR work requirements.

e. Minor construction projects for structures and appurtenances will conform to the Master Plan for the installation in accordance with AR 210-20.

**Table 3-1
Routine Bridge Maintenance Tasks**

<i>General bridge maintenance</i>	<i>Timber bridge maintenance</i>	<i>Steel bridge maintenance</i>	<i>Stone masonry arch bridge maintenance</i>	<i>Inspection</i>
Prevention of scouring and undermining	Fire protection	Removing rust	Repointing mortar joints	Annual.
Clean expansion joints and bearing plates	Insect protection	Tightening bolts and rivets	Replacing damaged or dislocated stones	Triennial.
Cleaning scuppers		Tightening cables		After major floods or disturbances.
Crack and joint sealing				
Tightening handrails				
Patching deck				
Patch painting of steel members				
Cleaning and lubricating rockers, pins and rollers				
Snow removal and ice control				

3-10. Project level management

Project level management decisions should be based on a detailed analysis of the following:

a. Bridge inspection. Results of the annual and triennial bridge inspections shall be used in conjunction with additional detailed inspections to determine maintenance, repair, and construction needs at the project level.

b. Problem definition. Deterioration of bridge elements should 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 should be developed. Bridge maintenance and rehabilitation alternatives must be reviewed before replacement is considered as an alternative. Project selection should be based (M&R versus replacement) upon lowest life cycle costs that meet loading and other serviceability factors.

d. Project analysis. Documentation of project analysis shall be included in the project files for each bridge project over \$50,000. Documentation should consist of data relevant to the project, including:

- (1) Project number.
- (2) Project description.
- (3) Facility number/branch.
- (4) Project location.
- (5) Category code (5-digit).
- (6) Facility use (s).
- (7) Bridge type.
- (8) Adjacent pavement rank (s).
- (9) Bridge dimensions/area.
- (10) Bridge age (s).
- (11) Bridge condition.
- (12) Deck roughness.
- (13) Feasible M&R strategies.
- (14) Life-cycle costs.

e. Preliminary design. Qualified engineering personnel will review maintenance, repair, and construction projects using the AWP as the source for work requirements.

3-11. Project validation

a. All M&R projects submitted to CEHSC-FB for DA approval will be thoroughly reviewed by the MACOM/operating agency commanders to validate work classification and scope of work. Project documentation will include that prescribed in AR 420-10 and DD Form 1391 (Project Analysis and Statement of Operational Necessity). For a single undertaking involving more than one classification of work, costs applicable to each classification of work are

to be considered separately with reference to limitations and approval authority.

b. For all bridge projects, a project folder should be maintained by the DEH and include a cost estimate with life cycle cost analysis; an analysis of alternatives; justification for specific alternative, and a completed DA Form 4283, rationale for classification of the project.

3-12. Project approval

Projects will be approved in accordance with AR 420-10, AR 415-35, and MACOM and MSC policies.

3-13. Project plans and specifications

a. Design criteria. Design of bridges and other structures will be based on current design and technical guidance found in AASHTO (for vehicular bridges) and American Railway Engineering Association (AREA) (for railroad bridges). For OCONUS installations, the bridge shall be designed in accordance with host nation standards and criteria.

b. Materials and specifications. Materials and specifications used for maintenance, repair, and minor construction will meet Federal, Military, State, AASHTO or AREA, ASTM, and other recognized national or host-nation industry and technical specifications and standards. Wood used for structural members, planking, railroad ties, piles, posts, and other items in contact with the ground, concrete, or water will be preservative treated in accordance with criteria from the American Wood Preservers Association (AWPA).

c. Engineering. The services of a qualified engineer experienced in structural design will be used to determine the technical requirements and the manner of accomplishment of bridge projects.

3-14. Snow removal and ice control

Snow removal and ice control on bridge decks will conform to guidance in paragraphs 2-10c and 2-16.

3-15. Safety

Work zone traffic control. Work on bridges involves hazards associated with use of heavy equipment and movement of traffic. Necessary safety measures will be taken on bridges as outlined in the MUTCD, TM 5-624, EM 385-1-1, and Occupational Safety and Health Administration (OSHA) safety standards. These measures will be taken during all inspections involving maintenance, repair, and construction operations by both in-house and contract forces.

3-16. Quality assurance

The inspection of maintenance, repair, and construction work in progress, whether by in-house forces, or A/E services will be on a timely basis with special attention to quality assurance. Random

monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper maintenance, repair and construction procedures.

3-17. Recordkeeping and project close-out

In addition to retaining the project folder items listed in paragraph 3-11b, bridge inventory reports, real property records, and the IFS-M database will be updated.

3-18. Coordination

Open lines of communications should be maintained between project planners, designers, and inspectors at the network and project levels to provide information regarding bridge performance. This information should be used in development of preliminary M&R strategies at the network level and to modify future designs at the project level.

3-19. Disposal

Action will be taken to dispose of bridges, major culverts, retaining walls and appurtenances for which there is no foreseeable need, in accordance with AR 405-90.

Work designation codes—Bridges

General Bridge Maintenance

- (BM-1) Prevention of scouring and undermining
- (BM-2) Cleaning expansion joints and bearing plates
- (BM-3) Cleaning scuppers
- (BM-4) Crack and joint sealing
- (BM-5) Tightening handrails
- (BM-6) Patching deck
- (BM-7) Painting steel members
- (BM-8) Cleaning and lubricating rockers, pins, and rollers

Timber Bridge Maintenance

- (BM-9) Fire protection
- (BM-10) Insect protection

Steel Bridge Maintenance

- (BM-11) Removing rust
- (BM-12) Tightening bolts and rivets
- (BM-13) Tightening cables

Stone Masonry Arch Bridge Maintenance

- (BM-14) Repointing mortar joints

General Bridge Repair

- (BR-1) Repairing scouring and undermining
- (BR-2) Pier, footing, and abutment repair
- (BR-3) Deck replacement
- (BR-4) Replacement of other bridge elements as defined in TM 5-626
- (BR-5) Replacing damaged or dislocated stones

Bridge Construction

- (BC-1) Replacement of a bridge in a new location. (see exception, para 3-3b (3))
- (BC-2) Lane addition

This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair and construct bridges.

Figure 3-1. Work designation codes

Chapter 4 Railroad Track

Section I Policies and Procedures

4-1. Introduction

The general policy is to manage railroad trackage by periodically assessing conditions of the railroad network, establishing work plans to reach predetermined facility conditions, and developing maintenance strategies to make best use of available maintenance dollars. Preventive maintenance will be systematically applied to protect railroad investments. The DEH is responsible for the maintenance, repair, and improvements to railroad track located on Army installations and Army-owned access tracks. The responsibilities on privately-owned but Army-used railroads on leased land will be governed by the terms of the lease, permit, easement or other action conveying property rights, and the provisions of AR 420-17. Improvements, extensions, and construction are to be accomplished under a regular MCA program or a minor new construction program and shall be in accordance with the requirements of AR 415-35. The operation and maintenance of rolling stock on Army tracks, except for motor cars and machines used for track M&R, is not a DEH responsibility.

4-2. Railroad policies

a. Introduction. For all CONUS installations, the minimum required condition levels for Army railroad track are provided in TM 5-628, Railroad Track Standards. Host nation safety standards shall continue to apply to railroad trackage at all OCONUS sites. TM 5-628 shall be used for the inspection and routine maintenance of Army CONUS railroad track by in-house or contract personnel. Track inspection and routine maintenance programs for OCONUS sites may be done in conformance with TM 5-628, but no instance less than the host nation standard. The standards in TM 5-628 are not intended to be used as specifications for new construction or major track rehabilitation projects. TM 5-850-2 and AREA "Manual for Railway Engineering" and/or host nation industry/government standards will continue to apply to new construction and to complete reconstruction of segments of existing facilities.

b. Track classification. All Army track will be classified and maintained under one of the following categories:

(1) *Category A.*

- (a) Active main lines, or
- (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.

c. Establishing track categories. The installation DEH and the Directorate of Logistics (DOL) designate a track category for each track. Once track categories are designated, a set of track maps shall be marked to identify the appropriate categories. Track categories should be updated whenever a change in an installation's mission affects its railroad track.

d. Condition levels. The following track condition levels indicate the relative seriousness of defects, allow comparison of defects, and prioritizes repair work:

(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 will generally be 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 shall not be allowed, except as noted in TM 5-628.

e. Minimum required condition levels. The minimum required condition level for various Army track categories are as follows:

- (1) A—full compliance.
- (2) B—10 MPH.
- (3) C—as specified in TM 5-628.

f. Operation restrictions. TM 5-628 identifies track safety conditions which require restriction or suspension of train operations and establishes minimum required condition levels for Army track. Track restriction or suspension procedures shall be applied as outlined in TM 5-628, immediately upon discovery of the substandard condition.

g. Preventive maintenance. Preventive maintenance of railroads and appurtenances should provide a means for early detection of any apparent deterioration of the facility. Routine track inspections shall be considered a preventive maintenance activity.

4-3. Work classification

a. M&R work is defined in AR 420-10; minor construction in AR 415-35 for facilities other than family housing; and AR 415-15 for the MCA program.

b. Guidance for determining work classification is found in the above regulations in conjunction with DA Pamphlet 420-8. DA Pamphlet 420-8 provides examples of maintenance, repair, and a minor construction projects and proper work classification.

c. In accordance with Army facility classes and construction categories found in AR 415-28, real property improvements contained in the installation real property records under the three digit Category code 860 are be considered to be a single RPF for work classification.

d. Work classification categories.

(1) *Maintenance.* Maintenance includes those actions required to prevent track deterioration or to correct minor defects. The types of work which are classified as maintenance are listed in the work designation codes in figure 4-1.

(2) *Repair.* Repair includes those actions necessary to restore the track segments to a safe and efficient operating condition consistent with traffic carried. The types of work which are classified as repair are listed in the work designation codes in figure 4-1.

(3) *Construction/alteration.* Construction/alteration includes those actions involved in changing track alignment or new track involving an increase to the installation rail network (the placement of track where none existed before). Localized changes in alignment are properly classified as repair to accommodate current geometric design standards (curvature) if accomplished incidental to other major repairs to the track structure. The types of work which are classified as construction/alteration activities are listed in the work designation codes in figure 4-1.

Section II Levels of Performance for Railroad Track and Railroad Management Procedures

4-4. Performance standards

Army railroad track at all CONUS installations will be maintained at or above the minimum condition levels specified herein and technically defined in TM 5-628. This assures that trackage can support Army missions, and effects systematic track maintenance which will protect current and future rehabilitation investments. Host nation safety standards shall continue to apply to railroad trackage at all OCONUS sites. However, track inspection and routine maintenance programs for OCONUS sites should be done in conformance with TM 5-628, but is in no instance less than the host nation standard.

4-5. Condition inspection of railroad network

a. Inspections. Railroad track inspections will be conducted in accordance with TM 5-628 and the following guidance to identify defective conditions and determine the relative severity of those defects. The MACOMs will implement a track certification program under guidance given by the USAEHSC.

b. Inspectors. Track inspections will be conducted by a qualified track inspector.

c. Qualifications of inspector. Railroad track inspectors shall meet the following qualifications:

- (1) Know and understand the requirements of track maintenance.
- (2) Understand and detect deviations from the TM 5-628.
- (3) Recommend appropriate remedial action to correct deviations.

4-6. Network level management

Network level management systematically develops strategies and prioritizes maintenance activities for installation track. This includes work identification, prioritizing, budgeting, and execution of M&R work.

4-7. Work planning

Minimum routine M&R tasks for railroad track shall be incorporated into the installation resource management plan. Maps or plans of all railroad trackage will be maintained as part of the real property records.

a. AWP. The AWP for railroad track shall identify the ARR and the URR work planned for accomplishment in the program fiscal year and contain the following:

(1) The ARR Report portion of the AWP includes the following minimum routine railroad maintenance tasks shown in table 4-1, that should be accomplished annually for basic preventive and safety/functional maintenance measures. Each of the maintenance tasks listed in the table may not necessarily be accomplished annually at every installation or for every track segment nor is the list all inclusive. However, this list includes items of routine maintenance which should be programmed to maintain acceptable and economical levels of performance. Inspections should be made annually on every track segment to identify all routine maintenance tasks. These tasks collectively should be identified as the ARR (AR 420-16) and be fully funded. IJOs which include specific task description and location, the unit of measure (usually track feet or miles) and unit cost, will be prepared to facilitate orderly planning, review, and analysis for each task.

**Table 4-1
Routine Railroad Maintenance Tasks**

<i>General track maintenance</i>	<i>Inspections</i>	<i>Traffic control</i>
Ditch and culvert cleaning	Track inspection, internal rail defect inspection and crossing signal inspection.	Maintain signs and signals.
Vegetation control and brush cutting	Grade crossing inspection of riding surface and traffic control devices.	
Lubricate and check adjustment of switches		
Tighten and replace all track bolts		
Redrive loose or missing spikes		
Grind or weld switch and frog		
Spot correction of track geometry		
Snow and ice control		

(2) The major M&R portion of the AWP includes major M&R projects. Prioritization of major M&R alternatives should be based upon cost, type of repair and track condition.

b. Five-year long range plan. Long range plans will be developed for a 5 year period, year by year, and consist of the level of anticipated ARR work requirements and a network level M&R project list.

c. Snow removal and ice control plan. At installations where snow and ice accumulate on railroad track, a snow removal and ice control plan will be prepared. The plan should include all railroad track identified by priority for clearance, equipment and materials needed, and arrangement for military troop support and other emergency planning measures.

d. Conformance to master plan. Minor construction projects for railroad track will conform to the master plan for the installation in accordance with AR 210-20.

4-8. Project level management

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

a. Detailed inspection. Results of railroad track inspections shall be used to determine maintenance, repair, and construction needs at the project level.

b. Problem definition. Deterioration of railroad track and appurtenances should be investigated to determine the cause of failure and to provide a basis for corrective action.

c. Identification of alternatives. M&R alternatives which will eliminate or reduce the factors that led to the deterioration of the railroad track should be developed.

d. Project analysis. Documentation of project analysis shall be included in the project files for each track project over \$50,000. Documentation should consist of a record of data relevant to the project, including a life-cycle cost analysis of each feasible alternative developed. Relevant data should include the following:

- (1) Project title/description.
- (2) Project location.
- (3) Facility/branch/section number (s).
- (4) Facility/branch use (s).
- (5) Category code (5-digit).
- (6) Facility/branch use (s).
- (7) Surface type (s).
- (8) Track rank (s).
- (9) Track age (s).
- (10) Repair alternatives considered.
- (11) Life-cycle economic analysis for each alternative.

e. Preliminary design. Qualified engineering personnel will develop maintenance, repair, and improvement projects using the AWP as the source for work requirements.

4-9. Project approval

Projects will be approved in accordance with AR 420-10, AR 415-35, and MACOM and MSC policies.

4-10. Project plans and specifications

a. Design criteria. The DEH will use current USACE design criteria and guide specifications for the track.

b. Materials and specifications. Materials and specifications used in the performance of maintenance, repair and minor construction work will conform to the applicable Federal, Military, State, AREA, ASTM, AWPA and other recognized national or host-nation industry and technical specifications and standards.

c. Engineering. A qualified engineer with railroad experience shall be used for all railroad track designs.

4-11. Traffic engineering

a. Outloading studies should be performed periodically, since they can be an important planning document.

b. Signs and signals governing vehicular and pedestrian traffic shall be installed and maintained in accordance with the requirements MUTCD or host nation.

4-12. Snow removal and ice control

The DEH is responsible for snow and ice control on railroads, including provision of off-track equipment, snow fences, switch heaters, and chemicals.

4-13. Safety

a. Flagmen and watchmen service.

(1) *Flagmen.* Where maintenance, repair, and construction of railroads is accomplished in areas where traffic is possible, flagmen will be posted.

(2) *Watchmen.* Grade crossing watchmen service required for normal rail movements is the responsibility of the railroad operator.

b. Work zone traffic control. For work in the vicinity of grade crossings, work zone traffic control will be in accordance with TM 5-627, TM 5-624, and MUTCD.

c. Grade crossing traffic control devices. Railroads are the responsibility of the DEH. Grade crossing traffic control devices will be in accordance with the MUTCD.

d. Switch targets and lamps. Each switch stand will be equipped with switch targets or lamps. Reflectorized targets will be used where operating conditions warrant. Illuminated lamps should be used only where there are frequent train movements at night. Do not use lamps where explosive or highly combustible materials are stored or handled. Sealed or enclosed electric lamps may be used in hazardous areas when approved from a safety standpoint.

4-14. Quality assurance

The inspection of maintenance, repair and construction work in progress, whether by in-house forces or A/E services will be on a timely basis with special attention to quality assurance. Quality assurance inspections will be made on railroad track and appurtenance work and will be commensurate with the work performed. Random monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper railroad maintenance, repair, and construction procedures, and of sampling, testing, and field inspection work.

4-15. Railroad track scales

Track scales will be checked periodically by standard tests as prescribed by the AREA.

4-16. Recordkeeping and project close-out

Closing a project out will consist of updating the database to reflect changes in the network inventory, track condition, real property records, and IFS-M.

4-17. Disposal

a. Railroad trackage which is not required for current operations will be placed in standby status in accordance with AR 210-17. Traffic on each track or major portion thereof will be reviewed annually, to determine if individual tracks are required. Tracks not needed will be taken out of service and placed on standby status. Concurrently, tracks which have been in standby status for 1 year or more will be reviewed. Action will be taken to dispose of tracks for which there is no foreseeable need in accordance with AR 405-90. Removal of railroad trackage from an installation rail network, abandonment of interchange tracks with serving carriers, potential abandonment or abandonment of the commercial track serving the installation, and significant changes affecting the transportation capability of the rail net will be staffed through Director of Transportation and Services, DCSLOG, DA, WASH DC 20310 within 30 days of the submission of DA Form 337 (Request for Disposal). Category C track with no foreseeable mission should be reported to MACOM's and removed within 1 year, or procedures for removal should be identified by the MACOM within 1 year

b. When railroad track is removed, a sufficient quantity of sound track material should be stockpiled for future use as replacement material.

Work designation codes—Railroad track

Railroad Track Maintenance

- (RM-1) Track inspection
- (RM-2) Inspect and clean drainage structures and channels
- (RM-3) Vegetation maintenance and control
- (RM-4) Redrive loose spikes or replace missing spikes
- (RM-5) Tighten or replace bolts
- (RM-6) Remove and reset rail anchors
- (RM-7) Tighten gage rods
- (RM-8) Clean flangeways and crib areas of turnouts
- (RM-9) Clean flangeways at road grade crossings
- (RM-10) Lubricate and adjust switches
- (RM-11) Maintain signs and signals
- (RM-12) Drain pumping ties
- (RM-13) Shimming/removal of shims
- (RM-14) Tamping

Railroad Track Repair

- (RR-1) Replace defective or missing ties
- (RR-2) Install tie plates
- (RR-3) Replace defective joint bars
- (RR-4) Remove or replace bent or broken gage rods
- (RR-5) Replace defective rail
- (RR-6) Turnout repair
- (RR-7) Repair rail crossings/crossing frogs
- (RR-8) Replace signs and signals
- (RR-9) Increase rail weight (only when required to support a validated mission)
- (RR-10) Re-position guard rail
- (RR-11) Increase ballast thickness/ballast section
- (RR-12) Clean and replace ballast
- (RR-13) Ballast and subgrade stabilization
- (RR-14) Repair highway grade crossing

Railroad Track Construction

- (RC-1) Changing track alignment (exception, para 4-3d (3))
- (RC-2) Track extension or construction of track on new location
- (RC-3) Addition of grade crossing signs or signals where none existed before
- (RC-4) Replacement of entire facility (see para 4-3c for definition of "single real property facility")

This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair and construct railroad track.

Figure 4-1. Work designation codes

Appendix A References

Section I Required Publications

AR 55-80

Highways for National Defense. (Cited in para 2-15.)

AR 190-5

Motor Vehicle Traffic Supervision. (Cited in para 2-15.)

AR 210-17

Inactivation of Installation. (Cited in paras 4-17.)

AR 210-20

Master Planning for Army Installations. (Cited in paras 2-10, 3-9 and 4-7)

AR 405-90

Disposal of Real Estate. (Cited in paras 2-21, 3-19, and 4-17.)

AR 415-15

Military Construction, Army (MCA) Program Development. (Cited in paras 2-3, 3-3, and 4-3.)

AR 415-28

Department of the Army Facility Classes and Construction Categories (Category Codes). (Cited in paras 2-3, and 4-3.)

AR 415-35

Minor Construction. (Cited in paras 1-4, 2-3, 2-13, 3-3, 3-11, 3-12, 4-1, 4-3 and 4-9.)

AR 420-10

Management of Installation Directorates of Engineering and Housing. (Cited in paras 1-4, 2-3, 2-12, 2-13, 3-3, 3-12, 4-3, and 4-9.)

AR 420-16

Facilities Engineering Reports. (Cited in paras 3-9, and 4-7.)

AR 420-17

Real Property and Resource Management. (Cited in paras 1-4, 2-3, and 4-1.)

AASHTO —Manual for Maintenance Inspections of Bridges. (This publication can be acquired by writing to: AASHTO, General Offices, 444 N. Capitol Street NW., Suite 225, Washington DC 20001.) (Cited in para 3-7.)

TM 5-623

Pavement Maintenance Management. (Cited in paras 2-2, 2-3, 2-4, 2-6, 2-8, and 2-10.)

TM 5-624

Maintenance and Repair of Surface Areas. (Cited in paras 2-4, 2-5, 3-4, 3-15, and 4-13.)

TM 5-627

Maintenance of Trackage. (Cited in paras 4-13.)

TM 5-628

Railroad Track Standards. (Cited in paras 4-2, 4-4, and 4-5.)

TM 5-822-2

General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas. (Cited in paras 2-3, and 2-14.)

TM 5-826-6

Army Airfield Evaluation. (Cited in para 2-8.)

TM 5-850-2

Railroad Design and Construction at Army and Air Force Installations. (Cited in para 4-2.)

Section II Related Publications

AR 420-81

Custodial Services.

DoD 4270.1-M

Construction Criteria Manual.

TM 5-801-1

Historic Preservation; Administrative Procedures.

TM 5-803-4

Planning of Army Aviation Facilities.

FM 5-36

Route Reconnaissance and Classification.

Section III Prescribed Forms

This section contains no entries.

Section IV Referenced Forms

DA Form 337

Request for Approval of Disposal of Buildings and Improvements

DA Form 4283

Facilities Engineering Work Request

DA Form 1948

Traffic Engineering Needs Report

DD Form 1391

Decision Analysis and Statement of Operational Necessity

Glossary

Section I Abbreviations

AASHTO

American Association of State Highway and Transportation Officials

AE

architect/engineer

AEI

architectural and engineering instructions

AREA

American Railway Engineering Association

ARR

Annual Recurring Requirement

ASTM

American Society for Testing and Materials

BMAR

backlog of maintenance and repair

CBR

California Bearing Ratio

CEGS

Corps of Engineers Guide Specifications

CONUS

continental United States

DA

Department of the Army

DEH

Director of Engineering and Housing

DOD

Department of Defense

DOL

Directorate of Logistics

EUAC

Equivalent Uniform Annual Cost

FOA

field operating agency

GOCO

Government-owned, contractor-operated

GSA

General Services Administration

HSPS

Highway Safety Program Standards

IFR

Integrated Facilities Report

IFS

Integrated Facilities System

IJO

Individual Job Order

M&R

maintenance and repair

MACOM

major Army command

MCA

Military Construction, Army

MSC

major subordinate command

MTMC

Military Traffic Management Command

MUTCD

Manual on Uniform Traffic Control Devices

NDT

non-destructive testing

NEPA

National Environmental Policy Act

NICET

National Institute for Certification in Engineering Technologies

O&M

operations and maintenance

OCE

Office, Chief of Engineers

OCONUS

outside continental United States

ODCSLOG

Office, Deputy Chief of Staff for Logistics

OMA

Operation and Maintenance, Army

OSHA

Occupational Safety and Health Administration

PCI

Pavement Condition Index

PMO

provost marshal/security officer

PMP

pavement management plan

PPBES

planning, programming, budgeting and execution system

RMP

resources management plan

ROTC

Reserve Officers' Training Corps

RPF

real property facility

UAWP

Unit Annual Work Plan

URR

Unconstrained Requirements Report

URWP

Unit Recurring Work Plan

USACE

U.S. Army Corps of Engineers

USAEHSC

U.S. Army Engineering & Housing Support Center

USAEWES

U.S. Army Engineer Waterways Experiment Station

Section II Terms

Asphalt pavement recycling

The reusing of the two basic components of the original pavement surface, the aggregate and the asphalt, in the rehabilitated or upgraded pavement, either in the base course or the surface course.

Associated 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, markings; right of way or snow fencing; unstabilized shoulders; curbs; guard rails; cat-tleguards; 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 20 or more feet in length; erected over a depression or an obstacle; carrying a passageway for pedestrians, vehicles or railway equipment. Cat-walks and elevated pedestrian passageways connecting buildings are not considered to be bridges.

Major culvert

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

Pavement

Surfaced area designed for vehicular or aircraft use.

Preventive maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment, utility plants and systems, building and structures, and ground facilities for the purpose of detecting and correcting incipient failures and accomplishing minor maintenance.

Roads in the 50 States and U.S. possessions

a. Installation road. A road or street within the boundaries of a military installation or in which the Department of Defense has a real estate interest. It is not dedicated for public use and is not eligible for improvement with Defense Access Road funds (AR 55-80).

b. Public road (on-post or off-post). A road or street which is owned, operated, and maintained by a civil authority. These include those through a military installation when they are dedicated to public use.

c. Joint-use roads. A road or street which by lease, permit, easement, or other agreement is used and/or operated by the Army jointly with an individual(s) or civil authority. (A joint-use road may or may not be open to public traffic.) Maintenance of these roads will be in accordance with the terms of the agreement which should include appurtenances as defined in (1) above. Where the Army has maintenance responsibilities, the area associated with this responsibility will be included in the installation real property records inventory.

d. Defense access road. A public owned road that is authorized to be improved in whole or in part with Federal funds appropriated for defense access roads under the authority of 23 USC 210. Policies applicable to Defense Access Roads are prescribed in AR 55-80.

Roads outside the 50 States and U.S. possessions

a. Installation road. A road within an area designated for exclusive use of the U.S. Army by agreement or treaty.

b. Public road. A road outside or through areas set aside for U.S. Army use for which the U.S. Government is not obligated by agreement or treaty to maintain or repair.

b. Joint-use road. A road used by the U.S. Army and the public for which the U.S. Government is obligated by agreement or treaty to share in the maintenance and repair.

Surfaced areas.

Surfaced areas are structural systems constructed to support and sustain various types of traffic and loadings and normally include drainage features and an established profile or template. Surfaced areas include, but are not limited to vehicular and aircraft pavements (including parking areas), sidewalks, open storage areas, cargo handling areas, and equipment hardstands. Structural systems may consist of compacted subgrade, improved materials (subbase), interlocking aggregate base course and flexible or rigid surface or wearing course. Included within this definition are stabilized areas and so called "unsurfaced" roads and parking areas consisting of compacted subgrade and gravel or aggregate base and wearing course. It does not include grass, graded areas, or road tracks established by passage of vehicles.

Track

All Army-owned railroads used for transporting personnel and material. Crane tracks and tracks on target ranges do not fall under the purview of this regulation.

Stabilized area

Areas which have been improved from their natural condition by mechanical compaction with or without the addition of stabilizing agents such as calcium chloride, and lime. Tank trails, footpaths, unimproved open storage areas, firebreaks, and other locations are not considered to be stabilized areas.

Section III**Special Abbreviations and Terms**

There are no special terms.

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