SECTION 8

GENERAL CONDITIONS

00700-1 FAMILIARITY WITH SITE

Execution of this agreement by the Contractor is a representation that the Contractor has visited the sites, has become familiar with the local conditions under which the work is to be performed, and has correlated personal observations with the requirements of this agreement.

00700-2 CONTRACT DOCUMENTS

This agreement consists of Owner's invitation for bid, instructions to bidders, bid form, performance bond, payment bond, acknowledgments, the contract, general conditions, special conditions, specifications, plans, drawings, exhibits, addenda, and written change orders.

A. Notice of Award of Contract:

B. Execution of Contract Documents

Upon notification of Award of Contract, the Owner shall furnish the Contractor the conformed copies of Contract Documents for execution by the Contractor and the Contractor's surety.

Within ten (10) days after receipt the Contractor shall return all the documents properly executed by the Contractor and the Contractor's surety. Attached to each document shall be an original power-of-attorney for the person executing the bonds for the surety and certificates of insurance for the required insurance coverage.

After receipt of the documents executed by the Contractor and his surety with the power-of-attorney and certificates of insurance, the Owner shall complete the execution of the documents. Distribution of the completed documents will be made upon completion.

Should the Contractor and/or Surety fail to execute the documents within the time specified; the Owner shall have the right to proceed on the Bid Bond accompanying the bid.

If the Owner fails to execute the documents within the time limit specified, the Contractor shall have the right to withdraw the Contractor's bid without penalty.

Drawings and Specifications:

The Drawings, Specifications, Contract Documents, and all supplemental documents, are considered essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to define, describe and provide for all Work necessary to complete the Project in an acceptable manner, ready for use, occupancy, or operation by the Owner.

In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings.

In cases where products or quantities are omitted from the Specifications, the description and quantities shown on the Drawings shall govern.

Any ambiguities or need for clarification of the Drawings or Specifications shall be immediately reported to the Construction Manager in writing. Any such ambiguity or need for clarification shall be handled by the Construction Manager in writing. No clarification of the Drawings and Specifications hereunder by the Construction Manager shall entitle the Contractor to any additional monies unless a Change Order has been processed as provided by "Changes in the Contract" hereof.

Any work done by the Contractor following a discovery of such differing site condition or ambiguity or need for clarification in the Contract Drawings and Specifications prior to a written report to the Construction Manager shall not entitle the Contractor to additional monies and shall be done at the Contractor's risk.

The Construction Manager will furnish the Contractor five (5) copies of the Contract Drawings and the Specifications, one copy of which the Contractor shall have available at all times on the Project site.

00700-3 DEFINITIONS

The following terms as used in this agreement are defined as follows to the extent the definitions herein differ or conflict with those in the Instructions for Bidders, Section 00100, the definitions herein shall control.

Alternate bids – the amount stated in the bid or proposal to be added to or deducted from the amount of the base bid or base proposal if the corresponding change in project scope or alternate materials or methods of construction is accepted.

Base bid – the amount of money stated in the bid or proposal as the sum for which the bidder or proposer offers to perform the work.

Change Order - an alteration, addition, or deduction from the original scope of work as defined by the contract documents to address changes or unforeseen conditions necessary for project completion. A written order to the Contractor issued by the County pursuant to Fulton County Policy and Procedures 800-6 for changes in the work within the general scope of the contract documents, adjustment of the contract price, extension of the contract time, or reservation of determination of a time extension.

Construction Manager shall mean the individual designated in writing, by the Director of the Facilities and Transportation Services Department as the Construction Manager.

Contractor shall mean the party of the second part to the Contract Agreement or the authorized and legal representative of such party.

Contract Documents include the Contract Agreement, Contractor's Bid (including all documentation accompanying the Bid and any post-Bid documentation required by the County prior to the Notice of Award), Bonds, all Special Conditions, General Conditions, Supplementary Conditions, Specifications, Drawings and addenda, together with written amendments, change orders, field orders and the Construction Manager's written interpretations and clarifications issued in accordance with the General Conditions on or after the date of the Contract Agreement.

Shop drawing submittals reviewed in accordance with the General Conditions, geotechnical investigations and soils report and drawings of physical conditions in or relating to existing surface structures at or contiguous to the site are not Contract Documents.

Contract Price - The sum specified in the Agreement to be paid to the Contractor in consideration of the Work.

Contract Time shall mean the number of consecutive calendar days as provided in the Contract Agreement for completion of the Work, to be computed from the date of Notice to Proceed.

Owner or County shall mean Fulton County Government, party of the first part to the Contract Agreement, or its authorized and legal representatives.

Day - A calendar day of twenty-four hours lasting from midnight of one day to midnight the next day.

Detention Equipment Contractor ("DEC") – Any legally chartered business entity whose primary activity is the supply and/or installation of detention hardware equipment and related systems.

Director - Director of the Facilities and Transportation Services Department of Fulton County, Georgia or the designee thereof.

Engineer of Record – N/A

Final Completion shall mean the completion of all work as required in accordance with the terms and conditions of the contract documents.

Liquidated Damages shall mean the amount, stated in the Contract Agreement, which the Contractor agrees to pay to the Owner for each consecutive calendar day beyond the Contract time required to complete the Project or for failing to comply with associated milestones. Liquidated Damages will end upon written notification from the Owner of Final Acceptance of the Project or upon written notification of from the Owner of completion of the milestone.

Notice to Proceed - A written communication issued by the County to the Contractor authorizing it to proceed with the work, establishing the date of commencement and completion of the work, and providing other direction to the Contractor.

Products shall mean materials or equipment permanently incorporated into the work.

Program Manager - Not used in this contract. Delete all references.

Project Manual - The Contract Documents.

Provide shall mean to furnish and install.

Substantial Completion - The date certified by the Construction Manager when all or a part of the work, as established pursuant to General Condition 0700-81, is sufficiently completed in accordance with the requirements of the contract documents so that the identified portion of the work can be utilized for the purposes for which it is intended.

Work or Project - All of the services specified, indicated, shown or contemplated by the contract documents, and furnishing by the Contractor of all materials, equipment, labor, methods, processes, construction and manufacturing materials and equipment, tools, plans, supplies, power, water, transportation and other things necessary to complete such services in accordance with the contract documents to insure a functional and complete facility.

00700-4 CODES

All codes, specifications, and standards referenced in the contract documents shall be the latest editions, amendments and revisions of such referenced standards in effect as of the date of the request for proposals for this contract.

00700-5 REVIEW OF CONTRACT DOCUMENTS

Before making its proposal to the County, and continuously after the execution of the agreement, the Contractor shall carefully study and compare the contract documents and shall at once report to the Construction Manager any error, ambiguity, inconsistency or omission that may be discovered, including any requirement which may be contrary to any law, ordinance, rule, or regulation of any public authority bearing on the performance of the work. By submitting its proposal, the Contractor agrees that the contract documents, along with any supplementary written instructions issued by or through the Construction Manager that have become a part of the contract documents, appear accurate, consistent and complete insofar as can be reasonably determined. If the Contractor has timely reported in writing any error, inconsistency, or omission to the Construction Manager, has properly stopped the affected work until instructed to proceed, and has otherwise followed the instructions of the Construction Manager, the Contractor shall not be liable to the County for any damage resulting from any such error, inconsistency, or omission in the contract documents. The Contractor shall not perform any portion of the work without the contract documents, approved plans, specifications, products and data, or samples for such portion of the work. For purposes of this section "timely" is defined as the time period in which the contractor discovers, or should have discovered, the error, inconsistency, or omission, with the exercise of reasonable diligence.

00700-6 STRICT COMPLIANCE

No observation, inspection, test or approval of the County or Construction Manager shall relieve the Contractor from its obligation to perform the work in strict conformity with the contract documents except as provided in General Condition 00700-48.

00700-7 APPLICABLE LAW

All applicable State laws, County ordinances, codes, and rules and regulations of all authorities having jurisdiction over the construction of the project shall apply to this agreement. The Contractor shall comply with the requirements of any Fulton County program concerning non-discrimination in contracting. All work performed within the right of way of the Georgia Department of Transportation and any railroad crossing shall be in accordance with Georgia Department of Transportation regulations, policies and procedures and, where applicable, those of any affected railroad. The Contractor shall comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work as specified and the Contractor agrees to indemnify and hold harmless the County, its officers, agents and employees, as well as the Construction Manager and the Program Manager against any claim or liability arising from or based on the violation of any law, ordinance, regulation, order or decree affecting the conduct of the work, whether occasioned by the Contractor, his agents or employees.

00700-8 PERMITS, LICENSES AND BONDS

All permits and licenses necessary for the work shall be secured and paid for by the Contractor. If any permit, license or certificate expires or is revoked, terminated, or suspended as a result of any action on the part of the Contractor, the Contractor shall not be entitled to additional compensation or time. The Contractor shall obtain and keep in force at all times performance and payment bonds payable to Fulton County in penal amounts equal to 100% of the Contract price.

00700-9 TAXES

A. The Contractor shall pay all sales, retail, occupational, service, excise, old age benefit and unemployment compensation taxes, consumer, use and other similar taxes, as well as any other taxes or duties on the materials, equipment, and labor for the work provided by the Contractor which are legally enacted by any municipal, county, state or federal authority, department or agency at the time bids are received, whether or not yet effective. The Contractor shall maintain records pertaining to such taxes and levies as well as payment thereof and shall make the same available to the County at all reasonable times for inspection and copying. The Contractor shall apply for any and all tax exemptions which may be applicable and shall timely request from the County such documents and information as may be necessary to obtain such tax exemptions. The County shall have no liability to the Contractor for payment of any tax from which it is exempt.

B. The Contractor is obligated to comply with all local and State Sales and Use Tax laws. The Contractor shall provide the Owner with documentation to assist the Owner in obtaining sales and/or use tax refunds for eligible machinery and equipment used for the primary purpose of reducing or eliminating air or water pollution as provided for in Chapter 48-8-3 (36) and (37) of the Official Code of Georgia. All taxes shall be paid by the Contractor. All refunds will accrue to the Owner.

Acceptance of the project as complete and final payment will not be made by the Owner until the Contractor has fully complied with this requirement.

00700-10 DELINQUENT CONTRACTORS

The County shall not pay any claim, debt, demand or account whatsoever to any person firm or corporation who is in arrears to the County for taxes. The County shall be entitled to a counterclaim, backcharge, and offset for any such debt in the amount of taxes in arrears, and no assignment or transfer of such debt after the taxes become due shall affect the right of the County to offset any taxes owed against said debt.

00700-11 LIEN WAIVERS

The Contractor shall furnish the County with evidence that all persons who have performed work or furnished materials pursuant to this agreement have been paid in full prior to submitting its demand for final payment pursuant to this agreement. A final affidavit, Exhibit A, must be completed, and submitted to comply with requirements of 00700-11. In the event that such evidence is not furnished, the County may retain sufficient sums necessary to meet all lawful claims of such laborers and materialmen. The County assumes no obligation nor in any way undertakes to pay such lawful claims from any funds due or that may become due to the Contractor.

00700-12 MEASUREMENT

All items of work to be paid for per unit of measurement shall be subject to inspection, measurement, and confirmation by the Construction Manager.

00700-13 ASSIGNMENT

The Contractor shall not assign any portion of this agreement or moneys due there from (include factoring of receivables) without the prior written consent of the County. The

Contractor shall retain personal control and shall provide personal attention to the fulfillment of its obligations pursuant to this agreement. Any assignment without the express written consent of the County shall render this contract voidable at the sole option of the County.

00700-14 FOREIGN CONTRACTORS

In the event that the Contractor is a foreign corporation, partnership, or sole proprietorship, the Contractor hereby irrevocably appoints the Secretary of State of Georgia as its agent for service of all legal process for the purpose of this contract only.

00700-15 INDEMNIFICATION

The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any and all persons, including the Contractor's agents, servants, and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this contract or the prosecution of work hereunder, whether caused by the Contractor or the Contractor's agents, Servants, or employees, or by any of the Contractor's subcontractors or suppliers, and the Contractor shall indemnify and hold harmless the County, the Construction Manager, County's Commissioners, officers, employees, successors, assigns and agents, or any of their subcontractors from and against any and all loss and/or expense which they or any of them may suffer or pay as a result of claims or suits due to, because of, or arising out of any and all such injuries, deaths and/or damage, irrespective of County or Construction Manager negligence (except that no party shall be indemnified for their own sole negligence). The Contractor, if requested, shall assume and defend at the Contractor's own expense, any suit, action or other legal proceedings arising there from, and the Contractor hereby agrees to satisfy, pay, and cause to be discharged of record any judgment which may be rendered against the County and the Construction Manager arising there from.

In the event of any such loss, expense, damage, or injury, or if any claim or demand for damages as heretofore set forth is made against the County or the Construction Manager, the County may withhold from any payment due or thereafter to become due to the Contractor under the terms of this Contract, an amount sufficient in its judgment to protect and indemnify it and the Construction Manager, County's Commissioners, officers, employees, successors, assigns and agents from any and all claims, expense, loss, damages, or injury; and the County, in its discretion, may require the Contractor to furnish a surety bond satisfactory to the County providing for such protection and indemnity, which bond shall be furnished by the Contractor within five (5) days after written demand has been made therefore. The expense of said Bond shall be borne by the Contractor.

00700-16 SUPERVISION OF WORK AND COORDINATION WITH OTHERS

The Contractor shall supervise and direct the work using the Contractor's best skill and attention. The Contractor shall be solely responsible for all construction methods and procedures and shall coordinate all portions of the work pursuant to the contract subject to the overall coordination of the Construction Manager. All work pursuant to this agreement shall be performed in a skillful and workmanlike manner.

The County reserves the right to perform work related to the Project with the County's own forces and to award separate contracts in connection with other portions of the

project, other work on the site under these or similar conditions of the contract, or work which has been extracted from the Contractor's work by the County.

When separate contracts are awarded for different portions of the project or other work on the site, the term "separate contractor" in the Contract Documents in each case shall mean the contractor who executes each separate County Agreement.

The Contractor shall cooperate with the County and separate contractors in arranging the introduction and storage of materials and equipment and execution of their work, and shall cooperate in coordinating connection of its work with theirs as required by the Contract Documents.

If any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results **within fourteen (14) days** of discovery of such discrepancy or defect. Failure of the Contractor to so report in writing shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive the Work, except as to any defects which may subsequently become apparent in such work by others.

Any costs caused by defective or untimely work shall be borne by the party responsible therefore.

Should the Contractor wrongfully cause damage to the work or property of the County or to other work or property on the site, including the work of separate contractors, the Contractor shall promptly remedy such damage at the Contractor's expense.

Should the Contractor be caused damage by any other contractor on the Project, by reason of such other contractor's failure to perform properly his contract with the County, no action shall lie against the County or the Construction Manager inasmuch as the parties to this agreement are the only beneficiaries hereof and there are no third party beneficiaries and neither the County nor the Construction Manager shall have liabilities therefore, but the Contractor may assert his claim for damages solely against such other contractor. The Contractor shall not be excused from performance of the contract by reason of any dispute as to damages with any other contractor or third party.

Where the Work of this Contract shall be performed concurrently in the same areas as other construction work, the Contractor shall coordinate with the Construction Manager and the separate contractors in establishing mutually acceptable schedules and procedures that shall permit all jobs to proceed with minimum interference.

If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up, the County may clean up and charge the cost thereof to the Contractor or contractors responsible therefore as the County shall determine to be just.

00700-17 ADMINISTRATION OF CONTRACT

The Program Manager and the Construction Manager shall provide administration services as hereinafter described.

For the administration of this Contract, the Construction Manager shall serve as the County's primary representative during design and construction and until final payment to the Contractor is due. The Construction Manager shall advise and consult with the County and the Program Manager. The primary point of contact for the Contractor shall

be the Construction Manager. All correspondence from the Contractor to the County shall be forwarded through the Construction Manager. Likewise, all correspondence and instructions to the Contractor shall be forwarded through the Construction Manager.

The Construction Manager will determine in general that the construction is being performed in accordance with design and engineering requirements, and will endeavor to guard the County against defects and deficiencies in the Work.

The Construction Manager will not be responsible for or have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, nor will it be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Construction Manager will not be responsible for or have control or charge over the acts or omissions of the Contractor, its engineers, consultants, subcontractors, or any of their agents or employees, or any other persons performing the Work.

Based on the Construction Manager's observations regarding the Contractor's Applications for Payment, the Construction Manager shall determine the amounts owing to the Contractor, in accordance with the payment terms of the Contract, and shall issue Certificates for Payment in such amount to the County.

The Construction Manager shall render interpretations necessary for the proper execution or progress of the Work. Either party to the Contract may make written requests to the Construction Manager for such interpretations.

Claims, disputes and other matters in question between the Contractor and the County relating to the progress of the Work or the interpretation of the Contract Documents shall be referred to the Construction Manager for interpretation.

All interpretations of the Construction Manager shall be consistent with the intent of and reasonably inferable from the Contract Documents and shall be in writing or in graphic form.

Except as otherwise provided in this Contract, the Construction Manager shall issue a decision on any disagreement concerning a question of fact arising under this Contract. The Construction Manager shall reduce the decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Construction Manager shall be final and conclusive unless, within thirty (30) days from the date of receipt of such copy, the Contractor files a written appeal with the Director of Public Works and mails or otherwise furnishes the Construction Manager a copy of such appeal. The decision of the Director of Public Works or the Director's duly authorized representative for the determination of such appeals shall be final and conclusive. Such final decision shall not be pleaded in any suit involving a question of fact arising under this Contract, provided such is not fraudulent, capricious, arbitrary, so grossly erroneous as necessarily implying bad faith, or is not supported by substantial evidence. In connection with any appeal proceeding under this Article, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of Contractor's appeal. Pending any final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract as directed by the Construction Manager.

The Construction Manager shall have authority to reject Work which does not conform to the Contract Documents. Whenever, in the Construction Manager's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the County shall have authority to require special inspection or testing of the Work whether or not such Work be then fabricated, installed or completed. The

Contractor shall pay for such special inspection or testing if the Work so inspected or tested is found not to comply with the requirements of the contract; the County shall pay for special inspection and testing if the Work is found to comply with the contract. Neither the Construction Manager's authority to act under this Subparagraph, nor any decision made by the Construction Manager in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Construction Manager to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the Work.

The Contractor shall provide such shop drawings, product data, and samples as may be required by the Construction Manager and/or as required by these Contract Documents.

The Construction Manager shall conduct inspections to determine Substantial Completion and Final Completion, and shall receive and forward to the County for review written warranties and related documents required by the Contract Documents and assembled by the Contractor. The Construction Manager shall approve and issue Certificates for Payment upon compliance with Substantial and Final Completion requirements indicated in General Conditions 00700-81, 00700-82, 00700-84 and 00700-85 of this Agreement.

Except as provided in General Condition 00700-48, the Contractor shall not be relieved from the Contractor's obligations to perform the work in accordance with the contract documents by the activities or duties of the County or any of its officers, employees, or agents, including inspections, tests or approvals, required or performed pursuant to this agreement.

00700-18 RESPONSIBILITY FOR ACTS OF EMPLOYEES

The Contractor shall employ only competent and skilled personnel. The Contractor shall, upon demand from the Construction Manager, immediately remove any superintendent, foreman or workman whom the Construction Manager may consider incompetent or undesirable.

The Contractor shall be responsible to the County for the acts and omissions of the Contractor's employees, subcontractors, and agents as well as any other persons performing work pursuant to this agreement for the Contractor.

00700-19 LABOR, MATERIALS, SUPPLIES, AND EQUIPMENT

Unless otherwise provided in this agreement, the Contractor shall make all arrangements with necessary support agencies and utility companies provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the execution and completion of the work.

00700-20 DISCIPLINE ON WORK SITE

The Contractor shall enforce strict discipline and good order among its employees and subcontractors at all times during the performance of the work, to include compliance with the Fulton County Drug Free Work Place Policy. The Contractor shall not employ any subcontractor who is not skilled in the task assigned to it. The Construction Manager may, by written notice, require the Contractor to remove from the work any subcontractor or employee deemed by the Construction Manager to be incompetent.

00700-21 HOURS OF OPERATION

All work at the construction site shall be performed during regular business hours of the Fulton County government, except upon the Construction Manager's prior written consent to other work hours. It is further understood that the Contractor's construction schedule is based on a normal 40 hours, five day work week, less Fulton County-recognized holidays. Contractors work schedule shall not violate Fulton County Noise Ordinance by working hours inconsistent with the Fulton County Noise Ordinance. The County's current noise ordinance or other applicable ordinance shall govern. If the Contractor desires to work in excess of this limit, the Contractor shall submit a written request to the Construction Manager, a minimum of five days prior to the desired work date. The Contractor shall be responsible for any additional expenses incurred by the Owner as a result of the extended work hours, including resident inspection overtime. The cost associated with resident inspector overtime shall be deducted form the Contractor monthly payment request.

00700-22 FAMILIARITY WITH WORK CONDITIONS

The Contractor shall take all steps necessary to ascertain the nature and location of the work and the general and local conditions which may affect the work or the cost thereof. The Contractor's failure to fully acquaint itself with the conditions which may affect the work, including, but not limited to conditions relating to transportation, handling, storage of materials, availability of utilities, labor, water, roads, weather, topographic and subsurface conditions, other separate contracts to be entered into by the County relating to the project which may affect the work of the Contractor, applicable provisions of law, and the character and availability of equipment and facilities necessary prior to and during the performance of the work shall not relieve the Contractor of its responsibilities pursuant to this agreement and shall not constitute a basis for an equitable adjustment of the contract terms. The County reserves the right to perform with its own forces or to contract with other entities for other portions of the project work, in which case the Contractor's responsibility to assure its familiarity with work conditions hereunder shall include all coordination with such other contractors and the County necessary to insure that there is no interference between contractors as will delay or hinder any contractor in its prosecution of work on the project. The County assumes no responsibility for any understandings or representations concerning conditions of the work made by any of its officers, agents, or employees prior to the execution of this agreement.

00700-23 RIGHT OF ENTRY

The County reserves the right to enter the site of the work by such agent, including the Construction Manager, as it may elect for the purpose of inspecting the work or installing such collateral work as the County may desire. The Contractor shall provide safe facilities for such access so that the County and its agents may perform their functions.

00700-24 NOTICES

Any notice, order, instruction, claim or other written communication required pursuant to this agreement shall be deemed to have been delivered or received as follows:

Upon personal delivery to the Contractor, its authorized representative, or the Construction Manager on behalf of the County. Personal delivery may be accomplished by in-person hand delivery or bona fide overnight express service.

Three days after depositing in the United States mail a certified letter addressed to the Contractor or the Construction Manager for the County. For purposes of mailed notices, the County's mailing address shall be 141 Pryor Street, 6th Floor, Atlanta, Georgia 30303, or as the County shall have otherwise notified the Contractor. The Contractor's mailing address shall be the address stated in its proposal or as it shall have most recently notified the Construction Manager in writing.

00700-25 SAFETY

A. SAFETY, HEALTH AND LOSS PREVENTION

The Contractor shall be responsible for implementing a comprehensive project-specific safety, health and loss prevention program and employee substance abuse program for this project. All Sub-Contractors must either implement their own program or follow the Contractor's safety, health and loss prevention program and employee substance abuse program.

The Contractor's safety, health and loss prevention program and employee substance abuse program must meet or exceed all governmental regulations (OSHA, EPA, DOT, State, local), and any other specific Fulton County requirements

B. COUNTY'S SAFETY, HEALTH, AND LOSS PREVENTION PROCESS GUIDELINES AND REQUIREMENTS

The County and its agents reserve the right, but assume no duty, to establish and enforce safety, health, and loss prevention guidelines and to make the appropriate changes in the guidelines, for the protection of persons and property and to review the efficiency of all protective measures taken by the Contractor. The Contractor shall comply with all safety, health, and loss prevention process guidelines and requirements and changes made by the County or its agent(s). The issuance of any such guidelines or changes by the County or its agent(s) shall not relieve the Contractor of its duties and responsibilities under this Agreement, and the County or its agent(s) shall not thereby assume, nor be deemed to have assumed, any such duties or responsibilities of the Contractor.

C. COMPLIANCE OF WORK, EQUIPMENT, AND PROCEDURES WITH ALL APPLICABLE LAWS and REGULATIONS

All Work, whether performed by the Contractor or its Sub-Contractors of any tier, or anyone directly or indirectly employed by any of them, and all equipment, appliances, machinery, materials, tools and like items incorporated or used in the Work, shall be in compliance with and conform to:

1. All applicable laws, ordinances, rules, regulations and orders of any public, quasi-public or other governmental authority relating to the safety of persons and their protection against injury, specifically including, but in no event limited to, the Federal Occupational Safety and Health Act of 1970, as amended, and all rules and regulations now or hereafter in effect pursuant to said Act.
2. All rules, regulations, and requirements of the County or its agent(s) and its insurance carriers relating there to. In the event of a conflict or differing requirements the more stringent shall govern.

D. PROTECTION OF THE WORK

1. The Contractor shall, throughout the performance of the Work, maintain adequate and continuous protection of all Work and temporary facilities against loss or damage from whatever cause, shall protect the property of the County and third parties from loss or damage from whatever cause arising out of the performance of the Work, and shall comply with the requirements of the County or its agent(s) and its insurance carriers, and with all applicable laws, codes, rules and regulations, (as same may be amended) with respect to the prevention of loss or damage to property as a result of fire or other hazards.

2. The County or its agent(s) may, but shall not be required to, make periodic inspections of the Project work area. In such event, however, the Contractor shall not be relieved of its aforesaid responsibilities and the County or its agent(s) shall not assume, nor shall it be deemed to have assumed, any responsibility otherwise imposed upon the assurance of Contractor by this Agreement.

E. SAFETY EQUIPMENT

1. The Contractor shall provide to each worker on the Project work area the proper safety equipment for the duties being performed by that worker and will not permit any worker on the Project work area who fails or refuses to use the same. The County or its agent shall have the right, but not the obligation, to order the removal of a worker from the Project work site for his/her failure to comply with safe practices or substance abuse policies.

F. EMERGENCIES

1. In any emergency affecting the safety of persons or property, or in the event of a claimed violation of any federal or state safety or health law or regulation, arising out of or in any way connected with the Work or its performance, the Contractor shall act immediately to prevent threatened damage, injury or loss and to remedy said violation. Failing such action the County or its agent(s) may immediately take whatever steps it deems necessary including, but not limited to, suspending the Work as provided in this Agreement.

2. The County or its agent(s) may offset any and all costs or expenses of whatever nature, including attorneys' fees, paid or incurred by the County or its agent(s) (whether such fees are for in-house counsel or counsel retained by the County or its agent), in taking the steps authorized by Section 00700-25(G) (1) above against any sums then or thereafter due to the Contractor. The Contractor shall defend, indemnify and hold the County, its officers, agents, and employees harmless against any and all costs or expenses caused by or arising from the exercise by the County of its authority to act in an emergency as set out herein. If the Contractor shall be entitled to any additional compensation or extension of time change order on account of emergency work not due to the fault or neglect of the Contractor or its Sub-Contractors, such additional compensation or extension of time shall be determined in accordance with General Condition 00700-52 and General Condition 00700-87 of this Agreement.

G. SUSPENSION OF THE WORK

1. Should, in the judgment of the County or its agent(s), the Contractor or any Sub-Contractor fail to provide a safe and healthy work place, the County or its agent shall have the right, but not the obligation, to suspend work in the unsafe areas until deficiencies are corrected. All costs of any nature (including, without limitation, overtime pay, liquidated damages or other costs arising out of delays) resulting from the suspension, by whomsoever incurred, shall be borne by the Contractor.

2. Should the Contractor or any Sub-Contractor fail to provide a safe and healthy work place after being formally notified in writing by the County or its agents of such non-compliance, the contract may be terminated following the termination provision of the contract.

H. CONTRACTOR'S INDEMNITY OF THE COUNTY FOR CONTRACTOR'S NON-COMPLIANCE WITH SAFETY PROGRAM

1. The Contractor recognizes that it has sole responsibility to assure its Safety Program is implemented and to assure its construction services are safely provided. The Contractor shall indemnify, defend and hold the County and its agents harmless, from and against any and all liability (whether public or private), penalties (contractual or otherwise), losses, damages, costs, attorneys' fees, expenses, causes of action, claims or judgments resulting, either in whole or in part, from any failure of the Contractor, its Sub-Contractors of any tier or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, to comply with the safety requirements of the contract. The Contractor shall not be relieved of its responsibilities under the safety requirements of the Contract should the County or its agent(s) act or fail to act pursuant to its rights hereunder.

2. The Contractor shall not raise as a defense to its obligation to indemnify under this Subparagraph I any failure of those indemnified hereunder to assure Contractor operates safely, it being understood and agreed that no such failure shall relieve the Contractor from its obligation to assure safe operations or from its obligation to so indemnify. The Contractor also hereby waives any rights it may have to seek contribution, either directly or indirectly, from those indemnified hereunder.

3. In any and all claims against those indemnified hereunder by any employee of the Contractor, any Sub-Contractor of any tier or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Subparagraph I shall not be limited in any way as to the amount or type of damages, compensation or benefits payable by or for the Contractor or any Sub-Contractor of any tier under any workers' compensation act, disability benefit or other employee benefit acts.

00700-26 BLASTING AND EXCAVATION

The Contractor acknowledges that it is fully aware of the contents and requirements of O.C.G.A. § 25-9-1 through 25-9-12 concerning blasting and excavation near underground gas pipes and facilities and shall fully comply therewith.

00700-27 HIGH VOLTAGE LINES

The Contractor acknowledges that it is fully aware of the contents and requirements O.C.G.A. § 46-3-30 through 46-3-39 concerning safeguards against contact with high voltage lines, and the Contractor shall fully comply with said provisions.

00700-28 SCAFFOLDING AND STAGING

The Contractor acknowledges that it is the person responsible for employing and directing others to perform labor within the meaning of O.C.G.A. § 34-1-1 and agrees to comply with said provisions.

00700-29 CLEAN-UP

The Contractor shall clean up all refuse, rubbish, scrap materials, and debris caused by its operations to the end that the site of the work shall present a neat, orderly and workmanlike appearance at all times.

00700-30 PROTECTION OF WORK

The Contractor shall be responsible for maintenance and protection of the work, which shall include any County-furnished supplies, material, equipment, until final completion of this agreement and acceptance of the work as defined herein. Any portion of the work suffering injury, damage or loss shall be considered defective and shall be corrected or replaced by the Contractor without additional cost to the County.

00700-31 REJECTED WORK

The Contractor shall promptly remove from the project all work rejected by the Construction Manager for failure to comply with the contract documents and the Contractor shall promptly replace and re-execute the work in accordance with the contract documents and without expense to the County. The Contractor shall also bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.

00700-32 DEFECTIVE WORK

If the Contractor defaults or neglects to carry out any portion of the work in accordance with the contract documents, and fails within three days after receipt of written notice from the Construction Manager to commence and continue correction of such default or neglect with diligence and promptness, the County may, after three days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy the County may have, make good such deficiencies and complete all or any portion of any work through such means as the County may select, including the use of a separate Contractor. In such case, an appropriate change order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies. In the event the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County on demand.

The County may, at its option, accept defective or nonconforming work instead of requiring its removal or correction. In such case, a change order shall be issued reducing the price due the contractor to the extent appropriate and equitable. Such contract price adjustment shall be effected whether or not final payment has been made.

00700-33 WARRANTY OF NEW MATERIALS

The Contractor warrants to the County that all materials and equipment furnished under this contract will be new unless otherwise specified, and the Contractor further warrants that all work will be of good quality, free from faults and defects, and in conformance with the contract documents. The warranty set forth in this paragraph shall survive final acceptance of the work.

00700-34 CONTRACTOR'S WARRANTY OF THE WORK

If within one year after the date of issuance of the certificate of final payment pursuant to General Condition 84, or within such longer period of time as may be prescribed by law or by the term of any applicable special warranty required by the contract documents, any of the work is found to be defective or not in accordance with the contract documents, the Contractor shall correct such work promptly after receipt of written notice from the Construction Manager to do so. This obligation shall survive both final payment for the work and termination of the contract.

00700-35 ASSIGNMENT OF MANUFACTURERS' WARRANTIES

Without limiting the responsibility or liability of the Contractor pursuant to this agreement, all warranties given by manufacturers on materials or equipment incorporated in the work are hereby assigned by the Contractor to the County. If requested, the Contractor shall execute formal assignments of said manufacturer's warranties to the County. All such warranties shall be directly enforceable by the County.

00700-36 WARRANTIES IMPLIED BY LAW

The warranties contained in this agreement, as well as those warranties implied by law, shall be deemed cumulative and shall not be deemed alternative or exclusive. No one or more of the warranties contained herein shall be deemed to alter or limit any other.

00700-37 STOP WORK ORDERS

In the event that the Contractor fails to correct defective work as required by the contract documents or fails to carry out the work in accordance with contract documents, the Construction Manager, in writing, may order the Contractor to stop work until the cause for such order has been eliminated. This right of the County to stop work shall not give rise to any duty on the part of the County or the Construction Manager to execute this right for the benefit of the Contractor or for any other person or entity.

00700-38 TERMINATION FOR CAUSE

If the Contractor is adjudged bankrupt, makes a general assignment for the benefit of creditors, suffers the appointment of a receiver on account of its insolvency, fails to supply sufficient properly skilled workers or materials, fails to make prompt payment to subcontractors or materialmen, disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, fails to diligently prosecute the work, or is otherwise guilty of a material violation of this agreement and fails within seven days after receipt of written notice to commence and continue correction of such default, neglect, or violation with diligence and promptness, the County may, after seven days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy the County may have, terminate the employment of the Contractor and take possession of the site as well as all materials, equipment, tools, construction equipment and machinery thereon. The County may finish the work by whatever

methods the County deems expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is completed. If the unpaid balance of the contract price exceeds the cost of completing the work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the County on demand. This obligation for payment shall survive the termination of the contract. Termination of this agreement pursuant to this paragraph may result in disqualification of the Contractor from bidding on future County contracts.

00700-39 TERMINATION FOR CONVENIENCE

The County may, at any time upon written notice to the Contractor, terminate the whole or any portion of the work for the convenience of the County. The effective data of the terminations shall be provided in the written notice. Said termination shall be without prejudice to any right or remedy of the County provided herein. In addition, in the event this agreement has been terminated due to the default of the Contractor, and if it is later determined that the Contractor was not in default pursuant to the provisions of this agreement at the time of termination, then such termination shall be considered a termination for convenience pursuant to this paragraph.

00700-40 TERMINATION FOR CONVENIENCE - PAYMENT

If the Contract is terminated for convenience by the Owner as provided in this article, Contractor will be paid compensation for those services actually performed as approved by the Owner or his representative. Partially completed tasks will be compensated for based on a signed statement of completion prepared by the Project Manager and submitted to the Contractor which shall itemize each task element and briefly state what work has been completed and what work remains to be done. Contractor shall also be paid for reasonable costs for the orderly filing and closing of the project.

00700-41 TERMINATION FOR CONVENIENCE - PAYMENT LIMITATIONS

Except for normal spoilage, and except to the extent that the County shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor the fair value, as determined by the Construction Manager, of property which is destroyed, lost, stolen or damaged so as to become undeliverable to the County or to another buyer.

00700-42 COST TO CURE

If the County terminates for cause the whole or any part of the work pursuant to this agreement, then the County may procure upon such terms and in such manner as the Construction Manager may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the County for any excess costs for such similar supplies or services. The Contractor shall continue the performance of this agreement to the extent not terminated hereunder.

00700-43 ATTORNEY'S FEES

Should the Contractor default pursuant to any of the provisions of this agreement, the Contractor and its surety shall pay to the County such reasonable attorney's fees as the County may expend as a result thereof and all costs, expenses, and filing fees incidental thereto.

00700-44 CONTRACTOR'S RESPONSIBILITIES UPON TERMINATION

After receipt of a notice of termination from the County, and except as otherwise directed by the Construction Manager, the Contractor shall:

1. Stop work under the contract on the date and to the extent specified in the notice of termination;

2. Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the agreement as is not terminated;

3. Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination;

4. Assign to the County in the manner, at the times, and to the extent directed by the Construction Manager, all of the rights, title and interest of the Contractor under the orders and subcontracts so terminated, in which case the County shall have the right, at its discretion, to settle or pay any and all claims arising out of the termination of such orders or subcontracts;

5. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts with the approval or ratification of the Construction Manager, to the extent the Construction Manager may require, which approval or ratification shall be final for all purposes;

6. Transfer title and deliver to the entity or entities designated by the Construction Manager, in the manner, at the times, and to the extent, if any, directed by the Construction Manager, and to the extent specifically produced or specifically acquired by the Contractor for the performance of such portion of the work as has been terminated:

    a. The fabricated or un-fabricated parts, work, and progress, partially completed supplies, and equipment, materials, parts, tools, dyes, jigs, and other fixtures, completed work, supplies, and other material produced as a part of or acquired in connection with the performance of the work terminated by the notice of termination; and

    b. The completed or partially completed plans, drawings, information, and other property to the work.

7. Use its best efforts to sell in the manner, at the times, to the extent, and at the prices directed or authorized by the Construction Manager, any property described in Section 6 of this paragraph, provided, however, that the Contractor shall not be required to extend credit to any buyer and further provided that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the County to the Contractor pursuant to this agreement.

8. Complete performance of such part of the work as shall not have been terminated by the notice of termination; and

9. Take such action as may be necessary, or as the Construction Manager may direct, for the protection and preservation of the property related to the agreement which is in the possession of the Contractor and in which the County has or may acquire an interest.

00700-45 RECORDS

The Contractor shall preserve and make available to the County all of its records, books, documents and other evidence bearing on the costs and expenses of the Contractor and any subcontractor pursuant to this agreement upon three days advance notice to the Contractor.

00700-46 DEDUCTIONS

In arriving at any amount due the Contractor pursuant to the terms of this agreement, there shall be deducted all liquidated damages, advance payments made to the Contractor applicable to the termination portion of the contract, the amount of any claim which the County may have against the Contractor, the amount determined

By the Construction Manager to be necessary to protect the County against loss due to outstanding potential liens or claims, and the agreed price of any materials acquired or sold by the Contractor and not otherwise recovered by or credited to the County.

00700-47 REIMBURSEMENT OF THE COUNTY

In the event of termination, the Contractor shall refund to the County any amount paid by the County to the Contractor in excess of the costs properly reimbursable to the Contractor.

00700-48 SUSPENSION, INTERRUPTION, DELAY, DAMAGES

The Contractor shall be entitled to only those damages and that relief from termination by the County as specifically set forth in this agreement. The Construction Manager may issue a written order requiring the Contractor to suspend, delay or interrupt all or any part of the work for such period of time as the County may determine to be appropriate for the convenience of the County. If the performance of the work is interrupted for an unreasonable period of time by an act of the County or any of its officers, agents, employees, contractors, or consultants in the administration of this agreement, an equitable adjustment shall be made for any increase in the Contractor's costs of performance and any increase in the time required for performance of the work necessarily caused by the unreasonable suspension, delay, or interruption. Any equitable adjustment shall be reduced to writing and shall constitute a modification to this agreement. In no event, however, shall an equitable adjustment be made to the extent that performance of this agreement would have been suspended, delayed or interrupted by any other cause, including the fault or negligence of the Contractor. No claim for an equitable adjustment pursuant to this paragraph shall be permitted before the Contractor shall have notified the Construction Manager in writing of the act or failure to act involved, and no claim shall be allowed unless asserted in writing to the Construction Manager within ten days after the termination of such suspension, delay or interruption.

00700-49 COMMENCEMENT AND DURATION OF WORK

The County may issue a Notice to Proceed at any time within 120 days following execution of the contract by the County. The Contractor shall commence work pursuant to this agreement within ten days of mailing or delivery of written notice to proceed. The Contractor shall diligently prosecute the work to completion within the time specified therefore in the Agreement. The capacity of the Contractor's construction and manufacturing equipment and plan, sequence and method of operation and forces

employed, including management and supervisory personnel, shall be such as to insure completion of the work within the time specified in the Agreement. The Contractor and County hereby agree that the contract time for completion of the work is reasonable taking into consideration the average climatic conditions prevailing in the locality of the work and anticipated work schedules of other contractors whose activities are in conjunction with or may affect the work under this contract.

00700-50 TIME OF THE ESSENCE

All time limits stated in this agreement are of the essence of this contract.

00700-51 IMPACT DAMAGES

Except as specifically provided pursuant to a stop work order or change order, the Contractor shall not be entitled to payment or compensation of any kind from the County for direct or indirect or impact damages including, but not limited to, costs of acceleration arising because of delay, disruption, interference or hindrance from any cause whatsoever whether such delay, disruption, interference or hindrance is reasonable or unreasonable, foreseeable or unforeseeable, or avoidable, provided, however, that this provision shall not preclude the recovery of damages by the Contractor for hindrances or delays due solely to fraud or bad faith on the part of the County, its agents, or employees. The Contractor shall be entitled only to extensions in the time required for performance of the work as specifically provided in the contract.

00700-52 DELAY

The Contractor may be entitled to an extension of the contract time, but not an increase in the contract price or damages, for delays arising from unforeseeable causes beyond the control and without the fault or negligence of the Contractor or its subcontractors for labor strikes, acts of God, acts of the public enemy, acts of the state, federal or local government in its sovereign capacity, by acts of another separate contractor, or by an act or neglect of the County.

00700-53 INCLEMENT WEATHER

The Contractor shall not be entitled to an extension of the contract time due to normal inclement weather. Unless the Contractor can substantiate to the satisfaction of the Construction Manager that there was greater than normal inclement weather and that such greater than normal inclement weather actually delayed the work, the Contractor shall not be entitled to an extension of time therefore. The following shall be considered the normal inclement weather days for each month listed, and extensions of time shall be granted in increments of not less than one half day only for inclement weather in excess of the days set out.

January	10 days
February	10 days
March	7 days
April	6 days
May	4 days
June	3 days
July	4 days
August	2 days
September	2 days
October	3 days
November	6 days
December	9 days

00700-54 DELAY - NOTICE AND CLAIM

The Contractor shall not receive an extension of time unless a Notice of Delay is filed with the Construction Manager within ten days of the first instance of such delay, disruption, interference or hindrance and a written Statement of the Claim is filed with the Construction Manager within 20 days of the first such instance. In the event that the Contractor fails to comply with this provision, it waives any claim which it may have for an extension of time pursuant to this agreement.

00700-55 STATEMENT OF CLAIM - CONTENTS

The Statement of Claim referenced in Article 00700-54 shall include specific information concerning the nature of the delay, the date of commencement of the delay, the construction activities affected by the delay, the person or organization responsible for the delay, the anticipated extent of the delay, and any recommended action to avoid or minimize the delay.

00700-56 WORK BEHIND SCHEDULE, REMEDY BY CONTRACTOR

If the work actually in place falls behind the currently updated and approved schedule, and it becomes apparent from the current schedule that work will not be completed within the contract time, the Contractor agrees that it will, as necessary, or as directed by the Construction Manager, take action at no additional cost to the County to improve the progress of the work, including increasing manpower, increasing the number of working hours per shift or shifts per working day, increasing the amount of equipment at the site, and any other measure reasonably required to complete the work in a timely fashion.

00700-57 DILIGENCE

The Contractor's failure to substantially comply with the requirements of the preceding paragraph may be grounds for determination by the County that the Contractor is failing to prosecute the work with such diligence as will insure its completion within the time specified. In such event, the County shall have the right to furnish, from its own forces or by contract, such additional labor and materials as may be required to comply with the schedule after 48 hours written notice to the Contractor, and the Contractor shall be liable for such costs incurred by the County.

00700-58 SET-OFFS

Any monies due to the Contractor pursuant to the preceding paragraph of this agreement may be deducted by the County against monies due from the County to the Contractor.

00700-59 REMEDIES CUMULATIVE

The remedies of the County under Articles 00700-56, 00700-57, and 00700-58 are in addition to and without prejudice to all of the rights and remedies of the County at law, in equity, or contained in this agreement.

00700-60 TITLE TO MATERIALS

No materials or supplies shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sales contract or other agreement by which any interest is retained by the seller. The Contractor hereby warrants that it has good and marketable title to all materials and supplies used by it in the work, and the Contractor further warrants that all materials and supplies shall be free from all liens, claims, or encumbrances at the time of incorporation in the work.

00700-61 INSPECTION OF MATERIALS

All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards and in accordance with the requirements of the contract documents. Additional tests performed after the rejection of materials or equipment shall be at the Contractor's expense.

00700-62 CONSTRUCTION MANAGER'S PRESENCE DURING TESTING

All tests performed by the Contractor shall be witnessed by the Construction Manager unless the requirement therefore is waived in writing. The Construction Manager may perform additional tests on materials previously tested by the Contractor, and the Contractor shall furnish samples for this purpose as requested.

00700-63 MATERIALS INCORPORATED IN WORK

The Contractor shall furnish all materials and equipment to be incorporated in the work. All such materials or equipment shall be new and of the highest quality available. Manufactured materials and equipment shall be obtained from sources which are currently manufacturing such materials, except as otherwise specifically approved by the Construction Manager.

00700-64 STORAGE OF MATERIALS

Materials and equipment to be incorporated in the work shall be stored in such a manner as to preserve their quality and fitness for the work and to facilitate inspection.

00700-65 PAYROLL REPORTS

The Contractor may be required to furnish payroll reports to the Construction Manager as required by the Owner Controlled Insurance Program.

00700-66 CONTRACTORS' REPRESENTATIVE

Before beginning work, the Contractor shall notify the Construction Manager in writing of one person within its organization who shall have complete authority to supervise the work, receive orders from the Construction Manager, and represent the Contractor in all

matters arising pursuant to this agreement. The Contractor shall not remove its representative without first designating in writing a new representative. The Contractor's representative shall normally be present at or about the site of work while the work is in progress. When neither the Contractor nor its representative is present at the work site, the superintendent, foreman, or other of the Contractor' employee in charge of the work shall be an authorized representative of the Contractor.

00700-67 SPECIALTY SUB-CONTRACTORS

The Contractor may utilize the services of specialty subcontractors on those parts of the project which, under normal contracting practices, are performed by specialty subcontractors. The Contractor shall not award more than seventy-five percent of the work to subcontractors.

00700-68 INSPECTION BY THE CONSTRUCTION MANAGER

All work pursuant to this agreement shall be subject to inspection by the Construction Manager for conformity with contract drawings and specifications. The Contractor shall give the Construction Manager reasonable advance notice of operations requiring special inspection of a portion of the work.

00700-69 WORK COVERED PRIOR TO CONSTRUCTION MANAGER'S INSPECTION

In the event that work is covered or completed without the approval of the Construction Manager, and such approval is required by the specifications or required in advance by the Construction Manager, the Contractor shall bear all costs involved in inspection notwithstanding conformance of such portion of the work to the contract drawings and specifications.

00700-70 SCHEDULING OF THE WORK

The work of this contract shall be planned, scheduled, executed, and reported as required by the Contract Documents.

00700-71 PROGRESS ESTIMATES

The Contractor shall prepare a written report for the Construction Manager's approval, on County forms, of the total value of work performed and materials and equipment obtained to the date of submission. Such a report must accompany each request for a progress payment and is subject to review and approval by the Construction Manager. Approval of a progress estimate or tendering of a progress payment shall not be considered an approval or acceptance of any work performed, and all estimates and payments shall be subject to correction in subsequent estimates. Progress payments shall be made for all completed activities and for materials suitably stored on-site.

00700-72 PROGRESS PAYMENTS

Upon approval of each monthly estimate of work performed and materials furnished, the Construction Manager shall approve payment to the Contractor for the estimated value of such work, materials, and equipment, less the amount of all prior payments and any liquidated damages. The Contractor will be paid 100 percent, less retainage, of the cost of materials received and properly stored on-site but not incorporated into the work. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale to establish the County's title to such materials or equipment. The Contractor's request for payment shall provide sufficient detail as to the work completed or materials purchased for which payment is requested to permit meaningful review by the Construction Manager.

00700-73 TIME OF PAYMENT

The Contractor will be paid within 45 days following receipt of an approved Progress Estimate. The Contractor expressly agrees that the payment provisions within this Contract shall supersede the rates of interest, payment periods, and contract and subcontract terms provided for under the Georgia Prompt Pay Act, O.C.G.A. §13-11-1 et seq., and that the rates of interest, payment periods, and contract and subcontract terms provided for under the Prompt Pay Act shall have no application to this Contract. The County shall not be liable for any late payment interest or penalty.

00700-74 RETAINAGE

The County shall retain from each progress payment ten percent of the estimated value of the work performed until the progress payments, including retainage, total 50 percent of the contract price. If a contract includes two or more projects or assignments that have been separately priced and have separate budgets, and the performances of such projects or assignments are not related to or dependent upon the performance of any other, the fifty per cent (50%) limit shall be based upon the price for each individual project or assignment. Thereafter, no further retainage shall be withheld so long as the Contractor is making satisfactory progress to insure completion of the work within the time specified therefore. The County may reinstate the ten percent retainage in the event the Construction Manager determines that the Contractor is not making satisfactory progress to complete the work within the time specified in this agreement or in the event that the Construction Manager provides a specific cause for such withholding. The County may also withhold retainage upon substantial completion of the work as provided in O.C.G.A. §13-10-81(c). Interest may be paid upon the retainage in accordance with Georgia law.

00700-75 PAYMENT OF SUBCONTRACTORS

The Contractor shall promptly pay each subcontractor upon the receipt of payment from the County. Such payment shall be made from the amount paid to the Contractor pursuant to the subcontractor's work. The Contractor shall also maintain the records of the percentage retained from payments to the Contractor pursuant to such subcontractor's work. The Contractor shall procure agreements from each subcontractor requiring each subcontractor to pay their subcontractors, agents and employees in a similar manner. The County reserves the right to inquire of any subcontractor, supplier, materialmen, or subconsultant, the status of any indebtedness of the Contractor. The County further reserves the right to require the Contractor to designate on each instrument of payment exceeding $400.00 to subcontractors, suppliers, materialmen, and subconsultants that such payment is on account of the work under this Contract.

00700-76 COUNTY'S RESPONSIBILITIES TO SUBCONTRACTORS

Neither the County nor the Construction Manager shall have any obligation to pay any subcontractor except as otherwise required by law.

00700-77 PROGRESS PAYMENTS - ACCEPTANCE OF WORK

Certification of progress payments, as well as the actual payment thereof, shall not constitute the County's acceptance of work performed pursuant to this agreement.

00700-78 PAYMENTS IN TRUST

All sums paid to the Contractor pursuant to this agreement are hereby declared to constitute trust funds in the hands of the contractor to be applied first to the payment of claims of subcontractors, laborers, and suppliers arising out of the work, to claims for utilities furnished and taxes imposed, and to the payment of premiums on surety and other bonds and on insurance for any other application.

00700-79 JOINT PAYMENTS

The County reserves the right to issue any progress payment or final payment by check jointly to the Contractor and any subcontractor or supplier.

00700-80 RIGHT TO WITHHOLD PAYMENT

The Construction Manager may decline to approve payment and may withhold payment in whole or in part to the extent reasonable and necessary to protect the County against loss due to defective work, probable or actual third party claims, the Contractor's failure to pay subcontractors or materialmen, reasonable evidence that the work will not be completed within the contract time or contract price or damage to the County or any other contractor on the project.

00700-81 CERTIFICATE OF SUBSTANTIAL COMPLETION

Upon the Contractor's submission of a request for a certificate of Substantial Completion, the Construction Manager shall inspect the work and determine whether the work is Substantially Complete. If the work is Substantially Complete, the Construction Manager shall issue a certificate of Substantial Completion of the work which shall establish the date of Substantial Completion, shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the work and insurance, and shall fix the time within which the Contractor shall complete the items submitted by the Contractor as requiring correction or further work. The certificate of substantial completion of the work shall be submitted to the County and the Contractor for their written acceptance of the responsibilities assigned to them pursuant to such certificate.

If in the sole opinion of the Construction Manager, the work is not substantially complete, the Construction Manager shall notify the Contractor of such, in writing, and outline requirements to be met to achieve Substantial Completion.

00700-82 PAYMENT UPON SUBSTANTIAL COMPLETION

Upon Substantial Completion of the work and upon application by the Contractor and approval by the Construction Manager, the County shall make payment reflecting 100% work completed, less value of work remaining as determined by Construction Manager and any authorized retainage.

00700-83 COMMENCEMENT OF WARRANTIES

Warranties required by this agreement shall commence on the date of final completion of the project as determined under Article 00700-84 unless otherwise provided in the certificate of Substantial Completion.

00700-84 FINAL PAYMENT - WAIVER OF CLAIMS, DISPUTE OF FINAL PAYMENT

The acceptance of the Substantial Completion payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of application for payment at Substantial Completion and except for the retainage sums due at final acceptance. Following the Construction Manager's issuance of the certificate of Substantial Completion and the Contractor's completion of the work pursuant to this agreement, the Contractor shall forward to the Construction Manager a written notice that the work is ready for final inspection and acceptance. If after inspection the Construction Manager certifies that the work is complete and issues written notification of such to the Contractor, the Contractor shall forward to the Construction Manager a final application for payment. The Construction Manager shall issue a certificate for payment, which shall approve final payment to the Contractor and shall establish the date of final completion.

In the event the Contractor timely disputes the amount of the final payment, the amount due the Contractor shall be deemed by the Contractor and the County to be an unliquidated sum and no interest shall accrue or be payable on the sum finally determined to be due to the Contractor for any period prior to final determination of such sum, whether such determination be by agreement of the Contractor and the County or by final judgment of the proper court in the event of litigation between the County and the Contractor. The Contractor specifically waives and renounces any and all rights it may have under O.C.G.A. §13-6-13 and agrees that in the event suit is brought by the Contractor against the County for any sum claimed by the Contractor under the Contract or for any extra or additional work, no interest shall be awarded on any sum found to be due from the County to the Contractor in the final judgment entered in such suit. All final judgments shall draw interest at the legal rate, as specified by law.

00700-85 DOCUMENTATION OF COMPLETION OF WORK

Neither the final payment nor the remaining retainage shall become due until the Contractor submits the following documents to the Construction Manager:

a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid other otherwise satisfied;

b. The surety's consent to final payment; and

c. Any other data reasonably required by the County or Construction Manager establishing payment or satisfaction of all such obligations, including releases, waivers of liens, and documents of satisfaction of debts.

In the event that a subcontractor refuses to furnish a release or waiver as required by the County or Construction Manager, the Contractor may furnish a bond satisfactory to the County to indemnify the County against such loss. In the event that any lien or indebtedness remains unsatisfied after all payments are made, the contractor shall refund to the County all moneys that the County may become compelled to pay in discharging such lien or other indebtedness, including all costs and reasonable attorney's fees.

00700-86 GOVERNING LAW

Each and every provision of this agreement shall be construed in accordance with and governed by Georgia law. The parties acknowledge that this contract is executed in Fulton County, Georgia and that the contract is to be performed in Fulton County, Georgia. Each party hereby consents to the Fulton Superior Court's sole jurisdiction over any dispute which arises as a result of the execution or performance of this agreement, and each party hereby waives any and all objections to venue in the Fulton Superior Court.

00700-87 CHANGES IN THE WORK

A. CHANGE ORDERS

1. A Change Order is a written order to the Contractor signed to show the approval and the authorization of the County, issued after execution of the Contract, authorizing a change in the Work and/or an adjustment in the Contract Sum or the Contract Time. Change Orders shall be written using forms designated by the County with Contractor providing supporting documentation as required by the Construction Manager. The Contract Sum and the Contract Time may be changed only by approved Change Order pursuant to Fulton County Procedure 800-6. The amount payable by the Change Order is payment in full for all direct and indirect costs incurred and related to the work under said Change Order, including but not limited to delays, imports, acceleration, disruption and extended overhead. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in either or both of the Contract Sum or the Contract Time.

2. The County, without invalidating the Contract, may order changes in the Work within the general scope of the Contract as defined herein. The time allowed for performance of the work and the contract price to be paid to the Contractor may be adjusted accordingly.

3. The cost or credit to the County resulting from a change in the Work shall be determined in one or more of the following ways:

    a. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

    b. By unit prices stated in the Contract Documents or subsequently agreed upon;

    c. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

    d. By the method provided in Subparagraph A4 below.

4. If none of the methods set forth in Subparagraphs 3a, 3b, or 3c above is agreed upon, the Contractor, provided a written order signed by the Construction Manager is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Construction Manager on basis of the reasonable expenditures and savings of those performing the Work attributable to the change. The cost of the change shall include only the items listed in Subparagraph 5a

below, and in the case of either a decrease or an increase in the Contract Sum, an allowance for overhead and profit in accordance with the schedules set forth in Subparagraphs 5b and 6 below shall be applied to the cost or credit.

a. In such case, and also under Subparagraph 3a above, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting of all actual costs expended, together with appropriate supporting data for inclusion in a Change Order.

b. All hourly rate charges shall b submitted to the Construction Manager for prior review and approval. All hourly rate charges shall be properly supported as required by the Construction Manager with certified payrolls, or their acceptable equivalent. When authorized to proceed for a given change and actual expenditures have been made prior to execution of a Change Order for the entire change, such actual expenditures may be summarized monthly, and if approved, incorporated into a Change Order. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase or decrease, if any, with respect to that change.

5. In Subparagraphs 3 and 4 above, the items included in "Cost and "Overhead" shall be based on the following schedule:

a. Unless otherwise provided in the Contract Documents, "Cost" shall be limited to the following: cost of materials incorporated into the Work, including sales tax and cost of delivery; cost of direct labor (labor cost may include a pro rata share of foreman's account of the change) including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; rental value of equipment and machinery; costs for preparing Shop Drawings.

b. Unless otherwise provided in the Contract Documents, "Overhead" shall include the following: bond and insurance premiums including increase and decreases from change in the Work, supervision, superintendence, construction parking, wages of timekeepers, watchmen and clerks, small tools, consumable supplies, expendables, incidentals, general office expense, the cost of additional reproduction for the Contractor's subcontractors beyond that agreed upon in the Contract Documents, construction parking, any additional costs of craft supervision by the Contractor's or subcontractors' superintendents, and overhead charges which would be customary and expended regardless of the change in the Work due to other overlapping activities which are included as part of the original Contract, and all other expenses not included in "Cost" above.

c. In the event that a change is issued by the County which would require the expenditure of substantial amounts of special

supervision (beyond the foreman level) by the Contractor, the Contractor may, at the sole direction of the Construction Manager, be allowed to incorporate these charges into the agreement cost for the change.

6. In Subparagraphs 3 and 4 above, the allowance for overhead and profit combined, included in the total cost or credit to the County, shall be based on the following schedule:

   a. For the Contractor, for any work performed by the Contractor's own forces, ten (10) percent of the cost.

   b. For the Contractor, for any work performed by a Contractor's subcontractor, five (5) percent of the amount due the subcontractor.

   c. For each subcontractor or sub-subcontractor involved, for any work performed by that subcontractor's or sub-subcontractor's own forces, ten (10) percent of the cost.

   d. For each subcontractor, for work performed by a sub-subcontractor, five (5) percent of the amount due to the sub-subcontractor.

   e. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 5 above unless modified otherwise.

7. In order to facilitate checking of quotations for extras or credits, all proposals or bids, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs, including labor cost, materials and subcontracts. Labor and materials shall be itemized in the manner defined in Subparagraph 4 above. Where major cost items are subcontracts, they shall be itemized also. In no case shall a change be approved without such itemization.

8. No payment shall be made for any changes to the contract that are not included in a fully executed Change Order.

B. CONCEALED, UNKNOWN AND DIFFERING CONDITIONS

1. Should concealed conditions be encountered in the performance of the Work below the surface of the ground, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Sum and Contract Time shall be equitably adjusted by Change Order upon request by either party made **within twenty (20) days after the first observance** of the conditions. No such request for equitable adjustment shall be valid unless the Contractor complies with this (20) days notice and Subparagraph C.1. below.

2. The Contractor shall promptly, and before such conditions are disturbed, notify the Construction Manager in writing of any claim of concealed, unknown or differing conditions pursuant to this paragraph. The Construction Manager shall authorize the Engineer to investigate the conditions, and if it is found that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be recommended to the Construction Manager.

3. No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above, prior to disturbing the condition.

4. No claim by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this Contract.

5. Any materially differing site condition as between what is shown on the Drawings and Specifications and actually found on site shall be immediately reported to the Construction Manager in writing prior to the commencement of Work at the site. Failure of the Contractor to notify the Construction Manager in writing of the differing site condition prior to performance of Work at the site shall constitute a waiver of any claim for additional monies. Any Change Order necessitated by the differing site condition shall be processed as provided under "Changes in the Contract".

C. REQUESTS FOR ADDITIONAL COST

1. If the Contractor wishes to request an increase in the Contract Sum, the Contractor shall give the Construction Manager written notice thereof within twenty (20) days after the occurrence of the event, or identification of the conditions, giving rise to such request. This notice shall be give by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Article 00700-25 and Subparagraph A.4 above. No such request shall be valid unless so made within the twenty (20) days specified above. If the County and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by the Construction Manager. Any change in the Contract Sum resulting from such claim shall be documented by Change Order.

2. If the Contractor claims that addition cost is involved because of, but not limited to (1) any written interpretation pursuant to General Condition 00700-17 of this Agreement, (2) any order by the County to stop the Work pursuant to Articles 00700-25 and 00700-37 of this Agreement where the Contractor was not at fault, or any such order by the Construction Manager as the County's agent, or (3) any written order for a minor change in the Work issued pursuant to Paragraph D below, the Contractor shall submit a request for an increase in the Contract Sum as provided in Subparagraph C.1 above. No such claim shall be valid unless the Contractor complies with Subparagraph C.1 above and approved by the County pursuant to Change Order Policy 800-6.

D. MINOR CHANGES IN THE WORK

The Construction Manager may order minor changes in the Work not involving an adjustment in the Contract Price, extension of the time allowed for performance of the work and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by a written Change Directive issued by the Construction Manager, and shall be binding on the County and the Contractor. The Contractor shall carry out such written orders promptly.

E. BONDS

If any change order results in an increase in the contract price, the contractor shall increase the penal sum of the performance and payment bonds to equal the increased price.

00700-88 DISAGREEMENT WITH ORDERS FOR CHANGE

Contractor's written acceptance of a Change Order or other order for changes shall constitute his final and binding agreement to the provisions thereof and a waiver of all claims in connection therewith, whether direct or consequential in nature. Should Contractor disagree with any order for changes, he may submit a notice of potential claim to the Construction Manager, at such time as the order is set forth in the form of a Change Order. Disagreement with the provisions of an order for changes shall not relieve Contractor of his obligation under Article 00700-87 of this Agreement.

00700-89 NO WAIVER OF REMEDIES

Exercise by the County of any remedy is not exclusive of any other remedy available to County and shall not constitute a waiver of any such other remedies. Failure of the County to exercise any remedy, including breach of contract remedies, shall not preclude the County from exercising such remedies in similar circumstances in the future.

00700-90 LAND AND RIGHTS-OF-WAY

The owner will provide, as indicated in the Contract Documents and prior to Notice to Proceed, the lands upon which the work is to be done, right-of-way for access thereto, and such other lands which are designated for the use of the Contractor. The Contractor shall confine the Contractor's work and all associated activities to the easements and other areas designated for the Contractor's use. The Contractor shall comply with any limits on construction methods and practices which may be required by easement agreements. If, due to some unforeseen reason, the necessary easements are not obtained, the Contractor shall receive an equitable extension of contract time dependent upon the effect on the critical path of the project schedule or the County may terminate the Contract for its convenience.

00700-91 COORDINATION WITH STATE DEPARTMENT OF TRANSPORTATION

No clearing or grading shall be completed by Contractor within the State Department of Transportation (DOT) area under construction. The Contractor must coordinate his construction scheduling with DOT.

If the Contractor begins work before DOT's completion date, he must obtain the approval of DOT before starting work in the area. The state DOT has the right to stop the Contractor's work the DOT area.

The Contractor shall receive no additional compensation or damages resulting from delay or work stoppage from DOT actions or scheduling.

Contractor shall obtain DOT drawings of the DOT, project area for verification of road geometry, storm drains, etc. from Georgia Department of Transportation or Fulton County. The Contractor is responsible for obtaining any pertinent DOT revisions.

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EXHIBIT A

FINAL AFFIDAVIT

TO FULTON COUNTY, GEORGIA

I, _____, hereby certify that all suppliers of materials, equipment and service, subcontractors, mechanic, and laborers employed by _____ or any of his subcontractors in connection with the design and/or construction of _____ at Fulton County have been paid and satisfied in full as of _____, 20____, and that there are no outstanding obligations or claims of any kind for the payment of which Fulton County on the above-named project might be liable, or subject to, in any lawful proceeding at law or in equity.

_____
Signature

_____
Title

Personally appeared before me this _____ day of _____, 20_____. _____, who under Oath deposes and says that he is _____of the firm of _____, that he has read the above statement and that to the best of his knowledge and belief same is an exact true statement.

_____
Notary Public

_____
My Commission expires

SECTION 9

SPECIAL CONDITIONS

(Non-Applicable)

SECTION 10

EXHIBITS

Exhibit I: Fulton County's DoIT Standards
Exhibit II: Pavement Centerline File (GIS)

EXHIBIT I

Fulton County
Department of Information Technology
(DoIT)
Requirements & Standards

Purchasing & Contract Compliance

Last Revised: February, 2014

FULTON COUNTY

Table of Contents

1.0. DoIT Requirements and Standards

1.1. Overview and Objectives

The Fulton County Department of Information Technology (DoIT) is a centralized IT Department supporting all departments within Fulton County. DoIT is empowered through Fulton County Code, Policies and Procedures as the agency responsible for establishing, updating, enforcing, and retiring Information Technology (IT) requirements as well as its standards. IT requirements and standards ensure alignment, consistency, and modernization in the selection and maintenance of information systems used within the County.
The objective in providing vendors IT requirements & standards are threefold:

1. In order to ensure that IT acquisitions integrate well into Fulton's technology environment facilitating its ability to carry out the business of Fulton County.
2. In order to identify and manage the risk, security exposure, or liability associated with an IT acquisition.
3. As well as, ensuring Fulton County achieves the maximum value from any information technology investment.

Any product solution that relies on the IT system's enterprise infrastructure, connects to the IT network, or depends upon DoIT support must be fully conforming. The requirements & standards provided do not represent a comprehensive view of all the products in use across the County. However, the intent of the list is to convey the primary standards for the major solutions supported by DoIT and/or delivered with IT resources. The County's Chief Information Officer (CIO), in compliance with County Policy 600-61, must approve all procurements comprised of IT components.

1.2. Hardware, Software, Infrastructure Standards

Compliance is mandatory for all hardware and software solutions implemented as defined within requirements and standards guidelines. Proposers must provide a complete understanding of their respective solutions recommended systems architecture and the product solution's Total Cost of Ownership (TCO.)

Proposers must submit complete systems architecture diagrams defining all hardware, software, network, database, components, and their connectivity. In addition, a complete itemized list of costs associated with the aforementioned items must be included.

Proposers must provide complete explanations for each instance of non-conformance and may be subject to further compliance inquiry by DoIT.

1.2.1. End-User Software

Component	Current Standard
Operating System	Windows7, 64-bit
Word Processor	Microsoft Word 2010 , 64-bit
Spreadsheets	Microsoft Excel 2010, 64-bit
Presentations	Microsoft PowerPoint 2010, 64-bit
Collaboration	Microsoft One Note 2010, 64-bit
Database (Desktop)	Microsoft Access 2010 (Non-Shared – Single User Only)
E-Mail Client	• Microsoft Outlook 2010, 64-bit • Outlook Web Access (latest release)
Project Management	Microsoft Project Professional 2010 64-bit
Graphics	Microsoft Visio Professional 2010, 64-bit
Web Browser	Microsoft Internet Explorer –IE10
Java	JRE 7u51
Antivirus	Microsoft Forefront Server/Client Security
O/S & Office Suite Patch Management	Remote Patch Management
PDF Files Read/Write	• Adobe Acrobat (Read Only) Latest Version • Adobe Acrobat (Read / Write) Latest Version
Other	Must be Approved

Note:

- All Application software must be compliant with the most current version of the applicable O/S and/or Database within one year of release.
- DoIT must approve exceptions to the noted standards in advance.

1.2.2. End-User Hardware

Component	Desktop PC	Laptop
Platform	IBM Lenovo M93P, 64-bit	Toshiba Portege Z830-S8301 Ultra Book
CPU	Intel i-Series Processor	Intel Core i5-2557MProcessor
Disk Configuration	500 GB , SATA 7200 RPM hard drive	128GB Serial ATA SSD
Memory	4GB PC3-1333 RAM	4GB DDR3 1333MHz
Interface Card(S)	Ethernet 100/1000	Ethernet 100/1000
Wireless	802.11 a/n/ac wireless, Bluetooth 2.1, V92 Modem	802.11 a/n wireless, Bluetooth 2.1, V92 Modem
Operating System	Windows 7, 64-bit	Windows 7
File System	NTFS	NTFS
Maintenance	3 Year on-site, next business day (24x7x365)	3 Year Depot (24x7x365)

Component	Ultra Book	Tablet
Platform	HP IDS UMA NOWWAN 4540S BNBPC	
CPU	Intel Core i5-3210 Dual Core 4540S-CTO Processor	
Disk Configuration	320 GB , SATA 7200 RPM hard drive	
Media Drive	DVD+/-RW SM DL 4540S	
Memory	4GB 1333MHZ DDR3 1DM 454S RAM	
Monitor	Toshiba 15.6" LED HDSVA AG FCAN 4540S	
Video Card	Intel Integrated Graphics	
Interface Card(S)	Ethernet 100/1000	
Wireless	802.11 a/n wireless, Bluetooth 2.1, V92 Modem	
Operating System	Windows 7	
File System	NTFS	
Maintenance	3 Year on-site, next business day (24x7x365)	
Additional Hardware	Keyboard, Optical Mouse	

1.2.3. Enterprise Applications

Application	Current Standard
ERP	CGI Advantage v3.8.0.2
Databases Supported	• Oracle 11g R2 • MS SQL Server 2012 E/S
E-Mail	• Microsoft Exchange 2007 • Symantec Enterprise Vault 10.0.3 • Cisco Ironport E-mail Security
Geographic Information Systems (GIS) Suite	ESRI ArcGIS v10.2

1.2.4. Database Systems & Data Storage

Component	Current Standard
Operating Systems	• Microsoft Windows Server 2012, Standard and Data Center • Oracle Enterprise Linux v5.7/5.8 • Red Hat Enterprise Linux v5.8/6.5
Storage	SAN/NAS
Virtualization	VMWare ESXi v.5.1/5.5, Oracle VM v2.2.2/3.2.7

1.2.5. Server Hardware Specifications

Component	Application Server	Database Server
Type	INTEL	INTEL
Platform	Dell PowerEdge R710/R810; Fujitsu BX960 release	Dell PowerEdge R810/R910; Fujitsu BX900 releases
Power	Dual Redundant	Dual Redundant
Hard Drive Configuration	• Internal: 2 ea. 73GB 15KRPM serial attached SCSI • Additional Drives (separate enclosure) 5 ea. 300GB 15KRPM serial attach SCSI • RAID1/RAID5	• Internal: 2 ea. 146GB 15KRPM serial attached SCSI 6Gbps hot plug • Additional Drives (separate enclosure) 5 ea. 300GB 10KRPM serial attach SCSI Hot Plug • RAID1/RAID5

Component	Application Server	Database Server
CPU	• 2 each Intel Xeon X5570 • 2.93GHz, 8M Cache • 6.40GT/s QPI, Turbo, HT	• 4 each Intel Xeon E7540 • 2.0GHz, 18MB Cache • 6.4GT/s QPI, Turbo HT • 6 Core @ 1066MHz
Network Interface Cards	4 each. Full Ethernet 100/1000 Base-T	2 each, Dual Port Gigabit (1000Mb) NIC w/TOE iSCSI PCIe.
RAM	• 48GB (12x4GB), 1066MHz Dual • RDIMMs optimized for 2 processors	• 128GB (32x4GB) • 1066MHz Quad Ranked • RDIMMs optimized for 4 processors • Power Optimized
HBA	• Fiber channel • Dual Qlogic 8GB Optical fiber channel - Model 2460 or better.	• Fiber channel • Dual Qlogic 8Gb Optical fiber channel HBA PCIe
External Storage Controller	• SAS RAID controller - external • PCIe, 256MB Cache (minimum)	• SAS RAID controller - external • PCIe, 512MB Cache (minimum)
Maintenance	• 3 Year, 24/7, 4 hour on-site (or NBD if specified) • Parts & labor included.	• 3 Year, 24/7, 4 hour on-site • Parts & labor included
Additional Hardware Requirements	• Rails w/ cable management. • Internal DVD+/- RW, SATA drive.	• Rails w/ cable management arm. • Internal DVD+/- RW, SATA drive.

1.2.6. Networks and Telecommunications

Component	Current Standard
Protocols	• TCP/IP - Network environment is pure IP • EIGRP - WAN, MAN, Campus, Access & Distribution layer routing protocols • BGP4 - ISP routing protocol • SCCP, H.323 - IP Telephone and Video protocols
Structured Cabling Standard Access Layer Cabling	• CAT-5E – Legacy PC and Server Connectivity • CAT-6 – New construction and major renovations where applicable • Single-Mode Fiber – Data Center, Campus, and Metro connections depending on distance • Multi-Mode Fiber - Data Center, Campus, and Metro connections depending on distance
WAN, MAN, Campus & Internet Connection Types	• 10Mb & 100Mb Metro Ethernet – New and upgraded WAN & MAN locations • 100Mb Metro Ethernet – Internet connectivity • Gigabit Ethernet – Campus, Access & Distribution uplinks • Gigabit and 10Gigabit – Data Center uplinks & Server connectivity

Component	Current Standard
Closet Power Management	• UPS Models: • Smart-UPS 3000 RM XL • Smart-UPS 2200 RM XL • Smart-UPS 3000 RM XL • Smart-UPS 1500 RM XL • Smart-UPS 1400 RM XL • Smart-UPS 8000 RM XL • Smart-UPS RT 8000 XL • Smart-UPS RT 5000 XL • Symmetra LX 16000 RM • All UPS Models – connected via Male-Twist-Lock connector • All UPS Models – equipped with temperature sensors • Monitoring application – Utilizing APC - InfraStruXure Central
Video Conferencing	Polycom/Tandberg, MsLync

1.2.7. Mobile Communication Devices

Device	Current Standard
Blackberry	• Galaxy S4

1.2.8. Physical Security

Component	Manufacture	Model
Camera	Cisco	6020 / 6090

2.0. Application Programming Interfaces (API) Protocol

An application-programming interface (API) is a particular set of rules ('code') and specifications that software programs can follow to communicate with each other. The County prefers the use of service-oriented APIs that is not bound to a specific process or system as well as providing remote procedure calls or web services. Comprehensive documentation for APIs and data exchange protocols is subject to acceptance testing and approval. All APIs must conform to version upgrades, O/S upgrades, web browser upgrades, etc.

2.1. Testing and Acceptance

All new systems and/or products will undergo a process of testing and acceptance. This process shall include the following minimum testing procedures prior to final acceptance by Fulton County Government:

1. The proposer shall certify in writing to the County that the system is completely installed, meets all requirements, is free of defects, the data conversion is complete and accurate, and the total system (application, file building, conversion, back-up and recovery procedures, etc.) is ready for operation.

2. The proposer shall be prepared to demonstrate all functions of the system prior to the start of user acceptance testing.

3. The proposer shall provide documentation and interface specifics on each interface provided. The burden of proof regarding on how each interface conforms to the IT Standards and Procedures is the responsibility of the proposer.

4. Upon receipt of the letter of certification from the vendor, Fulton County has a minimum of a sixty-day period to commence the process that will either accept or deny the acceptance the letter of certification. User acceptance testing will include an intensive exercise of each component and module of the system simulating a normal workload. This testing will provide assurance that the various components and modules of the system operate as specified. During this period, the system shall demonstrate a total availability of 99.99% or better.

5. All Application software must be compliant with the most current version of the applicable O/S and/or Database within one year of release.

6. Customizations and/or modifications, which are not supported by the Vendor's Standard Annual Support Package, will not be approved.

7. Third Party Hosted solution must provide Fulton County Government with FULL access to the database of the host provider.

- **Acceptance Criteria**

    1. The solution meets the current published product specifications and documentation;

    2. The solution is capable of running a variety of data on a repetitive basis without failure;

    3. The solution meets the requirements and specifications described in this document and the functional requirements described in their bid response or response to RFP;

    4. All documentation has been delivered and accurately reflects the operation of the solution;

    5. All specified training has been conducted and accepted by Fulton County;

    6. The interfaces properly provide the data necessary without disrupting the performance of the system or disrupting any of the original data files.

    7. Once this acceptance testing is complete, the warranty period begins.

- **System Unavailable Criteria**

  1. Any component or module capability is not available to all active workstations.
  2. Any feature or specification either required within this document or stated in the proposer's response to bid or RFP does not perform as stated.
  3. Conversion of all existing data files is not complete or is incompatible.
  4. Interfaces are not complete and working.
  5. Reporting features are not available and in compliance with requirements.
  6. Training is incomplete or deemed inadequate by DoIT.

All new systems and/or products will undergo a process of testing and acceptance. This process shall include the following minimum testing procedures prior to final acceptance by Fulton County Government.

In addition, if the system requires a new install, either manually or automatically, for one hour or greater, the actual down time statistics will reflect the system as an outage.

In the event that the required level of reliability is not demonstrated by the end of the (sixty) 60 day period, the County may extend the acceptance testing by another sixty (60) days. The Proposer must correct any deficiencies with the system in this time frame. If this extension is permitted, the Proposer shall reinitiate certification by submitting a revised letter of certification to the County specifying the corrections made to the system. The certification process described above will then be repeated.

Final acceptance will be made after the warranty period begins. This period will be a sixty-day (60) period of closely monitored post implementation support provided by the proposer to resolve any issues that may arise after the system has been placed into production.

3.0. Training Requirements

The Vendor shall provide a detailed, documented training plan outlining the agenda regarding training goal, learning objectives, and learning methods. The training plan shall also include any prerequisites required for training for both the end-user and technical support staff. If learning objectives are not met at the end of the training period, the Vendor shall provide alternates means to meet learning objectives.

4.0. End-User Training

End-User Training must identify the types, amounts, duration, and costs. The proposer shall include a plan that results in acceptable training for all levels of the system's operation. The vendor shall recommend best practices and system

configuration for effective system set up. Using this information, the vendor will prepare a manual (Softcopy, preferably searchable PDF) that defines the workflow processes and procedures for users. The vendor shall provide a sample of the typical manual or training approach as part of their response.

5.0. Administrative/IT Training

The proposer shall prepare a training plan for IT staff that will enable them to administer and support the system. This plan shall include any courses off-site, classroom training, and on-the-job training necessary for systems analysts, computer operators, security personnel, programmers, database, web, and network personnel. Training will include the complete support and custom programming and custom reporting to applicable staff. Describe any prerequisite knowledge or skills required. The proposal must include the cost associated with training.

Additionally, the vendor must clearly define a description of the recommended number and type of staff required to support the system. The skill sets required of each individual should be included in this description. The description of recommended staffing requirements should include all management, technical and functional areas for the ongoing support of the system. The minimum training requirements include, at minimum, two employees in all support roles. The instructional method of "Train the trainer" is not a valid training platform.

During this training, Fulton County will designate senior technical personnel in each class to evaluate the training provided in order to ensure that the training and the instruction provided is sufficient to provide the necessary knowledge and skills. At the end of the first day of any training class, a signoff must be obtained from this designee in order for the proposer to meet this requirement.

6.0 Product Solution Documentation

It is required that the vendor provide an electronic copy, and optionally, a hardcopy of the following documentation. Please list all reproducible (DVD or CD format only) copies of documentation, which is a criteria for system acceptance.

For example:

1. User training manuals for all transactions and functions supported
2. Data Dictionary
3. Data model/entity relationship diagrams and data flow diagrams
4. System module chart (application flow) showing each application module and its relation to the other modules
5. General system design and reference information
6. System transaction flow and control
7. List of all application programs, with summary of their purpose or function including a table of all procedures or processes and which processes are called by what other processes
8. Detailed program documentation within each source module

9. Table definitions and record layouts
10. Definition of all system control tables
11. Report and workstation display formats
12. A listing of all "canned" reports complete with full descriptions of these reports
13. The County shall be granted the rights to duplicate documentation for record and training purposes.

7.0 Preferred Terms & Conditions

DoIT has established the following preferred terms & conditions relating to licenses (hardware, software) and support and maintenance agreements. Responses in this section will be referenced in the final contract.

Exhibit II Pavement Centerline (GIS)

STREET NAME	TO	FROM	MILES
Aero Drive	Dead End	Aviation Circle	0.334
Alan Drive	Campbellton Road	End	0.013
Albania Drive	Bethsaida Drive	Jonesboro Road	0.335
Aldredge Road	Butner Road	Merk Road	0.625
Austin Road	Dead End	Garrison Drive	0.196
Bakers Ferry Road	Fulton Industrial Blvd.	Mendel Drive	1.761
Beaver Creek Trail	Flat Shoals Road	End	0.296
Bellburn Road	Glace Road	Valley Bend Road	0.061
Ben Hill Road	Will Lee Road	Welcome All Road	0.648
Benidorm Court	Camp Valley Road	Dead End	0.177
Bethsaida Court	Bethsaida Drive	Dead End	0.001
Bethsaida Drive	Bethsaida Road	Albania Drive	0.002
Bethsaida Road	Bethsaida Drive	Highway 138	3.112
Binford Place	Boat Rock Road	Elva Drive	0.602
Birling Drive	Winkfield Place	Kimberly Mill Road	0.196
Bishop Road	Rivertown Road	Herndon Road	2.167
Boat Rock Boulevard	Fulton Industrial Blvd.	Dead End	2.104
Bodnant Drive	Spoleto Loop	St. Peter Way	0.096
Boulder Park Drive	Mendel Drive	Martin Luther King Dr	0.113
Browns Lake Road	Cedar Grove Road	End	2.170
Bruce Place	New Hope Road	Boat Rock Road	0.289
Bucknell Court	Cul-De-Sac	Bucknell Drive	0.155
Buffington Road	Roosevelt Highway	Flat Shoals Road	2.098
Burdett Road	Olad national Highway	Burdette Way	1.253
Butner Road	Highway 92	City of Atlanta	7.654
Camp Drive	Stonewall Tell Road	Roosevelt Highway	0.233
Camp Trail Road	Koweta Road	End	0.289
Camp Valley Road	Bethsaida Road	Clayton County	1.159
Campbell Drive	Roosevelt Highway	East Point	0.401
Carriage Lane	Guilford Lane	Dead End	0.239
Cascade Knolls Drive	Cascade Road	End	0.013
Cascade Pointe Drive	New Hope Road	End	0.004
Cascade Road	F.I.B	City of Atlanta	4.667
Catalina Circle	Yates Road	Alcapulco Way	0.001
Cavender Drive	Cochran Road	Elkmont Ridge	0.007
Cedar Grove Road	Rivertown Road	Chattahoochee Hills	7.506
Cherry Branch Circle	Cherry Branch Lane	End	0.025
Cherry Branch Lane	Pecan Wood Circle	Mahaogony Drive	0.295
Cochran Mill Road	Cascade Palmetto Highway	Chattahoochee Hills	3.892
Colgate Drive	Great SW Parkway	Tulane Drive	0.138
Commerce Drive	Fulton Industrial Blvd.	Commerce Cir	0.402
Connell Road	Flat Shoals Road	End	1.476
Dagenhart Road	Camp Valley Road	Bendorm Court	0.057
Danforth Road	New Hope Road	City of Atlanta to Cascade Roa	0.663
Deerfield Trail	Westford Circle	End	0.228
Demooney Road	Stonewall Tell Road	Highway 92	4.839
Derrick Road	Koweta Road	Jones Road	1.830
Devilla Trace	Red Oak Road	End	0.285
Diann Drive	Greentree Trail	Pullen Lane	0.364
Dodd Road	Old National Highway	Camp Valley Drive	0.153
Downey Drive	Sandgate Circle	Clayton County	0.002
Dublin Drive	Enon Road	Enon Road	0.476
Dunbritan Lane	Flat Shoals Road	Sandgate Road	0.130
Dunedin Drive	Thaxton Road	Old Fairburn Road	0.233
Dunmoreland Terrace	Long Meadow Lane	Northfield Blvd	0.172
Eagle Vista Parkway	Fulton Industrial Blvd.	Dead End	0.298
Easton Drive	Elva Drive	Boat Rock Road	0.211
Echota Way	Cul De Sac	Dead End	0.001

Exhibit II Pavement Centerline (GIS)

STREET NAME	TO	FROM	MILES
Elgin Road	Lees Mill Road	Spence Road	0.351
Elm Brook Drive	Dead End	Low Elm Street	0.105
Enon Road	Campbellton Road	Stonewall Tell Road	4.307
Erin Road	Kenny Drive	Enon Road	0.826
Fairburn Road	City of Atlanta	City of Atlanta	1.404
Falling Water Point	Old Carriage Drive	Hampton Ct.	0.005
Fayetteville Road	Oakley Industrial	Broad St	0.814
Feldwood Road	Roosevelt Highway	Flat Shoals Road	1.803
Fir Chase	Cherry Branch	Dead End	0.044
Fonseca Pass	Absinth Drive	Wrotham	0.012
Frederick Drive	Fulton Industrial Blvd.	End	0.898
Garland Circle	Renaissance Circle	Renaissance Circle	0.002
Garnet Way	Winterside Lane	Woodward Road	0.492
Garrison Drive	City of Atlanta	City of Atlanta	0.116
Godby Place	Godby Road	Old Bill Cook Road	0.055
Godby Road	Windsor Forrst Lane	charbett Dr	0.095
Goodson Road	Union City	Fayetteville Road	0.629
Gordon Street	Fayetteville Road	Lees Mill Road	0.293
Graham Road	Graham Drive	City of Fairburn	0.769
Great Southwest Parkway	Fulton Ind. Blvd.	Fulton Ind. Blvd.	3.533
Green Valley Road	Dead End	Fayette County Line	0.000
Greenbower Lane	Peppermill Lane	Cul De Sac	0.287
Greentree Trail	Old Fairburn Road	Dead End	0.814
Guilford Lane	Flat Shoals Road	Carriage Lane	0.199
Hallie Mill Road	Marley Drive	Old National Highway	0.025
Hartly Drive	Campbellton Road	Celtic Drive	0.035
Heatherland Drive	New Hope Road	County Line Road	0.383
Hidden Brook Trail	Flat Shoals Road	Dead End	0.284
High Point Trail	Old Fairburn Road	Dead End	0.000
Highland Lake Drive	Cul-De-Sac	Old Fairburn Road	0.024
Hillside Road	Old National Highway	Camp Valley Drive	0.229
Hobgood Road	Highway 29	Ono Road	2.248
Interchange Drive	Wendell Drive	Fulton Industrial Blvd.	0.296
Jailette Road	Welcome All Road	Welcome All Road	1.884
James Aldredge Boulevard	Fulton Industrial Blvd.	End	0.256
Jerome Road	Old National Highway	Old Bill Cook Road	0.898
John F Varley Court	Westgate Parkway	End	0.078
Jolly Road	Old National Highway	Northfield Blvd	0.247
Jones Road	Stonewall Tell Road	Highway 92	2.200
Judy Lane	Camp Valley Road	Clayton County	0.001
Kelden Circle	Will Lee Road	End	0.005
Kendall Park Lane	F.I.B	End	1.135
Kerry Drive	Limerick Drive	Dublin Drive	0.219
Kimberly Mill Road	Flat Shoals Road	Creel Road	1.484
Lake Estates Way	Preservation Circle	Lakeside Blvd	0.002
The Lakes Drive	Short Road	Cedar Grove Road	0.854
Lakes Point	S. Fulton Parkway	The Lakes Drive	0.406
Lantern Lane	Old National Highway	Dead End	0.597
Lawrence Avenue	Newton Drive	Newton Road	0.188
Lees Mill Road	Fayette County	Gordon Street	0.410
Lester Road	Fayette County	Buffington Road	0.241
Lewis Lane	Jerome Road	Old Bill Cook Road	0.110
Lexmark Circle	Lexington Pointe	Lexington Pointe	0.009
Limerick Drive	Erin Road	Dublin Drive	0.155
Loblolly Way	Upper Elm Street	Lower Elm Street	0.050
Loch Lomond Trail	New Hope Road	New Hope Road	0.576
Longleaf Road	Lower Elm Street	Elm Brook Drive	0.051
Longmeadow Lane	Jerome Road	Dunmoreland Terrace	0.535

Exhibit II Pavement Centerline (GIS)

STREET NAME	TO	FROM	MILES
Louis Xiv Lane	Rochelle Way	Clayton County	0.029
Lower Elm Street	Tupelo Way	End	0.275
Mahogany Court	Mahogany Drive	End	0.041
Mahogany Drive	Herndon Road	Pecan Wood Circle	0.374
Mallory Road	Roosevelt Highway	Flat Shoals Road	1.532
Mason Road	Roosevelt Highway	Union City	1.234
Melanie Lane	Mallory Road	End	0.387
Melanie Way	Pierce Road	Melanie Lane	0.102
Mendel Drive	Fulton Industrial Blvd.	Bakers Ferry Road	0.638
Merk Road	Union Road	Butner Road	2.037
Milam Road	Fayette County	Fairburn City Limits	0.443
Mill Valley Road	Garrison Drive	Dead End	0.001
Mougins Way	Cedar Grove Road	Spoleto loop	0.031
National Drive	Martin Luther King Jr Dr	Dead End	0.302
New Hope Road	Boat Rock Road	Cascade Road	2.182
Newman Road	Roosevelt Highway	Spring Street	0.167
Newton Drive	Butner Road	Dead End	0.333
Newton Road	Short Road	Dead End	0.107
Niskey Lake Road	City of Atlanta	Orkney Lane	0.009
Northfield Boulevard	Old Bill Cook Road	Dead End	0.046
Oakley Industrial Boulevard	Union City Limits	Fairburn City Limits	0.850
Oakley Road	Oakley Industrial	Red Hawk Run	1.052
Old Bill Cook Road	Buffington Road	Old National Highway	2.129
Old Carriage Drive	Carriage Lane	Burdett Road	0.236
Old Fairburn Road	Union Road	City of Atlanta	2.523
Old Jonesboro Road	Highway 138	Fayette County	1.974
Old Spanish Trail	Old Carriage Drive	End	0.285
Orchard Drive	Roosevelt Highway	End	0.301
Orkney Lane	Loch Lomond Trail	County Line Road	0.473
Pamela Lane	Shoreland Drive	City of Atlanta	0.014
Parkaire Place	Oakley Industrial	Boulder Pass	0.029
Patton Drive	Frederick Drive	End	0.598
Pecan Wood Circle	Mahogany Drive	End	0.508
Pecan Wood Court	Pecan Wood Circle	End	0.021
Peppermill Lane	Creel Road	End	0.882
Peters Road	Highway 138	Union City	0.475
Phillip Lee Drive	Fulton Industrial Blvd.	End	0.564
Pierce Road	Mallory Road	Feldwood Road	0.512
Plantation Road	Oakley Industrial	Harris Road	0.248
Pleasant Hill Road	Old National Highway	Clayton County	1.104
Plummer Road	F.I.B	Riverside Drive	1.601
Pontevedra Place	Butner Road	End	0.246
Pullen Lane	Jailette Road	End	0.224
Raventree Court	Derrick Road	End	0.348
Red Oak Road	Old Bill Cook Road	Flat Shoals Road	0.911
Reel Lake Drive	Stone Bay Drive	Sandtown Center Blvd	0.006
Ridge Road	Highway 92	Cascade Palmetto Hwy	2.542
Riverside Drive	Fulton Industrial Blvd.	Campbellton Road	1.040
Rivertown Road	Fairburn	Chattahoochee Hills	3.612
Rochelle Way	Scofield Road	Clayton County	0.290
Rockfield Court	Westpark Drive	End	0.085
Rocky Head Road	Union Road	Old Campbellton Road	0.178
Sable Chase Drive	Sable Glen ln	Sable Chase Lane	0.009
Sable Glen Road	Sable Run Road	Sable Glen Lane	0.003
Saint David Street	Cedar Grove Road	Dead End	0.528
Saint Jude Drive	Rivertown Road	Dead End	0.294
Saint Mark Way	Saint Peter Way	Dead End	0.351
Saint Peter Way	Cedar Grove Road	Saint Jude Drive	0.295

Exhibit II Pavement Centerline (GIS)

STREET NAME	TO	FROM	MILES
Sandgate Road	Wexford Drive	Dunbritan ln	0.192
Savoy Street	Louis XIV	Brittany Trail	0.008
Scarborough Road	Welcome All Road	Union City	0.893
Scofield Road	Godby Road	Surrey Trail	0.903
Shamrock Drive	Jones Road	Jones Road	0.545
Sherbrook Drive	Cul De Sac	Pontevedra Place	0.111
Shirley Drive	Fulton Industrial Blvd.	End	0.803
Shoreland Drive	Dead End	Tell Road	0.235
Shoshonee Trail	Dead End	Towanda Drive	0.336
Southwood Road	Dead End	Thompson Road	0.347
Spoleto Loop	Spoleto Loop	Cedar Grove Road	0.276
Spreading Oak Drive	Dead End	Lynhurst Drive (Atl)	0.000
Stoneglen Chase	Prestmoor Place	Cul De Sac	0.006
Stonewall Tell Road	Roosevelt Highway	Campbellton Road	5.875
Stubbs Road	Stonewall Tell Road	Cochran Road	4.539
Sulene Drive	Ben Hill Road	Dead End	0.426
Surrey Trail	Old National Hwy	Clayton County	1.129
Tahoe Drive	Flat Shoals Road	Devilla Trace	0.273
Teak Court	Mahogany Drive	Dead End	0.052
Teak Lane	Pecan Wood Circle	Dead End	0.091
Thistle Cove	Mason Road	Scarborough Road	0.151
Thurman Road	Ben Hill Road	Dead End	0.333
Towanda Drive	Ben Hill Road	Campbell Drive	0.437
Tupelo Way	Lower Elm Street	Derrick Road	0.086
Union Road	Stonewall Tell Road	Miles Road	3.429
Upper Elm Street	Derrick Road	Dead End	0.201
Valley Bend Road	bellburn road	Glace road	0.069
Valley Loop	village loop	splendida ct	0.003
Vandiver Road	Enon Road	Union Road	0.579
Village Drive	Fairburn Road	Dead End	0.134
Villanova Drive	Fulton Industrial Blvd.	Wheaton Drive	0.702
Wallace Road	Enon Road	End	1.023
Wartrace Drive	Lostcave Drive	Dead End	0.013
Washington Road	Roosevelt Highway	East Point	0.666
Welcome All Road	Highway 29	Jailett Road	2.310
Wendell Court	Wendell Drive	Dead End	0.132
West Road	Bethsaida Road	Old National Highway	1.343
Westbridge Road	Highway 138	Fayette County	0.266
Westchase Lane	Westchase Street	Dead End	0.044
Westfield Trail	Old Bill Cook Road	Westford Circle	0.054
Westford Circle	Old Bill Cook Road	Long Meadow Lane	0.358
Westpark Drive	Cascade Road	West Park Drive	1.463
Wexford Drive	Old National Highway	Knighton Drive	0.042
Wexford Road	Koweta Road	Dead End	0.638
Wilkerson Mill Road	Highway 29	Ono Road	0.586
Will Lee Road	Ben Hill Road	Welcome All Road	1.240
Wilson Road	Butner Road	West Stubbs Road	0.151
Winkfield Place	Kimberly Mill Road	Bethsaida Road	0.273
Winterside Lane	Peppermill Road	Greenbower Road	0.422
Wolf Club Drive	Enon Road	Dead End	0.036
Woodward Road	Old National Highway	Dead End	0.270
Wyncreek Drive	Enon Road	Boreal Way	0.036
Xavier Drive	Lagrange Blvd.	Dead End	0.367
		Total Mileage	**163.622**

SECTION 11

APPENDICES

ASTM D 6433 – 07: Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys

Designation: D 6433 – 07

Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys[1]

This standard is issued under the fixed designation D 6433; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the determination of roads and parking lots pavement condition through visual surveys using the Pavement Condition Index (PCI) method of quantifying pavement condition.

1.2 The PCI for roads and parking lots was developed by the U.S. Army Corps of Engineers (**1, 2**).[2] It is further verified and adopted by DOD and APWA.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 6.

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *additional sample*—a sample unit inspected in addition to the random sample units to include nonrepresentative sample units in the determination of the pavement condition. This includes very poor or excellent samples that are not typical of the section and sample units, which contain an unusual distress such as a utility cut. If a sample unit containing an unusual distress is chosen at random it should be counted as an additional sample unit and another random sample unit should be chosen. If every sample unit is surveyed, then there are no additional sample units.

2.1.2 *asphalt concrete (AC) surface*—aggregate mixture with an asphalt cement binder. This term also refers to surfaces constructed of coal tars and natural tars for purposes of this practice.

2.1.3 *pavement branch*—a branch is an identifiable part of the pavement network that is a single entity and has a distinct function. For example, each roadway or parking area is a separate branch.

2.1.4 *pavement condition index (PCI)*—a numerical rating of the pavement condition that ranges from 0 to 100 with 0 being the worst possible condition and 100 being the best possible condition.

2.1.5 *pavement condition rating*—a verbal description of pavement condition as a function of the PCI value that varies from "failed" to "excellent" as shown in Fig. 1.

2.1.6 *pavement distress*—external indicators of pavement deterioration caused by loading, environmental factors, construction deficiencies, or a combination thereof. Typical distresses are cracks, rutting, and weathering of the pavement surface. Distress types and severity levels detailed in Appendix X1 for AC, and Appendix X2 for PCC pavements must be used to obtain an accurate PCI value.

2.1.7 *pavement sample unit*—a subdivision of a pavement section that has a standard size range: 20 contiguous slabs (±8 slabs if the total number of slabs in the section is not evenly divided by 20 or to accommodate specific field condition) for PCC pavement, and 2500 contiguous square feet, ± 1000 ft^2 (225 ± 90 m^2), if the pavement is not evenly divided by 2500 or to accommodate specific field condition, for AC pavement.

2.1.8 *pavement section*—a contiguous pavement area having uniform construction, maintenance, usage history, and condition. A section should have the same traffic volume and load intensity.

2.1.9 *portland cement concrete (PCC) pavement*—aggregate mixture with portland cement binder including nonreinforced and reinforced jointed pavement.

2.1.10 *random sample*—a sample unit of the pavement section selected for inspection by random sampling techniques, such as a random number table or systematic random procedure.

3. Summary of Practice

3.1 The pavement is divided into branches that are divided into sections. Each section is divided into sample units. The type and severity of pavement distress is assessed by visual

[1] This practice is under the jurisdiction of ASTM Committee E17 on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee E17.41 on Pavement Testing, Evaluation, and Management Methods.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

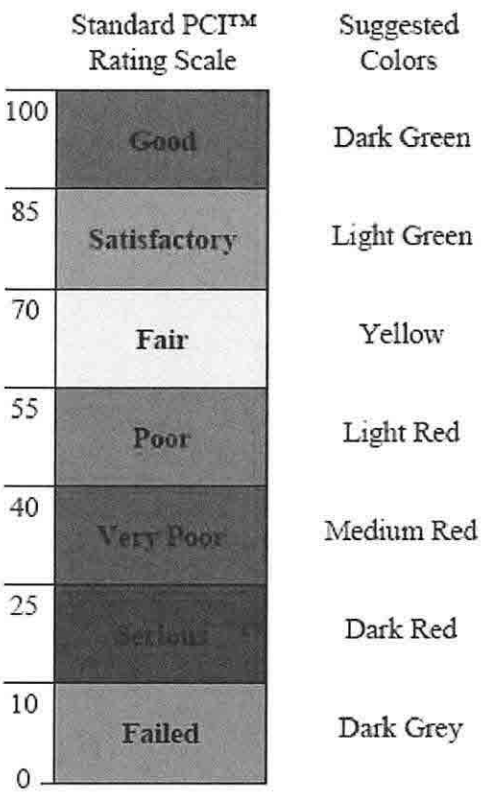


FIG. 1 Pavement Condition Index (PCI), Rating Scale, and Suggested Colors

inspection of the pavement sample units. The quantity of the distress is measured as described in Appendix X1 and Appendix X2. The distress data are used to calculate the PCI for each sample unit. The PCI of the pavement section is determined based on the PCI of the inspected sample units within the section.

4. Significance and Use

4.1 The PCI is a numerical indicator that rates the surface condition of the pavement. The PCI provides a measure of the present condition of the pavement based on the distress observed on the surface of the pavement, which also indicates the structural integrity and surface operational condition (localized roughness and safety). The PCI cannot measure structural capacity nor does it provide direct measurement of skid resistance or roughness. It provides an objective and rational basis for determining maintenance and repair needs and priorities. Continuous monitoring of the PCI is used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs. The PCI provides feedback on pavement performance for validation or improvement of current pavement design and maintenance procedures.

5. Apparatus

5.1 *Data Sheets*, or other field recording instruments that record at a minimum the following information: date, location, branch, section, sample unit size, slab number and size, distress types, severity levels, quantities, and names of surveyors. Example data sheets for AC and PCC pavements are shown in Figs. 2 and 3.

5.2 *Hand Odometer Wheel*, that reads to the nearest 0.1 ft (30 mm).

5.3 *Straightedge or String Line*, (AC only), 10 ft (3 m).

5.4 *Scale*, 12 in. (300 mm) that reads to ⅛ in. (3 mm) or better. Additional 12-in. (300 mm) ruler or straightedge is needed to measure faulting in PCC pavements.

5.5 *Layout Plan*, for network to be inspected.

6. Hazards

6.1 Traffic is a hazard as inspectors may walk on the pavement to perform the condition survey.

7. Sampling and Sample Units

7.1 Identify branches of the pavement with different uses such as roadways and parking on the network layout plan.

7.2 Divide each branch into sections based on the pavements design, construction history, traffic, and condition.

7.3 Divide the pavement sections into sample units. If the pavement slabs in PCC have joint spacing greater than 25 ft (8 m) subdivide each slab into imaginary slabs. The imaginary slabs all should be less than or equal to 25 ft (8 m) in length, and the imaginary joints dividing the slabs are assumed to be in perfect condition. This is needed because the deduct values developed for jointed concrete slabs are less than or equal to 25 ft (8 m).

7.4 Individual sample units to be inspected should be marked or identified in a manner to allow inspectors and quality control personnel to easily locate them on the pavement surface. Paint marks along the edge and sketches with locations connected to physical pavement features are acceptable. It is necessary to be able to accurately relocate the sample units to allow verification of current distress data, to examine changes in condition with time of a particular sample unit, and to enable future inspections of the same sample unit if desired.

7.5 Select the sample units to be inspected. The number of sample units to be inspected may vary from the following: all of the sample units in the section, a number of sample units that provides a 95 % confidence level, or a lesser number.

7.5.1 All sample units in the section may be inspected to determine the average PCI of the section. This is usually precluded for routine management purposes by available manpower, funds, and time. Total sampling, however, is desirable for project analysis to help estimate maintenance and repair quantities.

7.5.2 The minimum number of sample units (n) that must be surveyed within a given section to obtain a statistically adequate estimate (95 % confidence) of the PCI of the section

ASPHALT SURFACED ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET
FOR SAMPLE UNIT

SKETCH:

BRANCH _____ SECTION _____ SAMPLE UNIT _____
SURVEYED BY _____ DATE _____ SAMPLE AREA _____

1. Alligator Cracking
2. Bleeding
3. Block Cracking
4. Bumps and Sags
5. Corrugation
6. Depression
7. Edge Cracking
8. Jt. Reflection Cracking
9. Lane/Shoulder Drop Off
10. Long & Trans Cracking
11. Patching & Util Cut Patching
12. Polished Aggregate
13. Potholes
14. Railroad Crossing
15. Rutting
16. Shoving
17. Slippage Cracking
18. Swell
19. Weathering/Raveling

DISTRESS SEVERITY	QUANTITY									TOTAL	DENSITY %	DEDUCT VALUE

FIG. 2 Flexible Pavement Condition Survey Data Sheet for Sample Unit

CONCRETE SURFACED ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET FOR SAMPLE UNIT

BRANCH_____ SECTION_____ SAMPLE UNIT_____
SURVEYED BY_____ DATE_____ SAMPLE AREA_____

Distress Types

21. Blow up/Buckling
22. Corner Break
23. Divided Slab
24. Durability Crack
25. Faulting
26. Joint Seal
27. Lane/Shoulder
28. Linear Cracking
29. Patching (Large)
30. Patching (Small)
31. Polished Aggregate
32. Popouts
33. Pumping
34. Punchout
35. Railroad Crossing
36. Scaling
37. Shrinkage
38. Spalling Corner
39. Spalling Joint

DIST TYPE	SEV	NO. SLABS	DENSITY %	DEDUCT VALUE

SKETCH:

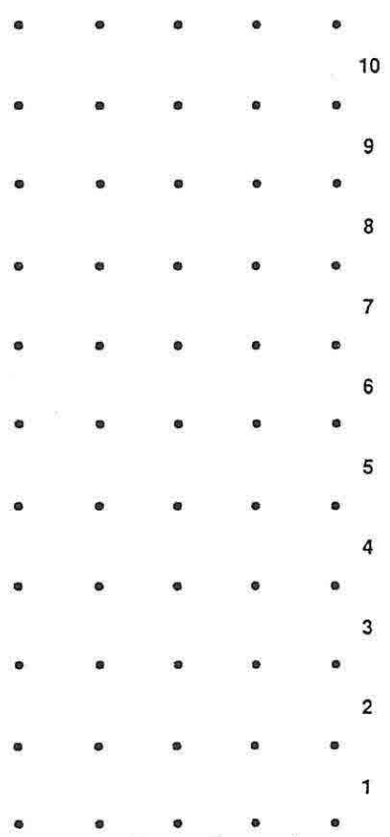


FIG. 3 Joint Rigid Pavement Condition Survey Data Sheet for Sample Unit

is calculated using the following formula and rounding n to the next highest whole number (see Eq 1).

$$n = Ns^2/((e^2/4)(N-1) + s^2) \quad (1)$$

where:

e = acceptable error in estimating the section PCI; commonly, $e=\pm 5$ PCI points;

s = standard deviation of the PCI from one sample unit to another within the section. When performing the initial inspection the standard deviation is assumed to be ten for AC pavements and 15 for PCC pavements. This assumption should be checked as described below after PCI values are determined. For subsequent inspections, the standard deviation from the preceding inspection should be used to determine n; and,

N = total number of sample units in the section.

7.5.2.1 If obtaining the 95 % confidence level is critical, the adequacy of the number of sample units surveyed must be confirmed. The number of sample units was estimated based on an assumed standard deviation. Calculate the actual standard deviation (s) as follows (see Eq 2):

$$s = (\sum_{i=1}^{n}(PCI_i - PCI_s)^2/(n-1))^{1/2} \quad (2)$$

where:

PCI_i = PCI of surveyed sample units i,

PCI_s = PCI of section (mean PCI of surveyed sample units), and

n = total number of sample units surveyed.

7.5.2.2 Calculate the revised minimum number of sample units (Eq 1) to be surveyed using the calculated standard deviation (Eq 2). If the revised number of sample units to be surveyed is greater than the number of sample units already surveyed, select and survey additional random sample units. These sample units should be spaced evenly across the section. Repeat the process of checking the revised number of sample units and surveying additional random sample units until the total number of sample units surveyed equals or exceeds the minimum required sample units (n) in Eq 1, using the actual total sample standard deviation.

7.5.3 Once the number of sample units to be inspected has been determined, compute the spacing interval of the units using systematic random sampling. Samples are spaced equally throughout the section with the first sample selected at random. The spacing interval (i) of the units to be sampled is calculated by the following formula rounded to the next lowest whole number:

$$i = N/n \quad (3)$$

where:

N = total number of sample units in the section, and
n = number of sample units to be inspected.

The first sample unit to be inspected is selected at random from sample units 1 through i. The sample units within a section that are successive increments of the interval i after the first randomly selected unit also are inspected.

7.6 A lessor sampling rate than the above mentioned 95 % confidence level can be used based on the condition survey objective. As an example, one agency uses the following table for selecting the number of sample units to be inspected for other than project analysis:

Given	Survey
1 to 5 sample units	1 sample unit
6 to 10 sample units	2 sample units
11 to 15 sample units	3 sample units
16 to 40 sample units	4 sample units
over 40 sample units	10 %

7.7 Additional sample units only are to be inspected when nonrepresentative distresses are observed as defined in 2.1.1. These sample units are selected by the user.

8. Inspection Procedure

8.1 The definitions and guidelines for quantifying distresses for PCI determination are given in Appendix X1 for AC pavements. Using this test method, inspectors should identify distress types accurately 95 % of the time. Linear measurements should be considered accurate when they are within 10 % if remeasured, and area measurements should be considered accurate when they are within 20 % if remeasured. Distress severities that one determines based on ride quality are considered subjective.

8.2 *Asphalt Concrete (AC) Surfaced Pavement*—Individually inspect each sample unit chosen. Sketch the sample unit, including orientation. Record the branch and section number and the number and type of the sample unit (random or additional). Record the sample unit size measured with the hand odometer. Conduct the distress inspection by walking over the sidewalk/shoulder of the sample unit being surveyed, measuring the quantity of each severity level of every distress type present, and recording the data. Each distress must correspond in type and severity to that described in Appendix X1. The method of measurement is included with each distress description. Repeat this procedure for each sample unit to be inspected. A copy of a Blank Flexible Pavement Condition Survey Data Sheet for Sample Unit is included in Fig. 2.

8.3 *PCC Pavements*—Individually inspect each sample unit chosen. Sketch the sample unit showing the location of the slabs. Record the sample unit size, branch and section number, and number and type of the sample unit (random or additional), the number of slabs in the sample unit and the slab size measured with the hand odometer. Perform the inspection by walking over the sidewalk/shoulder of the sample unit being surveyed and recording all distress existing in the slab along with their severity level. Each distress type and severity must correspond with that described in Appendix X2. Summarize the distress types, their severity levels and the number of slabs in the sample unit containing each type and severity level. Repeat this procedure for each sample unit to be inspected. A copy of a Blank Jointed Rigid Pavement Condition Survey Data Sheet for Sample Unit is included in Fig. 3.

9. Calculation of PCI for Asphalt Concrete (AC) Pavement

9.1 Add up the total quantity of each distress type at each severity level, and record them in the "Total Severities" section. For example, Fig. 4 shows five entries for the Distress Type 1, "Alligator Cracking": 5L, 4L, 4L, 8H, and 6H. The distress at each severity level is summed and entered in the "Total Severity" section as 13 ft^2 (1.2 m^2) of low severity and 14 ft^2 (1.3 m^2) of medium severity. The units for the quantities may be either in square feet (square meters), linear feet (meters), or number of occurrences, depending on the distress type.

9.2 Divide the total quantity of each distress type at each severity level from 9.1 by the total area of the sample unit and multiply by 100 to obtain the percent density of each distress type and severity.

9.3 Determine the deduct value (DV) for each distress type and severity level combination from the distress deduct value curves in Appendix X3.

9.4 Determine the maximum corrected deduct value (CDV). The procedure for determining maximum CDV from individual DVs is identical for both AC and PCC pavement types.

9.5 The following procedure must be used to determine the maximum CDV.

9.5.1 If none or only one individual deduct value is greater than two, the total value is used in place of the maximum CDV in determining the PCI; otherwise, maximum CDV must be determined using the procedure described in 9.5.2-9.5.5.

9.5.2 List the individual deduct values in descending order. For example, in Fig. 4 this will be 25.1, 23.4, 17.9, 11.2, 7.9, 7.5, 6.9, and 5.3.

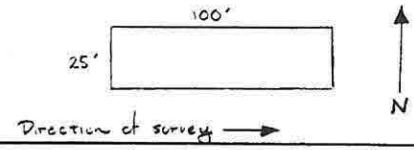
9.5.3 Determine the allowable number of deducts, m, from Fig. 5, or using the following formula (see Eq 4):

$$m = 1 + (9/98)(100–HDV) \leq 10 \quad (4)$$

ASPHALT SURFACED ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET
FOR SAMPLE UNIT

BRANCH SPRINGFIELD SECTION 001 SAMPLE UNIT 1
SURVEYED BY KAK DATE 10 Jul 93 SAMPLE AREA 2500 sf

SKETCH:



1. Alligator Cracking
2. Bleeding
3. Block Cracking
4. Bumps and Sags
5. Corrugation
6. Depression
7. Edge Cracking
8. Jt. Reflection Cracking
9. Lane/Shoulder Drop Off
10. Long & Trans Cracking
11. Patching & Util Cut Patching
12. Polished Aggregate
13. Potholes
14. Railroad Crossing
15. Rutting
16. Shoving
17. Slippage Cracking
18. Swell
19. Weathering/Raveling

DISTRESS SEVERITY	QUANTITY									TOTAL	DENSITY %	DEDUCT VALUE
1 L	1×5	1×4	1×4							13	0.52	7.9
1 H	1×8	1×6								14	0.56	23.4
7 L	32	15	18	24	41					130	5.20	7.5
8 M	20	15	35	27	23	10	13			143	5.72	25.1
11 H	3×4	2×5								22	0.88	17.9
13 L	1									1	0.04	11.2
15 L	4	9	8							21	0.84	6.9
19 L	250									250	10.0	5.3

FIG. 4 Example of a Flexible Pavement Condition Survey Data Sheet

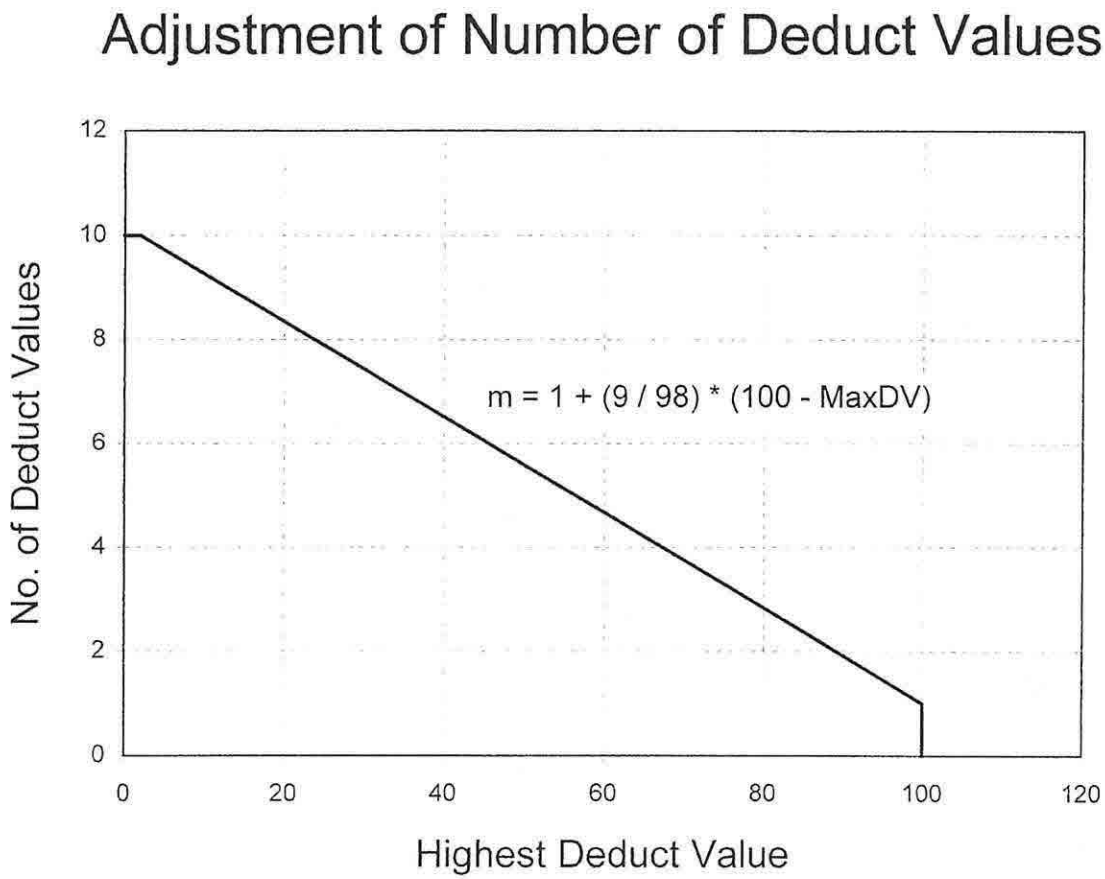


FIG. 5 Adjustment of Number of Deduct Values

where:

m = allowable number of deducts including fractions (must be less than or equal to ten), and

HDV = highest individual deduct value.

(For the example in Fig. 4, $m = 1 + (9/98)(100\text{-}25.1) = 7.9$).

9.5.4 The number of individual deduct values is reduced to the m largest deduct values, including the fractional part. For the example in Fig. 6, the values are 25.1, 23.4, 17.9, 11.2, 7.9, 7.5, 6.9, and 4.8 (the 4.8 is obtained by multiplying 5.3 by (7.9 – 7 = 0.9)). If less than m deduct values are available, all of the deduct values are used.

9.5.5 Determine maximum CDV iteratively, as shown in Fig. 6.

9.5.5.1 Determine total deduct value by summing individual deduct values. The total deduct value is obtained by adding the individual deduct values in 9.5.4, that is, 104.7.

9.5.5.2 Determine q as the number of deducts with a value greater than 2.0. For example, in Fig. 6, $q = 8$.

9.5.5.3 Determine the CDV from total deduct value and q by looking up the appropriate correction curve for AC pavements in Fig. X4.15 in Appendix X3.

9.5.5.4 Reduce the smallest individual deduct value greater than 2.0 to 2.0 and repeat 9.5.5.1-9.5.5.3 until $q = 1$.

9.5.5.5 Maximum CDV is the largest of the CDVs.

9.6 Calculate PCI by subtracting the maximum CDV from 100: PCI = 100-max CDV.

9.7 Fig. 6 shows a summary of PCI calculation for the example AC pavement data in Fig. 4. A blank PCI calculation form is included in Fig. 2.

10. Calculation of PCI for Portland Cement Concrete (PCC) Pavement

10.1 For each unique combination of distress type and severity level, add up the total number of slabs in which they occur. For the example in Fig. 7, there are two slabs containing low-severity corner break (Distress 22L).

10.2 Divide the number of slabs from 10.1 by the total number of slabs in the sample unit and multiply by 100 to obtain the percent density of each distress type and severity combination.

10.3 Determine the deduct values for each distress type severity level combination using the corresponding deduct curve in Appendix X4.

10.4 Determine PCI by following the procedures in 9.5 and 9.6, using the correction curve for PCC pavements (see Fig. X4.20 in Appendix X4) in place of the correction curve for AC pavements.

m = 1 + (9/98) (100 - 25.1) = 7.9 < 8

Use highest 7 deducts and 0.9 of eighth deduct.

0.9 x 5.3 = 4.8

#	Deduct Values										Total	q	CDV
1	25.1	23.4	17.9	11.2	7.9	7.5	6.9	(4.8)			104.7	8	51.0
2	25.1	23.4	17.9	11.2	7.9	7.5	6.9	2			101.9	7	50.0
3	25.1	23.4	17.9	11.2	7.9	7.5	2	2			96.0	6	46.0
4	25.1	23.4	17.9	11.2	7.9	2	2	2			90.5	5	47.0
5	25.1	23.4	17.9	11.2	2	2	2	2			84.6	4	48.0
6	25.1	23.4	17.9	2	2	2	2	2			75.4	3	48.0
7	25.1	23.4	2	2	2	2	2	2			59.5	2	44.0
8	25.1	2	2	2	2	2	2	2			38.1	1	38.0
9													
10													

Max CDV = 51

PCI = 100 - Max CDV = 49

Rating = FAIR

FIG. 6 Calculation of Corrected PCI Value—Flexible Pavement

10.5 Fig. 7 shows a summary of PCI calculation for the example PCC pavement distress data in Fig. 8.

11. Determination of Section PCI

11.1 If all surveyed sample units are selected randomly, then the PCI of the section (PCI_s) is calculated as the area weighted PCI of the randomly surveyed sample units ($\overline{PCI_r}$) using equation 5:

$$PCI_S = \overline{PCI_r} = \frac{\sum_{i=1}^{n} (PCI_{ri} \cdot A_{ri})}{\sum_{i=1}^{n} A_{ri}} \quad (5)$$

CONCRETE SURFACED ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET FOR SAMPLE UNIT

BRANCH SECOND SECTION 001 SAMPLE UNIT 1
SURVEYED BY KAK DATE 10 Jul 93 SAMPLE AREA 20 slabs

Distress Types

21. Blow up/Buckling
22. Corner Break
23. Divided Slab
24. Durability Crack
25. Faulting
26. Joint Seal
27. Lane/Shoulder
28. Linear Cracking
29. Patching (Large)
30. Patching (Small)
31. Polished Aggregate
32. Popouts
33. Pumping
34. Punchout
35. Railroad Crossing
36. Scaling
37. Shrinkage
38. Spalling Corner
39. Spalling Joint

DIST TYPE	SEV	NO. SLABS	DENSITY %	DEDUCT VALUE
26	H	—	100	8.0
22	L	3	15	12.6
22	M	1	5	7.7
23	M	3	15	30.5
30	M	4	20	4.4
34	M	2	10	25.1
38	L	6	30	5.8
39	H	1	5	9.0

SKETCH:

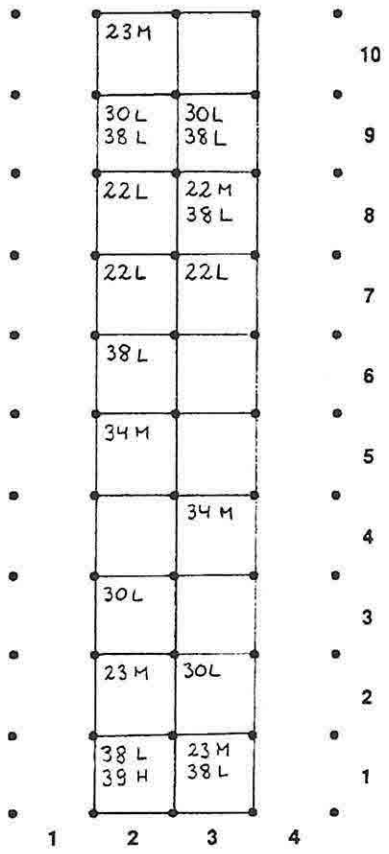


FIG. 7 Example of a Jointed Rigid Pavement Condition Survey Data Sheet

where:

$\overline{PCI_r}$ = area weighted PCI of randomly surveyed sample units,
PCI_{ri} = PCI of random sample unit i,
A_{ri} = area of random sample unit i,
n = number of random sample units surveyed.

If additional sample units, as defined in 2.1.1, are surveyed, the area weighted PCI of the surveyed additional units ($\overline{PCI_a}$) is calculated using equation 6. The PCI of the pavement section is calculated using equation 7.

$$\overline{PCI_a} = \frac{\sum_{i=1}^{m} (PCI_{ai} \cdot A_{ai})}{\sum_{i=1}^{m} A_{ai}} \quad (6)$$

$$PCI_s = \frac{\overline{PCI_r}(A - \sum_{i=1}^{m} A_{ai}) + \overline{PCI_a}(\sum_{i=1}^{m} A_{ai})}{A} \quad (7)$$

m = 1 ÷ (9/98) (100 - 30.5) = 7.4 < 8

Use highest 7 deducts and 0.4 of eighth deduct.

0.4 x 4.4 = 1.76

#	Deduct Values										Total	q	CDV
1	30.5	25.1	12.6	9.0	8.0	7.7	5.8	1.76			100.5	7	50.0
2	30.5	25.1	12.6	9.0	8.0	7.7	2	1.76			96.7	6	49.5
3	30.5	25.1	12.6	9.0	8.0	2	2	1.76			91.0	5	51.0
4	30.5	25.1	12.6	9.0	2	2	2	1.76			85.0	4	49.0
5	30.5	25.1	12.6	2	2	2	2	1.76			78.0	3	50.0
6	30.5	25.1	2	2	2	2	2	1.76			67.4	2	50.0
7	30.5	2	2	2	2	2	2	1.76			44.3	1	44.3
8													
9													
10													

Max CDV = 51

PCI = 100 - Max CDV = 49

Rating = FAIR

FIG. 8 Calculation of Corrected PCI Value—Jointed Rigid Pavement

$\overline{PCI_a}$ = area weighted PCI of additional sample units,
PCI_{ai} = PCI of additional sample unit i,
A_{ai} = area of additional sample unit i,
A = area of section,
m = number of additional sample units surveyed, and
PCI_s = area weighted PCI of the pavement section.

11.2 Determine the overall condition rating of the section by using the section PCI and the condition rating scale in Fig. 1.

12. Report

12.1 Develop a summary report for each section. The summary lists section location, size, total number of sample units, the sample units inspected, the PCIs obtained, the average PCI for the section, and the section condition rating.

APPENDIXES

(Nonmandatory Information)

X1. Distress in Asphalt Pavements

X1.1 During the field condition surveys and validation of the PCI, several questions are commonly asked about the identification and measurement of some of the distresses. The answers to these questions for each distress are included under the heading "How to Measure." For convenience, however, the most frequently raised issues are addressed below:

X1.1.1 If alligator cracking and rutting occur in the same area, each is recorded separately at its respective severity level.

X1.1.2 If bleeding is counted, polished aggregate is not counted in the same area.

X1.1.3 Spalling as used herein is the further breaking of pavement or loss of materials around cracks or joints.

X1.1.4 If a crack does not have the same severity level along its entire length, each portion of the crack having a different severity level should be recorded separately. If, however, the different levels of severity in a portion of a crack cannot be easily divided, that portion should be rated at the highest severity level present.

X1.1.5 If any distress, including cracking and potholes, is found in a patched area, it is not recorded; its effect on the patch, however, is considered in determining the severity level of the patch.

X1.1.6 A significant amount of polished aggregate should be present before it is counted.

X1.1.7 A distress is said to be raveled if the area surrounding the distress is broken (sometimes to the extent that pieces are removed).

X1.2 The reader should note that the items above are general issues and do not stand alone as inspection criteria. To properly measure each distress type, the inspector must be familiar with its individual measurement criteria.

X1.3 Nineteen distress types for asphalt-surfaced pavements are listed alphabetically in this manual.

RIDE QUALITY

X1.4 Ride quality must be evaluated in order to establish a severity level for the following distress types:

X1.4.1 Bumps.

X1.4.2 Corrugation.

X1.4.3 Railroad crossings.

X1.4.4 Shoving.

X1.4.5 Swells.

X1.4.6 To determine the effect these distresses have on ride quality, the inspector should drive at the normal operating speed and use the following severity-level definitions of ride quality:

X1.4.6.1 **L**—Low. Vehicle vibrations, for example, from corrugation, are noticeable, but no reduction in speed is necessary for comfort or safety. Individual bumps or settlements, or both, cause the vehicle to bounce slightly, but create little discomfort.

X1.4.6.2 **M**—Medium. Vehicle vibrations are significant and some reduction in speed is necessary for safety and comfort. Individual bumps or settlements, or both, cause the vehicle to bounce significantly, creating some discomfort.

X1.4.6.3 **H**—High. Vehicle vibrations are so excessive that speed must be reduced considerably for safety and comfort. Individual bumps or settlements, or both, cause the vehicle to bounce excessively, creating substantial discomfort, safety hazard, or high potential vehicle damage.

X1.4.7 The inspector should drive at the posted speed in a sedan that is representative of cars typically seen in local traffic. Pavement sections near stop signs should be rated at a deceleration speed appropriate for the intersection.

ALLIGATOR CRACKING (FATIGUE)

X1.5 *Description*—Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt concrete surface under repeated traffic loading. Cracking begins at the bottom of the asphalt surface, or stabilized base, where tensile stress and strain are highest under a wheel load. The cracks propagate to the surface initially as a series of parallel longitudinal cracks. After repeated traffic loading, the cracks connect, forming many sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are generally less than 0.5 m (1.5 ft) on the longest side. Alligator cracking occurs only in areas subjected to repeated traffic loading, such as wheel paths. Pattern-type cracking that occurs over an entire area not subjected to loading is called "block cracking," which is not a load-associated distress.

X1.5.1 *Severity Levels*:

X1.5.1.1 **L**—Fine, longitudinal hairline cracks running parallel to each other with no, or only a few interconnecting cracks. The cracks are not spalled (Fig. X1.1).

FIG. X1.1 Low-Severity Alligator Cracking

X1.5.1.2 **M**—Further development of light alligator cracks into a pattern or network of cracks that may be lightly spalled (Fig. X1.2).

X1.5.1.3 **H**—Network or pattern cracking has progressed so that the pieces are well defined and spalled at the edges. Some of the pieces may rock under traffic (Fig. X1.3).

X1.5.2 *How to Measure*—Alligator cracking is measured in square meters (square feet) of surface area. The major difficulty in measuring this type of distress is that two or three levels of severity often exist within one distressed area. If these portions can be easily distinguished from each other, they should be measured and recorded separately; however, if the different levels of severity cannot be divided easily, the entire area should be rated at the highest severity present. If alligator cracking and rutting occur in the same area, each is recorded separately as its respective severity level.

BLEEDING

X1.6 *Description*—Bleeding is a film of bituminous material on the pavement surface that creates a shiny, glasslike, reflecting surface that usually becomes quite sticky. Bleeding is caused by excessive amounts of asphaltic cement or tars in the mix, excess application of a bituminous sealant, or low air void content, or a combination thereof. It occurs when asphalt fills the voids of the mix during hot weather and then expands onto the pavement surface. Since the bleeding process in not reversible during cold weather, asphalt or tar will accumulate on the surface.

X1.6.1 *Severity Levels*:

X1.6.1.1 **L**—Bleeding only has occurred to a very slight degree and is noticeable only during a few days of the year. Asphalt does not stick to shoes or vehicles (Fig. X1.4).

X1.6.1.2 **M**—Bleeding has occurred to the extent that asphalt sticks to shoes and vehicles during only a few weeks of the year (Fig. X1.5).

X1.6.1.3 **H**—Bleeding has occurred extensively and considerable asphalt sticks to shoes and vehicles during at least several weeks of the year (Fig. X1.6).

X1.6.2 *How to Measure*—Bleeding is measured in square meters (square feet) of surface area. If bleeding is counted, polished aggregate should not be counted.

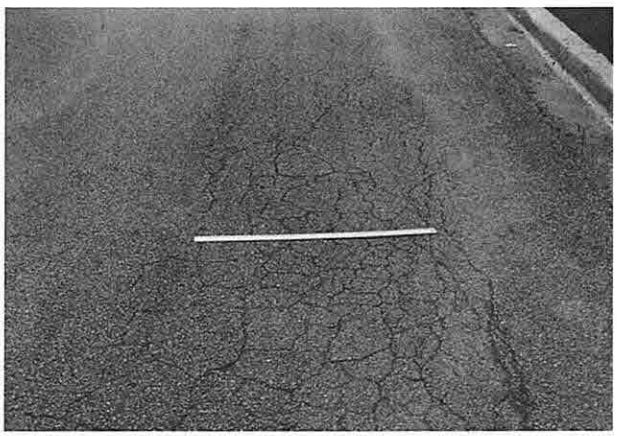


FIG. X1.2 Medium-Severity Alligator Cracking

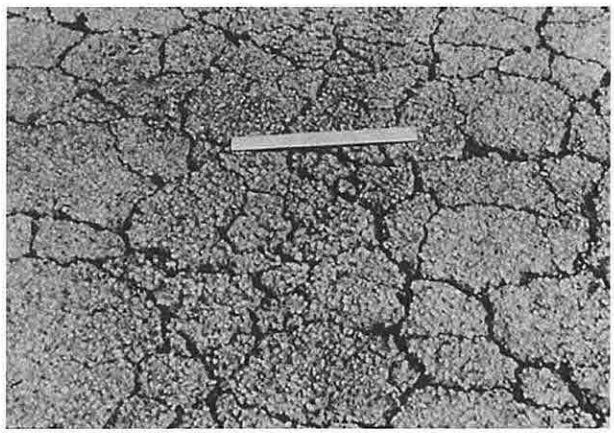


FIG. X1.3 High-Severity Alligator Cracking

FIG. X1.4 Low-Severity Bleeding

FIG. X1.5 Medium-Severity Bleeding

BLOCK CRACKING

X1.7 *Description*—Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 0.3 by 0.3 m (1 by 1 ft) to 3 by 3 m (10 by 10 ft). Block cracking is caused mainly by shrinkage of the asphalt concrete and daily

FIG. X1.6 High-Severity Bleeding

temperature cycling, which results in daily stress/strain cycling. It is not load-associated. Block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large portion of the pavement area, but sometimes will occur only in nontraffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles. Also, unlike block, alligator cracks are caused by repeated traffic loadings, and therefore, are found only in traffic areas, that is, wheel paths.

X1.7.1 *Severity Levels*:

X1.7.1.1 **L**—Blocks are defined by low-severity[3] cracks (Fig. X1.7).

X1.7.1.2 **M**—Blocks are defined by medium-severity[3] cracks (Fig. X1.8).

X1.7.1.3 **H**—Blocks are defined by high-severity[3] cracks (Fig. X1.9).

X1.7.2 *How to Measure*—Block cracking is measured in m^2 (ft^2) of surface area. It usually occurs at one severity level in a given pavement section; however, if areas of different severity levels can be distinguished easily from one another, they should be measured and recorded separately.

BUMPS AND SAGS

X1.8 *Description*:

X1.8.1 Bumps are small, localized, upward displacements of the pavement surface. They are different from shoves in that shoves are caused by unstable pavement. Bumps, on the other hand, can be caused by several factors, including:

X1.8.1.1 Buckling or bulging of underlying PCC slabs in AC overlay over PCC pavement.

X1.8.1.2 Frost heave (ice, lens growth).

X1.8.1.3 Infiltration and buildup of material in a crack in combination with traffic loading (sometimes called "tenting").

X1.8.1.4 Sags are small, abrupt, downward displacements of the pavement surface. If bumps appear in a pattern perpendicular to traffic flow and are spaced at less than 3 m (10 ft), the distress is called corrugation. Distortion and displacement that occur over large areas of the pavement surface, causing large or long dips, or both, in the pavement should be recorded as" swelling."

X1.8.2 *Severity Levels*:

X1.8.2.1 **L**—Bump or sag causes low-severity ride quality (Fig. X1.10).

X1.8.2.2 **M**—Bump or sag causes medium-severity ride quality (Fig. X1.11).

X1.8.2.3 **H**—Bump or sag causes high-severity ride quality (Fig. X1.12).

X1.8.3 *How to Measure*—Bumps or sags are measured in linear meters (feet). If the bump occurs in combination with a crack, the crack also is recorded.

[3] See definitions of longitudinal transverse cracking within Appendix X2.10.

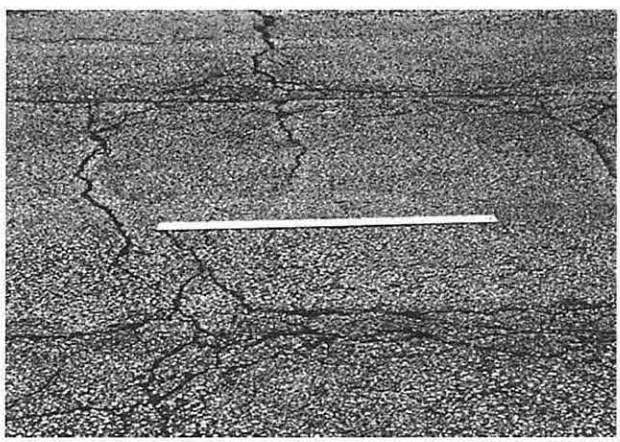


FIG. X1.7 Low-Severity Block Cracking

FIG. X1.8 Medium-Severity Block Cracking

FIG. X1.9 High-Severity Block Cracking

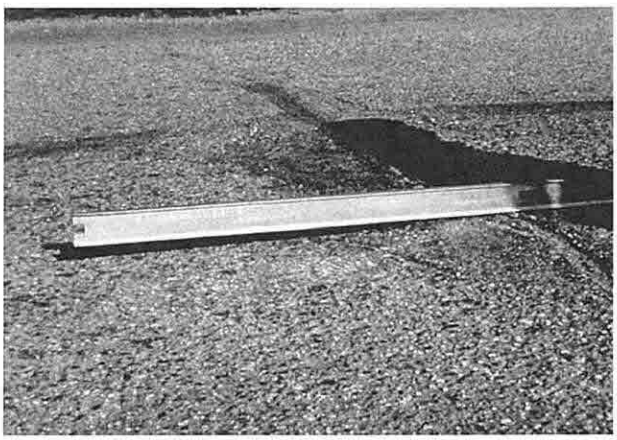


FIG. X1.10 Low-Severity Bumps and Sags

FIG. X1.11 Medium-Severity Bumps and Sags

CORRUGATION

X1.9 *Description*—Corrugation, also known as "washboarding", is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 3 m (10 ft) along the pavement. The ridges are perpendicular to the traffic direction. This type of distress usually is caused by traffic action combined with an unstable pavement surface or base.

X1.9.1 *Severity Levels*:

X1.9.1.1 **L**—Corrugation produces low-severity ride quality (Fig. X1.13).

X1.9.1.2 **M**—Corrugation produces medium-severity ride quality (Fig. X1.14).

X1.9.1.3 **H**—Corrugation produces high-severity ride quality (Fig. X1.15).

X1.9.2 *How to Measure*—Corrugation is measured in square meters (square feet) of surface area.

FIG. X1.12 High-Severity Bumps and Sags

DEPRESSION

X1.10 *Description*—Depressions are localized pavement surface areas with elevations slightly lower than those of the surrounding pavement. In many instances, light depressions are not noticeable until after a rain, when ponding water creates a "birdbath" area; on dry pavement, depressions can be spotted by looking for stains caused by ponding water. Depressions are created by settlement of the foundation soil or are a result of

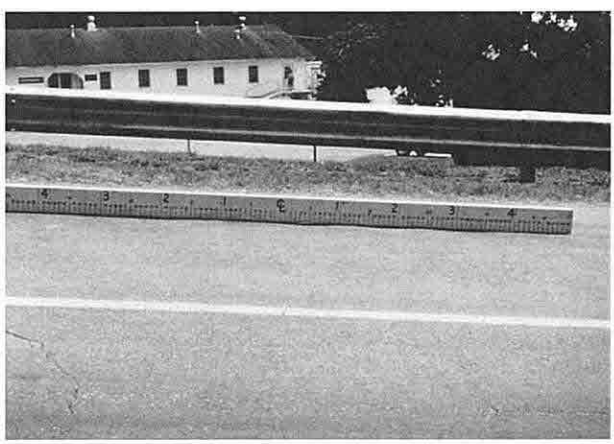


FIG. X1.13 Low-Severity Corrugation

FIG. X1.14 Medium-Severity Corrugation

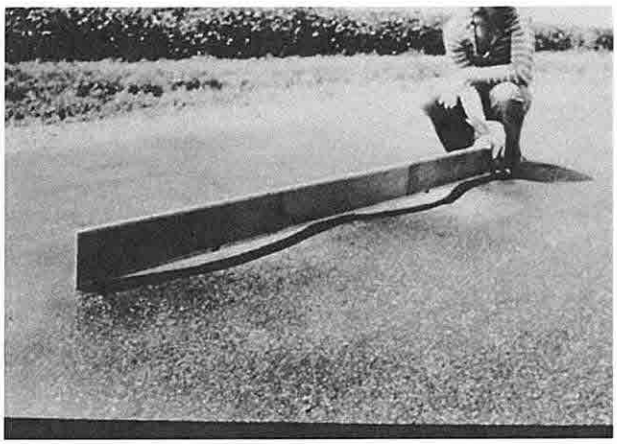


FIG. X1.15 High-Severity Corrugation

improper construction. Depressions cause some roughness, and when deep enough or filled with water, can cause hydroplaning.

X1.10.1 *Severity Levels (Maximum Depth of Depression)*:

X1.10.1.1 **L**–13 to 25 mm (½ to 1 in.) (Fig. X1.16).

X1.10.1.2 **M**–25 to 50 mm (1 to 2 in.) (Fig. X1.17).

FIG. X1.16 Low-Severity Depression

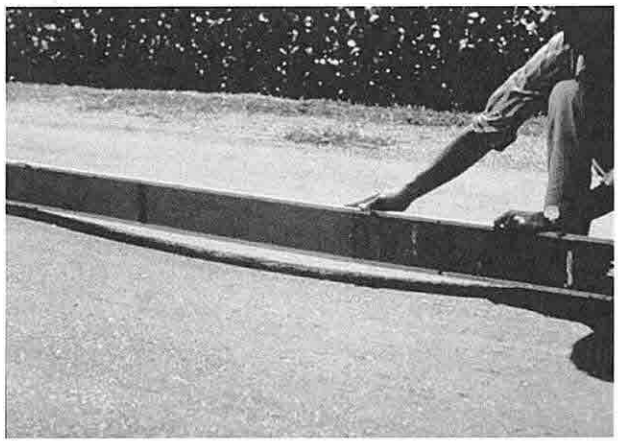


FIG. X1.17 Medium-Severity Depression

X1.10.1.3 **H**—More than 50 mm (2 in.) (Fig. X1.18).

X1.10.2 *How to Measure*—Depressions are measured in square meters (square feet) of surface area.

EDGE CRACKING

X1.11 *Description*—Edge cracks are parallel to and usually within 0.3 to 0.5 m (1 to 1.5 ft) of the outer edge of the pavement. This distress is accelerated by traffic loading and can be caused by frost-weakened base or subgrade near the edge of the pavement. The area between the crack and pavement edge is classified as raveled if it is broken up (sometimes to the extent that pieces are removed).

X1.11.1 *Severity Levels*:

X1.11.1.1 **L**—Low or medium cracking with no breakup or raveling (Fig. X1.19).

X1.11.1.2 **M**—Medium cracks with some breakup and raveling (Fig. X1.20).

X1.11.1.3 **H**—Considerable breakup or raveling along the edge (Fig. X1.21).

X1.11.2 *How to Measure*—Edge cracking is measure in linear meters (feet).

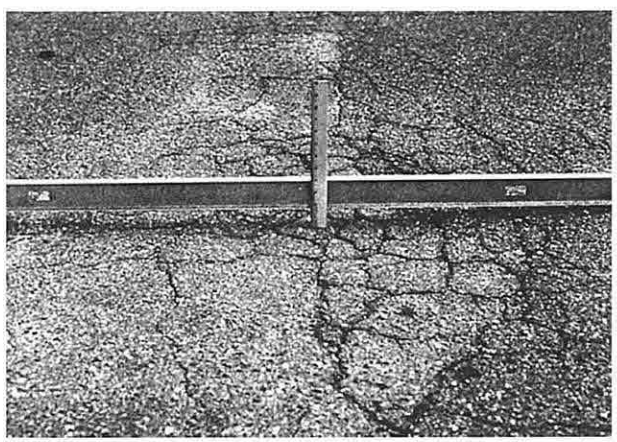


FIG. X1.18 High-Severity Depression

FIG. X1.19 Low-Severity Edge Cracking

FIG. X1.20 Medium-Severity Edge Cracking

FIG. X1.21 High-Severity Edge Cracking

JOINT REFLECTION CRACKING (From Longitudinal and Transverse PCC Slabs)

X1.12 *Description*—This distress occurs only on asphalt-surfaced pavements that have been laid over a PCC slab. It does not include reflection cracks from any other type of base, that is, cement- or lime-stabilized; these cracks are caused mainly by thermal- or moisture-induced movement of the PCC slab beneath the AC surface. This distress is not load-related; however, traffic loading may cause a breakdown of the AC surface near the crack. If the pavement is fragmented along a crack, the crack is said to be spalled. A knowledge of slab dimension beneath the AC surface will help to identify these distresses.

X1.12.1 *Severity Levels*:

X1.12.1.1 **L**—One of the following conditions exists (Fig. X1.22): Nonfilled crack width is less than 10 mm (⅜ in.), or filled crack of any width (filler in satisfactory condition).

X1.12.1.2 **M**—One of the following conditions exists (Fig. X1.23): Nonfilled crack width is greater than or equal to 10 mm (⅜ in.) and less than 75 mm (3 in.); nonfilled crack less than or equal to 75 mm (3 in.) surrounded by light secondary cracking; or, filled crack of any width surrounded by light secondary cracking.

X1.12.1.3 **H**—One of the following conditions exists (Fig. X1.24): Any crack filled or nonfilled surrounded by medium- or high-severity secondary cracking; nonfilled cracks greater than 75 mm (3 in.); or, a crack of any width where approximately 100 mm (4 in.) of pavement around the crack are severely raveled or broken.

X1.12.2 *How to Measure*—Joint reflection cracking is measured in linear meters (feet). The length and severity level of each crack should be identified and recorded separately. For example, a crack that is 15 m (50 ft) long may have 3 m (10 ft) of high severity cracks, which are all recorded separately. If a bump occurs at the reflection crack, it is recorded also.

LANE/SHOULDER DROP-OFF

X1.13 *Description*—Lane/shoulder drop-off is a difference in elevation between the pavement edge and the shoulder. This distress is caused by shoulder erosion, shoulder settlement, or by building up the roadway without adjusting the shoulder level.

X1.13.1 *Severity Levels*:

X1.13.1.1 **L**—The difference in elevation between the pavement edge and shoulder is > 25 mm (1 in.) and< 50 mm (2 in.) (Fig. X1.25).

FIG. X1.22 Low-Severity Joint Reflection Cracking

FIG. X1.23 Medium-Severity Joint Reflection Cracking

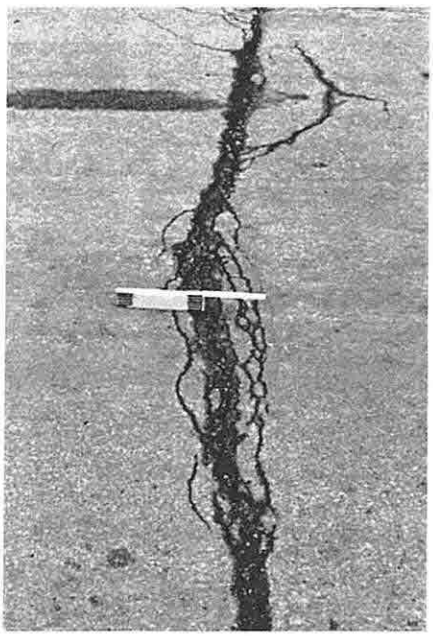


FIG. X1.24 High-Severity Joint Reflection Cracking

X1.13.1.2 **M**—The difference in elevation is > 50 mm (2 in.) and < 100 mm (4 in.) (Fig. X1.26).

X1.13.1.3 **H**—The difference in elevation is > 100 mm (4 in.) (Fig. X1.27).

X1.13.2 *How to Measure*—Lane/shoulder drop-off is measured in linear meters (feet).

LONGITUDINAL AND TRANSVERSE CRACKING (Non-PCC Slab Joint Reflective)

X1.14 *Description*:

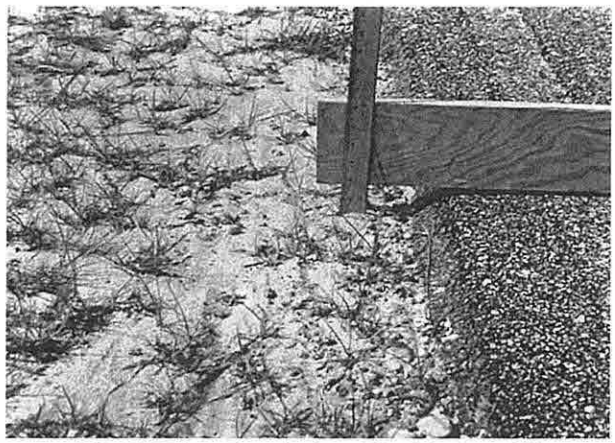


FIG. X1.25 Low-Severity Lane/Shoulder Drop-Off

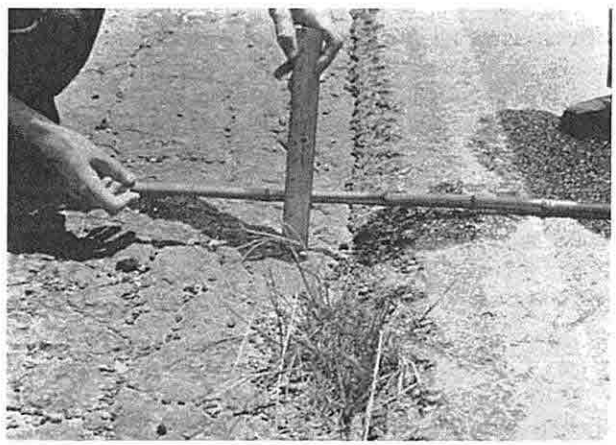


FIG. X1.26 Medium-Severity Lane/Shoulder Drop-Off

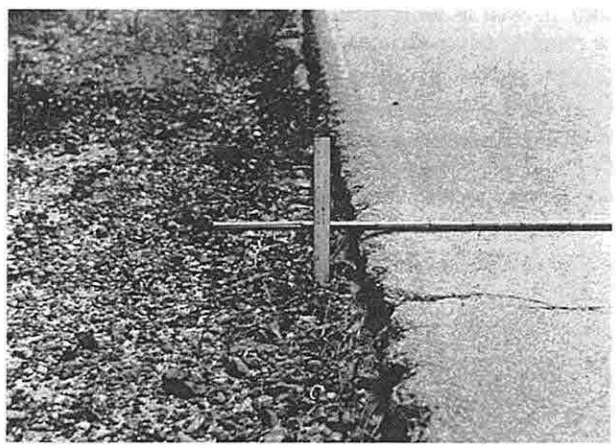


FIG. X1.27 High-Severity Lane/Shoulder Drop-Off

X1.14.1 Longitudinal cracks are parallel to the pavement's centerline or laydown direction. They may be caused by:

X1.14.1.1 A poorly constructed paving lane joint.

X1.14.1.2 Shrinkage of the AC surface due to low temperatures or hardening of the asphalt, or daily temperature cycling, or both.

X1.14.1.3 A reflective crack caused by cracking beneath the surface course, including cracks in PCC slabs, but not PCC joints.

X1.14.1.4 Transverse cracks extend across the pavement at approximately right angles to the pavement centerline or direction of laydown. These types of cracks are not usually load-associated.

X1.14.2 *Severity Levels*:

X1.14.2.1 **L**—One of the following conditions exists (Fig. X1.28): nonfilled crack width is less than 10 mm (⅜ in.), or filled crack of any width (filler in satisfactory condition).

X1.14.2.2 **M**—One of the following conditions exists (Fig. X1.29): nonfilled crack width is greater than or equal to 10 mm and less than 75 mm (⅜ to 3 in.); nonfilled crack is less than or equal to 75 mm (3 in.) surrounded by light and random cracking; or, filled crack is of any width surrounded by light random cracking.

X1.14.2.3 **H**—One of the following conditions exists (Fig. X1.30): any crack filled or nonfilled surrounded by medium- or high-severity random cracking; nonfilled crack greater than 75 m (3 in.); or, a crack of any width where approximately 100 mm (4 in.) of pavement around the crack is severely broken.

X1.14.3 *How to Measure*—Longitudinal and transverse cracks are measured in linear meters (feet). The length and severity of each crack should be recorded. If the crack does not have the same severity level along its entire length, each portion of the crack having a different severity level should be recorded separately.

PATCHING AND UTILITY CUT PATCHING

X1.15 *Description*—A patch is an area of pavement that has been replaced with new material to repair the existing pavement. A patch is considered a defect no matter how well it is performing (a patched area or adjacent area usually does not perform as well as an original pavement section). Generally, some roughness is associated with this distress.

X1.15.1 *Severity Levels*:

X1.15.1.1 **L**—Patch is in good condition and satisfactory. Ride quality is rated as low severity or better (Fig. X1.31).

X1.15.1.2 **M**—Patch is moderately deteriorated, or ride quality is rated as medium severity, or both (Fig. X1.32).

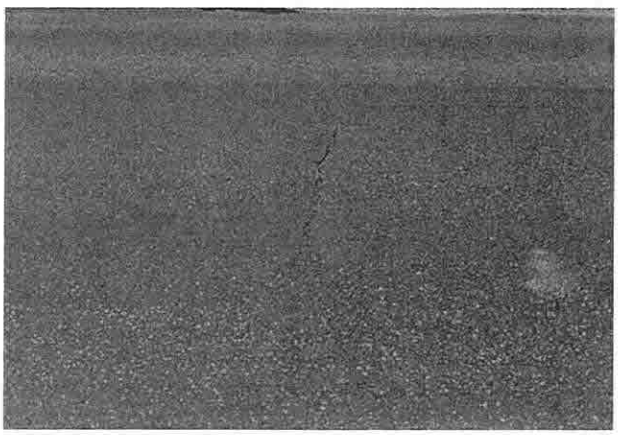


FIG. X1.28 Low-Severity Longitudinal and Transverse Cracking

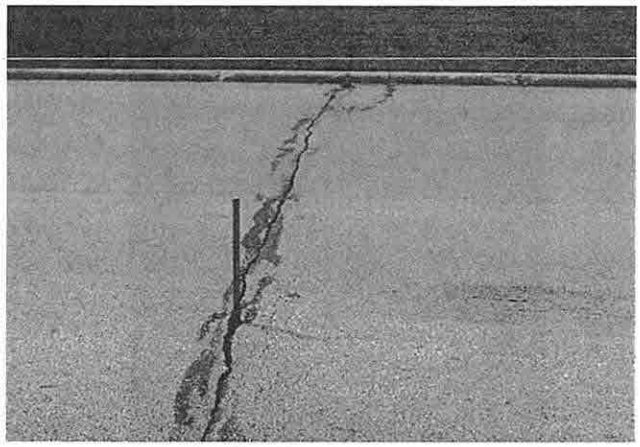


FIG. X1.29 Medium-Severity Longitudinal and Transverse Cracking

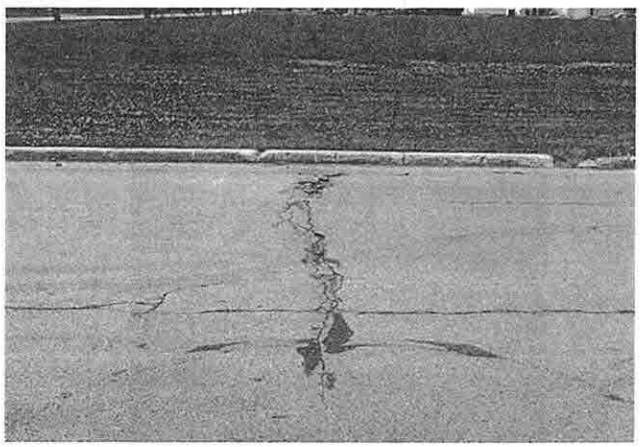


FIG. X1.30 High-Severity Longitudinal and Transverse Cracking

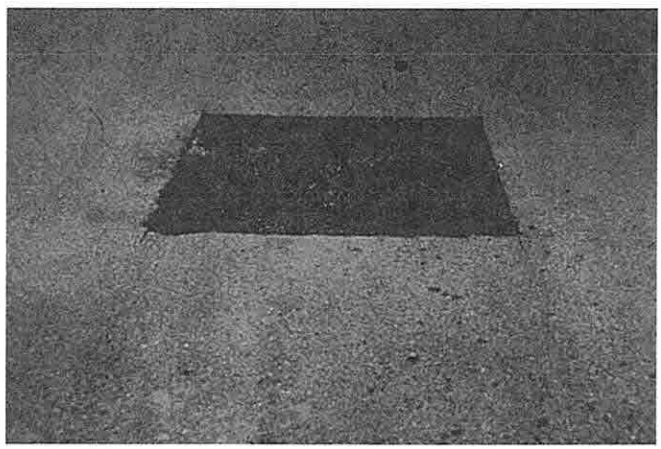


FIG. X1.31 Low-Severity Patching and Utility Cut Patching

X1.15.1.3 **H**—Patch is badly deteriorated, or ride quality is rated as high severity, or both; needs replacement soon (Fig. X1.33).

X1.15.2 *How to Measure*—Patching is rated in ft^2 of surface area; however, if a single patch has areas of differing

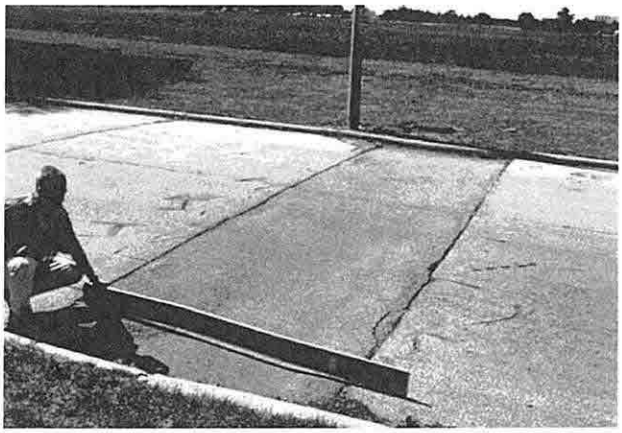


FIG. X1.32 Medium-Severity Patching and Utility Cut Patching

FIG. X1.33 High-Severity Patching and Utility Cut Patching

severity, these areas should be measured and recorded separately. For example, a 2.5 m^2 (27.0 ft^2) patch may have 1 m^2 (11 ft^2) of medium severity and 1.5 m^2 (16 ft^2) of low severity. These areas would be recorded separately. Any distress found in a patched area will not be recorded; however, its effect on the patch will be considered when determining the patch's severity level. No other distresses, for example, are recorded within a patch. Even if the patch material is shoving or cracking, the area is rated only as a patch. If a large amount of pavement has been replaced, it should not be recorded as a patch but considered as new pavement, for example, replacement of a complete intersection.

POLISHED AGGREGATE

X1.16 *Description*—This distress is caused by repeated traffic applications. Polished aggregate is present when close examination of a pavement reveals that the portion of aggregate extending above the asphalt is either very small, or there are no rough or angular aggregate particles to provide good skid resistance. When the aggregate in the surface becomes smooth to the touch, adhesion with vehicle tires is considerably reduced. When the portion of aggregate extending above the surface is small, the pavement texture does not significantly contribute to reducing vehicle speed. Polished aggregate should be counted when close examination reveals that the aggregate extending above the asphalt is negligible, and the surface aggregate is smooth to the touch. This type of distress is indicated when the number on a skid resistance test is low or has dropped significantly from a previous rating.

X1.16.1 *Severity Levels*—No degrees of severity are defined; however, the degree of polishing should be clearly evident in the sample unit in that the aggregate surface should be smooth to the touch (Fig. X1.34).

X1.16.2 *How to Measure*—Polished aggregate is measured in square meters (square feet) of surface area. If bleeding is counted, polished aggregate should not be counted.

POTHOLES

X1.17 *Description*—Potholes are small—usually less than 750 mm (30 in.) in diameter—bowl-shaped depressions in the pavement surface. They generally have sharp edges and vertical sides near the top of the hole. When holes are created by high-severity alligator cracking, they should be identified as potholes, not as weathering.

X1.17.1 *Severity Levels*:

X1.17.1.1 The levels of severity for potholes less than 750 mm (30 in.) in diameter are based on both the diameter and the depth of the pothole, according to Table X1.1.

X1.17.1.2 If the pothole is more than 750 mm (30 in.) in diameter, the area should be determined in square feet and divided by 0.5 m^2 (5.5 ft^2) find the equivalent number of holes. If the depth is 25 mm (1 in.) or less, the holes are considered medium-severity. If the depth is more than 25 mm (1 in.), they are considered high-severity (Figs. X1.35-X1.37).

X1.17.2 *How to Measure*—Potholes are measured by counting the number that are low-, medium-, and high-severity and recording them separately.

RAILROAD CROSSING

X1.18 *Description*—Railroad crossing defects are depressions or bumps around, or between tracks, or both.

X1.18.1 *Severity Levels*:

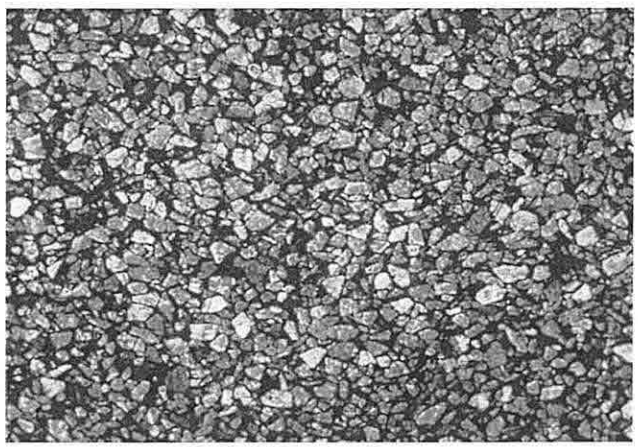


FIG. X1.34 Polished Aggregate

TABLE X1.1 Levels of Severity for Potholes

Maximum Depth of Pothole	Average Diameter (mm) (in.)		
	100 to 200 mm (4 to 8 in.)	200 to 450 mm (8 to 18 in.)	450 to 750 mm (18 to 30 in.)
13 to ≤25 mm (½ to 1 in.)	L	L	M
>25 and ≤50 mm (1 to 2 in.)	L	M	H
>50 mm (2 in.)	M	M	H

FIG. X1.35 Low-Severity Pothole

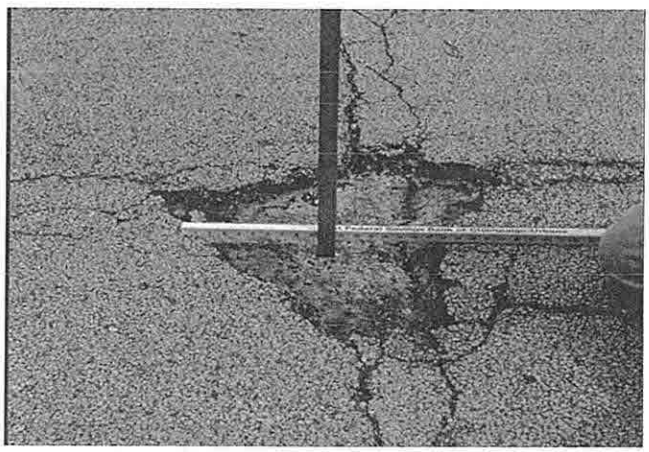


FIG. X1.36 Medium-Severity Pothole

X1.18.1.1 **L**—Railroad crossing causes low-severity ride quality (Fig. X1.38).

X1.18.1.2 **M**—Railroad crossing causes medium-severity ride quality (Fig. X1.39).

X1.18.1.3 **H**—Railroad crossing causes high-severity ride quality (Fig. X1.40).

X1.18.2 *How to Measure*—The area of the crossing is measured in square meters (square feet) of surface area. If the crossing does not affect ride quality, it should not be counted. Any large bump created by the tracks should be counted as part of the crossing.

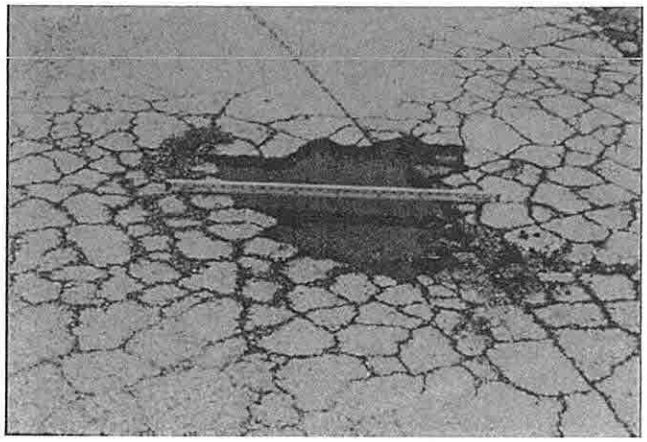


FIG. X1.37 High-Severity Pothole

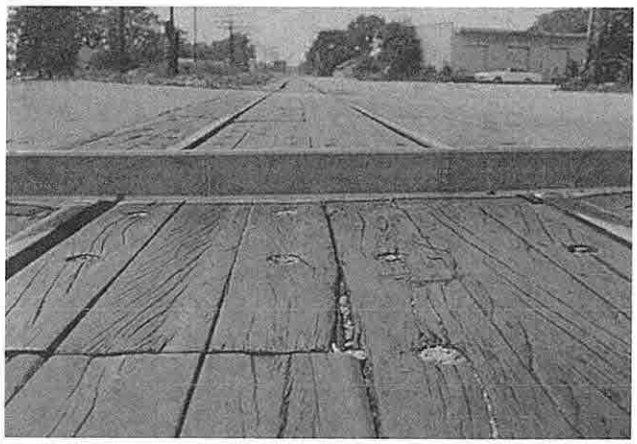


FIG. X1.38 Low-Severity Railroad Crossing

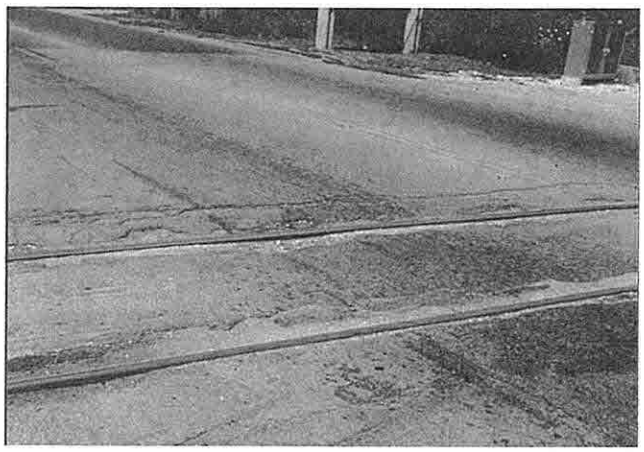


FIG. X1.39 Medium-Severity Railroad Crossing

RUTTING

X1.19 *Description*—A rut is a surface depression in the wheel paths. Pavement uplift may occur along the sides of the rut, but, in many instances, ruts are noticeable only after a

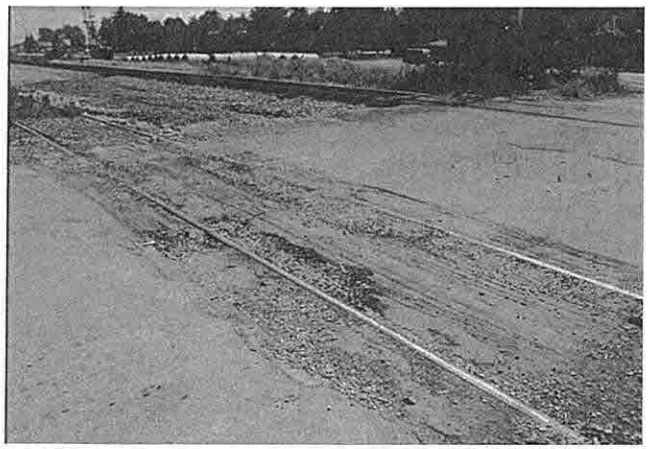


FIG. X1.40 High-Severity Railroad Crossing

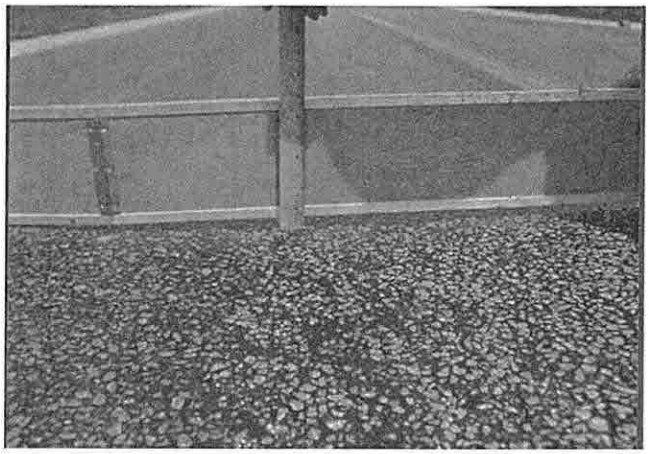


FIG. X1.42 Medium-Severity Rutting

rainfall when the paths are filled with water. Rutting stems from a permanent deformation in any of the pavement layers or subgrades, usually caused by consolidated or lateral movement of the materials due to traffic load.

X1.19.1 *Severity Levels (Mean Rut Depth)*:

X1.19.1.1 **L**—6 to 13 mm (¼ to ½ in.) (Fig. X1.41).

X1.19.1.2 **M**—>13 to 25 mm (>½ to 1 in.) (Fig. X1.42).

X1.19.1.3 **H**—>25 mm (>1 in.) (Fig. X1.43).

X1.19.2 *How to Measure*—Rutting is measured in square meters (square feet) of surface area, and its severity is determined by the mean depth of the rut (see X1.19.1.1-X1.19.1.3). The mean rut depth is calculated by laying a straight edge across the rut, measuring its depth, then using measurements taken along the length of the rut to compute its mean depth in millimeters.

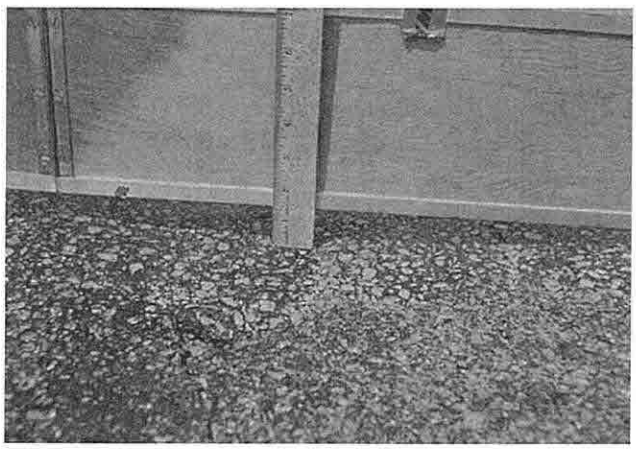


FIG. X1.43 High-Severity Rutting

SHOVING

X1.20 *Description*:

X1.20.1 Shoving is a permanent, longitudinal displacement of a localized area of the pavement surface caused by traffic loading. When traffic pushes against the pavement, it produces a short, abrupt wave in the pavement surface. This distress normally occurs only in unstable liquid asphalt mix (cutback or emulsion) pavements.

X1.20.2 Shoves also occur where asphalt pavements abut PCC pavements. The PCC pavements increase in length and push the asphalt pavement, causing the shoving.

X1.20.3 *Severity Levels*:

X1.20.3.1 **L**—Shove causes low-severity ride quality (Fig. X1.44).

X1.20.3.2 **M**—Shove causes medium-severity ride quality (Fig. X1.45).

X1.20.3.3 **H**—Shove causes high-severity ride quality (Fig. X1.46).

X1.20.4 *How to Measure*—Shoves are measured in square meters (feet) of surface area. Shoves occurring in patches are considered in rating the patch, not as a separate distress.

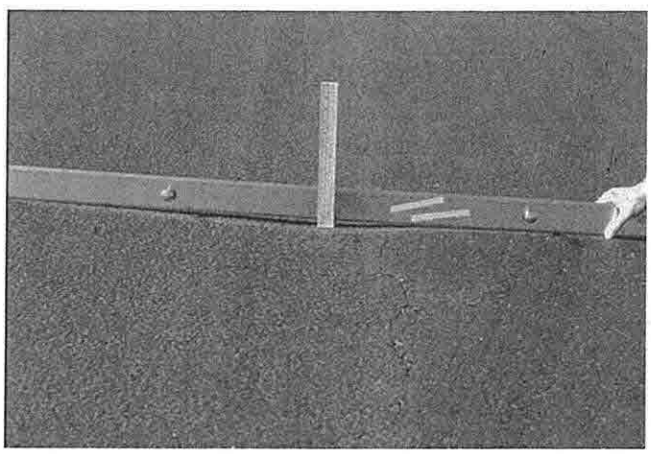


FIG. X1.41 Low-Severity Rutting

SLIPPAGE CRACKING

X1.21 *Description*—Slippage cracks are crescent or half-moon shaped cracks, usually transverse to the direction of travel. They are produced when braking or turning wheels cause the pavement surface to slide or deform. This distress usually occurs in overlaps when there is a poor bond between the surface and the next layer of the pavement structure.

FIG. X1.44 Low-Severity Shoving

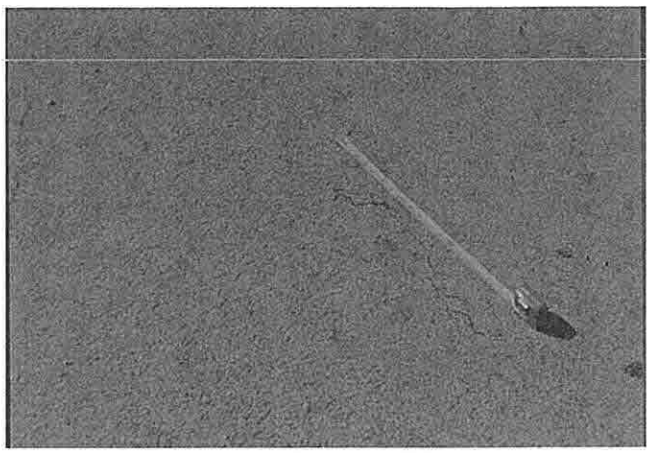


FIG. X1.47 Low-Severity Slippage Cracking

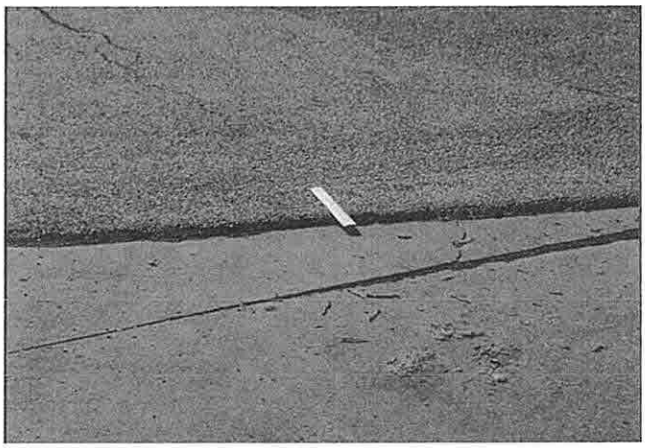


FIG. X1.45 Medium-Severity Shoving

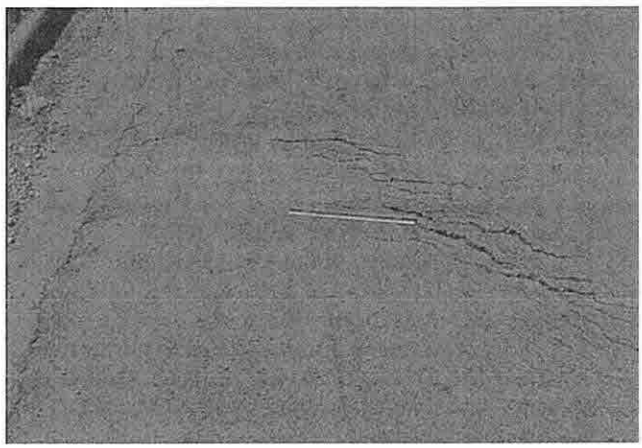


FIG. X1.48 Medium-Severity Slippage Cracking

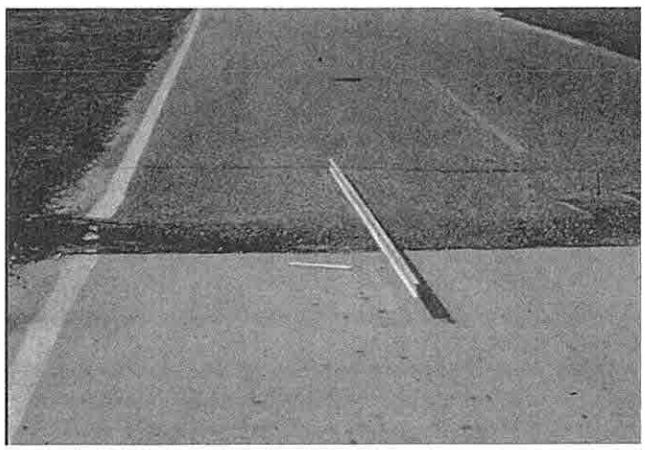


FIG. X1.46 High-Severity Shoving

X1.21.1 *Severity Level*:

X1.21.1.1 **L**—Average crack width is < 10 mm (⅜ in.) (Fig. X1.47).

X1.21.1.2 **M**—One of the following conditions exists (Fig. X1.48): average crack width is ≥ 10 and < 40 mm (≥ ⅜ and< 1-½ in.); or the area around the crack is moderately spalled, or surrounded with secondary cracks.

X1.21.1.3 **H**—One of the following conditions exists (Fig. X1.49): the average crack width is > 40 mm (1-½ in.) or the area around the crack is broken into easily removed pieces.

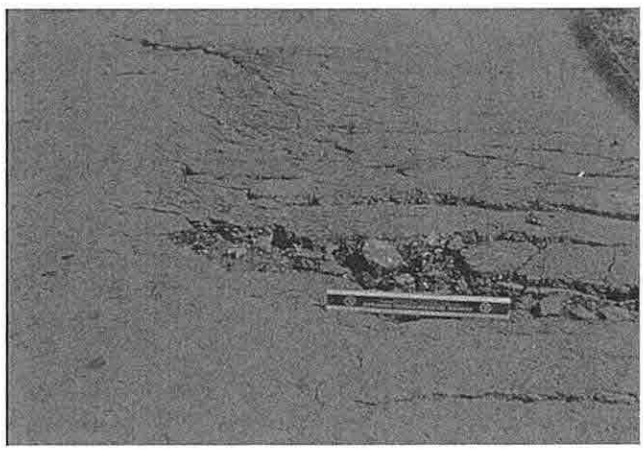


FIG. X1.49 High-Severity Slippage Cracking

X1.21.2 *How to Measure*—The area associated with a given slippage crack is measured in square meters (square feet) and rated according to the highest level of severity in the area.

SWELL

X1.22 *Description*—Swell is characterized by an upward bulge in the pavement's surface, a long, gradual wave more than 3 m (10 ft) long (Fig. X1.50). Swelling can be accompanied by surface cracking. This distress usually is caused by frost action in the subgrade or by swelling soil.

X1.22.1 *Severity Level*:

X1.22.1.1 **L**—Swell causes low-severity ride quality. Low-severity swells are not always easy to see but can be detected by driving at the speed limit over the pavement section. An upward motion will occur at the swell if it is present.

X1.22.1.2 **M**—Swell causes medium-severity ride quality.

X1.22.1.3 **H**—Swell causes high-severity ride quality.

X1.22.2 *How to Measure*—The surface area of the swell is measured in square meters (square feet).

WEATHERING AND RAVELING

X1.23 *Description*—Weathering and raveling are the wearing away of the pavement surface due to a loss of asphalt or tar binder and dislodged aggregate particles. These distresses indicate that either the asphalt binder has hardened appreciably or that a poor-quality mixture is present. In addition, raveling may be caused by certain types of traffic, for example, tracked vehicles. Softening of the surface and dislodging of the aggregates due to oil spillage also are included under raveling.

X1.23.1 *Severity Levels*:

X1.23.1.1 **L**—Aggregate or binder has started to wear away. In some areas, the surface is starting to pit (Fig. X1.51). In the case of oil spillage, the oil stain can be seen, but the surface is hard and cannot be penetrated with a coin.

X1.23.1.2 **M**—Aggregate or binder has worn away. The surface texture is moderately rough and pitted (Fig. X1.52). In the case of oil spillage, the surface is soft and can be penetrated with a coin.

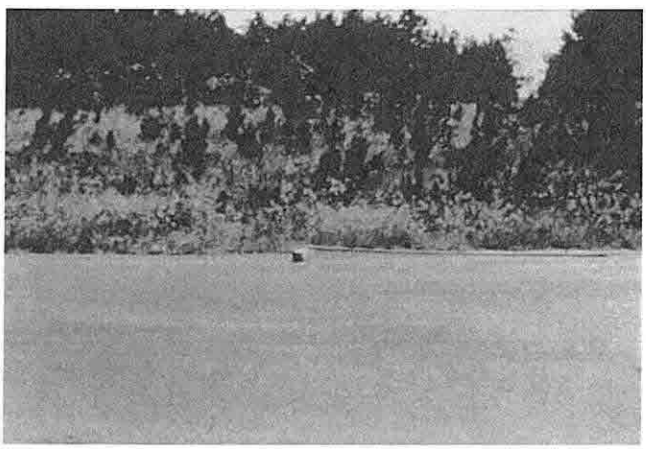


FIG. X1.50 Example Swell. Severity level is based on ride quality criteria.

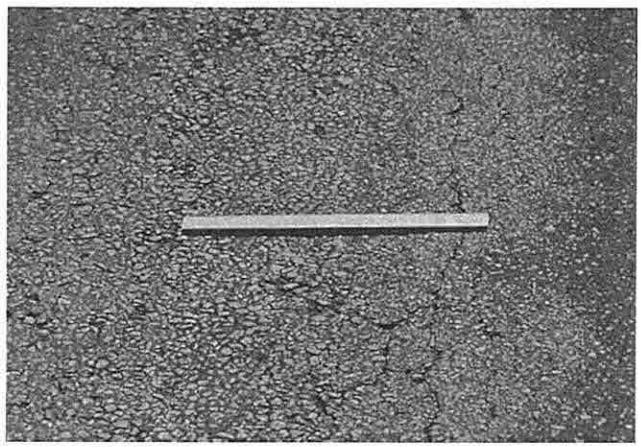


FIG. X1.51 Low-Severity Weathering and Raveling

FIG. X1.52 Medium-Severity Weathering and Raveling

X1.23.1.3 **H**—Aggregate or binder has been worn away considerably. The surface texture is very rough and severely pitted. The pitted areas are less than 10 mm (4 in.) in diameter and less than 13 mm (½ in.) deep (Fig. X1.53); pitted areas larger than this are counted as potholes. In the case of oil

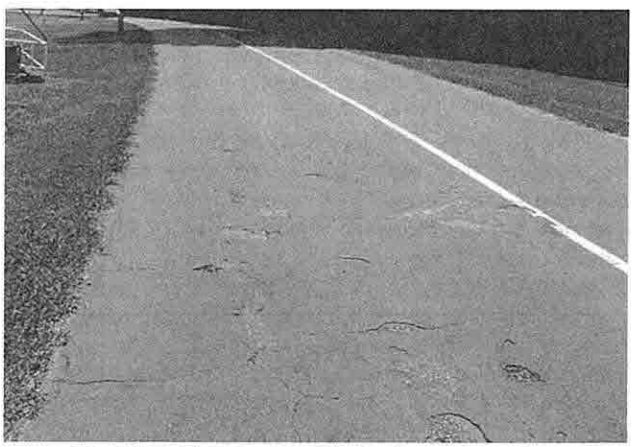


FIG. X1.53 High-Severity Weathering and Raveling

spillage, the asphalt binder has lost its binding effect and the aggregate has become loose.

X1.23.2 *How to Measure*—Weathering and raveling are measured in square meters (square feet) of surface area.

X2. DISTRESS IN JOINTED CONCRETE PAVEMENTS

X2.1 This Appendix lists alphabetically 19 distress types for jointed concrete pavements. Distress definitions apply to both plain and reinforced jointed concrete pavements, with the exception of linear cracking distress, which is defined separately for plain and reinforced jointed concrete.

X2.1.1 During the field condition surveys and validation of the PCI, several questions often are asked about the identification and counted method of some of the distresses. Answers to these questions are included under the heading "How to Count." For convenience, however, the most frequently raised issues are addressed below.

X2.1.1.1 Faulting is counted only at joints. Faulting associated with cracks is not counted separately since it is incorporated into the severity-level definitions of cracks. Crack definitions are also used in defining corner breaks and divided slabs.

X2.1.1.2 Joint seal damage is not counted on a slab-by-slab basis. Instead, a severity level is assigned based on the overall condition of the joint seal in the area.

X2.1.1.3 Cracks in reinforced concrete slabs that are less than ⅛ in. wide are counted as shrinkage cracks. Shrinkage cracks should not be counted to determine if the slab is broken into four or more pieces.

X2.1.1.4 Low-severity scaling, that is, crazing, should only be counted if there is evidence that future scaling is likely to occur.

X2.1.2 The user should note that the items above are general issues and do not stand alone as inspection criteria. To measure each distress type properly, the inspector must be familiar with the individual distress criteria.

X2.2 *Ride Quality*:

X2.2.1 Ride quality must be evaluated in order to establish a severity level for the following distress types:

X2.2.1.1 Blowup/buckling.

X2.2.1.2 Railroad crossings.

X2.2.2 To determine the effect these distresses have on ride quality, the inspector should drive at the normal operating speed and use the following severity-level definitions of ride quality:

X2.2.2.1 **L**—Low. Vehicle vibrations, for example, from corrugation, are noticeable, but no reduction in speed is necessary for comfort or safety, or individual bumps or settlements, or both, cause the vehicle to bounce slightly but create little discomfort.

X2.2.2.2 **M**—Medium. Vehicle vibrations are significant and some reduction in speed is necessary for safety and comfort, or individual bumps or settlements cause the vehicle to bounce significantly, or both, creating some discomfort.

X2.2.2.3 **H**—High. Vehicle vibrations are so excessive that speed must be reduced considerably for safety and comfort, or individual bumps or settlements, or both, cause the vehicle to bounce excessively, creating substantial discomfort, a safety hazard, or high potential vehicle damage, or a combination thereof.

X2.2.3 The inspector should drive at the posted speed in a sedan that is representative of cars typically seen in local traffic. Pavement sections near stop signs should be rated at a deceleration speed appropriate for the intersection.

BLOWUP/BUCKLING

X2.3 *Description*—Blowups or buckles occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit slab expansion. The insufficient width usually is caused by infiltration of incompressible materials into the joint space. When expansion cannot relieve enough pressure, a localized upward movement of the slab edges (buckling) or shattering will occur in the vicinity of the joint. Blowups also can occur at utility cuts and drainage inlets.

X2.3.1 *Severity Levels*:

X2.3.1.1 **L**—Buckling or shattering causes low-severity ride quality (Fig. X2.1).

X2.3.1.2 **M**—Buckling or shattering causes medium-severity ride quality (Fig. X2.2).

X2.3.1.3 **H**—Buckling or shattering causes high-severity ride quality (Fig. X2.3).

X2.3.2 *How to Count*—At a crack, a blowup is counted as being in one slab; however, if the blowup occurs at a joint and affects two slabs, the distress should be recorded as occurring in two slabs. When a blowup renders the pavement impassable, it should be repaired immediately.

CORNER BREAK

X2.4 *Description*—A corner break is a crack that intersects the joints at a distance less than or equal to one-half the slab length on both sides, measured from the corner of the slab. For

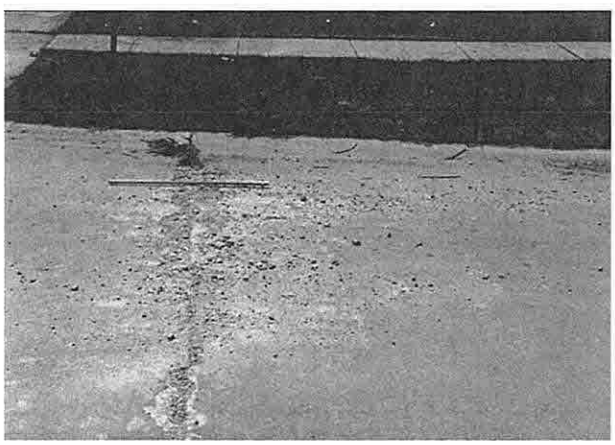


FIG. X2.1 Low Severity Blowup/Buckling

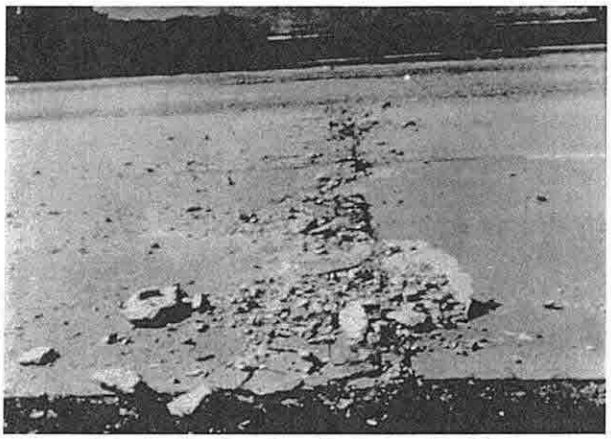


FIG. X2.2 Medium Severity Blowup/Buckling

FIG. X2.3 High-Severity Blowup/Buckling

example, a slab measuring 3.5 by 6.0 m (11.5 by 20.0 ft) that has a crack 1.5 m (5 ft) on one side and 3.5 m (11.5 ft) on the other side is not considered a corner break; it is a diagonal crack. However, a crack that intersects 0.5 m (4 ft) on one side and 2.5 m (8 ft) on the other is considered a corner break. A corner break differs from a corner spall in that the crack extends vertically through the entire slab thickness, whereas a corner spall intersects the joint at an angle. Load repetition combined with loss of support and curling stresses usually cause corner breaks.

X2.4.1 *Severity Levels*—

X2.4.1.1 **L**—Break is defined by a low-severity[4] crack. A low severity crack is < 13 mm (½ in.), cracks of any width with satisfactory filler; no faulting. The area between the break and the joints is not cracked or may be lightly cracked (Fig. X2.4).

X2.4.1.2 **M**—Break is defined by a medium-severity[4] crack, or the area between the break and the joints, or both, has a medium crack. A medium severity crack is a nonfilled crack > 13 mm and < 50 mm (>½ in. and < 2 in.), a nonfilled crack < 50 mm (2 in.) with faulting < 10 mm (⅜ in.), or a any filled crack with faulting < 10 mm (⅜ in.) (Fig. X2.5).

X2.4.1.3 **H**—Break is defined by a high-severity[4] crack, or the area between the break and the joints, or both, is highly cracked. A high severity crack is a nonfilled crack >50 mm (2 in.) wide, or any filled or nonfilled crack with faulting >10 mm (⅜ in.) (Fig. X2.6).

X2.4.2 *How to Count*—Distressed slab is recorded as one slab if it:

X2.4.2.1 A single corner break.

X2.4.2.2 More than one break of a particular severity.

X2.4.2.3 Two or more breaks of different severities. For two or more breaks, the highest level of severity should be recorded. For example, a slab containing both low- and medium-severity corner breaks should be counted as one slab with a medium corner break.

FIG. X2.4 Low-Severity Corner Break

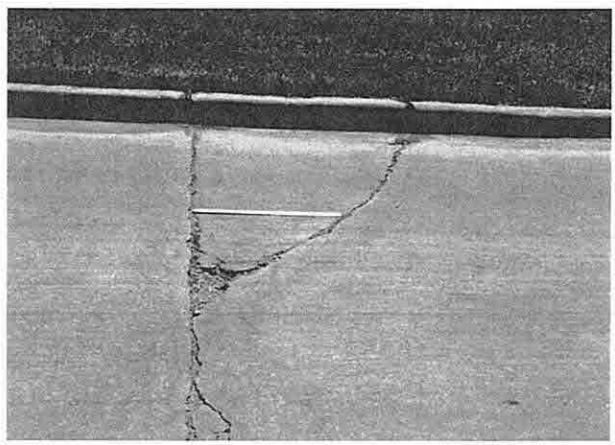


FIG. X2.5 Medium-Severity Corner Break

[4] The above crack severity definitions are for nonreinforced slabs. For reinforced slabs, see *linear cracking*.

FIG. X2.6 High-Severity Corner Break

FIG. X2.7 Low-Severity Divided Slab

DIVIDED SLAB

X2.5 *Description*—Slab is divided by cracks into four or more pieces due to overloading, or inadequate support, or both. If all pieces or cracks are contained within a corner break, the distress is categorized as a severe corner break.

X2.5.1 *Severity Levels*—Table X2.1 lists severity levels for divided slabs. Examples are shown in Figs. X2.7-X2.9.

X2.5.2 *How to Count*—If the divided slab is medium- or high-severity, no other distress is counted for that slab.

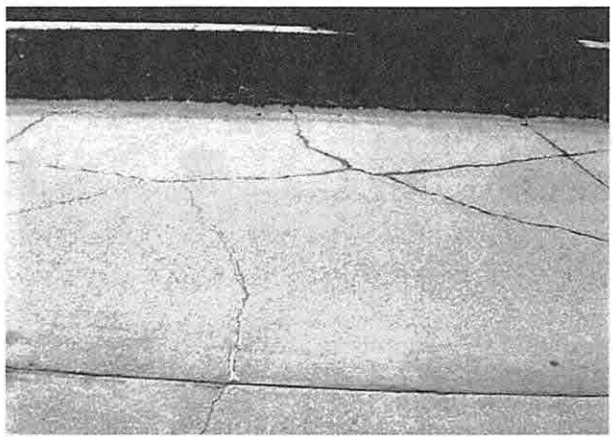


FIG. X2.8 Medium-Severity Divided Slab

DURABILITY ("D") CRACKING

X2.6 *Description*—"D" cracking is caused by freeze-thaw expansion of the large aggregate, which, over time, gradually breaks down the concrete. This distress usually appears as a pattern of cracks running parallel and close to a joint or linear crack. Since the concrete becomes saturated near joints and cracks, a dark-colored deposit can usually be found around fine" D" cracks. This type of distress may eventually lead to disintegration of the entire slab.

X2.6.1 *Severity Levels*:

X2.6.1.1 *L*—"D" cracks cover less than 15 % of slab area. Most of the cracks are tight, but a few pieces may be loose and or missing (Fig. X2.10).

X2.6.1.2 **M**—One of the following conditions exists (Fig. X2.11): "D" cracks cover less than 15 % of the area and most of the pieces are loose and or missing, or "D" cracks cover more than 15 % of the area. Most of the cracks are tight, but a few pieces may be loose and or missing.

X2.6.1.3 *H*—"D" cracks cover more than 15 % of the area and most of the pieces have come out or could be removed easily (Fig. X2.12).

FIG. X2.9 High-Severity Divided Slab

TABLE X2.1 Levels of Severity for Faulting

Severity Level	Difference of Elevation
L	>3 and <10 mm (>⅛ and <⅜ in.)
M	>10 and <20 mm (>⅜ and <¾ in.)
H	>20 mm (>¾ in.)

X2.6.2 *How to Count*—When the distress is located and rated at one severity, it is counted as one slab. If more than one severity level exists, the slab is counted as having the higher severity distress. For example, if low and medium "D" cracking are on the same slab, the slab is counted as medium-severity cracking only.

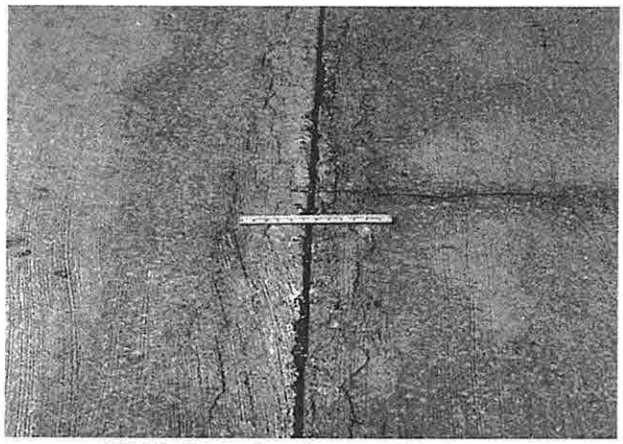


FIG. X2.10 Low-Severity Durability Cracking

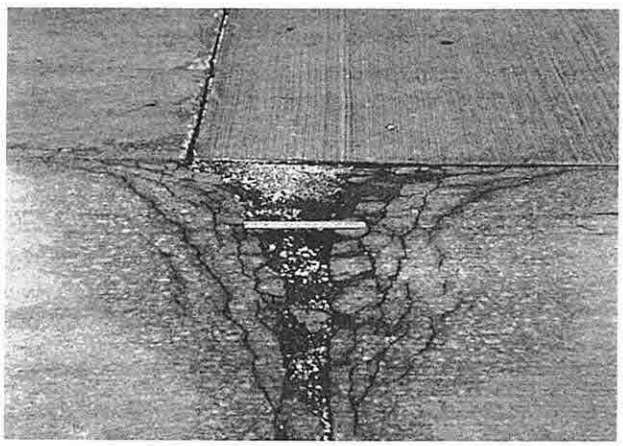


FIG. X2.11 Medium-Severity Durability Cracking

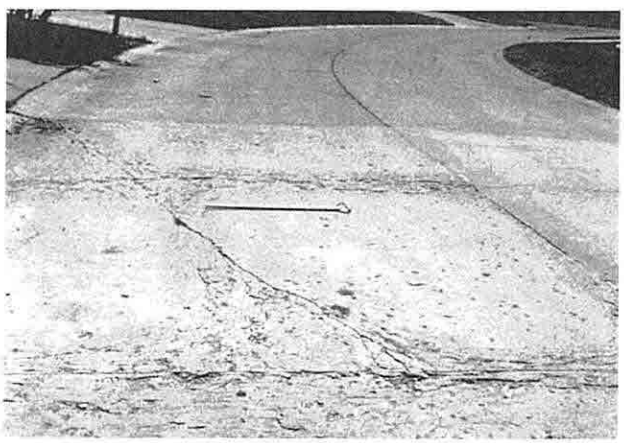


FIG. X2.12 High-Severity Durability Cracking

FAULTING

X2.7 *Description*:

X2.7.1 Faulting is the difference in elevation across a joint. Some common causes of faulting are as follows:

X2.7.1.1 Settlement because of soft foundation.

X2.7.1.2 Pumping or eroding of material from under the slab.

X2.7.1.3 Curling of the slab edges due to temperature and moisture changes.

X2.7.2 *Severity Levels*—Severity levels are defined by the difference in elevation across the joint as indicated in Table X2.2. Figs. X2.13-X2.15 show examples of the different severity levels.

X2.7.3 *How to Count*—Faulting across a joint is counted as one slab. Only affected slabs are counted. Faults across a crack are not counted as distress but are considered when defining crack severity.

JOINT SEAL DAMAGE

X2.8 *Description*:

X2.8.1 Joint seal damage is any condition that enables soil or rocks to accumulate in the joints or allows significant water infiltration. Accumulation of incompressible materials prevents the slab from expanding and may result in buckling, shattering, or spalling. A pliable joint filler bonded to the edges of the slabs protects the joints from material accumulation and prevents water from seeping down and softening the foundation supporting the slab. Typical types of joint seal damage are as follows:

X2.8.1.1 Stripping of joint sealant.

X2.8.1.2 Extrusion of joint sealant.

X2.8.1.3 Weed growth.

X2.8.1.4 Hardening of the filler (oxidation).

X2.8.1.5 Loss of bond to the slab edges.

X2.8.1.6 Lack or absence of sealant in the joint.

X2.8.2 *Severity Levels*:

X2.8.2.1 **L**—Joint sealant is in generally good condition throughout section (Fig. X2.16). Sealant is performing well, with only minor damage (see X2.8.1.1-X2.8.1.6). Joint seal damage is at low severity if a few of the joints have sealer, which has debonded from, but is still in contact with, the joint edge. This condition exists if a knife blade can be inserted between sealer and joint face without resistance.

X2.8.2.2 **M**—Joint sealant is in generally fair condition over the entire section, with one or more of the above types of damage occurring to a moderate degree. Sealant needs replacement within two years (Fig. X2.17). Joint seal damage is at medium severity if a few of the joints have any of the following conditions: joint sealer is in place, but water access is possible through visible openings no more than 3 mm (⅛ in.) wide. If a knife blade cannot be inserted easily between sealer and joint face, this condition does not exist; pumping debris are evident at the joint; joint sealer is oxidized and "lifeless" but pliable (like a rope), and generally fills the joint opening; or, vegetation in the joint is obvious but does not obscure the joint opening.

TABLE X2.2 Levels of Severity for Punchouts

Severity of the Majority of Cracks	Number of Pieces		
	2 to 3	4 to 5	>5
L	L	L	M
M	L	M	H
H	M	H	H

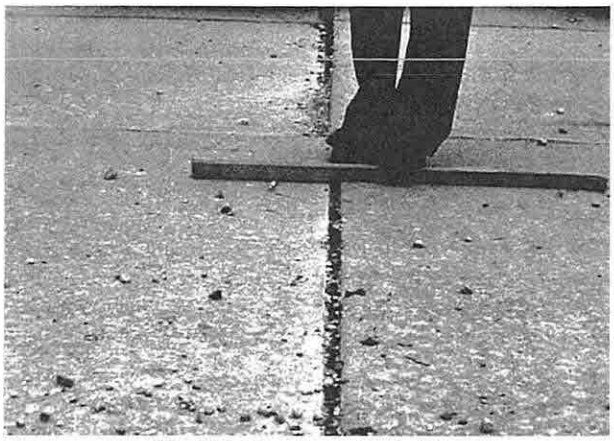


FIG. X2.13 Low-Severity Faulting

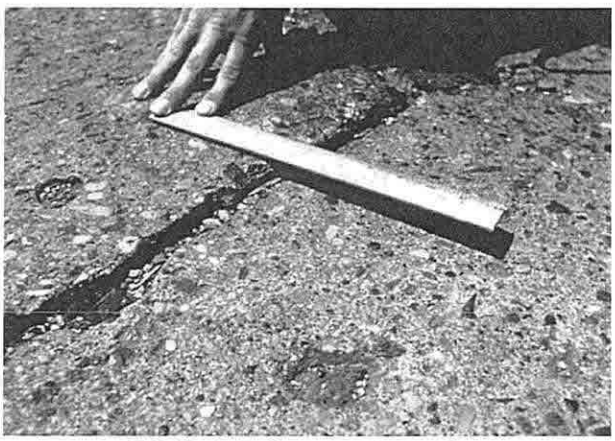


FIG. X2.14 Medium-Severity Faulting

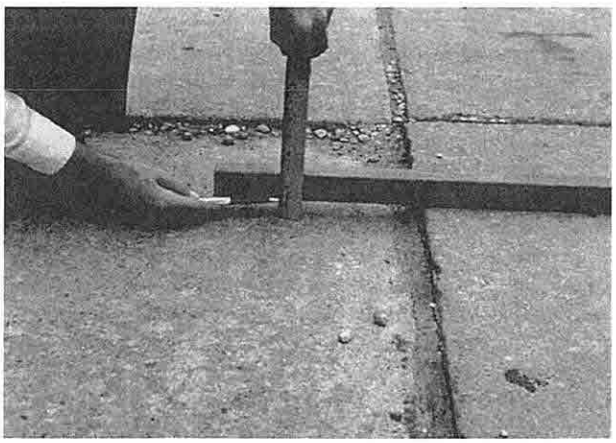


FIG. X2.15 High-Severity Faulting

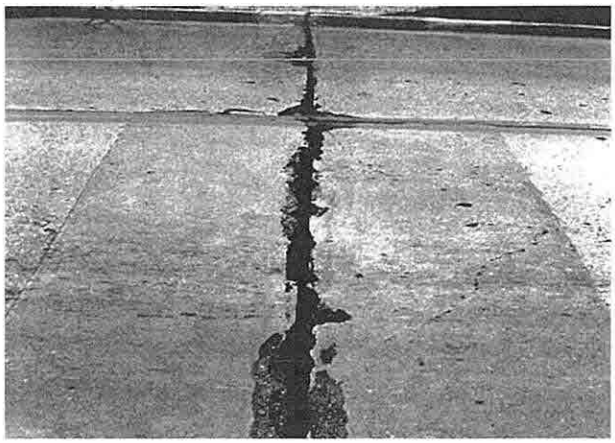


FIG. X2.16 Low-Severity Joint Seal Damage

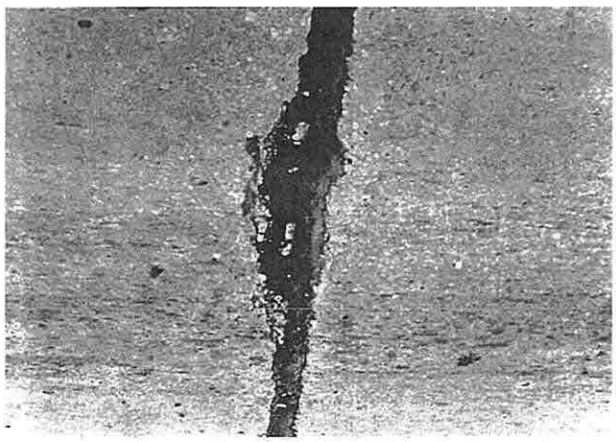


FIG. X2.17 Medium-Severity Joint Seal Damage

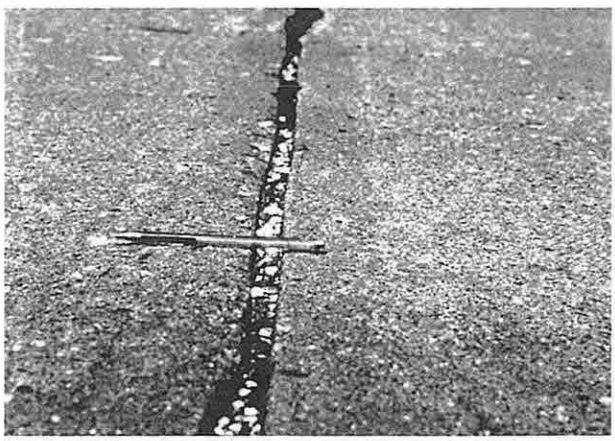


FIG. X2.18 High-Severity Joint Seal Damage

X2.8.2.3 **H**—Joint sealant is in generally poor condition over the entire section, with one or more of the above types of damage occurring to a severe degree. Sealant needs immediate replacement (Fig. X2.18). Joint seal damage is at high severity if 10 % or more of the joint sealer exceeds limiting criteria listed above or if 10 % or more of sealer is missing.

X2.8.3 *How to Count*—Joint seal damage is not counted on a slab-by-slab basis but is rated based on the overall condition of the sealant over the entire area.

LANE/SHOULDER DROP-OFF

X2.9 *Description*—Lane/shoulder drop-off is the difference

between the settlement or erosion of the shoulder and the pavement travel-lane edge. The elevation difference can be a safety hazard, and it also can cause increased water infiltration.

X2.9.1 *Severity Levels*:

X2.9.1.1 **L**—The difference between the pavement edge and shoulder is >25 and ≤50 mm (>1 and ≤2 in.) (Fig. X2.19).

X2.9.1.2 **M**—The difference in elevation is >50 and ≤100 mm (>2 and ≤4 in.) (Fig. X2.20).

X2.9.1.3 **H**—The difference in elevation is >100 mm (>4 in.) (Fig. X2.21).

X2.9.2 *How to Count*—The mean lane/shoulder drop-off is computed by averaging the maximum and minimum drop along the slab. Each slab exhibiting distress is measured separately and counted as one slab with the appropriate severity level.

LINEAR CRACKING
(Longitudinal, Transverse, and Diagonal Cracks)

X2.10 *Description*—These cracks, which divide the slab into two or three pieces, usually are caused by a combination of repeated traffic loading, thermal gradient curling, and repeated moisture loading. (Slabs divided into four or more pieces are counted as divided slabs.) Hairline cracks that are only a few feet long and do not extend across the entire slab, are counted as shrinkage cracks.

X2.10.1 *Severity Levels (Nonreinforced Slabs)*:

X2.10.1.1 **L**—Nonfilled[4] cracks ≤ 13 mm (≤ ½ in.) or filled cracks of any width with the filler in satisfactory condition. No faulting exists (Fig. X2.22).

X2.10.1.2 **M**—One of the following conditions exists: nonfilled crack with a width >13 and ≤50 mm (>½ and ≤ 2 in.); nonfilled crack of any width ≤ 50 mm (2 in.) with faulting of <10 mm (⅜ in.), or filled crack of any width with faulting <10 mm (⅜ in.) (Fig. X2.23).

X2.10.1.3 **H**—One of the following conditions exists: nonfilled crack with a width >50 mm (2 in.), or filled or nonfilled crack of any width with faulting >10 mm (⅜ in.) (Fig. X2.24).

X2.10.2 *Reinforced Slabs*:

X2.10.2.1 **L**—Nonfilled cracks ≥ 3 and < 25 mm (≥ ⅛ to < 1 in.) wide; filled crack of any width with the filler in satisfactory condition. No faulting exists.

FIG. X2.19 Low-Severity Lane/Shoulder Drop-Off

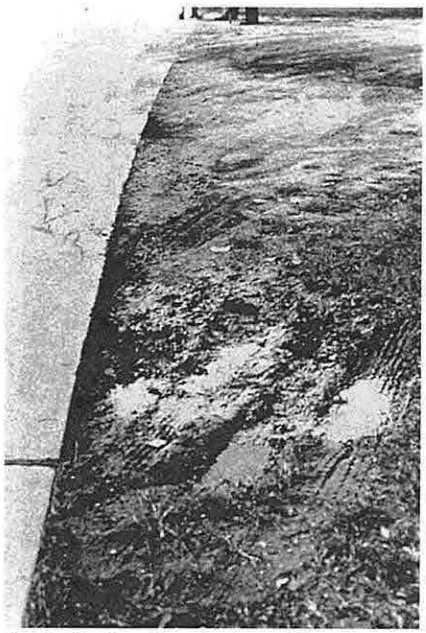


FIG. X2.20 Medium-Severity Lane/Shoulder Drop-Off

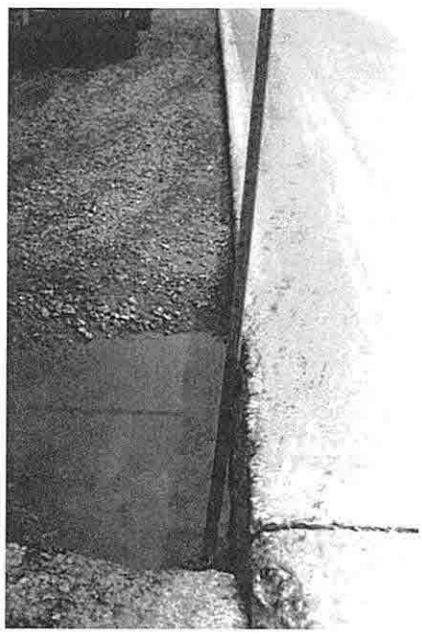


FIG. X2.21 High-Severity Lane/Shoulder Drop-Off

X2.10.2.2 **M**—One of the following conditions exists: nonfilled cracks with a width ≥ 25 and < 75 mm (≥ 1 and < 3 in.) and no faulting; nonfilled crack of any width ≤ 75 mm (3 in.) with ≤ 10 mm (⅜ in.) of faulting, or filled crack of any width with ≤ 10 mm (⅜ in.) faulting.

X2.10.2.3 **H**—Once of the following conditions exists: nonfilled crack >75 mm (3 in.) wide, or filled or nonfilled crack of any width with faulting >10 mm (⅜ in.).

X2.10.3 *How to Count*—One the severity has been identified, the distress is recorded as one slab. If two medium severity cracks are within one slab, the slab is counted as

FIG. X2.22 Low-Severity Linear Cracking

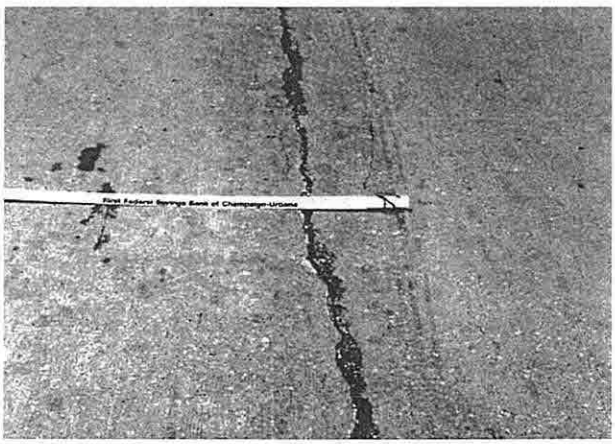


FIG. X2.23 Medium-Severity Linear Cracking

having one high-severity crack. Slabs divided into four or more pieces are counted as divided slabs. In reinforced slabs, cracks <3 mm (⅛ in.) wide are counted as shrinkage cracks. Slabs longer than 9 m (29.5 ft) are divided into approximately equal length" slabs" having imaginary joints assumed to be in perfect condition.

PATCHING, LARGE (MORE THAN 0.5 M^2 [5.5 FT^2]) AND UTILITY CUTS

X2.11 *Description*—A patch is an area where the original pavement has been removed and replaced by filler material. A utility cut is a patch that has replaced the original pavement to allow the installation or maintenance of underground utilities. The severity levels of a utility cut are assessed according to the same criteria as large patching.

X2.11.1 *Severity Levels*:

FIG. X2.24 High-Severity Linear Cracking

X2.11.1.1 **L**—Patch is functioning well, with little or no deterioration (Fig. X2.25).

X2.11.1.2 **M**—Patch is moderately deteriorated, or moderate spalling can be seen around the edges, or both. Patch material can be dislodged with considerable effort (Fig. X2.26).

X2.11.1.3 **H**—Patch is badly deteriorated. The extent of the deterioration warrants replacement (Fig. X2.27).

X2.11.2 *How to Count*—If a single slab has one or more patches with the same severity level, it is counted as one slab containing that distress. If a single slab has more than one severity level, it is counted as one slab with the higher severity level.

PATCHING, SMALL (LESS THAN 0.5 M^2 [5.5 FT^2])

X2.12 *Description*—A patch is an area where the original pavement has been removed and replaced by a filler material.

X2.12.1 *Severity Levels*:

X2.12.1.1 **L**—Patch is functioning well with little or no deterioration (Fig. X2.28).

X2.12.1.2 **M**—Patch is moderately deteriorated. Patch material can be dislodged with considerable effort (Fig. X2.29).

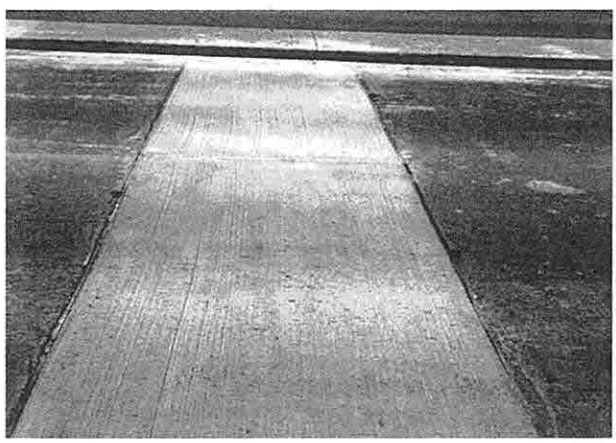


FIG. X2.25 Low-Severity Patching, Large and Utility Cuts

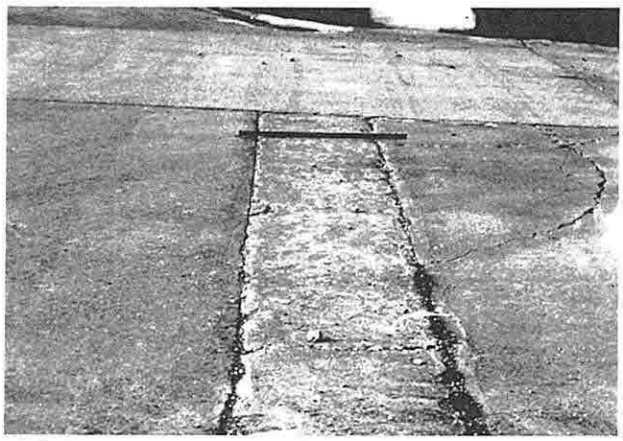


FIG. X2.26 Medium-Severity Patching, Large and Utility Cuts

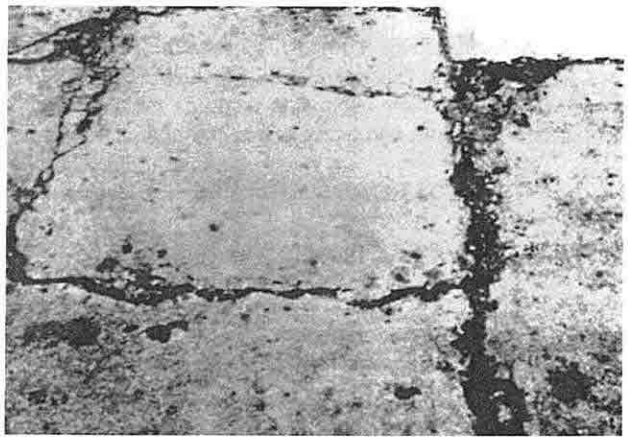


FIG. X2.27 High-Severity Patching, Large and Utility Cuts

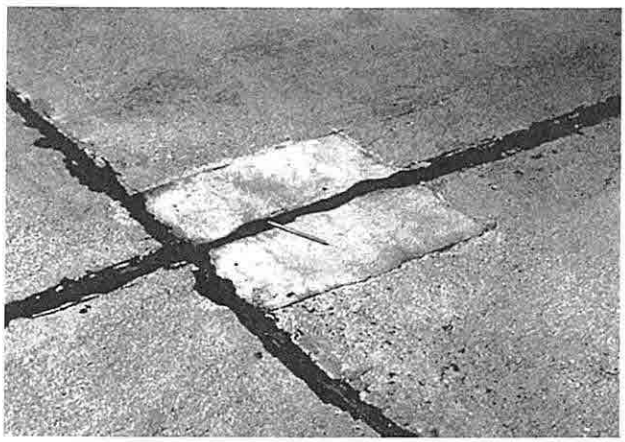


FIG. X2.28 Low-Severity Patching, Small

X2.12.1.3 **H**—Patch is badly deteriorated. The extent of deterioration warrants replacement (Fig. X2.30).

X2.12.2 *How to Count*—If a single slab has one or more patches with the same severity level, it is counted as one slab containing that distress. If a single slab has more than one severity level, it is counted as one slab with the higher severity level.

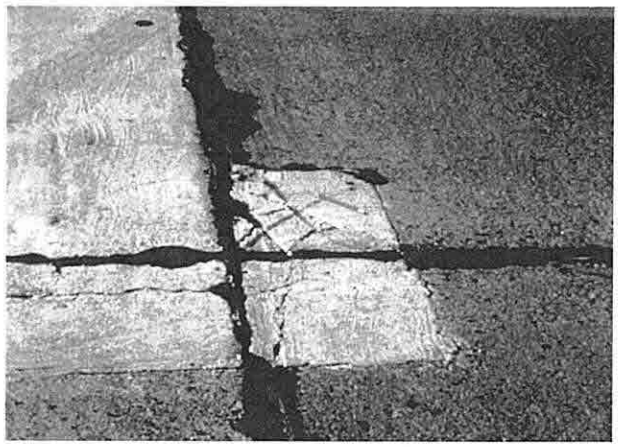


FIG. X2.29 Medium-Severity Patching, Small

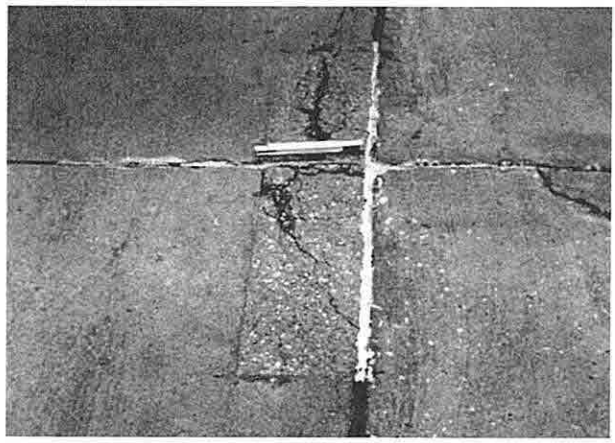


FIG. X2.30 High-Severity Patching, Small

POLISHED AGGREGATE

X2.13 *Description*—This distress is caused by repeated traffic applications. Polished aggregate is present when close examination of a pavement reveals that the portion of aggregate extending above the asphalt is either very small, or there are no rough or angular aggregate particles to provide good skid resistance.

X2.13.1 *Severity Levels*—No degrees of severity are defined; however, the degree of polishing should be significant before it is included in the condition survey and rated as a defect (Fig. X2.31).

X2.13.2 *How to Count*—A slab with polished aggregate is counted as one slab.

POPOUTS

X2.14 *Description*—A popout is a small piece of pavement that breaks loose from the surface due to freeze-thaw action, combined with expansive aggregates. Popouts usually range in diameter from approximately 25 to 100 mm (1 to 4 in.) and in depth from 13 to 50 mm (½ to 2 in.).

X2.14.1 *Severity Levels*—No degrees of severity are defined for popouts; however, popouts must be extensive before

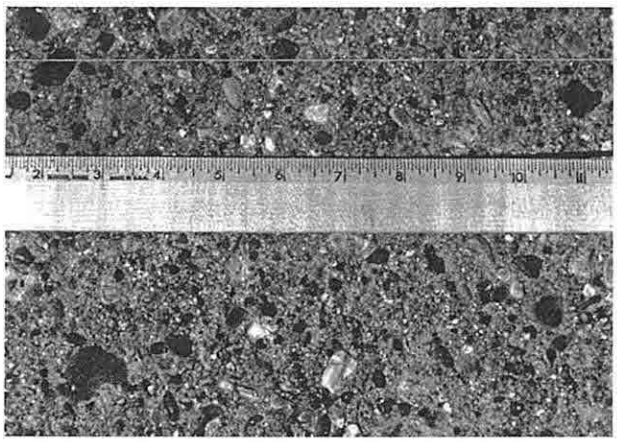


FIG. X2.31 Polished Aggregate

they are counted as a distress. Average popout density must exceed approximately three popouts/m^2 over the entire slab area (Fig. X2.32).

X2.14.2 *How to Count*—The density of the distress must be measured. If there is any doubt that the average is greater than three popouts per square yard, at least three random 1 m^2 (11 ft^2) areas should be checked. When the average is greater than this density, the slab should be counted.

PUMPING

X2.15 *Description*—Pumping is the ejection of material from the slab foundation through joints or cracks. This is caused by deflection of the slab with passing loads. As a load moves across the joint between the slabs, water is first forced under the leading slab, and then forced back under the trailing slab. This action erodes and eventually removes soil particles resulting in progressive loss of pavement support. Pumping can be identified by surface stains and evidence of base or subgrade material on the pavement close to joints or cracks. Pumping near joints is caused by poor joint sealer and indicates loss of support; repeated loading eventually will produce cracks. Pumping also can occur along the slab edge causing loss of support.

FIG. X2.32 Popouts

X2.15.1 *Severity Levels*—No degrees of severity are defined. It is enough to indicate that pumping exists (Fig. X2.33 and Fig. X2.34).

X2.15.2 *How to Count*—One pumping joint between two slabs is counted as two slabs; however, if the remaining joints around the slab are also pumping, one slab is added per additional pumping joint.

PUNCHOUT

X2.16 *Description*—This distress is a localized area of the slab that is broken into pieces. The punchout can take many different shapes and forms, but it is usually defined by a crack and a joint. The distance between the join and the crack or two closely spaced cracks is ≤ 1.5 m (5 ft) wide. This distress is caused by heavy repeated loads, inadequate slab thickness, loss of foundation support, or a localized concrete construction deficiency, for example, honeycombing.

X2.16.1 *Severity Levels*—Table X2.2 lists the severity levels for punchouts, and Figs. X2.35-X2.37 show examples.

X2.16.2 *How to Count*—If a slab contains more than one punchout or a punchout and a crack, it is counted as shattered.

RAILROAD CROSSING

X2.17 *Description*—Railroad crossing distress is characterized by depressions or bumps around the tracks.

X2.17.1 *Severity Levels*:

X2.17.1.1 **L**—Railroad crossing causes low-severity ride quality (Fig. X2.38).

X2.17.1.2 **M**—Railroad crossing causes medium-severity ride quality (Fig. X2.39).

X2.17.1.3 **H**—Railroad crossing causes high-severity ride quality (Fig. X2.40).

FIG. X2.33 Pumping

FIG. X2.34 Pumping

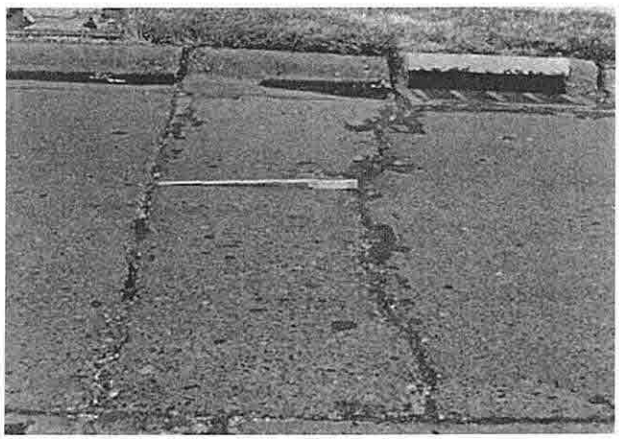


FIG. X2.35 Low-Severity Punchout

X2.17.2 *How to Count*—The number of slabs crossed by the railroad tracks is counted. Any large bump created by the tracks should be counted as part of the crossing.

SCALING, MAP CRACKING, AND CRAZING

X2.18 *Description*—Map cracking or crazing refers to a network of shallow, fine, or hairline cracks that extend only through the upper surface of the concrete. The cracks tend to intersect at angles of 120°. Map cracking or crazing usually is caused by concrete over-finishing and may lead to surface scaling, which is the breakdown of the slab surface to a depth of approximately 6 to 13 mm (¼ to ½ in.). Scaling also may be caused by deicing salts, improper construction, freeze-thaw cycles and poor aggregate. The type of scaling defined here is not caused by "D" cracking. If scaling is caused by "D" cracking, it should be counted under that distress only.

X2.18.1 *Severity Levels*:

FIG. X2.36 Medium-Severity Punchout

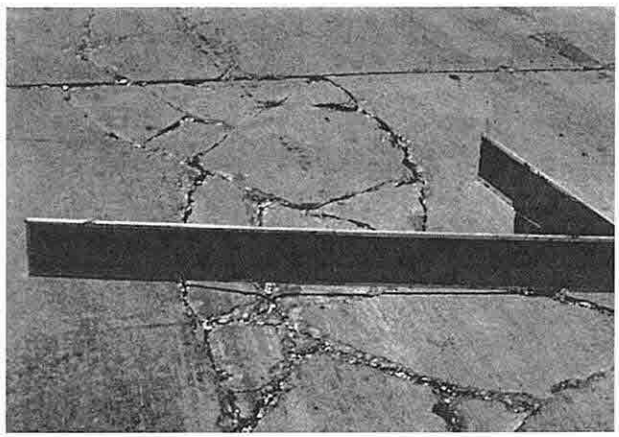


FIG. X2.37 High-Severity Punchout

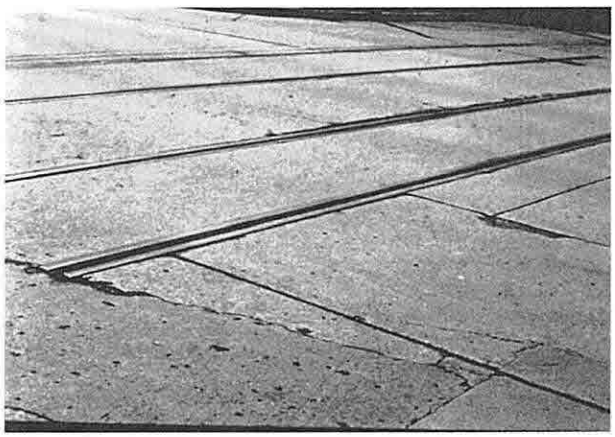


FIG. X2.38 Low-Severity Railroad Crossing

X2.18.1.1 **L**—Crazing or map cracking exists over most of the slab area; the surface is in good condition, with only minor scaling present (Fig. X2.41).

X2.18.1.2 **M**—Slab is scaled but less than 15 % of the slab is affected (Fig. X2.42).

X2.18.1.3 **H**—Slab is scaled over more than 15 % of its area (Fig. X2.43).

FIG. X2.39 Medium-Severity Railroad Crossing

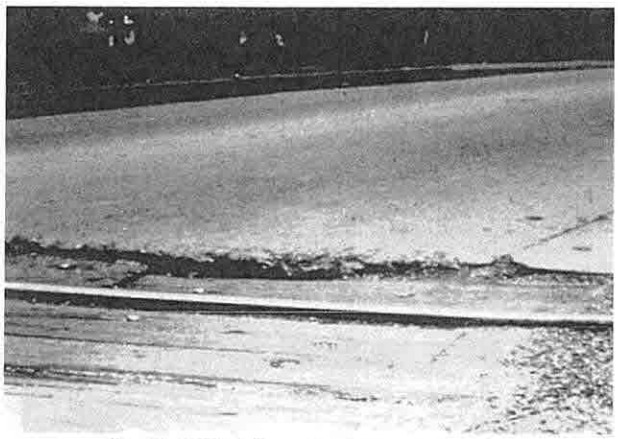


FIG. X2.40 High-Severity Railroad Crossing

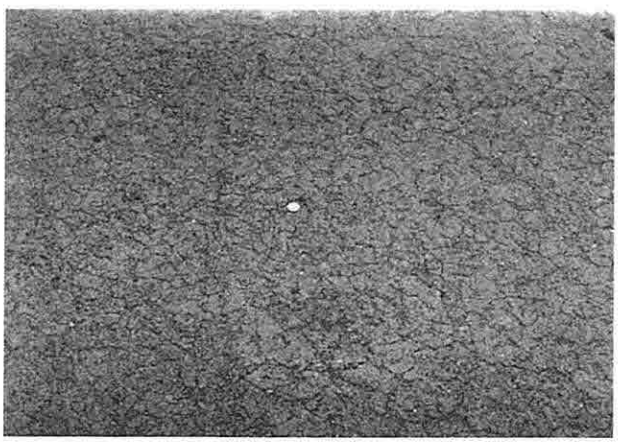


FIG. X2.41 Low-Severity Scaling, Map Cracking, and Crazing

X2.18.2 *How to Count*—A scaled slab is counted as one slab. Low-severity crazing only should be counted if the potential for scaling appears to be imminent or a few small pieces come out.

SHRINKAGE CRACKS

X2.19 *Description*—Shrinkage cracks are hairline cracks that usually are less than 2-m long and do not extend across the entire slab. They are formed during the setting and curing of the concrete and usually do not extend through the depth of the slab.

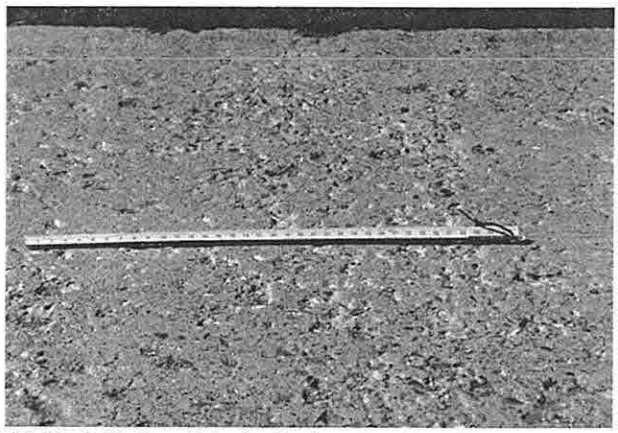


FIG. X2.42 Medium-Severity Scaling, Map Cracking, and Crazing

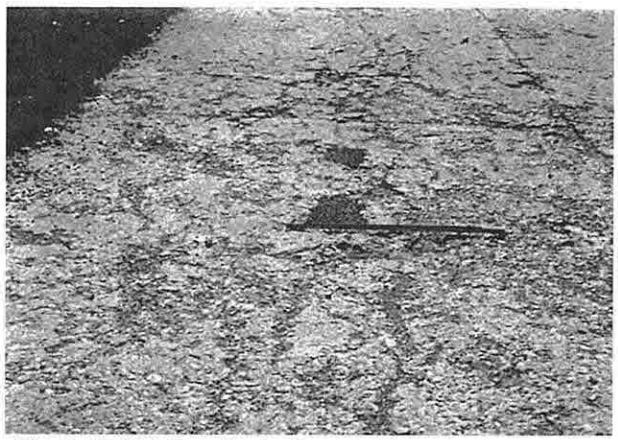


FIG. X2.43 High-Severity Scaling, Map Cracking, and Crazing

X2.19.1 *Severity Levels*—No degrees of severity are defined. It is enough to indicate that shrinkage cracks are present (Fig. X2.44).

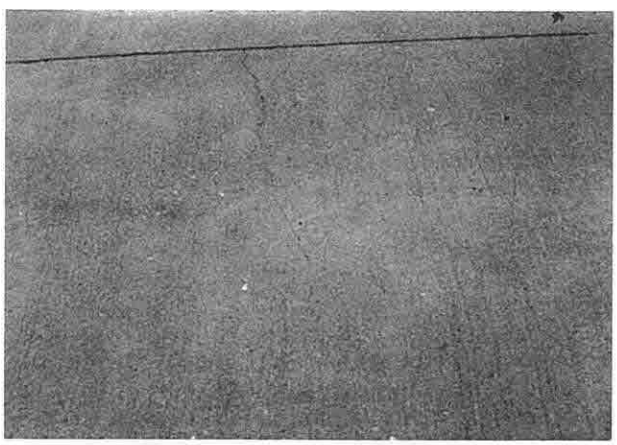


FIG. X2.44 Shrinkage Cracks

X2.19.2 *How to Count*—If any shrinkage cracks exist on a particular slab, the slab is counted as one slab with shrinkage cracks.

SPALLING, CORNER

X2.20 *Description*—Corner spalling is the breakdown of the slab within approximately 0.5 m (1.5 ft) of the corner. A corner spall differs from a corner break in that the spall usually angles downward to intersect the joint, whereas a break extends vertically through the slab corner. Spalls less than 130 mm (5 in.) from the crack to the corner on both sides should not be counted.

X2.20.1 *Severity Levels*—Table X2.3 lists the levels of severity for corner spalling. Figs. X2.45-X2.47 show examples. Corner spalling with an area of less than 650 cm (10 $in.^2$) from the crack to the corner on both sides should not be counted.

X2.20.2 *How to Count*—If one or more corner spalls with the same severity level are in a slab, the slab is counted as one slab with corner spalling. If more than one severity level occurs, it is counted as one slab with the higher severity level.

SPALLING, JOINT

X2.21 *Description*:

X2.21.1 Joint spalling is the breakdown of the slab edges within 0.5 m (1.5 ft) of the joint. A joint spall usually does not extend vertically through the slab, but intersects the joint at an angle. Spalling results from:

X2.21.1.1 Excessive stresses at the joint caused by traffic loading or by infiltration of incompressible materials.

X2.21.1.2 Weak concrete at the joint caused by overworking.

X2.21.1.3 Water accumulation in the joint and freeze-thaw action.

X2.21.2 *Severity Levels*—Table X2.4 and Figs. X2.48-X2.50 show the severity levels of joint spalling. A frayed joint where the concrete has been worn away along the entire joint is rated as low severity.

X2.21.3 *How to Count*—If spall is along the edge of one slab, it is counted as one slab with joint spalling. If spalling is on more than one edge of the same slab, the edge having the highest severity is counted and recorded as one slab. Joint spalling also can occur along the edges of two adjacent slabs.

TABLE X2.3 Levels of Severity for Corner Spalling

Depth of Spall	Dimensions of Sides of Spall	
	130 × 130 mm to 300 × 300 mm (5 × 5 in.) to (12 × 12 in.)	300 × 300 mm (>12 × 12 in.)
<25 mm (1 in.)	L	L
>25 to 50 mm (1 to 2 in.)	L	M
>50 mm (2 in.)	M	H

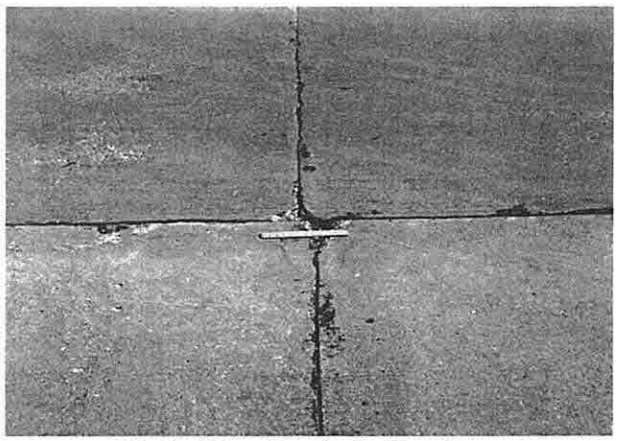


FIG. X2.45 Low-Severity Spalling, Corner

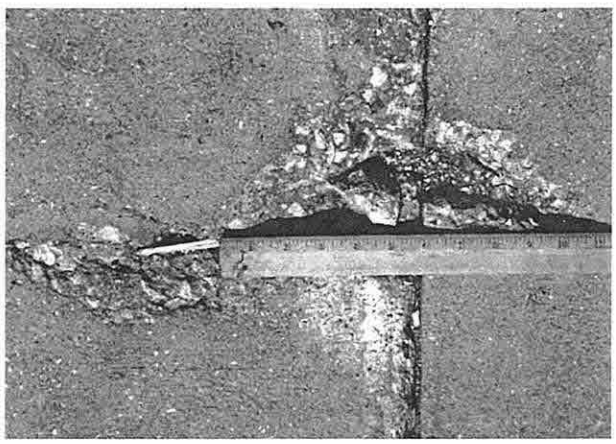


FIG. X2.46 Medium-Severity Spalling, Corner

FIG. X2.47 High-Severity Spalling, Corner

If this is the case, each slab is counted as having joint spalling.

TABLE X2.4 Levels of Severity for Joint Spalling

Spall Pieces	Width of Spall	Length of Spall <0.5 m (1.5 ft)	Length of Spall >0.5 m (1.5 ft)
Tight—cannot be removed easily (maybe a few pieces missing.	<100 mm (4 in.)	L	L
	>100 mm	L	L
Loose—can be removed and some pieces are missing; if most or all pieces are missing, spall is shallow, less than 25 mm (1 in.).	<100 mm	L	M
	>100 mm	L	M
Missing—most or all pieces have been removed.	<100 mm	L	M
	>100 mm	M	H

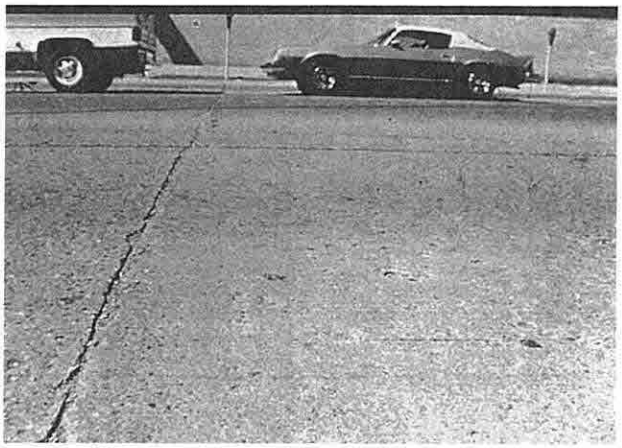


FIG. X2.48 Low-Severity Spalling, Joint

FIG. X2.49 Medium-Severity Spalling, Joint

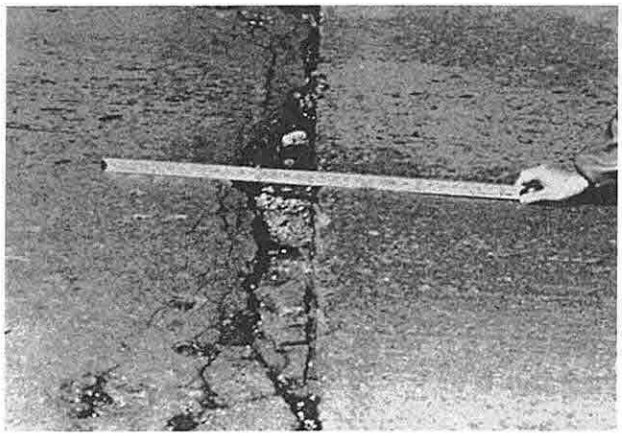


FIG. X2.50 High-Severity Spalling, Joint

X3. DEDUCT VALUE CURVES FOR ASPHALT

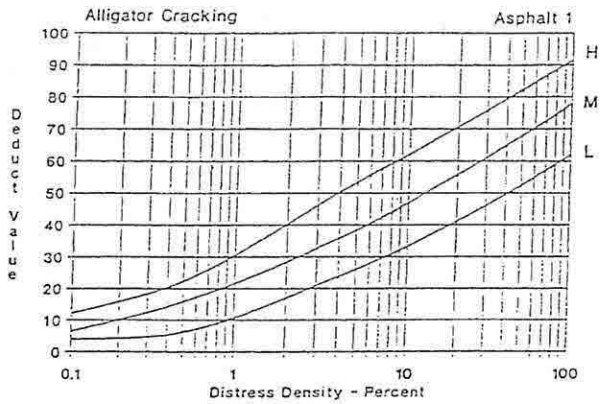


FIG. X3.1 Alligator Cracking

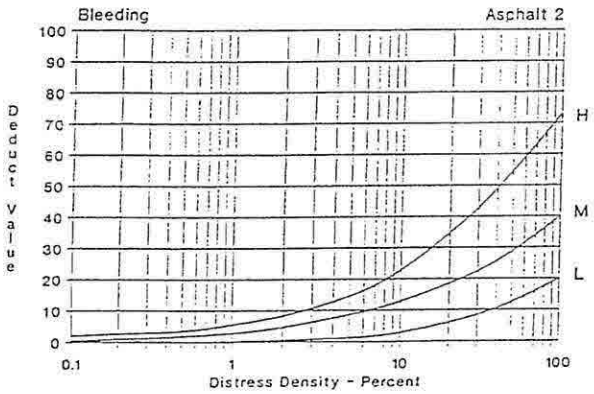


FIG. X3.2 Bleeding

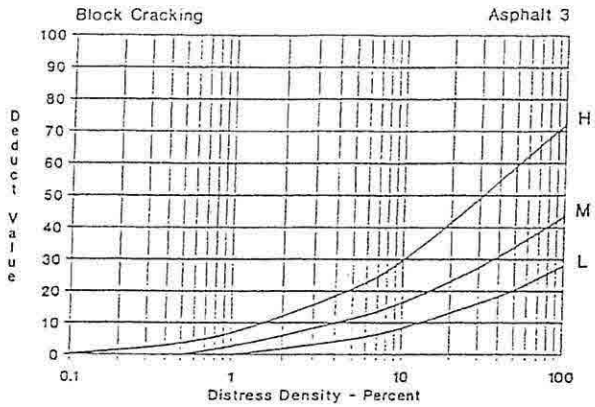


FIG. X3.3 Block Cracking

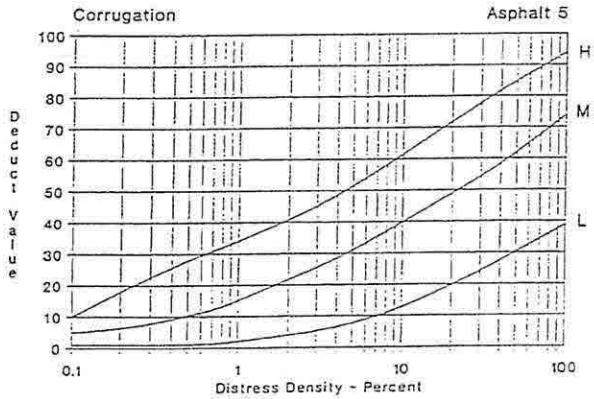


FIG. X3.6 Corrugation

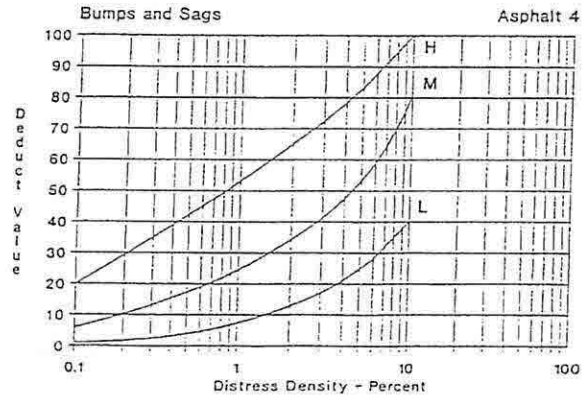


FIG. X3.4 Bumps and Sags

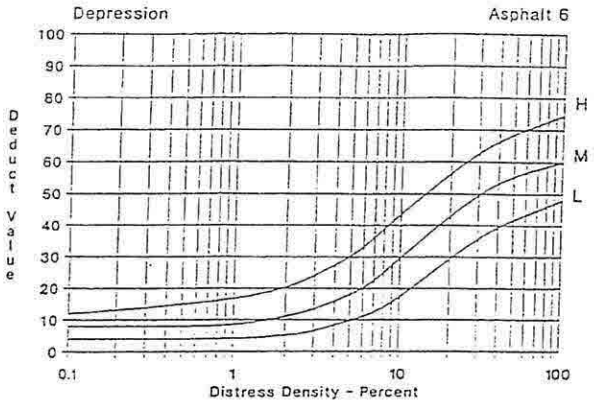


FIG. X3.7 Depression

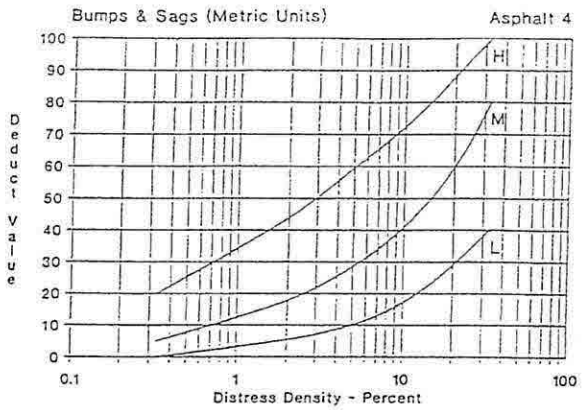


FIG. X3.5 Bumps and Sags (Metric units)

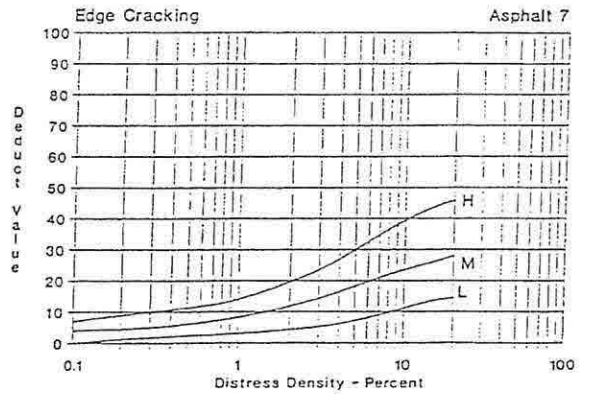


FIG. X3.8 Edge Cracking

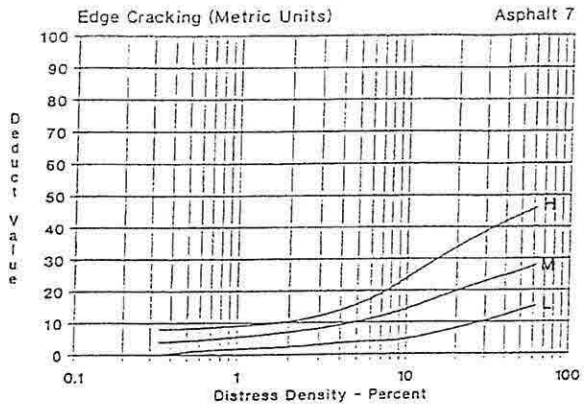


FIG. X3.9 Edge Cracking (metric units)

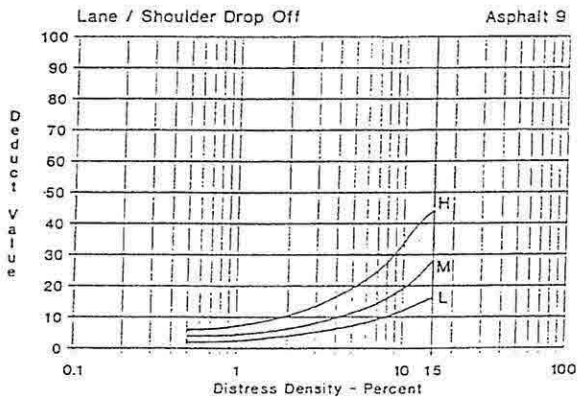


FIG. X3.12 Lane/Shoulder Drop-Off

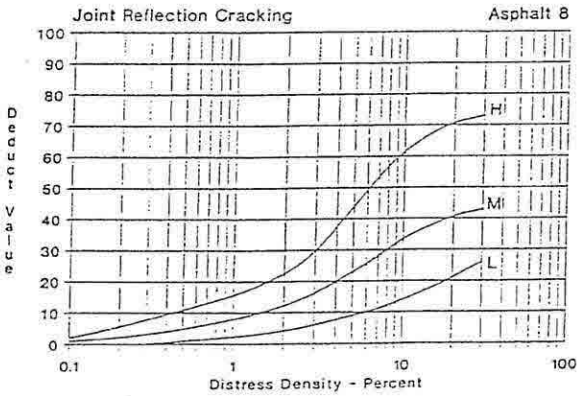


FIG. X3.10 Joint Reflection Cracking

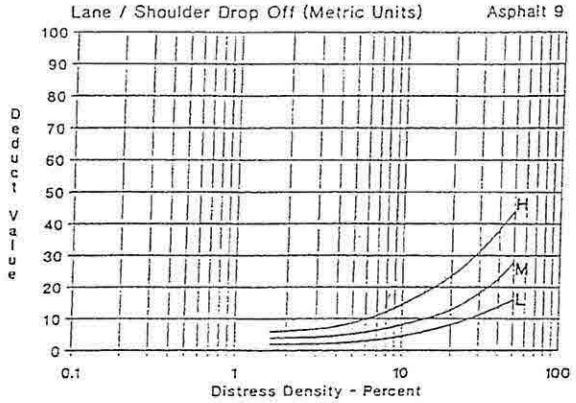


FIG. X3.13 Lane/Shoulder Drop-Off (metric units)

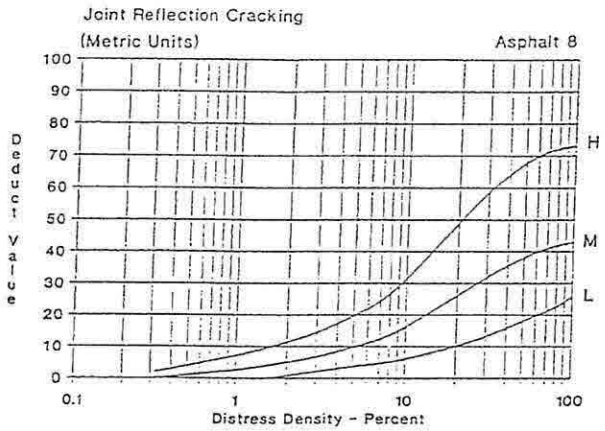


FIG. X3.11 Joint Reflection Cracking (metric units)

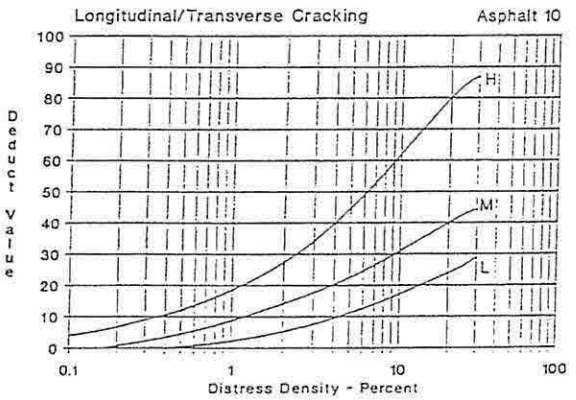


FIG. X3.14 Longitudinal/Transverse Cracking

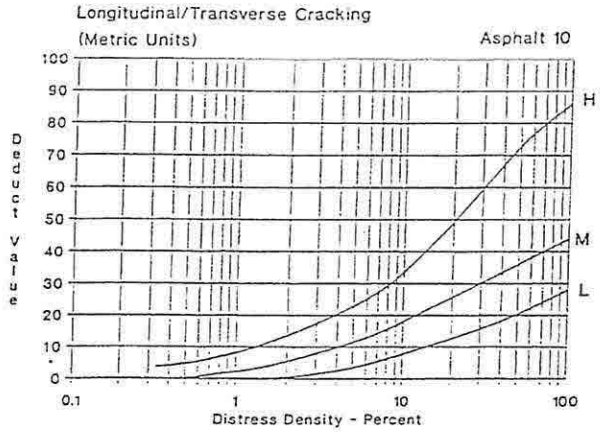


FIG. X3.15 Longitudinal/Transverse Cracking (metric units)

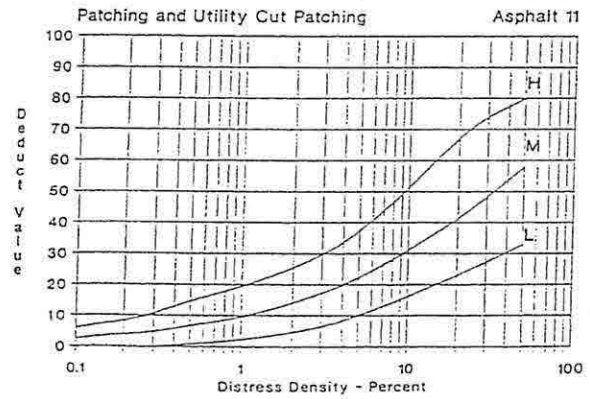


FIG. X3.16 Patching and Utility Cut Patching

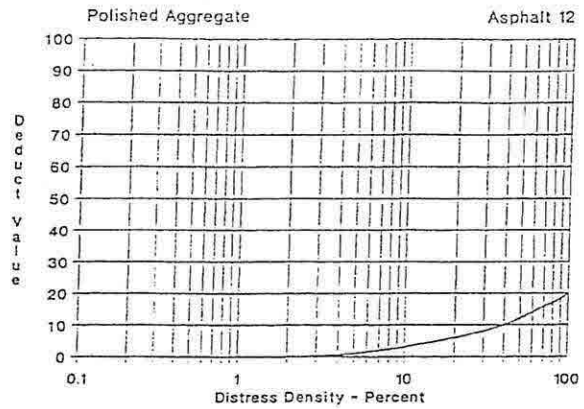


FIG. X3.17 Polished Aggregate

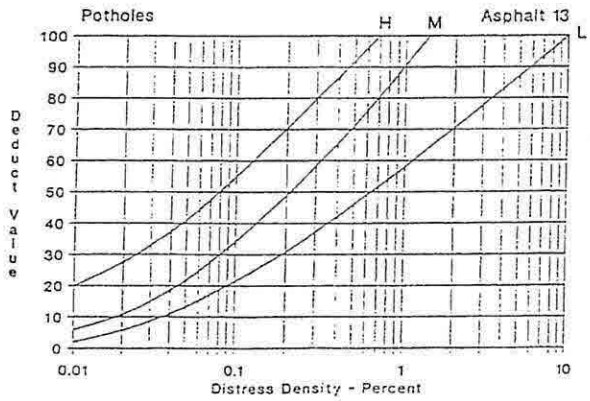


FIG. X3.18 Potholes

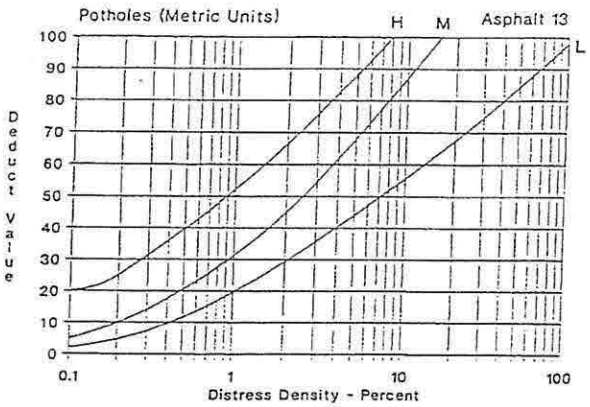


FIG. X3.19 Potholes (metric units)

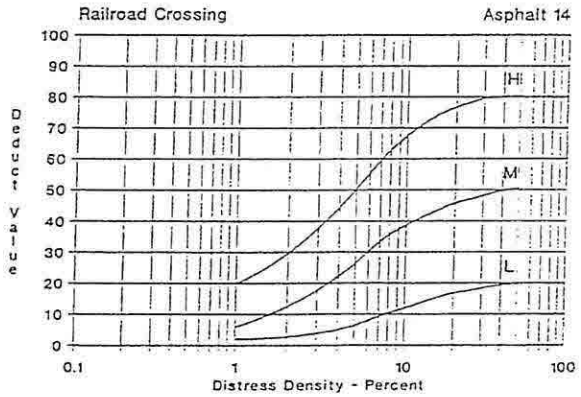


FIG. X3.20 Railroad Crossing

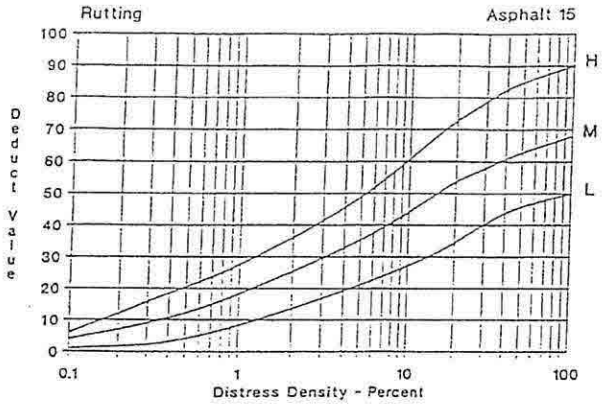


FIG. X3.21 Rutting

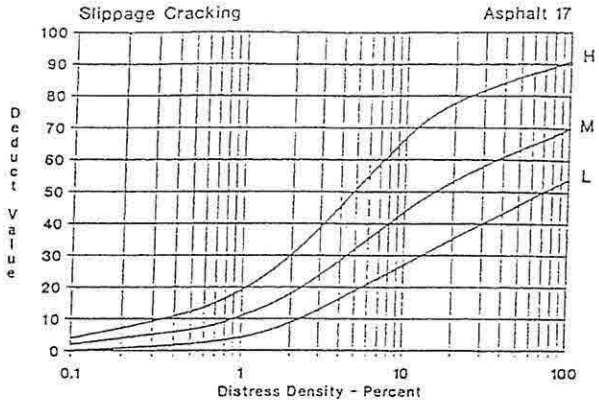


FIG. X3.23 Slippage Cracking

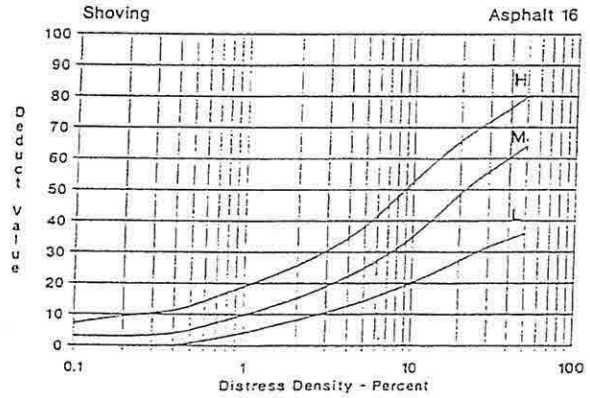


FIG. X3.22 Shoving

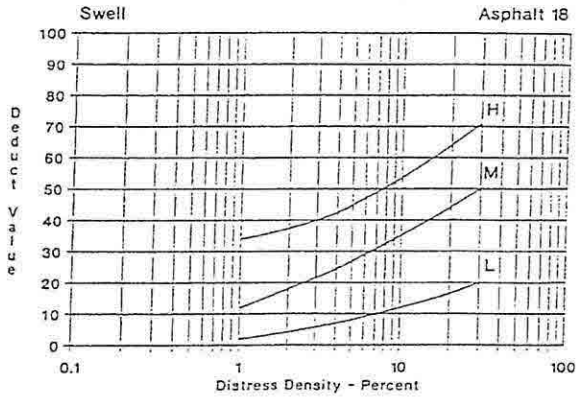


FIG. X3.24 Swell

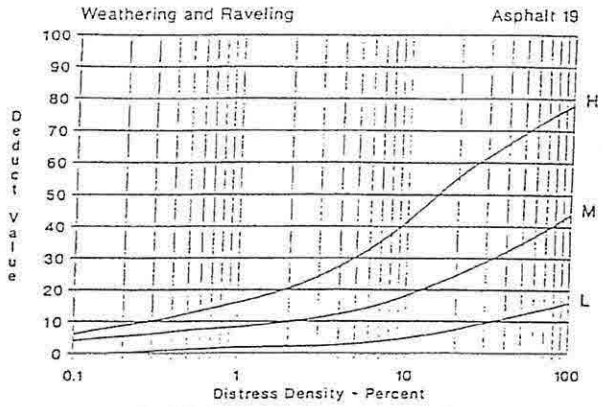


FIG. X3.25 Weathering and Raveling

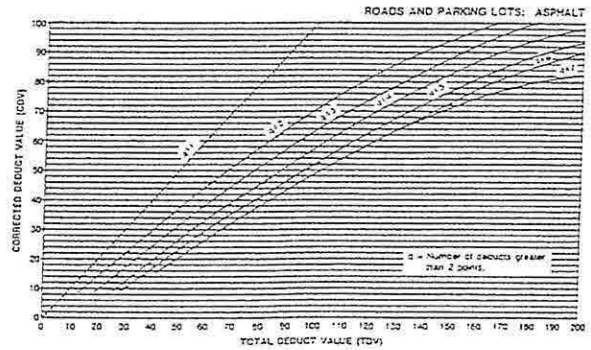


FIG. X3.26 Total Deduct Value

X4. DEDUCT VALUE CURVES FOR CONCRETE

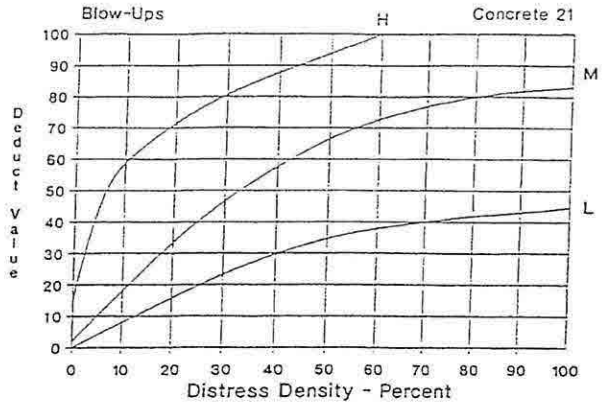


FIG. X4.1 Blowups

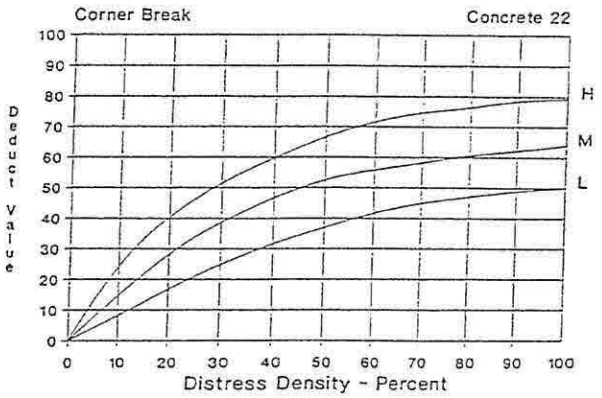


FIG. X4.2 Corner Break

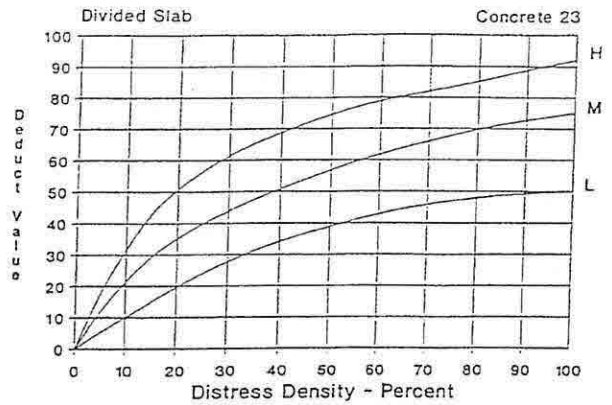


FIG. X4.3 Divided Slab

REFERENCES

(1) *PAVER Asphalt Distress Manual*, US Army Construction Engineering Laboratories, TR 97/104, June 1997.

(2) *PAVER Asphalt Distress Manual*, US Army Construction Engineering Laboratories, TR 97/105, June 1997.

(3) Carey, W.N., Jr. and Irick, P.E., "The Pavement Serviceability-Performance Concept," *HRB Bulletin 250*, 1960.

(4) Sayers, M. W., Gillespie, T. D., and Queiroz, C. A. V., "The International Road Roughness Experiment: Establishing Correlation and a Calibration Standard for Measurements," World Bank Technical Paper No. 45, the International Bank for Reconstruction and Development/the World Bank, Washington, DC, 1986.

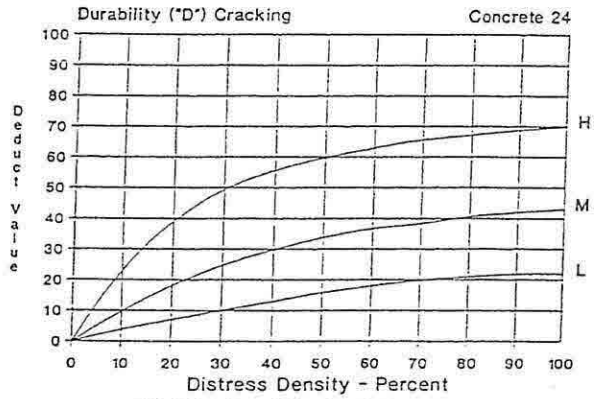


FIG. X4.4 Durability ("D") Cracking

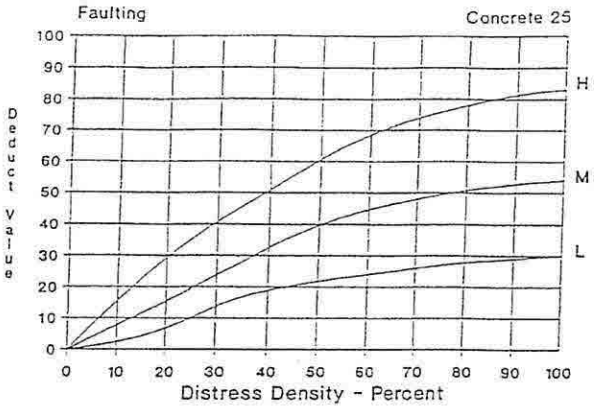


FIG. X4.5 Faulting

Joint Seal Damage Concrete 26

Joint seal damage is not rated by density. The severity of the distress is determined by the sealant's overall condition for a particular sample unit.

The deduct values for the three levels of severity are:

LOW	2 points
MEDIUM	4 points
HIGH	8 points

FIG. X4.6 Rigid Pavement Deduct Values, Distress 26, joint seal damage

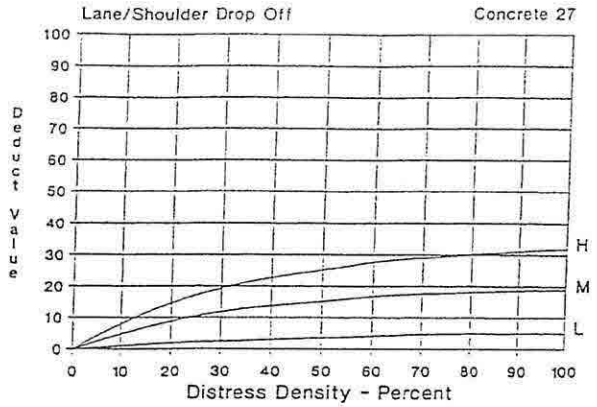


FIG. X4.7 Lane/Shoulder Drop-Off

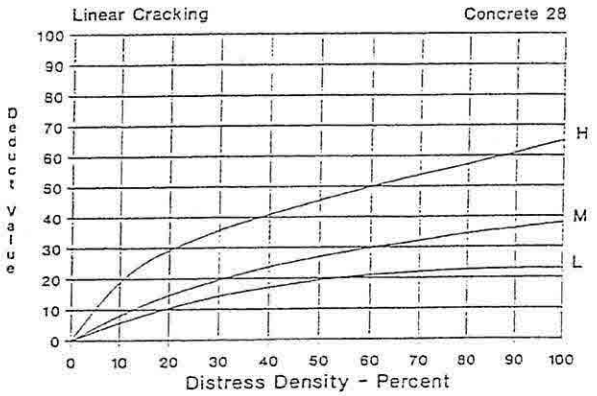


FIG. X4.8 Linear Cracking

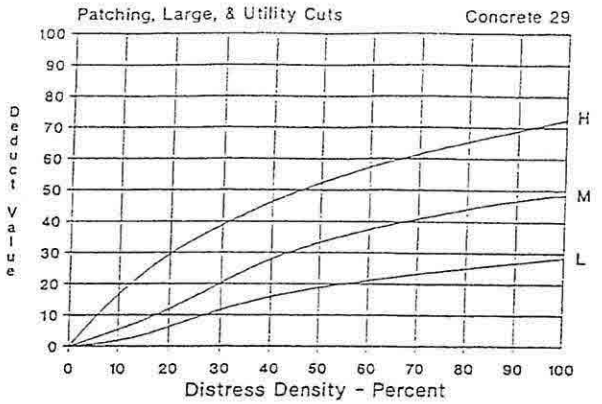


FIG. X4.9 Patching, Large, and Utility Cuts

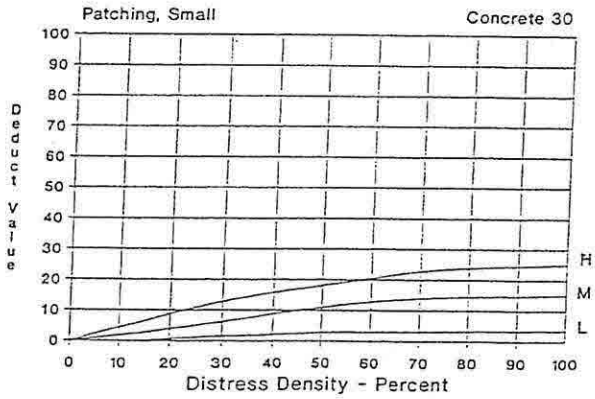


FIG. X4.10 Patching, Small

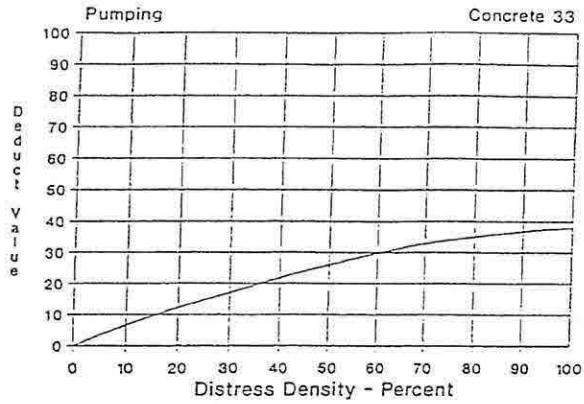


FIG. X4.13 Pumping

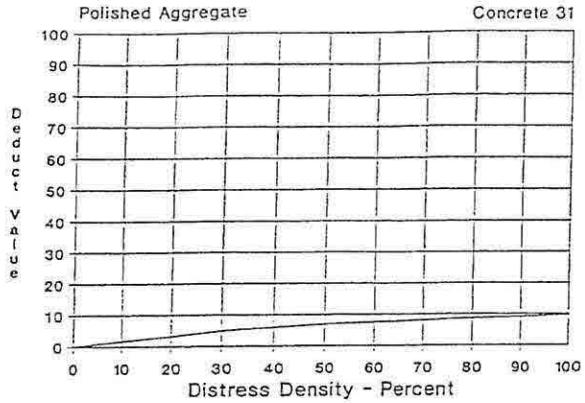


FIG. X4.11 Polished Aggregate

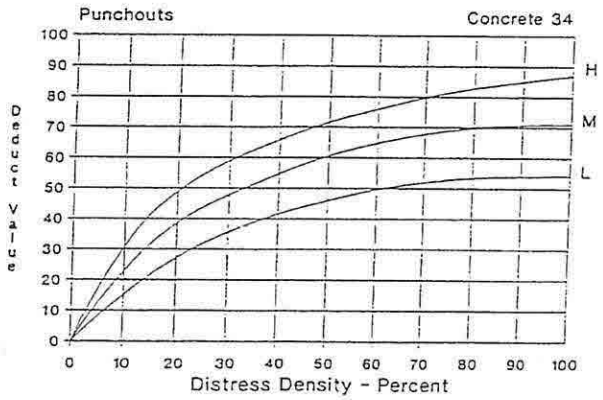


FIG. X4.14 Punchouts

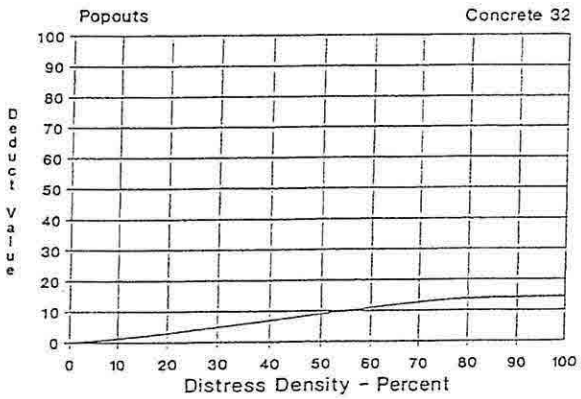


FIG. X4.12 Popouts

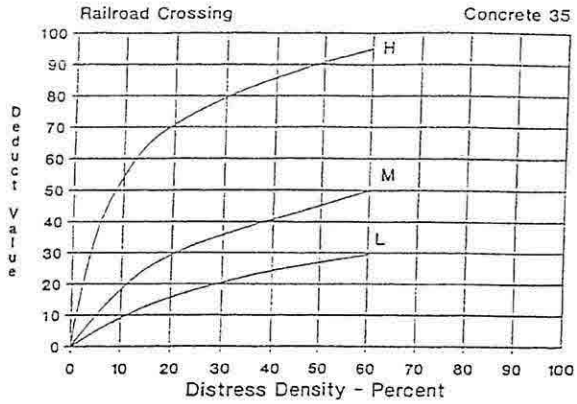


FIG. X4.15 Railroad Crossing

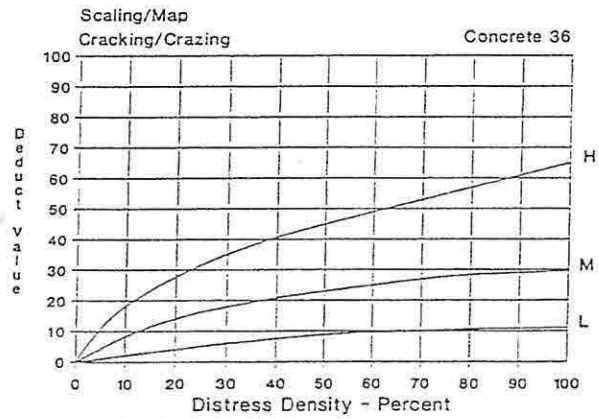


FIG. X4.16 Scaling/Map Cracking/Crazing

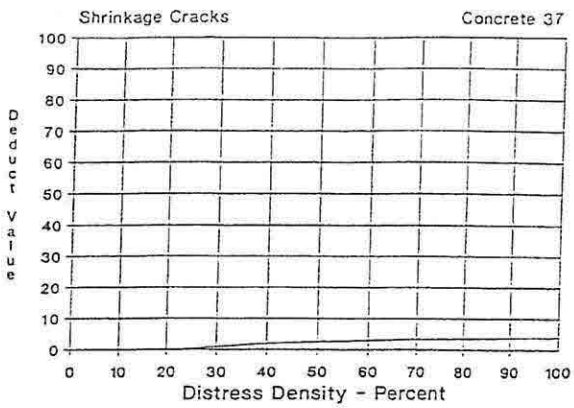


FIG. X4.17 Shrinkage Cracks

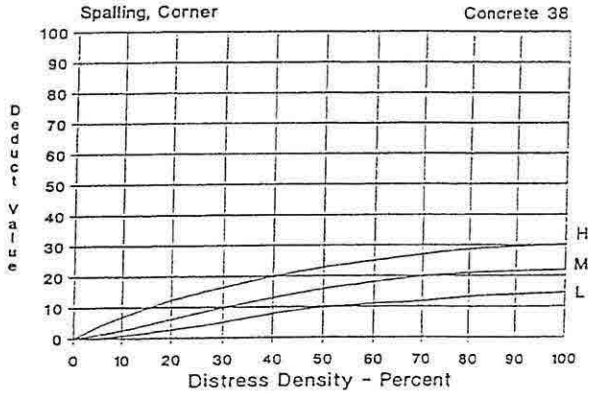


FIG. X4.18 Spalling, Corner

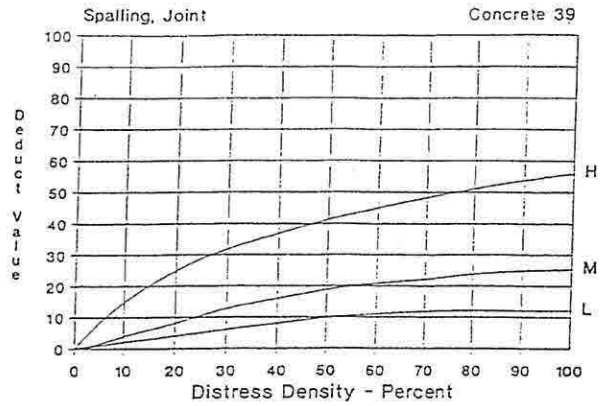
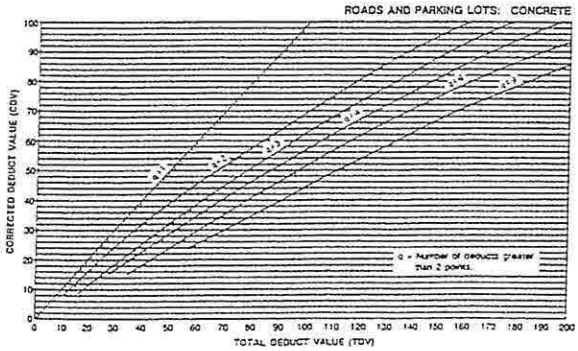


FIG. X4.19 Spalling, Joint



Corrected deduct values for jointed concrete pavement.

FIG. X4.20 Corrected Deduct Values for Jointed Concrete Pavement