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**Forest Service Handbook 4090.13 – Good Laboratory Practices Handbook
Zero Code**

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Approved by: David G. Unger, Acting Chief

Date approved:

Responsible Staff:

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POSTING NOTICE. Amendments are numbered consecutively by Handbook number and calendar year. Post document in numerical order of chapters (1109.12, sec. 4.32, ex. 01). Remove entire national text of the Handbook and replace with this amendment. DO NOT REMOVE SUPPLEMENTS OR INTERIM DIRECTIVES. Retain this transmittal as the first page of this document.

Digest: Following is an explanation of the changes throughout the directive by section.

This Handbook provides direction on the principles and requirements of Good Laboratory Practice (GLPs) for Forest Service management and technical personnel. Any study that is performed with the intention of submitting the data to the U.S. Environmental Protection Agency or the U.S. Food and Drug Administration in support of a research or marketing permit must follow GLP standards.

01 - 06.5: Sets forth Authority (sec. 01), Policy (sec. 03), Responsibility (sec. 04), Definitions (sec. 05), and References (sec. 06) in the zero code chapter for the new Handbook on Good Laboratory Practices.

11 - 12.4: Establishes a new chapter that provides direction on the applicability of Good Laboratory Practices (GLPs) (sec. 11) and aspects of compliance (sec. 12).

20.3 - 22: Establishes a new chapter that provides direction on staffing requirements and training for personnel conducting, or involved with, Good Laboratory Practices.

30.3 - 35: Establishes a new chapter that provides policy and direction to determine requirements for test system care facilities (sec. 31); test system supply facilities (sec. 32); facilities for handling test, control, and reference substances (sec. 33); laboratory facilities (sec. 34); and archiving facilities (sec. 35) where Good Laboratory Practices are conducted or stored.

40.3 - 42.3: Establishes a new chapter that provides direction on equipment requirements including equipment design (sec. 41) and calibration and maintenance (sec. 42) for studies complying with Good Laboratory Practices.

50.3 - 55.33: Establishes a new chapter that provides direction on facility operations required for Good Laboratory Practices, including preparation of master schedule (sec. 51); standard operating procedures (sec. 52); reagents and solutions (sec. 53); test system care (sec. 54); and characterization, handling, and mixing with carriers of test, control, and reference substances (sec. 55).

61 - 62.32: Establishes a new chapter that provides direction on the preparation of protocols and collection of raw data for Good Laboratory Practices.

70.4 - 73.3: Establishes a new chapter, Records, Reports, and Archiving that provides direction on reporting study results (sec. 71), archiving (sec. 72).

80.1 - 81.2: Establishes a new chapter that provides direction on the requirements and duties of local and national Quality Assurance Units in support of Good Laboratory Practices.

90.1 - 93.38: Establishes a new chapter that provides direction on inspections conducted by local and national Quality Assurance Units (sec. 91 and 92) and the U.S. Environmental Protection Agency (sec. 93) in conjunction with Good Laboratory Practices.

This Handbook is now available electronically in the National Information Center in the same format as the paper copy. Henceforth, amendments to this Handbook will be issued to Forest Service units electronically on a document basis.

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This Handbook provides direction on the principles and requirements of Good Laboratory Practices (GLPs) for Forest Service management and technical personnel. Any study that is performed with the intention of submitting the data to the U.S. Environmental Protection Agency or the U.S. Food and Drug Administration in support of a research or marketing permit must follow GLP standards. See FSM 4085 for broad direction on GLPs, and section 11 for detailed direction on determining whether a study needs to follow GLP standards.

This Handbook focuses primarily on GLP standards required by U.S. Environmental Protection Agency (40 CFR Part 160) under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136a, 136c, 136f, 136g, and 136v(c)) since most Forest Service research that requires GLPs involves pesticides. These regulations are reprinted in their entirety in section 01, exhibit 01. This Handbook also provides direction on the U.S. Food and Drug Administration regulations (40 CFR, Part 792) as mandated by the Toxic Substances Control Act (15 U.S.C. 2603), only when significant differences exist between these two sets of standards.

Compliance with GLPs (sec. 12) requires:

1. Following an appropriate, written protocol (sec. 61),
2. Using only a well-qualified staff to conduct the study (sec. 21),
3. Following written Standard Operating Procedures (sec. 52),
4. Conducting studies in proper and adequate facilities (ch. 30),
5. Using calibrated and well-maintained equipment (ch. 40),
6. Having fully retrievable raw data (sec. 62, ch. 70),
7. Having independent quality assurance (ch. 80, sec. 91), and
8. Providing written documentation that all of these requirements have been met.

01 - Authority

1. Federal Insecticide, Fungicide and Rodenticide Act; (FIFRA). (FSM 4085.01). Related regulations are set forth in their entirety as exhibit 01.
2. Toxic Substances Control Act; (TSCA). (FSM 4085.01).

01 - Exhibit 01

Good Laboratory Practice Standards; Title 40,
Code of Federal Regulations, Part 160 (40 CFR Part 160)

PART 160--GOOD LABORATORY PRACTICE STANDARDS

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Authority: 7 U.S.C. 136a, 136c, 136d, 136f, 136j, 136t, 136v, 136w; 21 U.S.C. 346a, 348, 371, Reorganization Plan No. 3 of 1970.

Subpart A--General Provisions

{ 160.1 Scope.

(a) This part prescribes good laboratory practices for conducting studies that support or are intended to support applications for research or marketing permits for pesticide products regulated by the EPA. This part is intended to assure the quality and integrity of data submitted pursuant to sections 3, 4, 5, 8, 18 and 24(c) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended (7 U.S.C. 136a, 136c, 136f, 136q and 136v(c)) and sections 408 and 409 of the Federal Food, Drug and Cosmetic Act (FFDCA) (21 U.S.C. 346a, 348).

(b) This part applies to any study described by paragraph (a) of this section which any person conducts, initiates, or supports on or after October 16, 1989.

{ 160.3 Definitions.

As used in this part the following terms shall have the meanings specified: Application for research or marketing permit includes:

01 - Exhibit 01--continued

- (1) An application for registration, amended registration, or reregistration of a pesticide product under FIFRA sections 3, 4 or 24(c).
- (2) An application for an experimental use permit under FIFRA section 5.
- (3) An application for an exemption under FIFRA section 18.
- (4) A petition or other request for establishment or modification of a tolerance, for an exemption for the need for a tolerance, or for other clearance under FFDCA section 408.
- (5) A petition or other request for establishment or modification of a food additive regulation or other clearance by EPA under FFDCA section 409.
- (6) A submission of data in response to a notice issued by EPA under FIFRA section 3(c)(2)(B).
- (7) Any other application, petition, or submission sent to EPA intended to persuade EPA to grant, modify, or leave unmodified a registration or other approval required as a condition of sale or distribution of a pesticide.

Batch means a specific quantity or lot of a test, control, or reference substance that has been characterized according to { 160.105(a).

Carrier means any material, including but not limited to feed, water, soil, nutrient media, with which the test substance is combined for administration to a test system.

Control substance means any chemical substance or mixture, or any other material other than a test substance, feed, or water, that is administered to the test system in the course of a study for the purpose of establishing a basis for comparison with the test substance for known chemical or biological measurements.

EPA means the U.S. Environmental Protection Agency.

Experimental start date means the first date the test substance is applied to the test system.

Experimental termination date means the last date on which data are collected directly from the study.

FDA means the U.S. Food and Drug Administration.

FFDCA means the Federal Food, Drug and Cosmetic Act, as amended (21 U.S.C. 321 et seq).

01 - Exhibit 01--continued

FIFRA means the Federal Insecticide, Fungicide and Rodenticide Act as amended (7 U.S.C. 136 et seq).

Person includes an individual, partnership, corporation, association, scientific or academic establishment, government agency, or organizational unit thereof, and any other legal entity.

Quality assurance unit means any person or organizational element, except the study director, designated by testing facility management to perform the duties relating to quality assurance of the studies.

Raw data means any laboratory worksheets, records, memoranda, notes, or exact copies thereof, that are the result of original observations and activities of a study and are necessary for the reconstruction and evaluation of the report of that study. In the event that exact transcripts of raw data have been prepared (e.g., tapes which have been transcribed verbatim, dated, and verified accurate by signature), the exact copy or exact transcript may be substituted for the original source as raw data. "Raw data" may include photographs, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments.

Reference substance means any chemical substance or mixture, or analytical standard, or material other than a test substance, feed, or water, that is administered to or used in analyzing the test system in the course of a study for the purposes of establishing a basis for comparison with the test substance for known chemical or biological measurements.

Specimens means any material derived from a test system for examination or analysis.

Sponsor means:

- (1) A person who initiates and supports, by provision of financial or other resources, a study;
- (2) A person who submits a study to the EPA in support of an application for a research or marketing permit; or
- (3) A testing facility, if it both initiates and actually conducts the study.

01 - Exhibit 01--continued

Study means any experiment at one or more test sites, in which a test substance is studied in a test system under laboratory conditions or in the environment to determine or help predict its effects, metabolism, product performance (efficacy studies only as required by 40 CFR 158.640), environmental and chemical fate, persistence and residue, or other characteristics in humans, other living organisms, or media. The term "study" does not include basic exploratory studies carried out to determine whether a test substance or a test method has any potential utility.

Study completion date means the date the final report is signed by the study director.

Study director means the individual responsible for the overall conduct of a study.

Study initiation date means the date the protocol is signed by the study director.

Test substance means a substance or mixture administered or added to a test system in a study, which substance or mixture:

- (1) Is the subject of an application for a research or marketing permit supported by the study, or is the contemplated subject of such an application; or
- (2) Is an ingredient, impurity, degradation product, metabolite, or radioactive isotope of a substance described by paragraph (1) of this definition, or some other substance related to a substance described by that paragraph, which is used in the study to assist in characterizing the toxicity, metabolism, or other characteristics of a substance described by that paragraph.

Test system means any animal, plant, microorganism, chemical or physical matrix, including but not limited to soil or water, or subparts thereof, to which the test, control, or reference substance is administered or added for study. "Test system" also includes appropriate groups or components of the system not treated with the test, control, or reference substance.

Testing facility means a person who actually conducts a study, i.e., actually uses the test substance in a test system. "Testing facility" encompasses only those operational units that are being or have been used to conduct studies.

Vehicle means any agent which facilitates the mixture, dispersion, or solubilization of a test substance with a carrier.

{ 160.10 Applicability to studies performed under grants and contracts.

01 - Exhibit 01--continued

When a sponsor or other person utilizes the services of a consulting laboratory, contractor, or grantee to perform all or a part of a study to which this part applies, it shall notify the consulting laboratory, contractor, or grantee that the service is, or is part of, a study that must be conducted in compliance with the provisions of this part.

{ 160.12 Statement of compliance or non-compliance.

Any person who submits to EPA an application for a research or marketing permit and who, in connection with the application, submits data from a study to which this part applies shall include in the application a true and correct statement, signed by the applicant, the sponsor, and the study director, of one of the following types:

- (a) A statement that the study was conducted in accordance with this part; or
- (b) A statement describing in detail all differences between the practices used in the study and those required by this part; or
- (c) A statement that the person was not a sponsor of the study, did not conduct the study, and does not know whether the study was conducted in accordance with this part.

{ 160.15 Inspection of a testing facility.

- (a) A testing facility shall permit an authorized employee or duly designated representative of EPA or FDA, at reasonable times and in a reasonable manner, to inspect the facility and to inspect (and in the case of records also to copy) all records and specimens required to be maintained regarding studies to which this part applies. The records inspection and copying requirements should not apply to quality assurance unit records of findings and problems, or to actions recommended and taken, except that EPA may seek production of these records in litigation or formal adjudicatory hearings.
- (b) EPA will not consider reliable for purposes of supporting an application for a research or marketing permit any data developed by a testing facility or sponsor that refuses to permit inspection in accordance with this part. The determination that a study will not be considered in support of an application for a research or marketing permit does not, however, relieve the applicant for such a permit of any obligation under any applicable statute or regulation to submit the results of the study to EPA.

{ 160.17 Effects of non-compliance.

- (a) EPA may refuse to consider reliable for purposes of supporting an application for a research or marketing permit any data from a study which was not conducted in accordance with this part.

01 - Exhibit 01--continued

- (b) Submission of a statement required by { 160.12 which is false may form the basis for cancellation, suspension, or modification of the research or marketing permit, or denial or disapproval of an application for such a permit, under FIFRA section 3, 5, 6, 18, or 24 or FFDCA section 406 or 409, or for criminal prosecution under 18 U.S.C. 2 or 1001 or FIFRA section 14, or for imposition of civil penalties under FIFRA section 14.

Subpart B--Organization and Personnel

{ 160.29 Personnel.

- (a) Each individual engaged in the conduct of or responsible for the supervision of a study shall have education, training, and experience, or combination thereof, to enable that individual to perform the assigned functions.
- (b) Each testing facility shall maintain a current summary of training and experience and job description for each individual engaged in or supervising the conduct of a study.
- (c) There shall be a sufficient number of personnel for the timely and proper conduct of the study according to the protocol.
- (d) Personnel shall take necessary personal sanitation and health precautions designed to avoid contamination of test, control, and reference substances and test systems.
- (e) Personnel engaged in a study shall wear clothing appropriate for the duties they perform. Such clothing shall be changed as often as necessary to prevent microbiological, radiological, or chemical contamination of test systems and test, control, and reference substances.
- (f) Any individual found at any time to have an illness that may adversely affect the quality and integrity of the study shall be excluded from direct contact with test systems, and test, control, and reference substances, and any other operation or function that may adversely affect the study until the condition is corrected. All personnel shall be instructed to report to their immediate supervisors any health or medical conditions that may reasonably be considered to have an adverse effect on a study.

{ 160.31 Testing facility management.

For each study, testing facility management shall:

- (a) Designate a study director as described in { 160.33 before the study is initiated.

01 - Exhibit 01--continued

- (b) Replace the study director promptly if it becomes necessary to do so during the conduct of a study.
- (c) Assure that there is a quality assurance unit as described in { 160.35.
- (d) Assure that test, control, and reference substances or mixtures have been appropriately tested for identity, strength, purity, stability, and uniformity, as applicable.
- (e) Assure that personnel, resources, facilities, equipment, materials and methodologies are available as scheduled.
- (f) Assure that personnel clearly understand the functions they are to perform.
- (g) Assure that any deviations from these regulations reported by the quality assurance unit are communicated to the study director and corrective actions are taken and documented.

{ 160.33 Study director.

For each study, a scientist or other professional of appropriate education, training, and experience, or combination thereof, shall be identified as the study director. The study director has overall responsibility for the technical conduct of the study, as well as for the interpretation, analysis, documentation, and reporting of results, and represents the single point of study control. The study director shall assure that:

- (a) The protocol, including any change, is approved as provided by { 160.120 and is followed.
- (b) All experimental data, including observations of unanticipated responses of the test system are accurately recorded and verified.
- (c) Unforeseen circumstances that may affect the quality and integrity of the study are noted when they occur, and corrective action is taken and documented.
- (d) Test systems are as specified in the protocol.
- (e) All applicable good laboratory practice regulations are followed.
- (f) All raw data, documentation, protocols, specimens, and final reports are transferred to the archives during or at the close of the study.

{ 160.35 Quality assurance unit.

01 - Exhibit 01--continued

- (a) A testing facility shall have a quality assurance unit which shall be responsible for monitoring each study to assure management that the facilities, equipment, personnel, methods, practices, records, and controls are in conformance with the regulations in this part. For any given study, the quality assurance unit shall be entirely separate from and independent of the personnel engaged in the direction and conduct of that study. The quality assurance unit shall conduct inspections and maintain records appropriate to the study.
- (b) The quality assurance unit shall:
 - (1) Maintain a copy of a master schedule sheet of all studies conducted at the testing facility indexed by test substance, and containing the test system, nature of study, date study was initiated, current status of each study, identity of the sponsor, and name of the study director.
 - (2) Maintain copies of all protocols pertaining to all studies for which the unit is responsible.
 - (3) Inspect each study at intervals adequate to ensure the integrity of the study and maintain written and properly signed records of each periodic inspection showing the date of the inspection, the study inspected, the phase or segment of the study inspected, the person performing the inspection, findings and problems, action recommended and taken to resolve existing problems, and any scheduled date for reinspection. Any problems which are likely to affect study integrity found during the course of an inspection shall be brought to the attention of the study director and management immediately.
 - (4) Periodically submit to management and the study director written status reports on each study, noting any problems and the corrective actions taken.
 - (5) Determine that no deviations from approved protocols or standard operating procedures were made without proper authorization and documentation.
 - (6) Review the final study report to assure that such report accurately describes the methods and standard operating procedures, and that the reported results accurately reflect the raw data of the study.
 - (7) Prepare and sign a statement to be included with the final study report which shall specify the dates inspections were made and findings reported to management and to the study director.

01 - Exhibit 01--continued

- (c) The responsibilities and procedures applicable to the quality assurance unit, the records maintained by the quality assurance unit, and the method of indexing such records shall be in writing and shall be maintained. These items including inspection dates, the study inspected, the phase or segment of the study inspected, and the name of the individual performing the inspection shall be made available for inspection to authorized employees or duly designated representatives of EPA or FDA.
- (d) An authorized employee or a duly designated representative of EPA or FDA shall have access to the written procedures established for the inspection and may request testing facility management to certify that inspections are being implemented, performed, documented, and followed up in accordance with this paragraph.

Subpart C--Facilities

{ 160.41 General.

Each testing facility shall be of suitable size and construction to facilitate the proper conduct of studies. Testing facilities which are not located within an indoor controlled environment shall be of suitable location to facilitate the proper conduct of studies. Testing facilities shall be designed so that there is a degree of separation that will prevent any function or activity from having an adverse effect on the study.

{ 160.43 Test system care facilities.

- (a) A testing facility shall have a sufficient number of animal rooms or other test system areas, as needed, to ensure: proper separation of species or test systems, isolation of individual projects, quarantine or isolation of animals or other test systems, and routine or specialized housing of animals or other test systems.
 - (1) In tests with plants or aquatic animals, proper separation of species can be accomplished within a room or area by housing them separately in different chambers or aquaria. Separation of species is unnecessary where the protocol specifies the simultaneous exposure of two or more species in the same chamber, aquarium, or housing unit.
 - (2) Aquatic toxicity tests for individual projects shall be isolated to the extent necessary to prevent cross-contamination of different chemicals used in different tests.

01 - Exhibit 01--continued

- (b) A testing facility shall have a number of animal rooms or other test system areas separate from those described in paragraph (a) of this section to ensure isolation of studies being done with test systems or test, control, and reference substances known to be biohazardous, including volatile substances, aerosols, radioactive materials, and infectious agents.
- (c) Separate areas shall be provided, as appropriate, for the diagnosis, treatment, and control of laboratory test system diseases. These areas shall provide effective isolation for the housing of test systems either known or suspected of being diseased, or of being carriers of disease, from other test systems.
- (d) Facilities shall have proper provisions for collection and disposal of contaminated water, soil, or other spent materials. When animals are housed, facilities shall exist for the collection and disposal of all animal waste and refuse or for safe sanitary storage of waste before removal from the testing facility. Disposal facilities shall be so provided and operated as to minimize vermin infestation, odors, disease hazards, and environmental contamination.
- (e) Facilities shall have provisions to regulate environmental conditions (e.g., temperature, humidity, photoperiod) as specified in the protocol.
- (f) For marine test organisms, an adequate supply of clean sea water or artificial sea water (prepared from deionized or distilled water and sea salt mixture) shall be available. The ranges of composition shall be as specified in the protocol.
- (g) For freshwater organisms, an adequate supply of clean water of the appropriate hardness, pH, and temperature, and which is free of contaminants capable of interfering with the study, shall be available as specified in the protocol.
- (h) For plants, an adequate supply of soil of the appropriate composition, as specified in the protocol, shall be available as needed.

{ 160.45 Test system supply facilities.

- (a) There shall be storage areas, as needed, for feed, nutrients, soils, bedding, supplies, and equipment. Storage areas for feed nutrients, soils, and bedding shall be separated from areas where the test systems are located and shall be protected against infestation or contamination. Perishable supplies shall be preserved by appropriate means.
- (b) When appropriate, plant supply facilities shall be provided. As specified in the protocol, these include:

01 - Exhibit 01--continued

(1) Facilities for holding, culturing, and maintaining algae and aquatic plants.

(2) Facilities for plant growth, including, but not limited to greenhouses, growth chambers, light banks, and fields.

(c) When appropriate, facilities for aquatic animal tests shall be provided. These include, but are not limited to, aquaria, holding tanks, ponds, and ancillary equipment, as specified in the protocol.

{ 160.47 Facilities for handling test, control, and reference substances.

(a) As necessary to prevent contamination or mix-ups, there shall be separate areas for:

(1) Receipt and storage of the test, control, and reference substances.

(2) Mixing of the test, control, and reference substances with a carrier, e.g., feed.

(3) Storage of the test, control, and reference substance mixtures.

(b) Storage areas for test, control, and/or reference substance and for test, control, and/or reference mixtures shall be separate from areas housing the test systems and shall be adequate to preserve the identity, strength, purity, and stability of the substances and mixtures.

{ 160.49 Laboratory operation areas.

Separate laboratory space and other space shall be provided, as needed, for the performance of the routine and specialized procedures required by studies.

{ 160.51 Specimen and data storage facilities.

Space shall be provided for archives, limited to access by authorized personnel only, for the storage and retrieval of all raw data and specimens from completed studies.

Subpart D--Equipment

{ 160.61 Equipment design

Equipment used in the generation, measurement, or assessment of data and equipment used for facility environmental control shall be of appropriate design and adequate capacity to function according to the protocol and shall be suitably located for operation, inspection, cleaning, and maintenance.

01 - Exhibit 01--continued

{ 160.63 Maintenance and calibration of equipment.

- (a) Equipment shall be adequately inspected, cleaned, and maintained. Equipment used for the generation, measurement, or assessment of data shall be adequately tested, calibrated, and/or standardized.
- (b) The written standard operating procedures required under { 160.81(b)(11) shall set forth in sufficient detail the methods, materials, and schedules to be used in the routine inspection, cleaning, maintenance, testing, calibration, and/ or standardization of equipment, and shall specify, when appropriate, remedial action to be taken in the event of failure or malfunction of equipment. The written standard operating procedures shall designate the person responsible for the performance of each operation.
- (c) Written records shall be maintained of all inspection, maintenance, testing, calibrating, and/or standardizing operations. These records, containing the dates of the operations, shall describe whether the maintenance operations were routine and followed the written standard operating procedures. Written records shall be kept of nonroutine repairs performed on equipment as a result of failure and malfunction. Such records shall document the nature of the defect, how and when the defect was discovered, and any remedial action taken in response to the defect.

Subpart E--Testing Facilities Operation

{ 160.81 Standard operating procedures.

- (a) A testing facility shall have standard operating procedures in writing setting forth study methods that management is satisfied are adequate to insure the quality and integrity of the data generated in the course of a study. All deviations in a study from standard operating procedures shall be authorized by the study director and shall be documented in the raw data. Significant changes in established standard operating procedures shall be properly authorized in writing by management.
- (b) Standard operating procedures shall be established for, but not limited to, the following:
 - (1) Test system area preparation.
 - (2) Test system care.
 - (3) Receipt, identification, storage, handling, mixing, and method of sampling of the test, control, and reference substances.

01 - Exhibit 01--continued

(4) Test system observations.

(5) Laboratory or other tests.

(6) Handling of test systems found moribund or dead during study.

(7) Necropsy of test systems or postmortem examination of test systems.

(8) Collection and identification of specimens.

(9) Histopathology.

(10) Data handling, storage and retrieval.

(11) Maintenance and calibration of equipment.

(12) Transfer, proper placement, and identification of test systems.

(c) Each laboratory or other study area shall have immediately available manuals and standard operating procedures relative to the laboratory or field procedures being performed. Published literature may be used as a supplement to standard operating procedures.

(d) A historical file of standard operating procedures, and all revisions thereof, including the dates of such revisions, shall be maintained.

{ 160.83 Reagents and solutions.

All reagents and solutions in the laboratory areas shall be labeled to indicate identity, titer or concentration, storage requirements, and expiration date. Deteriorated or outdated reagents and solutions shall not be used.

{ 160.90 Animal and other test system care.

(a) There shall be standard operating procedures for the housing, feeding, handling, and care of animals and other test systems.

(b) All newly received test systems from outside sources shall be isolated and their health status or appropriateness for the study shall be evaluated. This evaluation shall be in accordance with acceptable veterinary medical practice or scientific methods.

01 - Exhibit 01--continued

- (c) At the initiation of a study, test systems shall be free of any disease or condition that might interfere with the purpose or conduct of the study. If during the course of the study, the test systems contract such a disease or condition, the diseased test systems should be isolated, if necessary. These test systems may be treated for disease or signs of disease provided that such treatment does not interfere with the study. The diagnosis, authorization of treatment, description of treatment, and each date of treatment shall be documented and shall be retained.
- (d) Warm-blooded animals, adult reptiles, and adult terrestrial amphibians used in laboratory procedures that require manipulations and observations over an extended period of time or in studies that require these test systems to be removed from and returned to their test system-housing units for any reason (e.g., cage cleaning, treatment, etc.), shall receive appropriate identification (e.g., tattoo, color code, ear tag, ear punch, etc.). All information needed to specifically identify each test system within the test system-housing unit shall appear on the outside of that unit. Suckling mammals and juvenile birds are excluded from the requirement of individual identification unless otherwise specified in the protocol.
- (e) Except as specified in paragraph (e)(1) of this section, test systems of different species shall be housed in separate rooms when necessary. Test systems of the same species, but used in different studies, should not ordinarily be housed in the same room when inadvertent exposure to test, control, or reference substances or test system mix-up could affect the outcome of either study. If such mixed housing is necessary, adequate differentiation by space and identification shall be made.
 - (1) Plants, invertebrate animals, aquatic vertebrate animals, and organisms that may be used in multispecies tests need not be housed in separate rooms, provided that they are adequately segregated to avoid mix-up and cross contamination.
 - (2) (Reserved)
- (f) Cages, racks, pens, enclosures, aquaria, holding tanks, ponds, growth chambers, and other holding, rearing and breeding areas, and accessory equipment, shall be cleaned and sanitized at appropriate intervals.
- (g) Feed, soil, and water used for the test systems shall be analyzed periodically to ensure that contaminants known to be capable of interfering with the study and reasonably expected to be present in such feed, soil, or water are not present at levels above those specified in the protocol. Documentation of such analyses shall be maintained as raw data.

01 - Exhibit 01--continued

- (h) Bedding used in animal cages or pens shall not interfere with the purpose or conduct of the study and shall be changed as often as necessary to keep the animals dry and clean.
- (i) If any pest control materials are used, the use shall be documented. Cleaning and pest control materials that interfere with the study shall not be used.
- (j) All plant and animal test systems shall be acclimatized to the environmental conditions of the test, prior to their use in a study.

Subpart F--Test, Control, and Reference Substances

{ 160.105 Test, control, and reference substance characterization.

- (a) The identity, strength, purity, and composition, or other characteristics which will appropriately define the test, control, or reference substance shall be determined for each batch and shall be documented before its use in a study. Methods of synthesis, fabrication, or derivation of the test, control, or reference substance shall be documented by the sponsor or the testing facility, and the location of such documentation shall be specified.
- (b) When relevant to the conduct of the study the solubility of each test, control, or reference substance shall be determined by the testing facility or the sponsor before the experimental start date. The stability of the test, control, or reference substance shall be determined before the experimental start date or concomitantly according to written standard operating procedures, which provide for periodic analysis of each batch.
- (c) Each storage container for a test, control, or reference substance shall be labeled by name, chemical abstracts service number (CAS) or code number, batch number, expiration date, if any, and, where appropriate, storage conditions necessary to maintain the identity, strength, purity, and composition of the test, control, or reference substance. Storage containers shall be assigned to a particular test substance for the duration of the study.
- (d) For studies of more than 4 weeks experimental duration, reserve samples from each batch of test, control, and reference substances shall be retained for the period of time provided by { 160.195.
- (e) The stability of test, control, and reference substances under storage conditions at the test site shall be known for all studies.

{ 160.107 Test, control, and reference substance handling.

01 - Exhibit 01--continued

Procedures shall be established for a system for the handling of the test, control, and reference substances to ensure that:

- (a) There is proper storage.
- (b) Distribution is made in a manner designed to preclude the possibility of contamination, deterioration, or damage.
- (c) Proper identification is maintained throughout the distribution process.
- (d) The receipt and distribution of each batch is documented. Such documentation shall include the date and quantity of each batch distributed or returned.

{ 160.113 Mixtures of substances with carriers.

- (a) For each test, control, or reference substance that is mixed with a carrier, tests by appropriate analytical methods shall be conducted:
 - (1) To determine the uniformity of the mixture and to determine, periodically, the concentration of the test, control, or reference substance in the mixture.
 - (2) When relevant to the conduct of the study, to determine the solubility of each test, control, or reference substance in the mixture by the testing facility or the sponsor before the experimental start date.
 - (3) To determine the stability of the test, control, or reference substance in the mixture before the experimental start date or concomitantly according to written standard operating procedures, which provide for periodic analysis of each batch.
- (b) Where any of the components of the test, control, or reference substance carrier mixture has an expiration date, that date shall be clearly shown on the container. If more than one component has an expiration date, the earliest date shall be shown.
- (c) If a vehicle is used to facilitate the mixing of a test substance with a carrier, assurance shall be provided that the vehicle does not interfere with the integrity of the test.

Subpart G--Protocol for and Conduct of a Study

{ 160.120 Protocol.

01 - Exhibit 01--continued

- (a) Each study shall have an approved written protocol that clearly indicates the objectives and all methods for the conduct of the study. The protocol shall contain but shall not necessarily be limited to the following information:
- (1) A descriptive title and statement of the purpose of the study.
 - (2) Identification of the test, control, and reference substance by name, chemical abstracts service (CAS) number or code number.
 - (3) The name and address of the sponsor and the name and address of the testing facility at which the study is being conducted.
 - (4) The proposed experimental start and termination dates.
 - (5) Justification for selection of the test system.
 - (6) Where applicable, the number, body weight range, sex, source of supply, species, strain, substrain, and age of the test system.
 - (7) The procedure for identification of the test system.
 - (8) A description of the experimental design, including methods for the control of bias.
 - (9) Where applicable, a description and/or identification of the diet used in the study as well as solvents, emulsifiers and/or other materials used to solubilize or suspend the test, control, or reference substances before mixing with the carrier. The description shall include specifications for acceptable levels of contaminants that are reasonably expected to be present in the dietary materials and are known to be capable of interfering with the purpose or conduct of the study if present at levels greater than established by the specifications.
 - (10) The route of administration and the reason for its choice.
 - (11) Each dosage level, expressed in milligrams per kilogram of body or test system weight or other appropriate units, of the test, control, or reference substance to be administered and the method and frequency of administration.
 - (12) The type and frequency of tests, analyses, and measurements to be made.
 - (13) The records to be maintained.

01 - Exhibit 01--continued

(14) The date of approval of the protocol by the sponsor and the dated signature of the study director.

(15) A statement of the proposed statistical method to be used.

(b) All changes in or revisions of an approved protocol and the reasons therefore shall be documented, signed by the study director, dated, and maintained with the protocol.

{ 160.130 Conduct of a study.

(a) The study shall be conducted in accordance with the protocol.

(b) The test systems shall be monitored in conformity with the protocol.

(c) Specimens shall be identified by test system, study, nature, and date of collection. This information shall be located on the specimen container or shall accompany the specimen in a manner that precludes error in the recording and storage of data.

(d) In animal studies where histopathology is required, records of gross findings for a specimen from postmortem observations shall be available to a pathologist when examining that specimen histopathologically.

(e) All data generated during the conduct of a study, except those that are generated by automated data collection systems, shall be recorded directly, promptly, and legibly in ink. All data entries shall be dated on the day of entry and signed or initialed by the person entering the data. Any change in entries shall be made so as not to obscure the original entry, shall indicate the reason for such change, and shall be dated and signed or identified at the time of the change. In automated data collection systems, the individual responsible for direct data input shall be identified at the time of data input. Any change in automated data entries shall be made so as not to obscure the original entry, shall indicate the reason for change, shall be dated, and the responsible individual shall be identified.

{ 160.135 Physical and chemical characterization studies.

(a) All provisions of the GLP standards shall apply to physical and chemical characterization studies designed to determine stability, solubility, octanol water partition coefficient, volatility, and persistence (such as biodegradation, photodegradation, and chemical degradation studies) of test, control, or reference substances.

01 - Exhibit 01--continued

- (b) The following GLP standards shall not apply to studies, other than those designated in paragraph (a) of this section, designed to determine physical and chemical characteristics of a test, control, or reference substance:

- { 160.31 (c), (d), and (g)
- { 160.35 (b) and (c)
- { 160.43
- { 160.45
- { 160.47
- { 160.49
- { 160.81(b) (1), (2), (6) through (9), and (12)
- { 160.90
- { 160.105 (a) through (d)
- { 160.113
- { 160.120(a) (5) through (12), and (15)
- { 160.185(a) (5) through (8), (10), (12), and (14)
- { 160.195 (c) and (d)

Subparts H and I--(Reserved)

Subpart J--Records and Reports

{ 160.185 Reporting of study results.

- (a) A final report shall be prepared for each study and shall include, but not necessarily be limited to, the following:
- (1) Name and address of the facility performing the study and the dates on which the study was initiated and was completed, terminated, or discontinued.
 - (2) Objectives and procedures stated in the approved protocol, including any changes in the original protocol.
 - (3) Statistical methods employed for analyzing the data.
 - (4) The test, control, and reference substances identified by name, chemical abstracts service (CAS) number or code number, strength, purity, and composition, or other appropriate characteristics.
 - (5) Stability and, when relevant to the conduct of the study the solubility of the test, control, and reference substances under the conditions of administration.

01 - Exhibit 01--continued

- (6) A description of the methods used.
 - (7) A description of the test system used. Where applicable, the final report shall include the number of animals used, sex, body weight range, source of supply, species, strain and substrain, age, and procedure used for identification.
 - (8) A description of the dosage, dosage regimen, route of administration, and duration.
 - (9) A description of all circumstances that may have affected the quality or integrity of the data.
 - (10) The name of the study director, the names of other scientists or professionals and the names of all supervisory personnel, involved in the study.
 - (11) A description of the transformations, calculations, or operations performed on the data, a summary and analysis of the data, and a statement of the conclusions drawn from the analysis.
 - (12) The signed and dated reports of each of the individual scientists or other professionals involved in the study, including each person who, at the request or direction of the testing facility or sponsor, conducted an analysis or evaluation of data or specimens from the study after data generation was completed.
 - (13) The locations where all specimens, raw data, and the final report are to be stored.
 - (14) The statement prepared and signed by the quality assurance unit as described in { 160.35(b)(7).
- (b) The final report shall be signed and dated by the study director.
- (c) Corrections or additions to a final report shall be in the form of an amendment by the study director. The amendment shall clearly identify that part of the final report that is being added to or corrected and the reasons for the correction or addition, and shall be signed and dated by the person responsible. Modification of a final report to comply with the submission requirements of EPA does not constitute a correction, addition, or amendment to a final report.
- (d) A copy of the final report and of any amendment to it shall be maintained by the sponsor and the test facility.
- { 160.190 Storage and retrieval of records and data.

01 - Exhibit 01--continued

- (a) All raw data, documentation, records, protocols, specimens, and final reports generated as a result of a study shall be retained. Specimens obtained from mutagenicity tests, specimens of soil, water, and plants, and wet specimens of blood, urine, feces, and biological fluids, do not need to be retained after quality assurance verification. Correspondence and other documents relating to interpretation and evaluation of data, other than those documents contained in the final report, also shall be retained.
- (b) There shall be archives for orderly storage and expedient retrieval of all raw data, documentation, protocols, specimens, and interim and final reports. Conditions of storage shall minimize deterioration of the documents or specimens in accordance with the requirements for the time period of their retention and the nature of the documents of specimens. A testing facility may contract with commercial archives to provide a repository for all material to be retained. Raw data and specimens may be retained elsewhere provided that the archives have specific reference to those other locations.
- (c) An individual shall be identified as responsible for the archives.
- (d) Only authorized personnel shall enter the archives.
- (e) Material retained or referred to in the archives shall be indexed to permit expedient retrieval.

{ 160.195 Retention of records.

- (a) Record retention requirements set forth in this section do not supersede the record retention requirements of any other regulations in this subchapter.
- (b) Except as provided in paragraph (c) of this section, documentation records, raw data, and specimens pertaining to a study and required to be retained by this part shall be retained in the archive(s) for whichever of the following periods is longest:
 - (1) In the case of any study used to support an application for a research or marketing permit approved by EPA, the period during which the sponsor holds any research or marketing permit to which the study is pertinent.
 - (2) A period of at least 5 years following the date on which the results of the study are submitted to the EPA in support of an application for a research or marketing permit.

01 - Exhibit 01--continued

- (3) In other situations (e.g., where the study does not result in the submission of the study in support of an application for a research or marketing permit), a period of at least 2 years following the date on which the study is completed, terminated, or discontinued.
- (c) Wet specimens, samples of test, control, or reference substances, and specially prepared material which are relatively fragile and differ markedly in stability and quality during storage, shall be retained only as long as the quality of the preparation affords evaluation. Specimens obtained from mutagenicity tests, specimens of soil, water, and plants, and wet specimens of blood, urine, feces, and biological fluids, do not need to be retained after quality assurance verification. In no case shall retention be required for longer periods than those set forth in paragraph (b) of this section.
- (d) The master schedule sheet, copies of protocols, and records of quality assurance inspections, as required by { 160.35(c) shall be maintained by the quality assurance unit as an easily accessible system of records for the period of time specified in paragraph (b) of this section.
- (e) Summaries of training and experience and job descriptions required to be maintained by { 160.29(b) may be retained along with all other testing facility employment records for the length of time specified in paragraph (b) of this section.
- (f) Records and reports of the maintenance and calibration and inspection of equipment, as required by { 160.63 (b) and (c), shall be retained for the length of time specified in paragraph (b) of this section.
- (g) If a facility conducting testing or an archive contracting facility goes out of business, all raw data, documentation, and other material specified in this section shall be transferred to the archives of the sponsor of the study. The EPA shall be notified in writing of such a transfer.
- (h) Specimens, samples, or other non-documentary materials need not be retained after EPA has notified in writing the sponsor or testing facility holding the materials that retention is no longer required by EPA. Such notification normally will be furnished upon request after EPA or FDA has completed an audit of the particular study to which the materials relate and EPA has concluded that the study was conducted in accordance with this part.
- (i) Records required by 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.

03 - Policy

1. Conduct all studies involving pesticides in accordance with the policies set forth in FSM 4085.03.
2. Conduct all studies involving chemicals other than pesticides in accordance with the policies set forth in FSM 4085.03.
3. Attach a disclaimer (sec. 11.21) to all pesticide studies that are not intended for submission to the Environmental Protection Agency.
4. Ensure that a study has only one Study Director. Study Directors must be of professional grade and be directly involved with the study (40 CFR 160.33; sec. 04.5).
5. Ensure that members of the Quality Assurance Unit (sec. 04.3, para. 2) are not involved in supervising or conducting studies that they monitor (40 CFR 160.35).

04 - Responsibility

04.1 - Deputy Chiefs for Research, State and Private Forestry, and the National Forest System

(FSM 4085.04a).

04.2 - Regional Foresters, Station Directors, Area Director, Director of the Forest Products Laboratory and Institute Director

(FSM 4085.04b).

04.3 - Line Officers

(Sec. 01, ex. 01; 40 CFR 160.31). In addition to the responsibilities in FSM 4085.04C, it is the responsibility of line officers to:

1. Assign and Replace Study Directors. Designate a Study Director before each study is initiated and replace Study Directors promptly if needed.
2. Implement Quality Assurance Principles. Ensure there is an adequate Quality Assurance Unit (QAU) staffed by qualified personnel who are not involved in any scientific aspect of the study. Options for implementing acceptable quality assurance are in section 81.2.
3. Ensure Quality of Test, Control, and Reference Substances. Ensure that test, control, and reference substances or mixtures have been properly tested for identity, strength, purity, stability, and uniformity (sec. 55).

4. **Oversee Scheduling.** Ensure that personnel, funds, facilities, equipment, and materials are available as scheduled.
5. **Provide Training.** Ensure that all personnel clearly understand their assigned functions through the development of an effective training program.
6. **Document and Correct Deviations.** Ensure that any deviations from Good Laboratory Practices Regulations detected by the QAU are documented and communicated to the Study Director. Ensure that corrective actions are taken and documented.
7. **Facilitate U.S. Environmental Protection Agency Inspections.** Serve as the contact point for U.S. Environmental Protection Agency inspections and correct areas of noncompliance (sec. 93).

04.4 - National and Local Quality Assurance Unit Manager

(Sec. 01, ex. 01; 40 CFR 160.35; FSM 4080.04d). It is the responsibility of the local and national Quality Assurance Unit (QAU) managers to ensure that the facilities, equipment, personnel, methods, practices, records, and controls in a study are monitored and in compliance with Good Laboratory Practices (sec. 80.42 and 80.44). The local QAU manager is also responsible for ensuring that each study is inspected at least once prior to making this assurance.

04.5 - Study Director

(Sec. 01, ex. 01; 40 CFR 160.33). It is the responsibility of the Study Director to:

1. **Provide leadership.** Provide overall leadership for the technical conduct of the study, and interpret, analyze, document, and report data and results. The Study Director is responsible for all aspects of the study, including those portions contributed by multiple collaborators at one or more locations. A Study Supervisor may be assigned at each location who reports directly to the Study Director. The Study Director should visit each location at least once during the study and must ensure that adequate communication takes place throughout the study.
2. **Notify contractors of standards.** Notify any consulting laboratories, contractors, or grantees that the contracted work must be conducted under the standards of Good Laboratory Practices (GLPs). Verify that GLPs are actually being followed before signing the compliance statement (sec. 12.2)
3. **Ensure protocol is approved and followed.** Ensure that the protocol, including amendments, is approved and followed. Sign each protocol and initiate the study.
4. **Ensure experimental data is recorded and verified.** Ensure that all experimental data, including unexpected observations, are accurately and properly recorded and verified.

5. Ensure corrective action is taken and documented. Ensure that any unforeseen circumstances that arise during the study that may affect the quality and integrity of the study are noted and that corrective action is taken and documented.
6. Ensure use of appropriate test systems. Ensure that the proper test systems described in the protocol are used.
7. Implement Good Laboratory Practices. Acquire a full knowledge of GLP regulations and ensure that they are properly applied for each study.
8. Ensure appropriate materials are archived. Deliver all raw data, documentation, protocols, specimens, and final reports to the archives when the study is completed. This requirement includes the delivery of all materials that must be stored at the sponsor's archives, archives of contract laboratories, independent commercial archives, or other required locations.
9. Review and sign the final report. Review and sign the final report to officially terminate the study (sec. 71).
10. Prepare and sign the compliance statement. Prepare and sign the compliance statement (sec. 12.2) to describe and attest to the degree of GLP compliance.

05 - Definitions

This section lists, in alphabetical order, terms used throughout this Handbook and their definitions or cross references to definitions in Title 40, Code of Federal Regulations, section 160.3 (reprinted in ex. 01 of sec. 01).

Applicant. Any person who submits an application to the U.S. Environmental Protection Agency for a research or marketing permit for a pesticide product.

Application for Research or Marketing Permit. (Sec. 01, ex. 01; 40 CFR 160.3).

Batch. (Sec. 01, ex. 01; 40 CFR 160.3).

Carrier. (Sec. 01, ex. 01; 40 CFR 160.3).

Chain of Custody. A system of documentation that traces the origin, movement, possession, identification, and location of a sample or of a test, control, or reference substance at all times in order to ensure its integrity, identity, and composition.

Compliance statement. A statement attached to the completed final report which states whether the research was conducted under Good Laboratory Practice standards and

whether any deviations from GLP standards occurred. The compliance statement must be signed by the applicant, the sponsor, and the Study Director (sec. 04.5).

Control substance. (Sec. 01, ex. 01; 40 CFR 160.3).

Experimental Start Date. (Sec. 01, ex. 01; 40 CFR 160.3).

Experimental Termination Date. (Sec. 01, ex. 01; 40 CFR 160.3).

Federal Food, Drug, and Cosmetic Act (FFDCA). (Sec. 01, ex. 01; 40 CFR 160.3).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). (Sec. 01, ex. 01; 40 CFR 160.3).

Good Laboratory Practices (GLPs). (FSM 4085.05).

Marketing Permit. (FSM 4085.05).

National Agricultural Pesticide Impact Assessment Program (NAPIAP). The NAPIAP is a program sponsored by the U.S. Department of Agriculture that provides funding for research needed for re-registration or to maintain registration of pesticides.

Person. (Sec. 01, ex. 01; 40 CFR 160.3).

Pesticide. (FSM 4085.05).

Pesticide Assessment Guidelines. A set of standards developed by the U.S. Environmental Protection Agency that describe experimental procedures for the evaluation of pesticides (sec. 06.5).

Protocol. A detailed plan that thoroughly describes the objectives and methods used in a study and meets specific documentation and accountability requirements specified in the regulations.

Quality Assurance Unit (QAU) (Sec. 01, ex. 01; 40 CFR 160.3).

Raw data. (Sec. 01, ex. 01; 40 CFR 160.3).

Reference Substance. (Sec. 01, ex. 01; 40 CFR 160.3).

Research Permit. (FSM 4085.05).

Specimens. (Sec. 01, ex. 01; 40 CFR 160.3).

Sponsor. The person who funds the research.

Standard Operating Procedure. An approved, written description of a process, technique, or procedure used in a study or as part of the routine operation of a facility.

Study. (Sec. 01, ex. 01; 40 CFR 160.3).

Study Completion Date. (Sec. 01, ex. 01; 40 CFR 160.3).

Study Director. (Sec. 01, ex. 01; 40 CFR 160.3).

Study Initiation Date. (Sec. 01, ex. 01; 40 CFR 160.3).

Test Substance. (Sec. 01, ex. 01; 40 CFR 160.3).

Test System. (Sec. 01, ex. 01; 40 CFR 160.3).

Testing Facility. (Sec. 01, ex. 01; 40 CFR 160.3).

Vehicle. (Sec. 01, ex. 01; 40 CFR 160.3). This definition includes surfactants and other additives which improve the performance of the test substance.

06 - References

06.1 - Good Laboratory Practices

1. Carson, P. A.; Dent, N. J. 1990. Good Laboratory and Clinical Practices, Techniques for the Quality Assurance Professional. Oxford: Heinemann Newnes. 390 p.
2. Garner, W. Y.; Barge, M. S. 1988. Good Laboratory Practices: An Agrochemical Perspective. American Chemical Society Symposium Series 369. Washington, DC: American Chemical Society. 165 p.
3. Garner, W. Y.; Barge, M. S.; and Ussary, J. P. 1992. Good Laboratory Practices Standards: Applications for Field and Laboratory Studies. Washington, DC: American Chemical Society. 571 p.
4. Hirsch, A. 1989. Good Laboratory Practice Regulations. New York: Marcel Dekker, Inc. 224 p.
5. Paget, G. E. 1979. Good Laboratory Practice. Baltimore, MD: University Park Press. 204 p.

6. Stevenson, R. E.; and Jong, S. C. 1992. Application of good laboratory practice (GLP) to culture collections of microbial and cell cultures. World Journal of Microbiology and Biotechnology 8: 229-235.

06.2 - Manuals

1. Good Laboratory Practices Compliance Inspections of Laboratories Conducting Health Effects Studies: Inspector's Manual. US EPA/Office of Toxic Substances, Office of Compliance Monitoring, Washington, DC (current edition). (Available from Office of Compliance Monitoring, U. S. Environmental Protection Agency, EN-342W, 401 M Street, SW, Washington, DC 20460.)
2. Good Laboratory Practices - Compliance Program Guidance Manual. Food and Drug Administration, Rockville, MD (current edition). (Available from the National Technical Information Service, Springfield, VA; 703-487-4600.)

06.3 - Briefings

1. U.S. Environmental Protection Agency, Office of Compliance Monitoring, Policy and Grants Subdivision. 1990. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Good Laboratory Practice Standards (GLPS) Questions and Answers. Washington, DC: U.S. Environmental Protection Agency. (Available from Policy and Grants Division, Office of Compliance Monitoring, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460.)
2. U.S. Environmental Protection Agency, Office of Compliance Monitoring. 1992. Good Laboratory Practices Regulation Advisories. Washington, DC: U.S. Environmental Protection Agency. (Available from: Office of Compliance Monitoring, U.S. Environmental Protection Agency, EN-342W, 401 M Street, SW, Washington, DC 20460)

06.4 - Quality Assurance

1. General Principles.
 - a. Carlson, R. D. 1981. Manual of Quality Assurance Procedures and Forms. Englewood Cliffs, NJ: Prentice Hall. 454 p.
 - b. Roberts, G. W. 1983. Quality Assurance in Research and Development. New York: Marcel Dekker, Inc. 135 p.
 - c. Schroeder, R. S. 1989. Effective Quality Assurance. Journal of the American College of Toxicology 8: 411-418.
2. Journals and Newsletters.

- a. American Society for Quality Control. The Journal of Quality Technology - Quarterly. Milwaukee, WI: ASQC Quality Control Press.
- b. American Society for Quality Control. Quality Progress - Quarterly. Milwaukee, WI: ASQC Quality Control Press.
- c. International Center for Health and Environmental Education. Network News. Alexandria, VA: International Center for Health and Environmental Education.
- d. Society of Quality Assurance - Newsletter. Annandale, VA: Society of Quality Assurance.

06.5 - Pesticide Assessment Guidelines

U.S. Environmental Protection Agency, Office of Pesticide and Toxic Substances. Pesticide Assessment Guidelines. Washington, DC: U.S. Environmental Protection Agency.

The Pesticide Assessment Guidelines are a set of standards developed by the U.S. Environmental Protection Agency that specifies how individual experiments are to be conducted to test specific properties of pesticides. Pesticide Assessment Guidelines are available for specific topics, such as: Hazard Evaluation, Environmental Fate, Product Chemistry, Product Performance, Biorational Pesticides, and Residue Chemistry. They are available from the National Technical Information Service, Springfield, VA (703-487-4650).