

NORTH CAROLINA STATE BUREAU OF INVESTIGATION

CRIME LABORATORY SYSTEM

INSPECTION OVERVIEW REPORT

C. Vander Ark
Team Captain

This report is provided to familiarize ASCLD/LAB members with:

1. Logistical information regarding the recent inspections of the North Carolina State Bureau of Investigation (SBI) Crime Laboratory System.
2. General comments pertaining to the North Carolina SBI Forensic Laboratory System.

The North Carolina SBI Laboratories were inspected July 13-17, 1998, by a team of nine inspectors assigned as follows:

All inspectors participated in the inspection of the full service Headquarters Laboratory in Raleigh. The smaller, limited service Regional Laboratory in Asheville was inspected by Jack Duncan and Clifton Vander Ark.

All team members convened from 3:00 pm to 6:00 pm on Sunday, July 12th, to discuss: each accreditation standard, the qualities of good inspectors and specific plans for the inspection. A meeting was held on Monday with several Assistant Directors, including Laboratory Director Bill Matthews, who were rotating the SBI Directorship in the absence of Director James Coman, who was recently hospitalized. It was very obvious that these gentlemen were very supportive of the accreditation process and looked forward to an objective, external assessment of their laboratories.

Prior to the "walk through" of the 120,000 sq. ft. facility in Raleigh, the team met with the entire staff of the laboratory to introduce each inspector and to provide an opportunity for staff members to ask questions about the inspection process. It is believed that this is an important facet in helping to relieve normal apprehensions of staff about being inspected.

During the inspection process, every attempt was made to advise Quality Manager Mark Nelson and Administrator John Neuner of the findings of the team.

At 10:00 am on Friday, the entire team met with the Laboratory Directors from the Raleigh and Asheville Laboratories. All unit supervisor personnel were also present for this meeting.

It should be noted that two criteria in Raleigh and one criterion in Asheville were graded "Yes" which, upon further reflection, should have been graded "No." These criteria for Raleigh are: 1.1.2.2, an Important criteria for both Raleigh and Asheville (IS THE BUDGET ADEQUATE TO MEET THE WRITTEN OBJECTIVES?). The Controlled Substance backlogs in both laboratories were inordinately high, making it difficult to provide the level of service turnaround times that should be expected by user agencies, i.e., more personnel are needed in this discipline in both laboratories. The other criterion is: 1.4.2.9, an Essential in the Raleigh Laboratory (IS THE QUALITY OF THE STANDARD SAMPLES AND REAGENTS ADEQUATE FOR THE PROCEDURE USED?). This criterion is closely connected with the issue addressed in 1.4.2.8 and the remediation required would satisfy both criteria.

ASCLD/LAB

INSPECTION REPORT

NORTH CAROLINA STATE BUREAU OF INVESTIGATION
CRIME LABORATORY

RALEIGH, NORTH CAROLINA

Inspected July 13-17, 1998

Submitted by Inspection Team:

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Reported August 17, 1998

INTRODUCTION

This report details the findings of the Inspection Team assigned to assess the North Carolina State Bureau of Investigation (NCSBI) Crime Laboratory in Raleigh, North Carolina. The laboratory is located at 121 East Tryon Road, Raleigh, North Carolina.

The individuals comprising the team were Neil Campbell, Ph.D., Director of the Forensic Science Laboratory at the Chemistry Centre in Perth, Australia; Robin Cotton, Ph.D., Director of Cellmark Diagnostics, Forensic Division in Germantown, Maryland; Gary Cortner, Firearms Supervisor at the California DOJ Forensic Laboratory in Fresno, California; Jack Duncan, Laboratory Director of the Florida Dept. of Law Enforcement Tampa Crime Laboratory in Tampa, Florida; John Eras, Director of the West Covina Satellite Laboratory for the Los Angeles County Sheriff's Dept. in Los Angeles, California; Hermann Metz, Supervisor of the Trace Analysis Section of the Victoria Forensic Science Centre in Victoria, Australia; Raymond Prime, Ph.D., Director of the Forensic Science Centre in Toronto, Canada; Amy Wong, Director of the Virginia Division of Forensic Science Laboratory, Northern Laboratory at Fairfax, Virginia; and Team Captain Clifton Vander Ark, Quality Manager of the Arizona Dept. of Public Safety Forensic Laboratory System in Phoenix, Arizona.

The Raleigh Laboratory was inspected during the week of July 13-17, 1998.

LABORATORY OVERVIEW

The Raleigh Laboratory is part of the Crime Laboratory Division operated by the North Carolina State Bureau of Investigation. The laboratory provides all services for which accreditation is available and serves the entire state of North Carolina. The population served is approximately 7.4 million. It should be noted that the 25 Western counties are served by the Division's Western Regional Laboratory at Asheville in the areas of controlled substances, latent print examination and arson analysis.

During the past year, the laboratory was moved into a new, state-of-the-art, spacious 120,000 sq. ft. facility comprised of four floors. This building is well designed and is one of the most impressive forensic facilities built in recent years and could well be a benchmark for other facilities that are being contemplated in other areas of the world.

There are currently 96 positions authorized, including 5 vacancies distributed as follows:

	TOTAL AUTHORIZED	VACANCIES
Management	8	
Clerical	17	4
Research Specialist (DNA)	1	

	TOTAL AUTHORIZED	VACANCIES
Research Technician (DNA)	2	
IBIS Technician	1	1
Evidence Technician	5	
Controlled Substances	16	
Toxicology	2	
Trace Evidence	11	
Serology	3	
DNA	7	
Firearms/Toolmarks	9	
Questioned Documents	4	
Latent Prints	10	

It should be noted that all employees are sworn SBI agents with the exception of clerical, evidence technician and some DNA database personnel.

The following report is intended to describe not only the criteria where non-compliances were found but also those areas where further improvements could be made, as well as those findings where the laboratory clearly exceeded the accreditation standard. It is hoped that ASCLD/LAB Board members will perceive a balanced picture of the overall high quality of the Raleigh Laboratory and its Quality System.

STANDARDS AND CRITERIA

1. LABORATORY MANAGEMENT AND OPERATIONS

1.1.2.2 (I) IS THE BUDGET ADEQUATE TO MEET THE WRITTEN OBJECTIVES?

Yes There does, however, appear to be a deficiency in personnel resources in the Controlled Substances Unit with most employees carrying a several hundred case backlog and lengthy turnaround times. More funds could also be used for equipment in the Trace Analysis Unit.

1.1.2.3 (E) HANDLING AND PRESERVING THE INTEGRITY OF EVIDENCE.

Yes Clear and easily understood procedures exist for all types of evidence with the exception of explosives. It may be advisable to implement a procedure that also involves a Trace Chemist taking possession of such evidence.

1.1.2.7 (D) MAINTENANCE AND CALIBRATION OF EQUIPMENT AND INSTRUMENTS.

Yes It is suggested that the laboratory establish acceptable temperature ranges for those pieces of equipment for which they currently monitor temperature in the Molecular Genetics Unit, i.e., water baths, freezers and refrigerators. Not all equipment or procedures need the same temperature precision; however, specifying acceptable ranges will allow staff to know when some intervention is required.

1.1.2.14 (I) DOES THE LABORATORY HAVE AND USE A MANAGEMENT INFORMATION SYSTEM?

Yes The existing case registration system is not capable of providing the support necessary for the case numbers handled by the Drug/Chemistry Section. It was noted that a new system with greater functionality is to be installed in the near future.

1.2.2.6 (I) ARE PERFORMANCE EXPECTATIONS ESTABLISHED AND ARE THEY UNDERSTOOD BY LABORATORY PERSONNEL?

Yes The Drug/Chemistry supervisor determines the average number of cases worked each quarter/drug chemist. This average is the target number of cases expected of each analyst for the following quarter. This is a moving average, which causes frustration for some of the chemists due to the large number of

cases received, the growing backlog and not knowing what the expectations are until the end of the quarter. The Drug/Chemistry Section receives approximately 26,000 cases per year. The average drug chemist analyzes more than 200 drug cases per month, about double the national average for drug cases/analyst. Several drug chemists have a personal backlog of more than 700 drug cases; consequently, the Drug/Chemistry Section is in dire need of additional personnel.

- 1.3.1.2 (I) DO SUPERVISORS CAREFULLY AND OBJECTIVELY REVIEW LABORATORY ACTIVITIES, METHODS, AND PERSONNEL?
- Yes The Trace Analysis Unit is to be commended for making a concerted effort to develop staff with skills in more than one area of specialization.
- 1.3.1.3 (D) DO THE SUPERVISORY TECHNIQUES ENCOURAGE CREATIVE, OBJECTIVE THINKING AND RECOGNIZE MERITORIOUS PERFORMANCE?
- Yes The NCSBI forensic lab staff are encouraged to participate and are well represented in numerous forensic science societies. The Molecular Genetics Section Supervisor, Mark Nelson, has done an excellent job of recognizing good performance. He is also using a very motivational team approach to enhance and facilitate development of the STR training program.
- 1.3.3.1 (I) DOES THE LABORATORY HAVE AND USE A TRAINING PROGRAM IN EACH FUNCTIONAL AREA?
- Yes The training programs available in each of the forensic disciplines are well developed and documented. The amount of detail and organization in these programs are undoubtedly very useful for training new personnel, as well as cross-training existing staff. Of particular note was the very comprehensive training program that is in place for Questioned Document trainees. These individuals are the beneficiaries of a diverse range of training with other government departments as well. A similar arrangement was also noted in the Trace Evidence area.
- 1.3.3.2 (I) DOES THE LABORATORY HAVE AN EMPLOYEE DEVELOPMENT PROGRAM?
- Yes Although the laboratory's self-evaluation rates this criterion with a "No," the NCSBI Laboratory has well developed strategies for staff training and development within the context of the laboratory system. To document such training, the laboratory has the data to produce a remarkably sophisticated "Training/-Career Development Transcript Report."

It was noted that the staff concern in this category primarily involved a significant pay inequity between laboratory staff and field agents. This situation should be remedied to enhance lab staff morale since both field and laboratory staff are all commissioned SBI agents. There appears to be no compelling reason for a differential in compensation.

1.3.3.3 (I) DOES THE FORENSIC LIBRARY CONTAIN CURRENT BOOKS, JOURNALS, AND OTHER LITERATURE DEALING WITH EACH FUNCTIONAL AREA?

Yes The laboratory has a very good library and receives a wide variety of forensic journals; however, the case backlog does not allow time for personnel in several of the sections to read current articles.

1.4.1.1 (E) DOES THE LABORATORY HAVE A CHAIN-OF-CUSTODY RECORD WITH ALL NECESSARY DATA?

Yes Although a chain-of-custody record exists, improvements could be made by more completely describing the custody of individual items on the chain-of-custody record when selected items within a case are signed out to personnel from the various specialized disciplines.

1.4.1.3 (E) IS EVIDENCE STORED UNDER PROPER SEAL?

No Several instances were found in the initial "walk through" of the Evidence Intake area where improperly sealed evidence was being received, i.e., no marks of the individual sealing the evidence. These deficiencies were observed on a variety of evidence parcels.

1.4.1.4 (E) IS EVIDENCE PROTECTED FROM LOSS, CROSS TRANSFER, CONTAMINATION AND/OR DELETERIOUS CHANGE?

Yes It is recommended that submitted weapons be wrapped in paper instead of plastic to best preserve latent print and biological fluid stains. This may have been a temporary situation since the paper supply was recently depleted. Fire debris was accepted in a variety of containers, all of which were stored at room temperature. Some were unlined paint cans which corroded in a matter of weeks. Some evidence was stored in boxes for this period of time and it was not known whether or not these contained improper containers of fire debris. The laboratory should take steps to control the type of can the submitting agencies use. This should include performing tests to determine whether an inherent contaminant is introduced during the manufacturing process and whether the container is subject to corrosion in humid climate.

- 1.4.2.1 (I) DOES THE LABORATORY HAVE A QUALITY MANUAL?
- Yes The Raleigh Laboratory under the guidance of Quality Manager Mark Nelson had well-developed Quality Assurance Manuals in every forensic discipline, including the clerical area. It is recommended that an overall Quality Manual be developed for the laboratory as well. This general manual could very well reference each of the other Quality Assurance Manuals and would help describe the quality system and its requirements for the entire laboratory.
- 1.4.2.2 (I) IS AN INDIVIDUAL DESIGNATED AS THE QUALITY MANAGER?
- Yes Mark Nelson supervises the Molecular Genetics Section and was recently appointed System Quality Manager, performing both functions superbly with a lot of extra effort and time. His continuing to perform both roles may become problematic. A laboratory system employing as many personnel as the NCSBI requires a full-time Quality Manager.
- 1.4.2.3 (I) ARE AUDITS OF THE ENTIRE LABORATORY OPERATION COMPLETED ANNUALLY?
- Yes The audit procedures were well documented and corrective actions had been instituted in all appropriate cases. It is recommended that for the aspects of the audit which require an evaluation of the technical performance of a section, i.e., where reference is made to the adequacy of technical procedures, the audit team should include an appropriately knowledgeable person.
- 1.4.2.6 (E) ARE NEW TECHNICAL PROCEDURES SCIENTIFICALLY VALIDATED BEFORE BEING USED IN CASEWORK AND IS THE VALIDATION DOCUMENTATION AVAILABLE FOR REVIEW?
- Yes Limited data for cocaine and benzoylcegonine was available to support a change from a "Varian" solid phase extraction column (SPE) to a "UTC" column in 1994. No "in-house" validation data was available for the extraction technique for other drugs. It is noted, however, that the SPE technique is considered a valid procedure and would not be regarded as "new." For future ISO based standards, "in-house" data will be required.
- 1.4.2.7 (E) ARE THE TECHNICAL PROCEDURES USED BY THE LABORATORY DOCUMENTED AND ARE THE DOCUMENTS AVAILABLE TO LABORATORY PERSONNEL FOR REVIEW?
- No The Drug/Chemistry Section has a Technical Procedures Manual which includes well-documented descriptions for all the analytical procedures used; however, written case handling protocols for drug and toxicology analysis do

not exist. It was noted that criteria for interpretation of results and/or acceptance of results was missing for a number of technical procedures in the above disciplines. The section "Selected Uses" in the toxicology procedures for solid phase extraction of drugs should include reference to the concentration of drugs detectable by the procedure.

Other areas where protocols either did not exist or had deficiencies were: ejection pattern determinations in the Firearms/Toolmarks Section; interpretation information for gunshot residue (GSR) analysis; and Ouchterlony test interpretations for species determination in serology.

- 1.4.2.8 (E) ARE APPROPRIATE CONTROLS AND STANDARDS SPECIFIED IN THE PROCEDURES AND ARE THEY USED TO ENSURE THE VALIDITY OF EXAMINATION RESULTS?
- No In the toxicology area, positive controls were not specified in the procedures or used in the analysis of the following drug classes when being analyzed by solid phase extraction/GC-MS: opiates, amphetamines, barbiturates, cocaine or benzodiazepines. Appropriate controls were used for alcohol and EMIT procedures and also for carboxytetrahydrocannabinol by SPE/GC-MS.
- 1.4.2.9 (E) IS THE QUALITY OF THE STANDARD SAMPLES AND REAGENTS ADEQUATE FOR THE PROCEDURE USED?
- Yes There were no deficiencies found in standards used in the laboratory with the exception of those noted in 1.4.2.8.
- 1.4.2.10 (E) DOES THE LABORATORY ROUTINELY CHECK THE RELIABILITY OF ITS REAGENTS?
- No Each drug chemist prepares their own reagents and labels each container with the date prepared and checked and the name of the preparer; however, a reagent log is not maintained as required by ASCLD/LAB standards.
- As referred to in criterion 1.4.2.8, the SPE cartridges used for toxicology extractions were not routinely checked for performance for the drug classes listed under that criterion (see above). It is recommended that the use of deuterated internal standards or a similar analytical strategy be implemented.
- 1.4.2.11 (I) ARE THE INSTRUMENTS/EQUIPMENT ADEQUATE FOR THE PROCEDURES USED?
- Yes There appears, however, to be more workload than the current scanning electron microscope can accommodate.

1.4.2.12 (I) ARE THE INSTRUMENTS/EQUIPMENT IN PROPER WORKING ORDER?

No The pyrolysis gas chromatograph is not working reliably. The FTIR is in working order but requires an inordinate amount of service. The NMR and HPLC in the Drug/Chemistry Section were not operational. In the event the NMR is placed into service in the future, a relevant technical procedure for its operation needs to be produced.

1.4.2.14 (E) DO THE EXAMINERS GENERATE AND DOES THE LABORATORY MAINTAIN, IN A CASE RECORD, ALL THE NOTES, WORKSHEETS, PHOTOGRAPHS, SPECTRA, PRINTOUTS, CHARTS AND OTHER DATA OR RECORDS USED BY EXAMINERS TO SUPPORT THEIR CONCLUSIONS?

No Several instances were noted where corrections in case notes were improperly made by being crossed through or being obliterated—not meeting the required single line, initialed strike-through requirement for corrections. This was particularly observed in the Drug/Chemistry and Trace Analysis areas. Some of the forms, e.g., SBI 5, did not have a unique identifier number as required.

The lab does not document which DNA extraction method is used for which samples (i.e., bloodstain/differential, etc.); however, the date the extraction is started is documented. The lab should consider specifying start date, extraction method, completion date and what samples were extracted concurrently.

1.4.2.17 (E) DOES THE LABORATORY REVIEW THE REPORTS TO ENSURE THAT THE CONCLUSIONS OF ITS EXAMINERS ARE REASONABLE AND WITHIN THE CONSTRAINTS OF SCIENTIFIC KNOWLEDGE?

Yes It is recommended that the laboratory review the conclusions used in gunshot residue cases and consider providing clear guidelines in the selection of the appropriate conclusion (see comments in 1.4.2.7). Steps should also be taken to review reporting formats for "possible saliva," with an effort to remove any implications that identification of material can be established from a presumptive test.

Two DNA cases were observed where multiple items were tested using RFLP methods. In these two cases, results were obtained for each item at a different number of loci. For example, Item A had results at 6 loci, Item B at 5 loci, and Item C at 4 loci. In the report, the results statement for each item says that there is a match between the item and a known at the correct number of loci (for each item) and that this match is a rare event. For Items B and C, the results state that no statistics will be calculated for this match. The conclusion then states that the statistics for this case are "1 in...." The conclusion should

have stated that the statistics given were for the match between A and the "known sample" in this case. The statistics presented were correctly calculated for "A and known"; therefore, the statistics need to be clearly identified as being related to the match between A and the known. Mark Nelson and the agent who did the work in this case indicated that an incorrect computer report shell had been used in these two cases and that they have corrected the problem.

1.4.3.2 (E) DOES THE LABORATORY PARTICIPATE IN PROFICIENCY TESTING PROGRAMS CONDUCTED BY APPROVED TEST PROVIDERS?

Yes The performance of the laboratory in externally provided proficiency tests was excellent overall.

In particular, the team members inspecting the Toxicology Section were very impressed with the laboratory correctly detecting and identifying all target drugs in all proficiency tests in 1996 and 1997.

2. PERSONNEL QUALIFICATIONS

The Raleigh Laboratory is well staffed by personnel with very excellent professional qualifications in their various fields of expertise.

It should be noted that not all Questioned Documents and Latent Print Examiners possess a baccalaureate degree, not meeting "Desirable" criteria 2.8.1 and 2.9.1.

3. PHYSICAL PLANT

3.1.5 (I) IS ADEQUATE SPACE AVAILABLE FOR EACH INSTRUMENT TO FACILITATE ITS OPERATION?

Yes It is recommended that a different arrangement be provided for operating the FTIR microscope that would eliminate the need for the analyst to use a 3-step ladder for its operation.

3.4.5 (I) DOES THE LABORATORY HAVE PROPER EQUIPMENT AND MATERIAL AVAILABLE FOR THE HANDLING OF CARCINOGENIC, TOXIC AND/OR OTHER DANGEROUS MATERIAL SPILLS?

No Although solvent spill kits are in the solvent room, they should also be in all areas where large amounts of solvents are used, e.g., petroleum ether in arson work areas.

3.4.6 (I) DOES THE LABORATORY HAVE SAFETY SHOWER AND EYE WASH EQUIPMENT IN APPROPRIATE LOCATIONS AND IN GOOD WORKING CONDITION?

No Eye wash equipment is not connected to a drain in numerous areas of the lab.

3.4.10 (I) IS APPROPRIATE SPACE PROVIDED FOR SAFE STORAGE OF VOLATILE, FLAMMABLE AND EXPLOSIVE MATERIALS?

Yes It is recommended that all flammable liquid storage areas beneath hoods are actually ventilated through the hood, i.e., all plugs removed between the cabinet and the exhaust flow of the hood.

SUMMATION OF CRITERIA RATINGS

	TOTAL POSSIBLE	TOTAL YES	TOTAL NO
Essential	62	57	5
Important	46	43	3
Desirable	29	26	3

Percent Essential - 92%

Percent Important - 93%

Percent Desirable - 90%

SUMMARY AND RECOMMENDATIONS

The Inspection Team would like to commend the staff for the holistic approach with which they work multi-examiner cases, especially in light of how physically separated the sections were in the past and continue to be in the new building. The overall professionalism of the staff and their open and forthcoming demeanor helped make the inspection process a very pleasant experience.

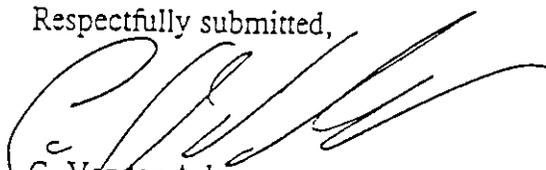
The team also wishes to thank Lab Director Bill Matthews for assigning Mark Nelson to be the SBI Inspection Coordinator. Mark carried out a masterful job, making detailed arrangements for the inspection process. His organization of the inspection documents also helped facilitate an efficient inspection. David Dunn did an excellent job of overseeing the arrangements for meals. The team also much appreciated the transportation for meals by some very hospitable laboratory staff. The inspectors from the three countries repeatedly expressed their appreciation for experiencing real "southern hospitality."

The Inspection Team does not recommend accreditation of the Raleigh Laboratory by the ASCLD/LAB Board of Directors until all Essential criteria have been met.

Areas sought for accreditation are:

Controlled Substances
Toxicology
Trace Evidence
Serology
DNA
Firearms/Toolmarks
Questioned Documents
Latent Prints

Respectfully submitted,



C. Vander Ark
Team Captain

CVA/dkr

SUGGESTED RESOLUTIONS FOR ESSENTIAL CRITERIA NOT MET IN THE NCSBI RALEIGH LABORATORY

1.4.1.3 IS THE EVIDENCE STORED UNDER PROPER SEAL?

Improper seals on all evidence stored within the laboratory need to be remediated according to the procedure outlined in the March 1997, ASCLD/LAB Newsletter, i.e., a perpendicular initialed seal over the defective seal. After the discovery on the first inspection day of the improperly sealed evidence, the NCSBI management took decisive steps to begin remediating the problem by discontinuing all casework in both laboratories and concentrating on remediating improperly sealed items in the entire system. Information received during the week of August 3, 1998, from Quality Manager Mark Nelson confirmed that all seal remediations have now been completed.

1.4.2.7 ARE THE TECHNICAL PROCEDURES USED BY THE LABORATORY DOCUMENTED AND ARE THE DOCUMENTS AVAILABLE TO LABORATORY PERSONNEL FOR REVIEW?

Written case handling protocols need to be produced for drug and toxicology analysis. Descriptions for the interpretation of results and/or acceptance of results need to be produced in these disciplines.

Protocols including interpretation information needs to be created for: 1) ejection pattern determinations; 2) gunshot residue analysis; and 3) Ouchterlony tests for species determinations.

1.4.2.8 ARE APPROPRIATE CONTROLS AND STANDARDS SPECIFIED IN THE PROCEDURES AND ARE THEY USED TO ENSURE THE VALIDITY OF EXAMINATION RESULTS?

Positive controls need to be specified in the toxicology procedures and actually used in the analysis of the following drug classes when analyzed by solid liquid extraction/GC/MS: opiates, amphetamines, barbiturates, cocaine and benzodiazepines.

1.4.2.10 DOES THE LABORATORY ROUTINELY CHECK THE RELIABILITY OF ITS REAGENTS?

Reagent logs need to be produced in the controlled substance area as required by ASCLD/LAB as promulgated in the 11/95 Newsletter.

1.4.2.14 DO THE EXAMINERS GENERATE AND DOES THE LABORATORY MAINTAIN, IN A CASE RECORD, ALL THE NOTES, WORKSHEETS, PHOTOGRAPHS, SPECTRA, PRINTOUTS, CHARTS AND OTHER DATA OR RECORDS USED BY EXAMINERS TO SUPPORT THEIR CONCLUSIONS?

The laboratory needs to demonstrate compliance with the proper means of making corrections and also placing the unique identifier number and examiner initials on each page of case files as required by this standard.