



**US Army Corps
of Engineers**
Construction Engineering
Research Laboratories

USACERL Special Report FF-94/11
October 1993
QA Inspections Via Condition Monitoring

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

Guide #11: Pest Control Services

by
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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 scheduled and unscheduled pest control services.

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| REPORT DOCUMENTATION PAGE | | | Form Approved OMB No. 0704-0188 | |
|--|--|---|---|--|
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| 1. AGENCY USE ONLY (Leave Blank) | 2. REPORT DATE October 1993 | 3. REPORT TYPE AND DATES COVERED Final | | |
| 4. TITLE AND SUBTITLE Guidelines for Quality Assurance Inspection fo Commercial Activities Contracts for Real Property Maintenance Activities, Guide #11: Pest Control Services | | | 5. FUNDING NUMBERS 4A162784 AT41 SB-A51 | |
| 6. AUTHOR(S) James H. Johnson and Paul C. Bresnahan | | | | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Construction Engineering Research Laboratories (USACERL) P.O. Box 9005 Champaign, IL 61826-9005 | | | 8. PERFORMING ORGANIZATION REPORT NUMBER SR FF-94/11 | |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Center for Public Works (USACPW) ATTN: CECPW-FM-S Bldg 358 Fort Belvoir, VA 22060-5516 | | | 10. SPONSORING/MONITORING AGENCY REPORT NUMBER | |
| 11. SUPPLEMENTARY NOTES Copies are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. | | | | |
| 12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited. | | | 12b. DISTRIBUTION CODE | |
| 13. ABSTRACT (Maximum 200 words) 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 scheduled and unscheduled pest control services. | | | | |
| 14. SUBJECT TERMS quality assurance real property maintenance activities pest control | | | 15. NUMBER OF PAGES 26 | |
| | | | 16. PRICE CODE | |
| 17. SECURITY CLASSIFICATION OF REPORT Unclassified | 18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified | 19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified | 20. LIMITATION OF ABSTRACT 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 #11: PEST CONTROL SERVICES**

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 pest control services 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 (SR FF-94/09)

#10: Refuse and Recyclable Handling (SR FF-94/10)

#11: **Pest Control Services**

#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 pest control services and is divided into sections that take the inspector through a step-by-step process of recommended performance indicators, inspection tasks, and surveillance methods.

Pest control services are divided into two subsystems in this guide:

1. Scheduled Pest Control Services
2. Unscheduled Pest Control Services.

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; 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 pest control services.

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 PEST CONTROL SERVICES QA INSPECTIONS

Scheduled Pest Control 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. An adequate level of household pest prevention is provided.

Verify that the contractor is performing an adequate level of household pest prevention:

- a. Verify that the contractor conducts weekly pest inspections and spot treats affected areas according to specifications. Check that all buildings scheduled for inspection have either been signed off by the resident or marked "not accessible" (NA) if the contractor's agent has not been able to gain entry after three attempts. See that the contractor asks residents about possible infestation problems and provides them with insect and rodent prevention as specified in the contract documents.

- b. Place sticky traps in areas where customers have reported insects, or in random sampling, where insects are likely to congregate, such as the kitchen or food storage area. Collect these traps 24 hours later. If more than five roaches or related pests are in the trap, consider the pest control level to be inadequate.

2. All appropriate refuse containers are being sprayed.

Verify that the contractor sprayed all appropriate refuse containers:

- a. Check to see that the contractor cleaned all specified refuse containers with fresh water and sprayed them for insect and rodent control. Schedule inspections using the contractor's list of refuse containers to be cleaned. Conduct the inspections as soon as possible after each sample is completed. The unit should be located in its permanent location and ready for use, and there should be no visible evidence of insects or rodents. Also, inspect the mechanical condition and appearance of the disposal unit and recommend any necessary maintenance.

- b. If there is reason to suspect that the contractor is not using a pesticide, collect a sample for laboratory testing, using the following procedures:

- (1) Wipe a 1-sq-ft* area of the surface with a cotton swab dipped in xylene.
- (2) Place the swab in a closed container and refrigerate.
- (3) Have a toxicology testing laboratory analyze the sample for the presence of the approved pesticide (usually a diazinon formulation).

*1 sq ft = 0.093m²; 1 ft = 0.305m.

- c. Document any discrepancies. Use a contract discrepancy report to notify the KO if the work is unsatisfactory. Provide a monthly performance summary to the KO with an overview of the contractor's performance.
3. An adequate level of vegetation control is provided.

Verify that the contractor is providing an adequate level of vegetation control:

a. Improved Grounds. Visually verify that broadleaf weeds do not exceed 10 weeds per 20-sq-yd area. If the presence of weeds is obvious, pace off a square of 24 normal steps on each side, marking the corners, and count the number of broadleaf weeds within the square. If the number exceeds 10, report to the KO that the work may not be satisfactory.

If nonperformance persists, start a random sampling procedure to formally evaluate the contractor's performance in order to adjust payment. To sample the work, divide the improved areas into approximately equal sections and number each section. The number of sections identified becomes the population size for random sampling purposes.

b. Special Areas. If the contract includes vegetation control in specified special areas, visually verify that these areas are essentially weed-free. Usually, special areas are decorative planting areas at entrances to the installation and surrounding headquarters buildings, and they require close attention due to their high visibility. If only a small number of these areas exist, use unscheduled inspections. Otherwise, list the special areas, number them consecutively, and inspect them using the random sampling method.

c. Fencing. Verify that vegetation control along fencing eliminates virtually all growth within 6 in. of the fenceline. Perform an initial evaluation of the contractor's performance by visual drive-by inspections of the fencelines on the way to other locations on the installation. If these inspections show that vegetation is often present near the fencelines, begin using random sampling by first determining the length of fencing for which the contractor is responsible and dividing it into sections of about 100 ft each. Number each section for identification on an installation map. These sections become the population size for the random sampling method.

d. Paved Surfaces. Visually verify that vegetation in paved surfaces does not exceed 1 in./ft of joint or crack. Give special attention to low-traffic areas where abrasion will not inhibit growth. If these inspections show that performance standards are not being met, begin using random sampling by dividing the paved areas into sections. Streets can be identified by blocks. Special areas, such as parking lots, tennis courts, and helicopter landing areas, can be identified separately. The sections, which are identified and numbered on an installation map, become the population size for the random sampling.

4. Wood infestation inspections are performed.

Verify that the contractor inspects all facilities annually for termites, wood-destroying beetles, and fungi:

a. Verify that the contractor's annual inspection schedule includes all buildings and facilities listed in the contract.

b. Verify that all buildings scheduled for inspection have been signed off by the resident as having been inspected. Select one or more buildings for visits to confirm that the actual condition corresponds to that stated in the inspection report. Interview the facility resident and look for the presence of dead or live insects, termite tunnels on foundation surfaces, and deterioration of wood joints, sill plates, porches, steps, and any other wood components located near soil, concrete slabs, foundations, or footings. QA instrumentation is recommended to check for pest infestations (Johnson 1993).

Document any discrepancies between the QAE inspection and the contractor's report. If observed conditions cause any uncertainty, notify the KO that a suspected deficiency exists so that confirmation can be made.

c. If the wood infestation inspection has found active wood-destroying vectors or recent damage to the facility, verify that the contractor submitted a report to the KO within 5 days after completion of the inspection, noting any areas where treatment is required and the extent of the damage.

5. An adequate level of mosquito control is provided.

Verify that annually during the month of April or May, the contractor provides and distributes a slow-release mosquito control pellet product impregnated with insecticide in the density recommended by the manufacturer.

a. When the contractor reports that the mosquito abatement material has been delivered to the installation, check to see that the product is specifically designed for mosquito control. Verify that the product is in original, unopened containers and clearly labeled. Tell the contractor to hold distribution if the product does not appear correct.

b. Verify that enough material is on hand to treat the areas specified at the recommended application rate:

- (1) Determine the manufacturer's recommended application rate in number of pellets per 100 sq ft.
- (2) Multiply the application rate times the number of square feet to be treated to get the total number of pellets required for the operation.
- (3) If the manufacturer's product is packaged by weight rather than the number of pellets, figure the number of pellets per pound:
 - (a) Select a moderate sample of pellets.
 - (b) Count the pellets, weight the sample, and divide the first number by the second number to get the number of pellets per pound.
 - (c) Divide the number of pellets required to complete the operation by the number of pellets per pound to determine the number of pounds of product required for the operation.
- (4) Verify that the contractor has at least the appropriate number of pounds of pellets on hand.

c. Verify that the product is distributed in the areas and at the rate specified. Immediately following application of the pellets, randomly select a portion of the treated grounds and count the number of pellets within a square measuring 10 ft on a side. Verify that the number equals or exceeds that recommended by the manufacturer.

Recommended Surveillance Approach

- Evaluate performance indicators #1 and #2 monthly using random sampling (normal surveillance, 10 percent AQL).
- Evaluate performance indicator #3 periodically using the unscheduled inspection method.
- Evaluate performance indicators #4 and #5 annually using the 100 percent inspection method.

Unscheduled Pest Control Services

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.

All work requests for pest control services are responded to in a timely, effective, and professional manner.

Verify that the contractor responds to work requests from the KO for pest control services in a timely, effective, and professional manner. As a rule, all unscheduled pest control services are performed as a Service Order (SO).

Verify that the contractor submitted a report of the completed work. Visit the site of the pest control work and confirm that the requested service has been performed. Interview the person(s) who requested the service to evaluate the timeliness and effectiveness of the service when its effect is not visibly obvious or when the results are not expected to be immediate.

Recommended Surveillance Approach

- Evaluate the performance indicator monthly using random sampling (normal surveillance, 5 percent AQL).

ACRONYMS

| | |
|---------|---------------------------------------|
| AQL | Acceptable Quality Level |
| COR | Contracting Officer's Representative |
| DEH | Director of Engineering and Housing |
| FESA | Facilities Engineering Support Agency |
| 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 | Reject Level | Class III Sample Size | Reject Level | Reject Level | Class I Sample Size | Reject Level | 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 | Reject Level | Class III Sample Size | Reject Level | Reject Level | Class I Sample Size | Reject Level | 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 | 4 | 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 | 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 | 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 | 4 | 2 | 2 | 6 | 8 | |
| 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 | 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 | 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 | |
| 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 | 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 | 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 | 3 | |
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| 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 5 | 9 | 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 | 8 | |
| 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 | |
| 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 | 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 | |
| 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | |
| 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 | 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 | 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 | 6 | |
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| 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 | 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 | 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 | 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 | 1 | |
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