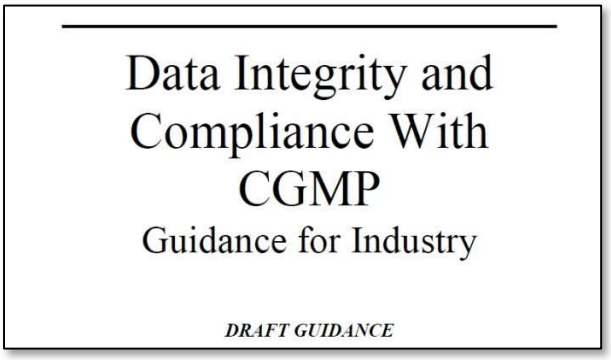
What is Data Integrity?

In April of 2016, the Food and Drug Administration released a "*Draft Guidance*" document titled

"*Data Integrity and Compliance with CGMP….Guidance for Industry*"



Just to serve as some background, CGMP represents the Current Good Manufacturing Practice regulations enforced by the US Food and Drug Administration (FDA). CGMP guidelines provide for systems that assure proper design, monitoring, and control of manufacturing processes and facilities in the pharmaceutical industry. Adherence to the CGMP regulations assures the identity, strength, quality, and purity of drug products by requiring that manufacturers adequately control manufacturing operations.

To ensure that CGMP guidelines are being adhered to, the FDA conducts audits on manufacturers of pharmaceutical products as well as medical device manufacturers that also fall under the same guidelines. Over may years, during inspections, the FDA has increasingly observed CGMP violations involving data integrity lapses. Therefore, this guidance was developed to clarify and explain in detail data integrity issues as they relate to the CGMP requirements in the 21 Code of Federal Regulations part 210, 211, and 212 which deal with manufacturing. It is important to note that this guidance document is not a comprehensive list of items that need to be addressed, but rather are key areas dealing with Data Integrity that have been focal points of problems that need to be addressed. It is up to the manufacturer to apply this guidance do their process.

Within this guidance document, the FDA defines Data Integrity as the following……..

> *Data integrity refers to the completeness, consistency, and accuracy of data. Complete, consistent, and accurate data should be attributable, legible, contemporaneously recorded, original or a true copy, and accurate (ALCOA).*

The use of this acronym "ALCOA" is something the FDA uses in other guidance documents as well. Throughout the guidance document, the review of how data is controlled, how audit trails are managed and how records are kept are discussed.

Particle Analyzers & their role in the Pharmaceutical industry …

Particle size specifications are used in pharmaceutical development as a parameter that can influence the final product. In most cases, solid or suspension delivery or bioavailability of pharmaceuticals are directly related to particle size given that it controls dissolution characteristics. Dissolution rates are proportional to surface area, therefore smaller particles with higher surface areas promotes a faster dissolution of the pharmaceutical compound.

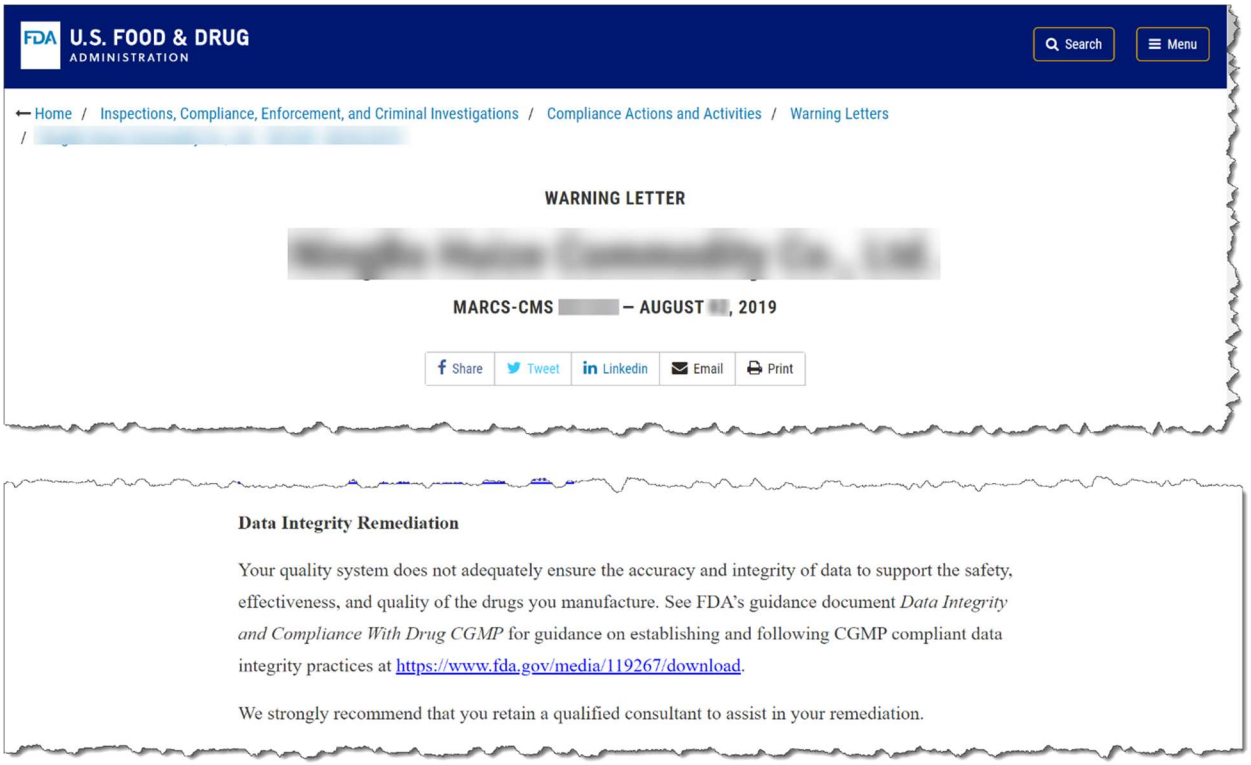
Besides particle size, the uniformity of the size distribution is also important. Narrower particle size distributions make for a more uniform and controlled dissolution rate. Conversely, pharmaceutical compounds are sometimes designed with larger particle distributions ensure a slower release of the therapeutic compound.

Because particle size, count and shape has taken on a large role in controlling the final pharmaceutical products, they have become a standard tool in development and manufacturing. Because of this, particle analysis equipment falls under the quality guidelines of each pharmaceutical manufacturer's quality program and will also be an area of attention for the FDA.

What does this mean for users that own particle sizing equipment …

Given the fact that the guidance document on Data Integrity is formatted very similar to the August 2003 guidance on Part 11 for Electronic records, it is highly likely that the implementation of the Data Integrity guidance document will follow the same path of enforcement. If you have read this far into this document, it is apparent that you have some knowledge either in the instrumentation that is used and / or are in the pharmaceutical sector with particle size analysis equipment. In either case, you may have experienced the seriousness the FDA takes on 21 CFR 11 and auditing / enforcing of the "guidance" points. It is more likely than not that the FDA will be adding to their CGMP audits a more in-depth investigation based on the Data Integrity guidance document. Therefore, it is important, as a manufacturer, to ensure all "computerized systems" are inspected to assess how they comply.

Here we show a section of a recent FDA Warning Letter submitted to a Pharmaceutical Company after an audit of their facility. After reading the warning letter in its entirety, Data Integrity deficiency issues were one of the most predominant findings.



U.S. FOOD & DRUG ADMINISTRATION

Search Menu

Home / Inspections, Compliance, Enforcement, and Criminal Investigations / Compliance Actions and Activities / Warning Letters

WARNING LETTER

MARCS-CMS – AUGUST , 2019

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Data Integrity Remediation

Your quality system does not adequately ensure the accuracy and integrity of data to support the safety, effectiveness, and quality of the drugs you manufacture. See FDA's guidance document *Data Integrity and Compliance With Drug CGMP* for guidance on establishing and following CGMP compliant data integrity practices at https://www.fda.gov/media/119267/download.

We strongly recommend that you retain a qualified consultant to assist in your remediation.

As this warning letter shows, the FDA is currently auditing to the Data Integrity guidance document.

In addition to the points set forth in the Data Integrity guidance document, it is equally important to note that the FDA also references the "ICH Q7 Good Manufacturing Practice of APIs" as a tool for validation protocols for computerized systems. Adequate installation and operational qualifications should be used to demonstrate the equipment performs the task it was assigned to do.

What does this mean for the manufacturers of particle sizing equipment …

Manufacturers of particle sizing equipment reacted to 21 CFR 11 as a requirement, not a "guidance". In order to compete in the market space, it was expected that manufacturers of equipment make any needed changes to ensure compliance. Keep in mind that the 21 CFR 11, being a guidance document, required the manufacturer to interpret the points within the guidance document and implement changes that they saw fit. However, what mattered was not how they implemented the guidance points, but rather how the internal quality auditors and the FDA would interpret the implementation of the guidance document. Therefore, it was evident back then that the instrument manufacturers that best satisfied the points set forth in the guidance document of 21 CFR 11 were those that were well synchronized with pharmaceutical companies and the expectations of the FDA.

For the Data Integrity guidance document, it is expected to be the same. It is only a matter of time before all pharmaceutical customers add to their 21 CFR 11 checklist for purchasing computerized systems new checklist items related to Data Integrity. Therefore, it falls, again, under the responsibility of the instrument manufacturer to ensure all points and topics are addressed, interpreted with a good understanding of what a pharmaceutical customer and the FDA expectation is, and to document how each point is implemented for Data Integrity. It is also important that instrument manufacturers have programs in place to facilitate the installation and operational qualification of equipment that will document the validation requirements of the FDA.

How does the Pi Sentinel PRO comply to the FDA guidance document for Data Integrity …

To satisfy the installation and operational qualification requirements, the Pi Sentinel PRO uses an IQ, OQ validation package which is documented separately from this document. In addition, the Pi Sentinel PRO software is fully compliant to the 21 CFR Part 11, Electronic Records and Signatures requirements set forth by the FDA. More information on this is available in the instrument manual.

Sec. 211.68 Automatic, mechanical, and electronic equipment.

(a) Automatic, mechanical, or electronic equipment or other types of equipment, including computers, or related systems that will perform a function satisfactorily, may be used in the manufacture, processing, packing, and holding of a drug product. If such equipment is so used, it shall be routinely calibrated, inspected, or checked according to a written program designed to assure proper performance. Written records of those calibration checks and inspections shall be maintained.

(b) Appropriate controls shall be exercised over computer or related systems to assure that changes in master production and control records or other records are instituted only by authorized personnel. Input to and output from the computer or related system of formulas or other records or data shall be checked for accuracy. The degree and frequency of input/output verification shall be based on the complexity and reliability of the computer or related system. A backup file of data entered into the computer or related system shall be maintained except where certain data, such as calculations performed in connection with laboratory analysis, are eliminated by computerization or other automated processes. In such instances a written record of the program shall be maintained along with appropriate validation data. Hard copy or alternative systems, such as duplicates, tapes, or microfilm, designed to assure that backup data are exact and complete and that it is secure from alteration, inadvertent erasures, or loss shall be maintained.

(c) Such automated equipment used for performance of operations addressed by 211.101(c) or (d), 211.103, 211.182, or 211.188(b)(11) can satisfy the requirements included in those sections relating to the performance of an operation by one person and checking by another person if such equipment is used in conformity with this section, and one person checks that the equipment properly performed the operation.

[43 FR 45077, Sept. 29, 1978, as amended at 60 FR 4091, Jan. 20, 1995; 73 FR 51932, Sept. 8, 2008]

Key areas in section 211.68 …

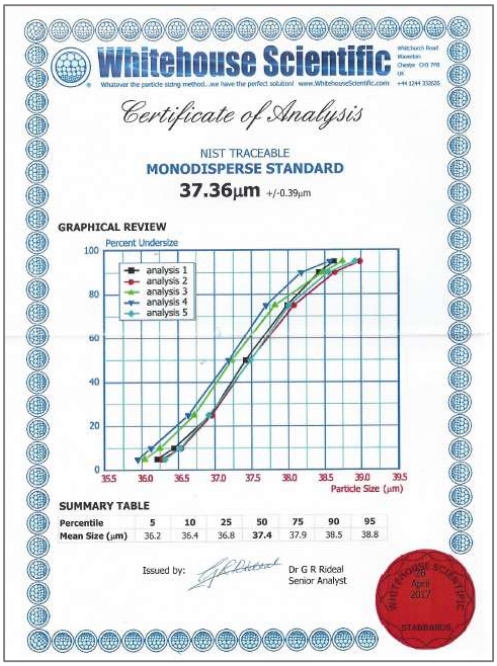
… If such equipment is so used, it shall be routinely calibrated, inspected, or checked according to a written program designed to assure proper performance. Written records of those calibration checks and inspections shall be maintained.

… A backup file of data entered into the computer or related system shall be maintained except where certain data, such as calculations performed in connection with laboratory analysis, are eliminated by computerization or other automated processes.

How the Pi Sentinel PRO complies …

The Pi Sentinel PRO has a robust IQ/OQ Qualification Program which is to be performed by qualified Field Service Engineers (FSE) specially trained and certified by the factory in the execution of the qualification process. A Qualification Kit provides a set of documents and forms, supplies and NIST traceable Standards to complete the Qualification. Maintenance and instrument performance should be monitored on a routine basis in accordance with Standard Operation Procedures (SOPs).

By using the IQ/OQ Qualification program, the end user is ensured of a proper installation and proof of operation at the site. The performance measurements produced by the Qualification process are documented for future reference, audits and tracking. The Pi Sentinel PRO Qualification program verifies the system functionality, the accuracy and performance of the system as measurements are made with devices and standards that are calibrated and traceable to NIST standards.



There are three MAIN items involved in the Qualification:

- Service Engineer Manual.
- Qualification Kit.
- Customer Manual.

Additional SUPPORTING documents:

- Qualifying Engineer Certificate of Qualification.
- Certificate of Analysis / Assay Sheet of Whitehouse Scientific NIST traceable standard.
- Local Field Service Report.

The Service Engineer manual contains the specific instructions for the Field Service Engineer (FSE) to complete and perform the set of tests and actions during the execution of the initial instrument Qualification and the annual qualification. The following are the actions during the annual qualification.

- ***Pre Testing***

This set of tests are intended to evaluate the performance of the instrument with a specific Standard before any preventive maintenance actions are taken. The results are saved in the *OQ Pre-Test form*.

- ***Preventive Maintenance***

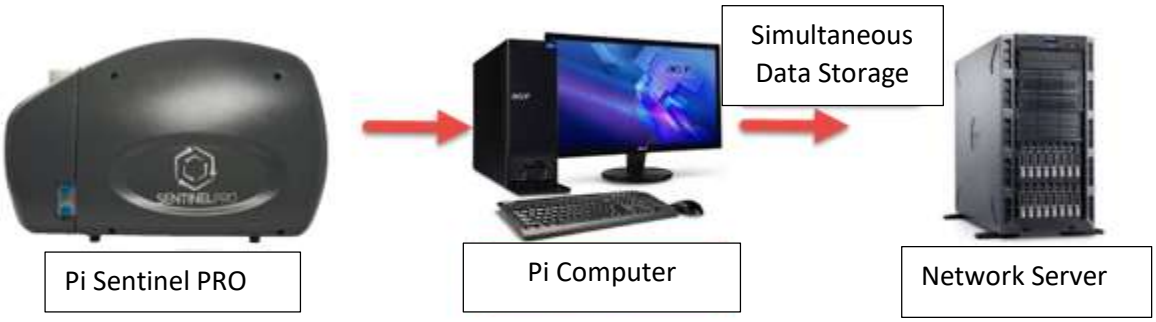
Verification and Cleaning of different sections of the instrument such as Optics, Fluidics and Hardware as well as Calibration are actions taken during *Preventive Maintenance* and the *Checklist* completed.

The Qualification Kit contain the forms that should be filled out during the execution of the Qualification.

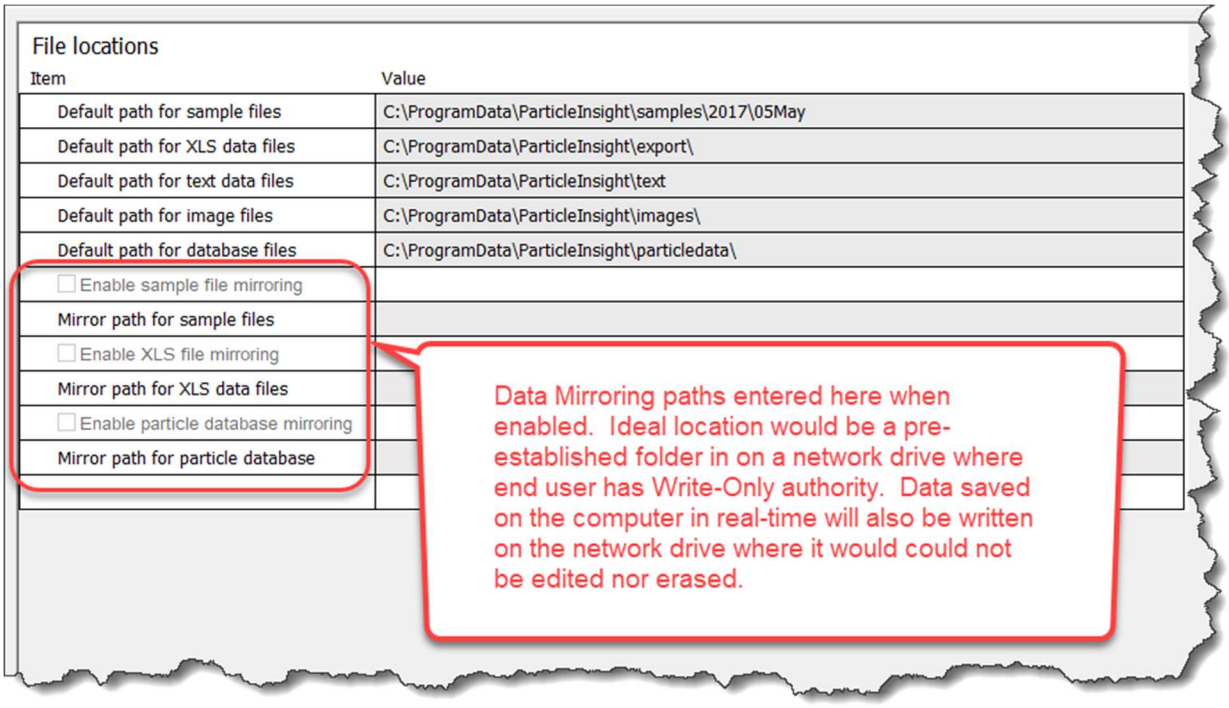
- ***IQ Info Data form -*** This form is used to enter all required information at installation time.
- ***OQ Test and OQ Pre-Test forms***
- ***OQ Test form -*** OQ Test form is used to enter the initial results***.***
- ***OQ Pre-Test form*** is used to enter the preliminary results during the annual certifications.
- ***Maintenance/Checklist form -*** This form contains the results of preventive Maintenance / Checklist.
- ***OQ Post-Test form -*** This form is used to enter the final results during the annual certifications.
- ***Qualification Report -*** This report contains the average readings from OQ Test, Pre-Test and Post forms as well as the Pass/Fail results.
- ***Post Testing -*** This set of tests are intended to evaluate the performance of the instrument with a specific Standard after preventive maintenance actions have been taken. The results are saved in the *OQ Post-Test form*.
- **Completion Notification -** To report that the Qualification was successfully completed
- **Acceptance Notification -** To confirm acceptance.
- **Out of Specification form -** This form should be filled out if any of the OQ Test or Pre-Test fails.
- **Corrective Actions form -** This form should be filled out if Out of Specification notification was completed. Name of the Test that failed should be entered and details on the corrective action taken to fix the problem.
- **Log form -** This form is to keep tracking of qualifications (initial and annuals).

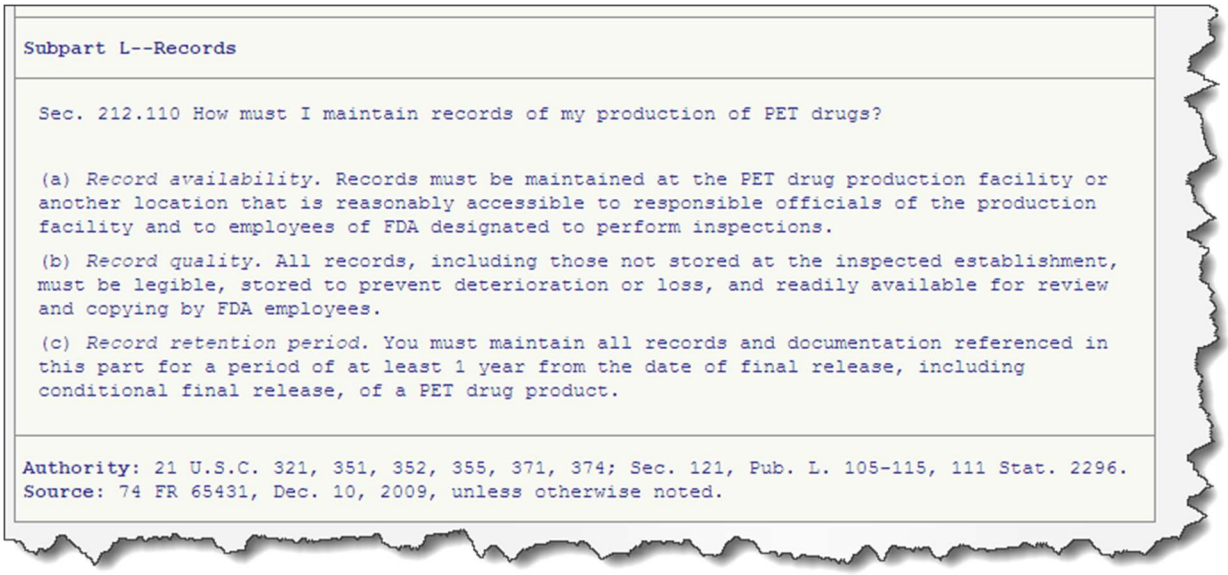
Data Mirroring …

Data Mirroring is a feature within the Pi Sentinel PRO software where the computer software will store the data files on a separate directory or hard drive or even a network drive at the same time it is being stored on the computer system operating the instrument.



Ideally, the path for the mirrored files should be an established network drive were Write-Only privileges are available. In doing so, backup files are created in real-time that cannot be modified nor can they be erased by the end user. This retains the Data Integrity of the sample analysis.





Subpart L--Records

Sec. 212.110 How must I maintain records of my production of PET drugs?

(a) *Record availability.* Records must be maintained at the PET drug production facility or another location that is reasonably accessible to responsible officials of the production facility and to employees of FDA designated to perform inspections.

(b) *Record quality.* All records, including those not stored at the inspected establishment, must be legible, stored to prevent deterioration or loss, and readily available for review and copying by FDA employees.

(c) *Record retention period.* You must maintain all records and documentation referenced in this part for a period of at least 1 year from the date of final release, including conditional final release, of a PET drug product.

Authority: 21 U.S.C. 321, 351, 352, 355, 371, 374; Sec. 121, Pub. L. 105-115, 111 Stat. 2296.
Source: 74 FR 65431, Dec. 10, 2009, unless otherwise noted.

Key areas in section 211.110(b) …

This section of the FDA regulations pointed out by the Data Integrity guidance document stresses that data must be stored to prevent deterioration or loss and must be readily available for review.

How the Pi Sentinel PRO complies …

Again, the Data Mirroring feature of the Pi Sentinel PRO satisfied this requirement. Data Mirroring is a feature within the Pi Sentinel PRO software where the computer software will store the data files on a separate directory or hard drive or even a network drive at the same time it is being stored on the computer system operating the instrument.

By having the data mirroring set up to store data simultaneously on a Write-Only network path, the data is written by the instrument software and cannot be erased or modified. This ensures that the data is not lost or cannot be modified which ensures compliance with 211.110 of the Code of Federal Regulations.

TITLE 21--FOOD AND DRUGS
CHAPTER I--FOOD AND DRUG ADMINISTRATION
DEPARTMENT OF HEALTH AND HUMAN SERVICES
SUBCHAPTER C--DRUGS: GENERAL

PART 211 -- CURRENT GOOD MANUFACTURING PRACTICE FOR FINISHED PHARMACEUTICALS

Subpart F--Production and Process Controls

Sec. 211.100 Written procedures; deviations.

(a) There shall be written procedures for production and process control designed to assure that the drug products have the identity, strength, quality, and purity they purport or are represented to possess. Such procedures shall include all requirements in this subpart. These written procedures, including any changes, shall be drafted, reviewed, and approved by the appropriate organizational units and reviewed and approved by the quality control unit.

(b) Written production and process control procedures shall be followed in the execution of the various production and process control functions and shall be documented at the time of performance. Any deviation from the written procedures shall be recorded and justified.

Subpart I--Laboratory Controls

Sec. 211.160 General requirements.

(a) The establishment of any specifications, standards, sampling plans, test procedures, or other laboratory control mechanisms required by this subpart, including any change in such specifications, standards, sampling plans, test procedures, or other laboratory control mechanisms, shall be drafted by the appropriate organizational unit and reviewed and approved by the quality control unit. The requirements in this subpart shall be followed and shall be documented at the time of performance. Any deviation from the written specifications, standards, sampling plans, test procedures, or other laboratory control mechanisms shall be recorded and justified.

(b) Laboratory controls shall include the establishment of scientifically sound and appropriate specifications, standards, sampling plans, and test procedures designed to assure that components, drug product containers, closures, in-process materials, labeling, and drug products conform to appropriate standards of identity, strength, quality, and purity. Laboratory controls shall include:

(1) Determination of conformity to applicable written specifications for the acceptance of each lot within each shipment of components, drug product containers, closures, and labeling used in the manufacture, processing, packing, or holding of drug products. The specifications shall include a description of the sampling and testing procedures used. Samples shall be representative and adequately identified. Such procedures shall also require appropriate retesting of any component, drug product container, or closure that is subject to deterioration.

(2) Determination of conformance to written specifications and a description of sampling and testing procedures for in-process materials. Such samples shall be representative and properly identified.

(3) Determination of conformance to written descriptions of sampling procedures and appropriate specifications for drug products. Such samples shall be representative and properly identified.

(4) The calibration of instruments, apparatus, gauges, and recording devices at suitable intervals in accordance with an established written program containing specific directions, schedules, limits for accuracy and precision, and provisions for remedial action in the event accuracy and/or precision limits are not met. Instruments, apparatus, gauges, and recording devices not meeting established specifications shall not be used.

• §§ 211.100 and 211.160 require that certain activities be documented at the time of performance and that laboratory controls be scientifically sound

Key areas in sections 211.100 and 211.160 …

These sections of the FDA regulations pointed out by the Data Integrity guidance document require that certain activities be documented at the time of performance and that the laboratory controls be scientifically sound.

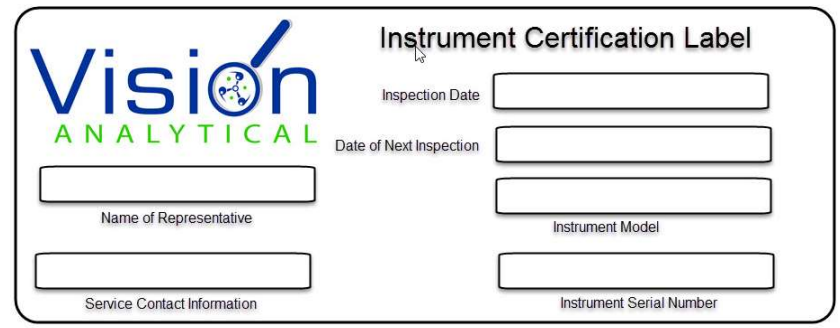
How the Pi Sentinel PRO complies …

The laboratory control activities carried out generally fall under the procedures and quality systems of each lab to ensure compliance to CGPM regulations. However, in section 211.160(4), the regulation states the following …

> *4) The calibration of instruments, apparatus, gauges, and recording devices at suitable intervals in accordance with an established written program containing specific directions, schedules, limits for accuracy and precision, and provisions for remedial action in the event accuracy and/or precision limits are not met. Instruments, apparatus, gauges, and recording devices not meeting established specifications shall not be used.*

To assist with this compliance to this section, the Pi Sentinel PRO Instrument Qualification Program, discussed above, does include NIST traceable standards as well as non-traceable controls that enable the end user to establish a routine to verify accuracy of the Pi Sentinel PRO at regular intervals. Also, upon completion of the Instrument Qualification, the Pi Sentinel PRO left with a calibration sticker that not only serves as objective evidence that the system was installed and calibrated by an authorized and trained engineer but also sates the interval of the next calibration.

Example of an instrument certification label …



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PART 211 -- CURRENT GOOD MANUFACTURING PRACTICE FOR FINISHED PHARMACEUTICALS

Subpart J--Records and Reports

Sec. 211.180 General requirements.

(a) Any production, control, or distribution record that is required to be maintained in compliance with this part and is specifically associated with a batch of a drug product shall be retained for at least 1 year after the expiration date of the batch or, in the case of certain OTC drug products lacking expiration dating because they meet the criteria for exemption under 211.137, 3 years after distribution of the batch.

(b) Records shall be maintained for all components, drug product containers, closures, and labeling for at least 1 year after the expiration date or, in the case of certain OTC drug products lacking expiration dating because they meet the criteria for exemption under 211.137, 3 years after distribution of the last lot of drug product incorporating the component or using the container, closure, or labeling.

(c) All records required under this part, or copies of such records, shall be readily available for authorized inspection during the retention period at the establishment where the activities described in such records occurred. These records or copies thereof shall be subject to photocopying or other means of reproduction as part of such inspection. Records that can be immediately retrieved from another location by computer or other electronic means shall be considered as meeting the requirements of this paragraph.

(d) Records required under this part may be retained either as original records or as true copies such as photocopies, microfilm, microfiche, or other accurate reproductions of the original records. Where reduction techniques, such as microfilming, are used, suitable reader and photocopying equipment shall be readily available.

(e) Written records required by this part shall be maintained so that data therein can be used for evaluating, at least annually, the quality standards of each drug product to determine the need for changes in drug product specifications or manufacturing or control procedures. Written procedures shall be established and followed for such evaluations and shall include provisions for:

(1) A review of a representative number of batches, whether approved or rejected, and, where applicable, records associated with the batch.

(2) A review of complaints, recalls, returned or salvaged drug products, and investigations conducted under 211.192 for each drug product.

(f) Procedures shall be established to assure that the responsible officials of the firm, if they are not personally involved in or immediately aware of such actions, are notified in writing of any investigations conducted under 211.198, 211.204, or 211.208 of these regulations, any recalls, reports of inspectional observations issued by the Food and Drug Administration, or any regulatory actions relating to good manufacturing practices brought by the Food and Drug Administration.

• § 211.180 requires true copies or other accurate reproductions of the original records.

How the Pi Sentinel PRO complies …

Data Mirroring …

As mentioned above, Data Mirroring is a feature within the Pi Sentinel PRO software where the computer software will store the data files on a separate directory or hard drive or even a network drive at the same time it is being stored on the computer system operating the instrument.

TITLE 21--FOOD AND DRUGS
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PART 211 -- CURRENT GOOD MANUFACTURING PRACTICE FOR FINISHED PHARMACEUTICALS

Subpart J--Records and Reports

Sec. 211.188 Batch production and control records.

Batch production and control records shall be prepared for each batch of drug product produced and shall include complete information relating to the production and control of each batch. These records shall include:

(a) An accurate reproduction of the appropriate master production or control record, checked for accuracy, dated, and signed;

(b) Documentation that each significant step in the manufacture, processing, packing, or holding of the batch was accomplished, including:

(1) Dates;

(2) Identity of individual major equipment and lines used;

(3) Specific identification of each batch of component or in-process material used;

(4) Weights and measures of components used in the course of processing;

(5) In-process and laboratory control results;

(6) Inspection of the packaging and labeling area before and after use;

(7) A statement of the actual yield and a statement of the percentage of theoretical yield at appropriate phases of processing;

(8) Complete labeling control records, including specimens or copies of all labeling used;

(9) Description of drug product containers and closures;

(10) Any sampling performed;

(11) Identification of the persons performing and directly supervising or checking each significant step in the operation, or if a significant step in the operation is performed by automated equipment under 211.68, the identification of the person checking the significant step performed by the automated equipment.

(12) Any investigation made according to 211.192.

(13) Results of examinations made in accordance with 211.134.

PART 211 -- CURRENT GOOD MANUFACTURING PRACTICE FOR FINISHED PHARMACEUTICALS

Subpart J--Records and Reports

Sec. 211.194 Laboratory records.

(a) Laboratory records shall include complete data derived from all tests necessary to assure compliance with established specifications and standards, including examinations and assays, as follows:

(1) A description of the sample received for testing with identification of source (that is, location from where sample was obtained), quantity, lot number or other distinctive code, date sample was taken, and date sample was received for testing.

(2) A statement of each method used in the testing of the sample. The statement shall indicate the location of data that establish that the methods used in the testing of the sample meet proper standards of accuracy and reliability as applied to the product tested. (If the method employed is in the current revision of the United States Pharmacopeia, National Formulary, AOAC INTERNATIONAL, Book of Methods, 1 or in other recognized standard references, or is detailed in an approved new drug application and the referenced method is not modified, a statement indicating the method and reference will suffice). The suitability of all testing methods used shall be verified under actual conditions of use.

(3) A statement of the weight or measure of sample used for each test, where appropriate.

(4) A complete record of all data secured in the course of each test, including all graphs, charts, and spectra from laboratory instrumentation, properly identified to show the specific component, drug product container, closure, in-process material, or drug product, and lot tested.

(5) A record of all calculations performed in connection with the test, including units of measure, conversion factors, and equivalency factors.

(6) A statement of the results of tests and how the results compare with established standards of identity, strength, quality, and purity for the component, drug product container, closure, in-process material, or drug product tested.

(7) The initials or signature of the person who performs each test and the date(s) the tests were performed.

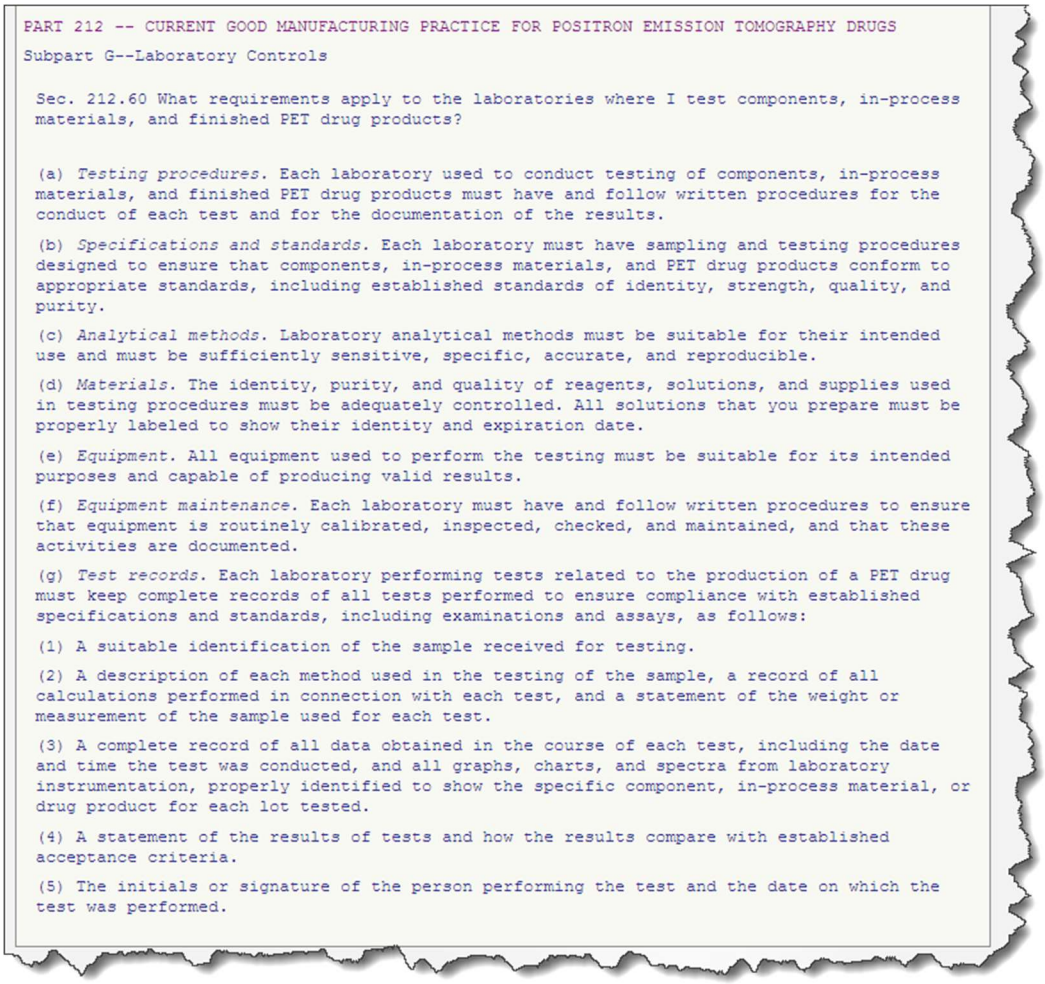
(8) The initials or signature of a second person showing that the original records have been reviewed for accuracy, completeness, and compliance with established standards.

(b) Complete records shall be maintained of any modification of an established method employed in testing. Such records shall include the reason for the modification and data to verify that the modification produced results that are at least as accurate and reliable for the material being tested as the established method.

(c) Complete records shall be maintained of any testing and standardization of laboratory reference standards, reagents, and standard solutions.

(d) Complete records shall be maintained of the periodic calibration of laboratory instruments, apparatus, gauges, and recording devices required by 211.160(b)(4).

(e) Complete records shall be maintained of all stability testing performed in accordance with 211.166.



PART 212 -- CURRENT GOOD MANUFACTURING PRACTICE FOR POSITRON EMISSION TOMOGRAPHY DRUGS

Subpart G--Laboratory Controls

Sec. 212.60 What requirements apply to the laboratories where I test components, in-process materials, and finished PET drug products?

(a) *Testing procedures.* Each laboratory used to conduct testing of components, in-process materials, and finished PET drug products must have and follow written procedures for the conduct of each test and for the documentation of the results.

(b) *Specifications and standards.* Each laboratory must have sampling and testing procedures designed to ensure that components, in-process materials, and PET drug products conform to appropriate standards, including established standards of identity, strength, quality, and purity.

(c) *Analytical methods.* Laboratory analytical methods must be suitable for their intended use and must be sufficiently sensitive, specific, accurate, and reproducible.

(d) *Materials.* The identity, purity, and quality of reagents, solutions, and supplies used in testing procedures must be adequately controlled. All solutions that you prepare must be properly labeled to show their identity and expiration date.

(e) *Equipment.* All equipment used to perform the testing must be suitable for its intended purposes and capable of producing valid results.

(f) *Equipment maintenance.* Each laboratory must have and follow written procedures to ensure that equipment is routinely calibrated, inspected, checked, and maintained, and that these activities are documented.

(g) *Test records.* Each laboratory performing tests related to the production of a PET drug must keep complete records of all tests performed to ensure compliance with established specifications and standards, including examinations and assays, as follows:

(1) A suitable identification of the sample received for testing.

(2) A description of each method used in the testing of the sample, a record of all calculations performed in connection with each test, and a statement of the weight or measurement of the sample used for each test.

(3) A complete record of all data obtained in the course of each test, including the date and time the test was conducted, and all graphs, charts, and spectra from laboratory instrumentation, properly identified to show the specific component, in-process material, or drug product for each lot tested.

(4) A statement of the results of tests and how the results compare with established acceptance criteria.

(5) The initials or signature of the person performing the test and the date on which the test was performed.

• §§ 211.188, 211.194, and 212.60(g) require complete information, complete data derived from all tests, complete record of all data, and complete records of all tests performed.

How the Pi Sentinel PRO complies …

21 CFR Part 11 compliance that is embedded into the Pi Sentinel PRO incorporates Audit Trails capturing all activities of all tests performed. Data files with raw data are prevented from modification once the sample is completed and saved. Any attempt to modify data files outside of the Pi Sentinel PRO software is prevented with Check-Sum verifications on data files.

Assurance that the files are stored where they can only be accessible is achieved with the Data Mirroring featured discussed above.

References

FDA.Gov Website

Current Expectations and Guidance, including Data Integrity and Compliance With CGMP, Sarah Barkow, PhD

Particle size analysis, Apr 01, 2009, By Paul Kippax, Pharmaceutical Technology Europe PTE, Volume 21, Issue 4

1. ICH Topic Q6A — Specifications: Test Procedures and Acceptance Criteria for New Drug Substances and New Drug Products: Chemical Substances, December 2000. http://www.ich.org/