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USACERL Special Report FF-94/09  
October 1993  
QA Inspections Via Condition Monitoring

# Guidelines for Quality Assurance Inspection of Commercial Activities Contracts for Real Property Maintenance Activities

## Guide #9: Surfaced Areas

by  
James H. Johnson  
Paul C. Bresnahan

A Quality Assurance (QA) Program allows the Army to evaluate and document a contractor's work performance. It depends on a QA Surveillance Plan (QASP). The QASP, which is based on the contract Performance Work Statement, lists contractor activities and the surveillance approach, number of items to be inspected, and an Acceptable Quality Level (AQL) for each activity. This series of 12 guides will help the Contracting Officer's Representative/Quality Assurance Evaluator by defining and clarifying the inspection tasks required by the QASP, which will facilitate inspection uniformity and effectiveness.

This guide discusses QA monitoring of paved surfaces, stormwater collection systems, traffic services, sand/snow removal and ice control, and recreational areas.

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| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                            | Form Approved<br>OMB No. 0704-0188 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|------------------------------------|
| Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.                                                                                                                      |                                                             |                                                            |                                    |
| 1. AGENCY USE ONLY (Leave Blank)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2. REPORT DATE<br>October 1993                              | 3. REPORT TYPE AND DATES COVERED<br>Final                  |                                    |
| 4. TITLE AND SUBTITLE<br>Guidelines for Quality Assurance Inspection of Commercial Activities Contracts for Real Property Maintenance Activities, Guide #9: Surfaced Areas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                             | 5. FUNDING NUMBERS<br>4A162784<br>AT41<br>SB-A51           |                                    |
| 6. AUTHOR(S)<br>James H. Johnson and Paul C. Bresnahan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |                                                            |                                    |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>U.S. Army Construction Engineering Research Laboratories (USACERL)<br>P.O. Box 9005<br>Champaign, IL 61826-9005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                             | 8. PERFORMING ORGANIZATION<br>REPORT NUMBER<br>SR FF-94/09 |                                    |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)<br>U.S. Army Center for Public Works (USACPW)<br>ATTN: CECPW-FM-S<br>Bldg 358<br>Fort Belvoir, VA 22060-5516                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                             | 10. SPONSORING/MONITORING<br>AGENCY REPORT NUMBER          |                                    |
| 11. SUPPLEMENTARY NOTES<br><br>Copies are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                             |                                                            |                                    |
| 12a. DISTRIBUTION/AVAILABILITY STATEMENT<br>Approved for public release; distribution is unlimited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                             | 12b. DISTRIBUTION CODE                                     |                                    |
| 13. ABSTRACT (Maximum 200 words)<br><br>A Quality Assurance (QA) Program allows the Army to evaluate and document a contractor's work performance. It depends on a QA Surveillance Plan (QASP). The QASP, which is based on the contract Performance Work Statement, lists contractor activities and the surveillance approach, number of items to be inspected, and an Acceptable Quality Level (AQL) for each activity. This series of 12 guides will help the Contracting Officer's Representative/Quality Assurance Evaluator by defining and clarifying the inspection tasks required by the QASP, which will facilitate inspection uniformity and effectiveness.<br><br>This guide discusses QA monitoring of paved surfaces, stormwater collection systems, traffic services, sand/snow removal and ice control, and recreational areas. |                                                             |                                                            |                                    |
| 14. SUBJECT TERMS<br>quality assurance<br>real property maintenance activities<br>pavements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             | 15. NUMBER OF PAGES<br>34                                  |                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                             | 16. PRICE CODE                                             |                                    |
| 17. SECURITY CLASSIFICATION<br>OF REPORT<br>Unclassified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 18. SECURITY CLASSIFICATION<br>OF THIS PAGE<br>Unclassified | 19. SECURITY CLASSIFICATION<br>OF ABSTRACT<br>Unclassified | 20. LIMITATION OF ABSTRACT<br>SAR  |

## **FOREWORD**

This research was performed for the U.S. Army Center for Public Works (USACPW), under project 4A162784AT41, "Military Facilities Engineering Technology," Work Unit SB-A51, "QA Inspections Via Condition Monitoring." The technical monitors were Robert Hohenberg and George Cromwell, CECPW-FM-S.

The work was performed by the Facility Management Division (FF) of the Infrastructure Laboratory (FL), U.S. Army Construction Engineering Research Laboratories (USACERL). Alan W. Moore is Acting Chief, CECER-FF, and Dr. Michael J. O'Connor is Chief, CECER-FL. Special appreciation is expressed to Robert D. Neathammer of CECER-FF and John H. Williamson, formerly of CECER-FF, for their contributions. The USACERL technical editor was Linda L. Wheatley, Information Management Office.

LTC David J. Rehbein is Commander of USACERL and Dr. L.R. Shaffer is Director.

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# **GUIDELINES FOR QUALITY ASSURANCE INSPECTION OF COMMERCIAL ACTIVITIES CONTRACTS FOR REAL PROPERTY MAINTENANCE ACTIVITIES GUIDE #9: SURFACED AREAS**

## **1 INTRODUCTION**

### **Background**

A Quality Assurance (QA) program allows the Army to evaluate and document a contractor's performance. The Quality Assurance Evaluator (QAE) conducts skilled and carefully planned inspections aimed at verifying the satisfactory completion of contractor work. The inspections evaluate the quality, quantity, and timeliness of the services provided, not the contractor's methods used in performing the work. A good QA program promotes the best possible product within the terms of the standing contract.

A well organized QA program depends on a QA Surveillance Plan (QASP), which is prepared by the Government and contains the purpose and methods of the QA program. Although the QASP is not a part of the contract, it is based on the contract Performance Work Statement, which is part of the contract. The QASP lists contractor activities and the surveillance approach, approximate number of items to be surveyed, and an Acceptable Quality Level (AQL) for each activity.

The installation Director of Public Works (DPW), the Contracting Officer (KO), or the Contracting Officer's Representative (COR) often oversees the QASP. The COR/QAE needs an inspection guide to help define and clarify the inspection tasks required by the QASP, and to facilitate inspection uniformity and effectiveness. To meet this need, the U.S. Army Construction Engineering Research Laboratories (USACERL) developed this series of 12 inspection guides.

### **Objective**

This guide series is intended to supplement any existing QASP and to provide QA guidance for evaluating Operations and Maintenance (O&M) work as performed by contractors on Army property. This surfaced areas guide contains recommended surveillance methods that can be amended by direction of the KO or QA management to fit the needs of a specific installation.

### **Guide Series Organization**

This series includes the following guides by USACERL published in October 1993:

- #1: Water Systems (Special Report [SR] FF-94/01)
- #2: Wastewater Systems (SR FF-94/02)
- #3: Natural Gas Distribution Systems (SR FF-94/03)
- #4: Electrical Systems (SR FF-94/04)
- #5: Heating Systems (SR FF-94/05)
- #6: Ventilation, Air Conditioning, and Refrigeration Systems (SR FF-94/06)
- #7: Building Services (SR FF-94/07)
- #8: Grounds Maintenance (SR FF-94/08)
- #9: Surfaced Areas

- #10: Refuse and Recyclable Handling (SR FF-94/10)
- #11: Pest Control Services (SR FF-94/11)
- #12: Custodial Services (SR FF-94/12).

The QAE is expected to evaluate a contractor's performance by applying appropriate visual and instrumentation procedures along with necessary technical and interpretive skills. This guide covers QAE inspection of surfaced areas, and is divided into sections that take the inspector through a step-by-step process of recommended performance indicators, inspection tasks, and surveillance methods.

Surfaced areas are divided into five subsystems in this guide:

1. Paved Surfaces
2. Stormwater Collection Systems
3. Traffic Services
4. San/Snow Removal and Ice Control
5. Recreational Areas

General QA information, including detailed explanations of the available surveillance methods, is given in Chapter 2.

Chapter 3 provides performance indicators, inspection tasks, and recommended surveillance approaches for each subsystem.

Appendix A contains sampling inspection tables. Appendix B contains QAE Worksheets for each subsystem and a Service Order Questionnaire; they may be reproduced for field use.

## **2 GENERAL QA INSPECTION INFORMATION**

### **Inspection Organization and Planning**

According to custom and standard practice, the contractor submits copies of the previous month's O&M activities and regulatory agency reports to the COR and the QAE. The due dates of these reports control the start of inspection scheduling. If possible, the QAE's inspection should be conducted within 3 days after receiving the reports. Effective coordination will allow more efficient inspection of services. The COR/QAE should look for specific indicators of the contractor's performance and should evaluate that performance based on Detailed Inspection Tasks. The following chapter lists the Performance Indicators and Detailed Inspection Tasks for surfaced areas.

### **Quality Assurance Surveillance Methods**

The QAE can use the following five surveillance methods to determine contractor performance:

1. Random Sampling
2. Planned Sampling
3. 100 Percent Inspection
4. Unscheduled Inspection
5. Customer Complaints.

#### ***Random Sampling***

The methods are based on statistical criteria provided in Military Standard (MIL-STD)-105E, *Sampling Procedures and Tables for Inspection by Attributes* (10 May 1989) and are presented as recommendations. The methods used should be based on the unique needs of an individual system. Generally, all five methods are not used to evaluate an individual system.

Random sampling is recommended for situations where many work items are candidates for inspection. For instance, because it is impractical to inspect every roof on an installation with 500 buildings, only a select number of the buildings should be inspected. Likewise, in random sampling, only a portion of the total performed work is inspected. Acceptance of the work is based on the assumption that the inspected items are representative of the quality of the contractor's work. The random sampling technique spreads the selected samples evenly throughout the evaluation period. The following are steps to be used by the QAE in random sampling.

Tables A1 and A2 in Appendix A should be used to determine the number of samples to be inspected and the number of rejects allowed as a function of the number of inspected work items for AQLs of 4 and 10 percent, and the level of surveillance. The three levels of surveillance are: normal, increased (tightened), and reduced. Initially, this guide recommends normal surveillance for random sampling. However, under the direction of the KO, the level of surveillance can be changed depending on the contractor's performance.

As an example, assume that the contractor's total scheduled output (i.e., population size) for a particular work item is 125 units and that the normal surveillance level with an AQL of 4 percent has been selected. According to Table A1, 20 of the 125 units of work should be inspected, and the entire output of 125 units should be rejected if 3 or more of the 20 sample units are not acceptable.

The QA Worksheets in Appendix B provide room to record the population size, the number of samples, the maximum number of rejects, and the interval for each performance indicator.

The work planned by the contractor for each maintenance task should be listed by date to make it easier to predict the time when the work samples will be ready for inspection.

### *Planned Sampling*

Evaluation by planned sampling inspects some, but not all, of the work activities and is appropriate when the number of work items is large. Some items are evaluated before scheduled completion because they are inaccessible after the work is completed. The COR/QAE subjectively selects key work items for inspection; the sample size is determined arbitrarily.

The COR/QAE will normally use planned sampling when the contractor's performance at selected locations or tasks is poor. With this type of evaluation, the contractor knows that work performed in these areas is more likely to be monitored. Planned sampling provides a systematic way of focusing on specific output and forming conclusions about the contractor's performance level.

### *100 Percent Inspection*

Inspection at 100 percent requires total inspection of all items in a contract requirement. It is normally used to monitor infrequent work or critical contract work when the number of work items is small and in cases where nonperformance could seriously damage Army-furnished equipment or processes. It may also be used in areas where a contractor has had prior performance difficulties.

### *Unscheduled Inspection*

Unscheduled inspections can be used for areas of poor past contractor performance, noncritical areas, areas of infrequent repairs, or as a follow-up check of previous inspections. If the QAE notices such an area, an unscheduled inspection can be conducted to evaluate contractor performance.

### *Customer Complaints*

The customer complaint method is based on an informed and cooperative customer population, that is generally aware of local contract requirements. Customers are expected to monitor contractor services and, when performance is poor or nonexistent, to notify the COR/QAE. If investigation reveals that the complaint is valid, the COR/QAE documents the deficiency. Since this is a reactive QA inspection approach, this method of surveillance normally supplements planned inspection methods.

### **Increased Surveillance**

For areas of poor past contractor performance, the QAE should consult with the KO to intensify the surveillance method. More than one option is usually available, and selection should be based on the initial method and the amount of work performed.

#### **1. Random Sampling (Normal Surveillance) can be replaced by:**

- Random Sampling (Increased Surveillance)
- Planned Sampling (for a large population size)

- 100 Percent Inspection (for a small population size)
  - Unscheduled Inspection (for any population size).
2. Planned Sampling can be replaced by:
- Random Sampling (Normal Surveillance)
  - 100 Percent Inspection (for a small population size)
  - Unscheduled Inspection (for any population size).
3. Unscheduled Inspections can be replaced by:
- 100 Percent Inspection (for a small population size)
  - Random Sampling (Normal Surveillance)
  - Planned Sampling.

### **Decreased Surveillance**

For work areas in which the contractor maintains a consistently satisfactory performance for 3 to 6 months, the QAE should consult with the KO to decrease the intensity of the surveillance. More than one option is usually available and selection should be based on the initial method and the amount of work performed.

1. Random Sampling (Normal Surveillance) can be replaced by:
- Random Sampling (Reduced Surveillance)
  - Planned Sampling
  - Unscheduled Inspection (for any population size)
  - Customer Complaints.
2. Planned Sampling can be replaced by:
- Unscheduled Inspection (for any population size)
  - Customer Complaints.
3. 100 Percent Inspection can be replaced by:
- Random Sampling (Normal Surveillance)
  - Random Sampling (Reduced Surveillance)
  - Planned Sampling
  - Unscheduled Inspection (for any population size)
  - Customer Complaints.

### **3 SURFACED AREAS QA INSPECTIONS**

#### **Paved Surfaces**

##### *Performance Indicators and Detailed Inspection Tasks*

The following numeric items are performed by the contractor. The related detailed inspection tasks are used by the QAE to verify the contractor's performance.

1. The level of preventive maintenance (PM) performed for paved surfaces is adequate.

Verify that the contractor performs an adequate level of PM for paved surfaces. Check for the following:

- a. Potholes, upheavals, and alligator-cracked areas are repaired.
  - (1) Any observed potholes are less than 6 inches\* in diameter.
  - (2) Any observed upheavals are less than 1 in. above the plane of surrounding pavement and show no evidence of cracking (pieces of pavement loose, missing, or crushed).
  - (3) Any observed alligator-cracked areas show no evidence of pieces of pavement that are loose, missing, or crushed.
- b. Cracks are sealed. Cracks larger than 1 1/2 in. are repaired with prepared joint sealer.
- c. Road shoulders are properly maintained.
  - (1) Road shoulders protect the road edge (i.e., the edge will not deteriorate rapidly because it is abutted with a substantial fill).
  - (2) Road shoulders are protected from erosion (i.e., steps have been taken to ensure that erosion will not become a problem).
- d. Repairs are done in a professional manner.

2. Paved surfaces are swept as needed.

Verify that off-road paved surfaces, sidewalks, and parking areas are swept and litter free. Perform a "windshield" inspection of areas to be sampled. If this visual inspection yields doubts about the contractor's performance level, perform a more detailed inspection. Sweep together debris from a section of street about 10-ft square. An acceptable accumulation of debris is less than one handful. Document any discrepancies.

3. All contracted Service Orders (SOs) and Individual Job Orders (IJOs) are done in a timely, effective, and professional manner.

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\*A metric conversion table appears on p 14.

Verify that the contractor performed all contracted SOs and IJOs in a timely, effective, and professional manner. The overall quality and appearance of the repair, including materials, should be comparable to the facility's original construction quality and appearance. Document any discrepancies between the QAE inspection and the contractor's report of work completed.

Inspect the following items:

- a. Utility cuts in pavements are in straight lines with the task done in a professional manner.
- b. If water flows off the road, the drainage is smooth-flowing. There should be no evidence of erosion, and steps are taken to ensure that erosion will not occur in the future (e.g., grass should be planted along the shoulder, etc).
- c. Road shoulders must protect the road edge (i.e., the edge will not deteriorate rapidly because it is abutted with earth fill).
- d. Gravel-stabilized surfaces contain no ruts or holes and permit proper drainage.
- e. Repair of curbs, gutters, swales, dikes, etc. allow adequate drainage and control road shoulder erosion.
- f. The headwall must prevent erosion.
- g. Traffic signs are not damaged or missing.
- h. Guardrails, guardrail posts, and other physical traffic barriers are not damaged or missing.
- i. Within 2 hours of clearing accident debris, when requested by the KO, there is no debris at the accident site. (NOTE: This does not include disabled or wrecked vehicles.)

#### *Recommended Surveillance Approach*

- Evaluate performance indicators #1 and #2 monthly using random sampling (normal surveillance, 10 percent AQL).
- For performance indicator #3, evaluate SOs monthly using random sampling (normal surveillance, 5 percent AQL) and questionnaire feedback, and evaluate IJOs monthly using the 100 percent inspection method.

#### **Stormwater Collection Systems**

##### *Performance Indicators and Detailed Inspection Tasks.*

The following numeric items are performed by the contractor. The related detailed inspection tasks are used by the QAE to verify the contractor's performance.

1. Catch basins, manholes, drainage swales, ditches, and storm drainage systems are able to drain the amount of stormwater for which they were designed.

Verify that catch basins, manholes, drainage swales, ditches, and storm drainage systems are able to drain the amount of stormwater for which they were designed. Conduct inspections

approximately 12 working hours after the end of each rain of 1 in. or more. The contractor should begin cleanup immediately after the rain ends.

To perform the inspection, do the following:

- a. Visually inspect the gratings of catch basins and curb inlets for accumulated debris. Any significant accumulation is unsatisfactory.
  - b. Insert a pole until it reaches the bottom of the catch basin and move it around. If the pole moves freely, the cleaning process is satisfactory. However, sluggish movement of the pole indicates the presence of debris, and the cleaning is unsatisfactory. When the pole is removed, if the level of debris marking is lower than 2 in., the cleaning is satisfactory. If it is higher than 2 in., the cleaning is unsatisfactory.
2. "As-built" drawings are updated with changes and corrections.

Verify that the contractor maintains current "as-built" drawings of storm sewer facilities and equipment. Check to see that the drawings are updated annually with all changes and corrections. The draftperson's initials and the date should accompany each change.

#### *Recommended Surveillance Approach*

- Evaluate performance indicator #1 monthly using random sampling (normal surveillance, 10 percent AQL).
- Evaluate Performance Indicator #2 annually using the 100 percent inspection method.

#### **Traffic Services**

##### *Performance Indicators and Detailed Inspection Tasks*

The following numeric items are performed by the contractor. The related detailed inspection tasks are used by the QAE to verify the contractor's performance.

1. Traffic regulatory, warning, guidance, and lane markings, and traffic islands are in good repair and proper working order.

Verify that traffic regulatory, warning, guidance, and lane markings, and traffic islands are in good repair and proper working order.

More specifically, check to see that:

- a. Traffic control signals are operating and are:
  - (1) not missing
  - (2) square to oncoming traffic
  - (3) at the proper height
  - (4) plumb
  - (5) undamaged
- b. Traffic control signs are:
  - (1) not missing

- (2) clearly visible to oncoming traffic
  - (3) square to oncoming traffic
  - (4) at the proper height
  - (5) plumb
  - (6) undamaged (i.e., twisted, bent, or marred)
- c. Islands are in good repair with no areas of crushed or missing concrete or asphalt.
  - d. Guidance markings, lane marking, and other traffic markings are clearly visible, with more than 90 percent of their surfaces clean and free of defects. This can be checked by marking off a 5-ft length of lane marking and inspecting it for defects.
- 2. Parking area and helipad markings are clearly visible.

Verify that parking area and helipad markings are clearly visible, with more than 90 percent of their surfaces clean and free of defects.

#### *Recommended Surveillance Approach*

- Evaluate both performance indicators monthly using random sampling (normal surveillance, 10 percent AQL).

#### **Sand/Snow Removal and Ice Control**

##### *Performance Indicators and Detailed Inspection Tasks*

The following numeric items are performed by the contractor. The related detailed inspection tasks are used by the QAE to verify the contractor's performance.

Conduct inspections at least 12 hours after the snow stops falling or at the KO's request for service.

Check the following:

- 1. Snow is removed to bare pavement from designated roads and parking areas.

Verify that snow is removed to the bare pavement from designated roads and parking areas.

- 2. Abrasives used for ice control are removed within 8 working hours after ice in the vicinity has melted.

Verify that abrasives used for ice control are removed within 8 working hours after ice in the vicinity has melted. (The same criteria as used for the sweeping of paved surfaces will apply.)

- 3. Clear access to crosswalks is available from sidewalks, fire hydrants, building entrances and exits, and refuse containers.

Verify that clear access to crosswalks is available from sidewalks, fire hydrants, building entrances and exits, and refuse containers. Clear access means that anyone who would normally have access to an area when there is no snow has access to that area after sand/snow removal.

### ***Recommended Surveillance Approach***

- Evaluate all performance indicators seasonally using random sampling (normal surveillance, 10 percent AQL).

### **Recreational Areas**

#### ***Performance Indicator and Detailed Inspection Tasks***

The following item is performed by the contractor. The related detailed inspection tasks are used by the QAE to verify the contractor's performance.

Playground equipment is repaired as needed and is maintained in good condition.

Verify that playground equipment is repaired as needed and is maintained in good condition.

Check to see that:

1. No pieces of equipment are missing or broken.
2. Painted surfaces are free of defects. (Check by inspecting a 1-sq-ft or 1-linear-ft area of a painted surface. More than 90 percent of the surface should be free of defects, such as paint chipping, rust, or dents.) QA instrumentation is recommended to check the paint condition (Johnson 1993).
3. Except for normal wear, the equipment is free from damage as if it were newly installed (i.e., bent, broken, missing, rusted, rotten, or non-usable equipment is unsatisfactory). QA instrumentation is recommended to check for corrosion/coating condition (Johnson 1993).

### ***Recommended Surveillance Approach***

- Evaluate the performance indicator monthly using random sampling method (normal surveillance, 10 percent AQL).

#### **METRIC CONVERSION TABLE**

|         |                        |
|---------|------------------------|
| 1 in.   | = 2.54 cm              |
| 1 ft    | = 0.305 m              |
| 1 sq ft | = 0.093 m <sup>2</sup> |

## ACRONYMS

|         |                                      |
|---------|--------------------------------------|
| AQL     | Acceptable Quality Level             |
| COR     | Contracting Officer's Representative |
| DEH     | Director of Engineering and Housing  |
| KO      | Contracting Officer                  |
| MIL-STD | Military Standard                    |
| O&M     | Operations and Maintenance           |
| QA      | Quality Assurance                    |
| QAE     | Quality Assurance Evaluator          |
| QASP    | QA Surveillance Plan                 |

## REFERENCES

Johnson, James, Special Report FF-93/DRAFT, *Catalog of Industrial Instrumentation for Army Real Property Quality Assurance Applications* (U.S. Army Construction Engineering Research Laboratory, 1993).

Military Standard 105E, *Sampling Procedures and Tables for Inspection by Attributes* (Department of Defense, 10 May 1989).

# APPENDIX A: Inspection Sampling Tables

Table A1

Sample Sizes and Reject Levels (4% AQL)  
(As developed from Tables I & II in MIL STD 105E)

| Population Size | Normal Surveillance  |              |    | Increased (Tightened) Surveillance |              |    | Reduced Surveillance |              |   |
|-----------------|----------------------|--------------|----|------------------------------------|--------------|----|----------------------|--------------|---|
|                 | Class II Sample Size | Reject Level |    | Class III Sample Size              | Reject Level |    | Class I Sample Size  | Reject Level |   |
| 08 to 50        | *                    | 25%          | 1  | *                                  | 40%          | 1  | *                    | -            | - |
| 51 to 90        | E                    | 13           | 2  | F                                  | 20           | 2  | *                    | 3%           | 1 |
| 91 to 150       | F                    | 20           | 3  | G                                  | 32           | 3  | *                    | 3%           | 1 |
| 151 to 280      | G                    | 32           | 4  | H                                  | 50           | 4  | E                    | 5            | 2 |
| 281 to 500      | H                    | 50           | 6  | J                                  | 80           | 6  | F                    | 8            | 3 |
| 501 to 1200     | J                    | 80           | 8  | K                                  | 125          | 9  | G                    | 13           | 4 |
| 1201 to 3200    | K                    | 125          | 11 | L                                  | 200          | 13 | H                    | 20           | 5 |

The Reject Level is the number of failed inspections requiring rejection of the Lot (population).  
An asterisk (\*) indicates that the sample level is outside the range of a 4% AQL for the selected class.

Table A2

Sample Sizes and Reject Levels (10% AQL)  
(As developed from Tables I & II in MIL STD 105E)

| Population Size | Normal Surveillance  |              |    | Increased Tightened Surveillance |              |    | Reduced Surveillance |              |   |
|-----------------|----------------------|--------------|----|----------------------------------|--------------|----|----------------------|--------------|---|
|                 | Class II Sample Size | Reject Level |    | Class III Sample Size            | Reject Level |    | Class I Sample Size  | Reject Level |   |
| 06 to 15        | *                    | 33%          | 1  | *                                | 50%          | 1  | *                    | -            | - |
| 16 to 25        | C                    | 5            | 2  | D                                | 8            | 2  | *                    | 8%           | 1 |
| 26 to 50        | D                    | 8            | 3  | E                                | 13           | 3  | C                    | 2            | 2 |
| 51 to 90        | E                    | 13           | 4  | F                                | 20           | 4  | C                    | 2            | 2 |
| 91 to 150       | F                    | 20           | 6  | G                                | 32           | 6  | D                    | 3            | 3 |
| 151 to 280      | G                    | 32           | 8  | H                                | 50           | 9  | E                    | 5            | 4 |
| 281 to 500      | H                    | 50           | 11 | J                                | 80           | 13 | F                    | 8            | 5 |
| 501 to 1200     | J                    | 80           | 15 | K                                | 125          | 19 | G                    | 13           | 6 |
| 1201 to 3200    | K                    | 125          | 22 | L                                | 200          | 19 | H                    | 20           | 8 |

The Reject Level is the number of failed inspections that require rejection of the Lot (population).  
An asterisk (\*) indicates that the sample level is outside the range of a 10% AQL for the selected class.

Table A3

## Random Numbers

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 6 | 1 | 6 | 9 | 3 | 5 | 5 | 1 | 1 | 3 | 1 | 2 | 5 | 5 | 1 | 7 | 8 | 7 | 5 | 6 | 6 | 8 | 4 | 4 | 9 | 4 | 6 | 2 | 8 | 9 | 3 | 5 |
| 1 | 8 | 1 | 4 | 5 | 9 | 2 | 7 | 2 | 2 | 5 | 4 | 9 | 1 | 9 | 2 | 9 | 4 | 9 | 2 | 9 | 3 | 6 | 3 | 5 | 1 | 4 | 3 | 1 | 1 | 1 | 6 | 1 |
| 4 | 2 | 3 | 6 | 8 | 4 | 6 | 3 | 2 | 6 | 6 | 8 | 8 | 5 | 4 | 9 | 1 | 1 | 3 | 2 | 8 | 6 | 1 | 9 | 8 | 7 | 1 | 2 | 4 | 3 | 4 | 1 | 3 |
| 2 | 7 | 2 | 4 | 8 | 8 | 8 | 3 | 5 | 3 | 3 | 2 | 6 | 3 | 9 | 3 | 2 | 7 | 7 | 1 | 8 | 3 | 5 | 9 | 6 | 8 | 1 | 5 | 9 | 3 | 2 | 4 | 6 |
| 8 | 4 | 1 | 3 | 7 | 4 | 4 | 6 | 1 | 6 | 9 | 6 | 3 | 7 | 5 | 6 | 2 | 1 | 4 | 3 | 2 | 8 | 5 | 7 | 8 | 2 | 4 | 7 | 7 | 7 | 4 | 2 | 6 |
| 2 | 6 | 4 | 8 | 1 | 5 | 4 | 9 | 7 | 1 | 7 | 3 | 3 | 7 | 2 | 1 | 7 | 4 | 4 | 7 | 7 | 8 | 2 | 7 | 5 | 7 | 6 | 5 | 6 | 6 | 2 | 5 | 8 |
| 1 | 9 | 8 | 6 | 9 | 6 | 8 | 3 | 7 | 5 | 4 | 1 | 3 | 6 | 1 | 1 | 3 | 3 | 2 | 8 | 7 | 5 | 4 | 1 | 9 | 1 | 4 | 9 | 7 | 1 | 8 | 4 | 8 |
| 1 | 4 | 3 | 7 | 5 | 6 | 5 | 5 | 9 | 9 | 4 | 6 | 4 | 6 | 2 | 3 | 4 | 5 | 8 | 9 | 9 | 9 | 8 | 3 | 2 | 3 | 2 | 7 | 7 | 5 | 9 | 9 | 8 |
| 8 | 3 | 6 | 3 | 8 | 6 | 3 | 8 | 9 | 6 | 1 | 9 | 3 | 9 | 8 | 3 | 9 | 8 | 5 | 6 | 4 | 9 | 5 | 8 | 7 | 4 | 3 | 7 | 8 | 2 | 3 | 8 | 4 |
| 1 | 5 | 2 | 5 | 8 | 3 | 7 | 5 | 2 | 3 | 7 | 9 | 4 | 4 | 4 | 4 | 8 | 3 | 1 | 2 | 6 | 7 | 2 | 9 | 9 | 7 | 8 | 4 | 2 | 3 | 4 | 1 | 4 |
| 1 | 5 | 7 | 2 | 9 | 4 | 2 | 5 | 6 | 4 | 8 | 6 | 1 | 3 | 5 | 4 | 5 | 1 | 9 | 2 | 2 | 1 | 5 | 9 | 7 | 5 | 7 | 6 | 7 | 5 | 5 | 6 | 3 |
| 6 | 9 | 2 | 7 | 1 | 9 | 7 | 7 | 5 | 4 | 3 | 6 | 6 | 3 | 6 | 3 | 4 | 4 | 6 | 6 | 8 | 3 | 8 | 1 | 4 | 7 | 9 | 1 | 4 | 7 | 2 | 7 | 7 |
| 2 | 5 | 5 | 8 | 6 | 6 | 7 | 8 | 5 | 8 | 2 | 6 | 2 | 4 | 3 | 2 | 7 | 6 | 6 | 1 | 7 | 4 | 3 | 2 | 8 | 4 | 8 | 9 | 3 | 1 | 7 | 7 | 7 |
| 6 | 1 | 1 | 9 | 1 | 9 | 2 | 9 | 9 | 9 | 1 | 2 | 8 | 6 | 4 | 7 | 3 | 7 | 5 | 4 | 7 | 1 | 8 | 1 | 3 | 4 | 2 | 1 | 5 | 9 | 2 | 5 | 7 |
| 9 | 9 | 5 | 1 | 1 | 4 | 8 | 9 | 9 | 8 | 2 | 6 | 9 | 3 | 3 | 2 | 5 | 9 | 5 | 7 | 9 | 6 | 2 | 8 | 3 | 1 | 1 | 9 | 3 | 3 | 1 | 6 | 2 |
| 9 | 6 | 1 | 8 | 8 | 7 | 7 | 8 | 3 | 2 | 2 | 5 | 2 | 6 | 3 | 6 | 6 | 4 | 5 | 2 | 2 | 8 | 1 | 3 | 3 | 2 | 3 | 3 | 6 | 9 | 3 | 9 | 4 |
| 2 | 2 | 8 | 7 | 7 | 3 | 8 | 1 | 7 | 8 | 2 | 8 | 8 | 3 | 3 | 9 | 8 | 5 | 7 | 1 | 7 | 3 | 6 | 2 | 7 | 6 | 5 | 9 | 6 | 8 | 2 | 7 | 7 |
| 3 | 9 | 6 | 7 | 1 | 1 | 4 | 7 | 3 | 6 | 9 | 2 | 7 | 4 | 8 | 8 | 3 | 2 | 5 | 8 | 4 | 2 | 2 | 9 | 1 | 4 | 8 | 4 | 6 | 5 | 3 | 6 | 4 |
| 3 | 6 | 4 | 2 | 9 | 6 | 4 | 4 | 6 | 9 | 7 | 8 | 8 | 4 | 7 | 3 | 5 | 5 | 1 | 7 | 9 | 5 | 9 | 8 | 4 | 8 | 7 | 1 | 1 | 3 | 2 | 5 | 8 |
| 7 | 6 | 5 | 6 | 3 | 1 | 9 | 7 | 8 | 9 | 8 | 1 | 7 | 6 | 8 | 8 | 9 | 3 | 5 | 8 | 3 | 1 | 9 | 4 | 6 | 7 | 4 | 2 | 7 | 4 | 7 | 9 | 8 |
| 5 | 4 | 7 | 2 | 8 | 9 | 2 | 7 | 2 | 1 | 3 | 5 | 6 | 1 | 9 | 6 | 8 | 3 | 7 | 8 | 9 | 9 | 6 | 5 | 9 | 6 | 4 | 8 | 7 | 5 | 9 | 5 | 5 |
| 2 | 2 | 6 | 5 | 1 | 1 | 3 | 3 | 7 | 6 | 1 | 7 | 4 | 4 | 4 | 9 | 5 | 2 | 5 | 9 | 1 | 7 | 2 | 5 | 4 | 9 | 9 | 4 | 9 | 9 | 8 | 8 | 2 |
| 4 | 6 | 6 | 8 | 6 | 4 | 6 | 1 | 5 | 4 | 6 | 3 | 9 | 6 | 8 | 4 | 5 | 6 | 2 | 4 | 2 | 4 | 1 | 8 | 3 | 8 | 4 | 3 | 5 | 9 | 5 | 9 | 6 |
| 4 | 5 | 7 | 4 | 1 | 8 | 8 | 2 | 3 | 5 | 6 | 3 | 5 | 3 | 2 | 1 | 8 | 2 | 9 | 2 | 5 | 6 | 5 | 1 | 9 | 9 | 4 | 8 | 4 | 4 | 4 | 4 | 5 |
| 9 | 9 | 9 | 1 | 1 | 9 | 5 | 8 | 9 | 9 | 8 | 9 | 8 | 3 | 4 | 7 | 9 | 1 | 2 | 5 | 7 | 5 | 3 | 6 | 5 | 4 | 2 | 3 | 1 | 8 | 8 | 3 | 5 |
| 2 | 2 | 7 | 4 | 6 | 8 | 2 | 2 | 5 | 9 | 4 | 4 | 2 | 3 | 7 | 9 | 5 | 7 | 7 | 8 | 8 | 1 | 3 | 1 | 4 | 3 | 1 | 1 | 6 | 1 | 2 | 5 | 8 |
| 8 | 5 | 7 | 3 | 9 | 8 | 7 | 9 | 2 | 2 | 1 | 9 | 7 | 9 | 8 | 6 | 1 | 1 | 9 | 8 | 5 | 3 | 6 | 4 | 3 | 3 | 9 | 6 | 3 | 8 | 1 | 5 | 1 |
| 7 | 9 | 4 | 2 | 3 | 8 | 6 | 1 | 7 | 6 | 7 | 5 | 3 | 4 | 3 | 5 | 2 | 1 | 4 | 7 | 6 | 9 | 1 | 8 | 9 | 2 | 4 | 4 | 3 | 7 | 4 | 8 | 1 |
| 1 | 3 | 7 | 8 | 6 | 8 | 7 | 8 | 9 | 9 | 3 | 3 | 1 | 6 | 3 | 3 | 8 | 4 | 3 | 3 | 4 | 8 | 1 | 8 | 6 | 3 | 4 | 9 | 9 | 8 | 4 | 5 | 4 |
| 5 | 4 | 7 | 4 | 9 | 3 | 7 | 3 | 1 | 9 | 2 | 3 | 8 | 7 | 3 | 8 | 9 | 2 | 5 | 1 | 5 | 9 | 4 | 2 | 4 | 9 | 1 | 9 | 9 | 8 | 1 | 7 | 9 |
| 7 | 6 | 7 | 6 | 2 | 7 | 3 | 2 | 5 | 7 | 9 | 3 | 4 | 4 | 4 | 2 | 6 | 1 | 5 | 2 | 4 | 5 | 1 | 7 | 9 | 9 | 2 | 8 | 6 | 6 | 8 | 8 | 5 |
| 8 | 4 | 6 | 5 | 9 | 2 | 1 | 3 | 5 | 5 | 1 | 7 | 8 | 6 | 1 | 7 | 9 | 8 | 3 | 6 | 6 | 9 | 1 | 7 | 9 | 2 | 2 | 9 | 6 | 7 | 1 | 5 | 3 |
| 2 | 3 | 6 | 2 | 7 | 9 | 5 | 6 | 2 | 9 | 7 | 2 | 4 | 2 | 7 | 4 | 7 | 7 | 5 | 4 | 6 | 9 | 7 | 5 | 1 | 9 | 9 | 1 | 2 | 9 | 6 | 7 | 5 |
| 6 | 2 | 2 | 4 | 5 | 8 | 2 | 9 | 4 | 9 | 5 | 6 | 2 | 6 | 3 | 6 | 2 | 6 | 6 | 2 | 1 | 3 | 9 | 6 | 8 | 4 | 6 | 1 | 4 | 2 | 5 | 7 | 4 |
| 6 | 3 | 5 | 4 | 9 | 1 | 1 | 2 | 1 | 2 | 7 | 1 | 1 | 5 | 9 | 1 | 1 | 7 | 2 | 3 | 2 | 1 | 1 | 7 | 9 | 5 | 5 | 3 | 8 | 7 | 8 | 9 | 1 |
| 2 | 4 | 7 | 6 | 7 | 9 | 3 | 2 | 2 | 2 | 2 | 8 | 1 | 3 | 4 | 2 | 9 | 8 | 7 | 6 | 9 | 5 | 7 | 8 | 6 | 5 | 8 | 5 | 3 | 6 | 8 | 6 | 2 |
| 6 | 9 | 1 | 7 | 1 | 4 | 6 | 4 | 7 | 6 | 5 | 8 | 5 | 4 | 9 | 4 | 8 | 8 | 4 | 5 | 5 | 8 | 1 | 7 | 9 | 5 | 9 | 3 | 2 | 1 | 3 | 7 | 6 |
| 4 | 8 | 4 | 1 | 9 | 8 | 6 | 4 | 7 | 4 | 4 | 1 | 5 | 9 | 2 | 4 | 3 | 3 | 6 | 7 | 4 | 8 | 9 | 2 | 1 | 5 | 4 | 3 | 7 | 2 | 5 | 1 | 2 |
| 2 | 1 | 6 | 8 | 6 | 8 | 3 | 6 | 1 | 4 | 5 | 7 | 9 | 6 | 8 | 7 | 2 | 3 | 8 | 6 | 2 | 9 | 9 | 1 | 3 | 4 | 7 | 5 | 4 | 4 | 3 | 9 | 8 |
| 9 | 8 | 5 | 4 | 5 | 6 | 1 | 4 | 3 | 6 | 2 | 9 | 6 | 1 | 9 | 8 | 1 | 8 | 8 | 9 | 9 | 9 | 5 | 1 | 7 | 4 | 9 | 2 | 1 | 9 | 1 | 6 | 6 |
| 5 | 3 | 2 | 7 | 5 | 6 | 1 | 3 | 3 | 3 | 5 | 4 | 1 | 2 | 4 | 6 | 2 | 3 | 3 | 2 | 5 | 7 | 9 | 1 | 8 | 3 | 8 | 4 | 6 | 1 | 1 | 1 | 6 |
| 2 | 2 | 7 | 7 | 2 | 5 | 7 | 2 | 6 | 1 | 1 | 2 | 1 | 6 | 1 | 8 | 6 | 6 | 8 | 1 | 2 | 1 | 4 | 8 | 5 | 2 | 8 | 4 | 1 | 1 | 7 | 3 | 9 |
| 2 | 8 | 9 | 4 | 9 | 9 | 6 | 8 | 4 | 3 | 2 | 3 | 9 | 9 | 4 | 7 | 3 | 2 | 4 | 1 | 9 | 6 | 5 | 4 | 1 | 8 | 5 | 3 | 7 | 7 | 3 | 6 | 9 |
| 2 | 3 | 4 | 9 | 7 | 5 | 3 | 2 | 4 | 6 | 4 | 4 | 6 | 8 | 6 | 3 | 1 | 1 | 8 | 9 | 6 | 4 | 7 | 7 | 6 | 3 | 1 | 5 | 7 | 8 | 9 | 7 | 7 |
| 6 | 7 | 9 | 5 | 5 | 8 | 5 | 4 | 4 | 5 | 6 | 1 | 4 | 9 | 4 | 5 | 3 | 1 | 7 | 3 | 2 | 1 | 8 | 6 | 2 | 2 | 4 | 7 | 8 | 1 | 4 | 5 | 9 |
| 5 | 3 | 7 | 8 | 6 | 6 | 4 | 1 | 1 | 4 | 4 | 2 | 5 | 1 | 1 | 4 | 8 | 9 | 4 | 2 | 8 | 9 | 9 | 7 | 2 | 4 | 7 | 8 | 4 | 1 | 8 | 1 | 1 |
| 7 | 2 | 3 | 2 | 1 | 7 | 2 | 8 | 6 | 4 | 6 | 9 | 7 | 3 | 9 | 3 | 3 | 4 | 4 | 7 | 1 | 4 | 4 | 8 | 8 | 6 | 7 | 4 | 1 | 9 | 9 | 5 | 1 |
| 8 | 4 | 3 | 4 | 9 | 2 | 7 | 2 | 6 | 3 | 7 | 9 | 8 | 3 | 1 | 9 | 9 | 5 | 8 | 7 | 1 | 2 | 9 | 9 | 6 | 6 | 8 | 8 | 8 | 7 | 8 | 4 | 8 |

## APPENDIX B: QAE Inspection Worksheets

### Paved Surfaces Worksheet

Page 1 of 3

**Performance Indicator #1:** The level of PM performed for paved surfaces is adequate.

- a. Potholes, upheavals, and alligator-cracked areas are repaired.
- b. Cracks are sealed.
- c. Road shoulders are properly maintained.
- d. Repairs are done in a professional manner.

Using the population size \_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives \_\_\_\_\_ number of samples and \_\_\_\_\_ number of allowable rejects.

#### LOCATION

|       |    |   |   |
|-------|----|---|---|
| _____ | S* | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |
| _____ | S  | U | N |

Remarks:

\_\_\_\_\_  
\*S = Satisfactory, U = Unsatisfactory, N = Not applicable. Circle one rating for each item.

## Paved Surfaces Worksheet

Page 2 of 3

**Performance Indicator #2: Paved surfaces are swept as needed.**

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

**LOCATION**[illegible]**Remarks:**

## Page 3 of 3

Using the population size\_\_\_\_\_, and referring to normal surveillance Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

[illegible]

### Quality Assurance Evaluator

Date \_\_\_\_\_

## Page 1 of 2

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

[illegible]

21

**Performance Indicator #2:** "As-built" drawings are updated with changes and corrections.

a. The draftperson's initials accompany each change.

S      U      N

b. The date of change accompanies each correction.

S      U      N

**Remarks:**

---

Quality Assurance Evaluator

---

Date

## Traffic Services Worksheet

Page 1 of 2

**Performance Indicator #1:** Traffic regulatory, warning, guidance, and lane markings, and traffic islands are in good repair and proper working order.

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

## LOCATION

[illegible]**Remarks:**

## Traffic Services Worksheet

Page 2 of 2

**Performance Indicator #2: Parking areas and helipad markings are clearly visible.**

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

## LOCATION

[illegible]**Remarks:**

## Quality Assurance Evaluator

Date \_\_\_\_\_

## Page 1 of 3

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_number of samples and\_\_\_\_number of allowable rejects.

[illegible]

25

Using the population size\_\_\_\_\_, and referring to normal surveillance Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

[illegible]

26

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

[illegible]

### Quality Assurance Evaluator

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## Recreational Areas Worksheet

Page 1 of 1

**Performance Indicator:** Playground equipment is repaired as needed and is maintained in good condition.

Using the population size\_\_\_\_\_, and referring to normal surveillance in Tables A1 and A2 gives\_\_\_\_\_number of samples and\_\_\_\_\_number of allowable rejects.

**LOCATION**[illegible]**Remarks:**

### Quality Assurance Evaluator

Date \_\_\_\_\_

## Service Order Questionnaire

Page 1 of 2

This survey should be completed using information collected from the person who has had the most contact with maintenance personnel. Please circle the letter of the answer selected or write in an appropriate answer where there are blanks.

1. Response (in days) to repair requested work:

- a) Excellent response (normal conditions - 7 days)  
(emergency conditions - 1 day)
- b) Adequate response (within 2 weeks)
- c) Too long (Approximately how long? \_\_\_\_ days)

2. Quality of work: (Are you satisfied that quality work was performed?)

Yes \_\_\_\_ No \_\_\_\_ Defect was not fixed \_\_\_\_

Explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Cleanup of area after repair: (Was area left as clean as it was before work personnel arrived?)

Yes \_\_\_\_ No \_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_

4. Efforts of work personnel: (Are you satisfied that the work was performed in a professional, effective manner?)

Comments: \_\_\_\_\_  
\_\_\_\_\_

5. Attitude of work personnel: (Were they helpful, friendly, courteous, cheerful?)

Comments: \_\_\_\_\_  
\_\_\_\_\_

6. Do you think this type of repair could be accomplished as "self help" if material and instructions were supplied?

Yes \_\_\_\_ No \_\_\_\_ Maybe \_\_\_\_

**7. Remarks:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Thank you for your cooperation.**

\_\_\_\_\_  
**Quality Assurance Evaluator**

\_\_\_\_\_  
**Date Questionnaire Completed**

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