SOP Log Sheet

ID # 500169

Region: NCR

State: MI City: Fennville

Location: Field Mgr Fennville (TNRC)

FRD/LRD: Anthony Van Weerden
Submitter

Effective Date: 6/8/17

Description of Material (s): 2017 SOPs

Reviewed By: [signature] 6/9/17
Sign/Date

Receive Date: 6/9/17 Date to Archivist: 6/9/17

File Format: E-mail ☐ CD ☐ Hard Copy ☒

Electronic copy ok to use: Y or (No) If no, indicated below, what needs to be done
(Circle one)

Date from Reviewer: ~~6/15/17~~ 6/9/15

Date Posted: 6/15/17 Archive Date: 6/15/17

Archive Location: Active File Rm Cabinet 7 Drawer 2

Sign: [signature]

Comment: _____

S: Facility Files- SOP Cover Sheet

9/13/16 JT

MICHIGAN STATE
UNIVERSITY

TO: Mr. Anthony VanWoerkom
Michigan State University
Trevor Nichols Research Center
6237 124th Ave
Fennville, MI 49408

FROM: Satoru Miyazaki, IR-4 Regional Field Coordinator

SUBJECT: STANDARD OPERATING PROCEDURE APPROVAL

DATE: June 8, 2017 (RFC Approval date) Satoru Miyazaki

Per 40CRF160 Good Laboratory Practice Standards (GLP), this is to notify you that your Standard Operating Procedure (SOP) in use is approved. Please retain this document with your SOP to fulfill GLP requirements.

SOP	Revision date	FRD Approval date	SOP	Revision date	FRD Approval date
A.000.00	4-14-17	4-14-17	R.003.14	3-17-15	4-14-17
A.001.12	3-17-15	4-14-17	R.004.07	3-17-15	4-14-17
A.003.08	3-17-15	4-14-17	R.005.07	3-17-15	4-14-17
A.004.10	3-17-15	4-14-17	R.006.04	3-17-15	4-14-17
A.005.09	3-17-15	4-14-17	M.001.12	3-18-16	4-14-17
A.006.09	3-17-15	4-14-17	M.003.10	3-17-15	4-14-17
A.009.07	3-17-15	4-14-17	M.004.10	3-23-16	4-14-17
A.010.08	3-17-15	4-14-17	M.005.15	3-18-16	4-14-17
A.012.07	3-17-15	4-14-17	M.006.09	3-17-15	4-14-17
A.013.06	3-17-15	4-14-17	M.008.08	3-17-15	4-14-17
A.014.07	3-17-15	4-14-17	M.009.07	3-17-15	4-14-17
A.015.07	3-17-15	4-14-17	M.010.07	3-17-15	4-14-17
A.016.09	3-17-15	4-14-17	M.012.06	3-17-15	4-14-17
A.018.06	3-17-15	4-14-17	M.013.08	3-17-15	4-14-17
A.019.00	1-21-16	4-14-17	M.014.10	3-23-16	4-14-17
A.020.00	3-23-16	4-14-17	M.015.05	3-17-15	4-14-17
C.001.16	3-17-15	4-14-17	M.016.06	3-17-15	4-14-17
C.002.10	3-17-15	4-14-17	M.017.05	3-17-15	4-14-17
C.003.10	10-16-15	4-14-17	M.018.07	3-17-15	4-14-17
C.004.09	3-17-15	4-14-17	M.019.02	3-17-15	4-14-17
C.005.01	10-16-15	4-14-17	X.001.05	3-17-15	4-14-17
R.001.10	3-17-15	4-14-17	X.002.04	3-17-15	4-14-17
R.002.09	3-17-15	4-14-17			

IR-4 NORTH CENTRAL REGION RESEARCH CENTER
Michigan State University
3900 Collins Road, Suite 1031B
Lansing, MI
48910-8396
517.337.3181
Fax: 517.432.2098

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The following are the current Standard Operating Procedures used by Trevor Nichols Research Center Staff in compliance with Good Laboratory Standards.

Standard Operating Procedures

Section A

April 14, 2017

A.000.00	Standard Operating Procedures for Standard Operating Procedures
A.001.12	Archiving Storage of Records and Raw Data
A.003.08	Soil Sampling for Soil Characteristics
A.004.10	Recording of Raw Data
A.005.09	Tank Sampling Procedures
A.006.09	Measuring Wind Speed and Direction
A.009.07	Signature Log
A.010.08	Curriculum Vitae
A.012.07	Master Trial Schedule
A.013.06	Weather Data
A.014.07	EPA Audit or Inspection
A.015.07	Sponsor Visit or Audit
A.016.09	Rounding-off Numbers
A.018.06	Developing the Residue Calculation Sheet
A.019.00	Data Archiving, Retention and Quality Control Review
A.020.00	Using Borrowed Equipment

Section C

C.001.16	Receipt, Storage, and Disposal of Test Substance
C.002.10	Measuring Liquid Chemicals
C.003.10	AND EK 4100i Electronic Balance Calibration

X.001.05	Safety and Safety Inspection
X.002.04	Treated Crop Destruct

STANDARD OPERATING PROCEDURES REVIEW – REVIEW LOG

SOP NUMBER	DATE REVIEWED	REVISED (Yes, No, New, Retired)	REVISED SOP NUMBER	REVISION DATE
A.000.00	4/14/2017	New	A.000.00	4/14/2017
A.001.11	4/14/2017	No	A.001.12	3/17/2015
A.003.07	4/14/2017	No	A.003.08	3/17/2015
A.004.09	4/14/2017	No	A.004.10	3/17/2015
A.005.08	4/14/2017	No	A.005.09	3/17/2015
A.006.08	4/14/2017	No	A.006.09	3/17/2015
A.008.10	4/14/2017	Retired	A.008.11	4/14/2017
A.009.06	4/14/2017	No	A.009.07	3/17/2015
A.010.07	4/14/2017	No	A.010.08	3/17/2015
A.011.07	4/14/2017	Retired	A.011.07	5/5/2014
A.012.06	4/14/2017	No	A.012.07	3/17/2015
A.013.05	4/14/2017	No	A.013.06	3/17/2015
A.014.06	4/14/2017	No	A.014.07	3/17/2015
A.015.06	4/14/2017	No	A.015.07	3/17/2015
A.016.08	4/14/2017	No	A.016.09	3/17/2015
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A.019.00	4/14/2017	No	A.019.00	1/21/2016
A.020.00	4/14/2017	No	A.020.00	3/23/2016
C.001.15	4/14/2017	No	C.001.16	3/17/2015
C.002.09	4/14/2017	No	C.002.10	3/17/2015
C.003.09	4/14/2017	No	C.003.10	10/16/2015
C.004.08	4/14/2017	No	C.004.09	3/17/2015
C.005.00	4/14/2017	No	C.005.01	10/16/2015
M.001.11	4/14/2017	No	M.001.12	3/18/2016
M.003.09	4/14/2017	No	M.003.10	3/17/2015
M.004.09	4/14/2017	No	M.004.10	3/23/2016
M.005.14	4/14/2017	No	M.005.15	3/18/2016
M.006.08	4/14/2017	No	M.006.09	3/17/2015
M.008.07	4/14/2017	No	M.008.08	3/17/2015
M.009.06	4/14/2017	No	M.009.07	3/17/2015
M.010.06	4/14/2017	No	M.010.07	3/17/2015

4-14-17

Signature and Date

STANDARD OPERATING PROCEDURES REVIEW – REVIEW LOG

M.012.05	4/14/2017	No	M.012.06	3/17/2015
M.013.07	4/14/2017	No	M.013.08	3/17/2015
M.014.09	4/14/2017	No	M.014.10	3/23/2016
M.015.04	4/14/2017	No	M.015.05	3/17/2015
M.016.05	4/14/2017	No	M.016.06	3/17/2015
M.017.04	4/14/2017	No	M.017.05	3/17/2015
M.018.06	4/14/2017	No	M.018.07	3/17/2015
M.019.01	4/14/2017	No	M.019.02	3/17/2015
R.001.09	4/14/2017	No	R.001.10	3/17/2015
R.002.08	4/14/2017	No	R.002.09	3/17/2015
R.003.13	4/14/2017	No	R.003.14	3/17/2015
R.004.06	4/14/2017	No	R.004.07	3/17/2015
R.005.06	4/14/2017	No	R.005.07	3/17/2015
R.006.03	4/14/2017	No	R.006.04	3/17/2015
X.001.04	4/14/2017	No	X.001.05	3/17/2015
X.002.03	4/14/2017	No	X.002.04	3/17/2015

4-14-17

Signature and Date

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

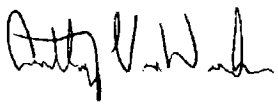
STANDARD OPERATING PROCEDURES

Standard Operating Procedure for Standard Operating Procedures

SOP Number: A.000.00
Submitted by: Anthony VanWoerkom
Title: Research Technician I

Supersedes: None
Revised by: Anthony VanWoerkom
Date: 4/14/17

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To ensure that Trevor Nichols Research Center (IR-4 Research Center) staff will have written SOP's in place, for field residue trials study methods, to ensure the quality and integrity of a study.

EQUIPMENT DESCRIPTION:

A copy of the Good Laboratory Practice Standards must be used.

PROCEDURES:

The designated personnel that will conduct the preparation of Standard operating procedures will refer to the following outlined SOP and Good Laboratory Practice Standards (40 CFR Part 160) to ensure the integrity of the studies.

PREPARATION OF STANDARD OPERATION PROCEDURES:

1. A standard operating procedure, or SOP, is a written document that describes how routine activities are to be performed. The IR-4 Field Research Director will develop standard operating procedures (SOPs) for all phases of research conducted in support of chemical registration.

2. The protocol always takes precedence over any SOP.

3. An SOP should exist for all routine procedures and regularly used equipment. Individuals completely familiar with the process or equipment should write the SOPs. The SOP should include enough detail so that someone with the appropriate education, training, and experience can perform the procedure correctly.

4. The individual SOPs, together with an Index and SOP Review Log will constitute SOPs for IR-4 chemical residue studies at Trevor Nichols Research Center.

5. SOPs will be reviewed annually and revised as needed. The review and revisions will be recorded on the SOP Review Log, which will be maintained as part of the SOPs. All earlier versions of SOPs must be retained in an archive file.

6. Each individual SOP will be approved, initialed/signed, and dated by the Field Research Director and the Regional Coordinator.

7. Any deviations from the SOPs that would affect the results of a study must be documented in writing and signed by the Study Director.

8. In the SOPs, the following terms will have the meanings specified.

    a. Batch – a specific quantity or lot of a test substance that has been adequately characterized

b. Experimental start date – the first date the test substance is applied to the test system (crop).
c. Experimental termination date – the last date on which data are collected directly from a study
d. Good Laboratory Practices (GLP) – a set of guidelines mandated by Congress to which researchers must adhere to assure the integrity of research data. All IR-4 studies are conducted under GLP guidelines.
e. Master Timetable – a list of trials which is maintained by the Field Research Director. It must be indexed by chemical and crop, and contain type of trial, approximate experimental start dates, and termination dates.
f. Master Schedule – a list, maintained by the quality assurance unit, 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.
g. Protocol – a specific document, provided by the sponsor that contains details for accurate completion of a trial.
h. Quality Assurance Unit (QAU) – any person or organizational element as per 40CFR 160.35, who is designated to perform the monitoring duties to assure that the research is conducted according to standard operating procedures and good laboratory practices. Regional IR-4 representatives will designate the Quality Assurance Officer (QAO) for IR-4 trials.
i. Raw Data – worksheets, records, memoranda, notes, etc., that are the results of original observations and activities of a study. This includes photographs and computer printouts.
j. Sponsor – the individual, corporation, association, scientific or academic establishment, government agency or other organizational unit who initiates and supports, by provision of financial or other resources, a study.
k. Standard Operating Procedures (SOP) – written documentation of routine activities utilized in research studies.
l. Trial – an experiment in which a test substance (pesticide) is applied to a test system to determine or help predict its effect, metabolism, environmental and chemical fate, or other characteristics.
m. Frequently Used Acronyms –
    i. Michigan State University (MSU)
    ii. Trevor Nichols Research Center (TNRC)
    iii. Clarksville Research Center (CRC)

9. The Regional Field Coordinator and other study personnel will receive copies of the SOPs on request. The original SOPs will be kept in a secure file in the Field Research Directors office.

10. The original copy of the previous years SOPs will be shipped to IR-4 Headquarters for archiving within one year of the updated version being signed by the Field Research Director. A true copy of all previous sops will be archived in the Field Research Director's office.

11. Each SOP will contain a title page which will include: the facility name, the title of the SOP, SOP number, the revision number, the person who submitted / revised the SOP and their title; also the signature of the Field Research Director and the date the SOP was approved.

12. Each SOP shall have a unique classification letter and a unique numbering system. The letter classification will be as follows: A. = Archiving and Data Gathering; C. = Chemical Related; R. = Residue Samples; M. = Maintenance and Calibration; X. = Miscellaneous

13. The unique numbering system will start following the initial of the classification letter; a series of three numerical digits, followed by a period, then a series of two numerical digits will be used to identify each SOP.

14. The first set of three numerical digits will indicate the number of the SOP and the second set of two numerical digits indicates the number of approved revisions to the original SOP. For example, this SOP is A.000.00.

15. Each SOP will contain a purpose, equipment description and a procedure.

16. The SOP's will be made available to all personnel involved in the residue trial process conducted at the Trevor Nichols Research Center. A copy of the SOP's will be in or near the equipment to be used.

17. The original SOP's and all revisions will be retained in the archives. Any SOP that is retired will be placed in the archives and will be logged in the review process.

STANDARD OPERATING PROCEDURES REVIEW – REVIEW LOG

SOP NUMBER	DATE REVIEWED	REVISED (Yes, No, New, Retired)	REVISED SOP NUMBER	REVISION DATE
A.000.00	4/14/2017	New	A.000.00	4/14/2017
A.001.11	4/14/2017	No	A.001.12	3/17/2015
A.003.07	4/14/2017	No	A.003.08	3/17/2015
A.004.09	4/14/2017	No	A.004.10	3/17/2015
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A.010.07	4/14/2017	No	A.010.08	3/17/2015
A.011.07	4/14/2017	Retired	A.011.07	5/5/2014
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A.013.05	4/14/2017	No	A.013.06	3/17/2015
A.014.06	4/14/2017	No	A.014.07	3/17/2015
A.015.06	4/14/2017	No	A.015.07	3/17/2015
A.016.08	4/14/2017	No	A.016.09	3/17/2015
A.018.05	4/14/2017	No	A.018.06	3/17/2015
A.019.00	4/14/2017	No	A.019.00	1/21/2016
A.020.00	4/14/2017	No	A.020.00	3/23/2016
C.001.15	4/14/2017	No	C.001.16	3/17/2015
C.002.09	4/14/2017	No	C.002.10	3/17/2015
C.003.09	4/14/2017	No	C.003.10	10/16/2015
C.004.08	4/14/2017	No	C.004.09	3/17/2015
C.005.00	4/14/2017	No	C.005.01	10/16/2015
M.001.11	4/14/2017	No	M.001.12	3/18/2016
M.003.09	4/14/2017	No	M.003.10	3/17/2015
M.004.09	4/14/2017	No	M.004.10	3/23/2016
M.005.14	4/14/2017	No	M.005.15	3/18/2016
M.006.08	4/14/2017	No	M.006.09	3/17/2015
M.008.07	4/14/2017	No	M.008.08	3/17/2015
M.009.06	4/14/2017	No	M.009.07	3/17/2015
M.010.06	4/14/2017	No	M.010.07	3/17/2015

Signature and Date

STANDARD OPERATING PROCEDURES REVIEW – REVIEW LOG

M.012.05	4/14/2017	No	M.012.06	3/17/2015
M.013.07	4/14/2017	No	M.013.08	3/17/2015
M.014.09	4/14/2017	No	M.014.10	3/23/2016
M.015.04	4/14/2017	No	M.015.05	3/17/2015
M.016.05	4/14/2017	No	M.016.06	3/17/2015
M.017.04	4/14/2017	No	M.017.05	3/17/2015
M.018.06	4/14/2017	No	M.018.07	3/17/2015
M.019.01	4/14/2017	No	M.019.02	3/17/2015
R.001.09	4/14/2017	No	R.001.10	3/17/2015
R.002.08	4/14/2017	No	R.002.09	3/17/2015
R.003.13	4/14/2017	No	R.003.14	3/17/2015
R.004.06	4/14/2017	No	R.004.07	3/17/2015
R.005.06	4/14/2017	No	R.005.07	3/17/2015
R.006.03	4/14/2017	No	R.006.04	3/17/2015
X.001.04	4/14/2017	No	X.001.05	3/17/2015
X.002.03	4/14/2017	No	X.002.04	3/17/2015

Signature and Date

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

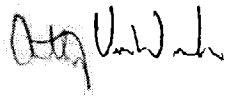
STANDARD OPERATING PROCEDURES

Archiving and Storage of Records and Raw Data

SOP Number: A.001.12
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.001.11 – 1/22/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To assure that all records and raw data generated as a result of a study shall be logged and retained in an appropriate method.

EQUIPMENT DESCRIPTION:

Fire-retardant file cabinets will be used to archive all data generated from studies performed at the Trevor Nichols Research Center. The file cabinets must have a locking mechanism to ensure the integrity of the data.

PROCEDURES:

The designated personnel that will conduct the archiving of records and raw data will refer to the following outlined SOP to ensure the integrity of the data.
Main Archivist: Anthony VanWoerkom
1st Back-up Archivist: Jason Seward
2nd Back-up Archivist: John Wise

ARCHIVING AND STORAGE OF RECORDS AND RAW DATA PROCEDURES:

1. All raw data, documentation, records and copies of protocols generated as a result of a study shall be archived. The Master Schedule Sheet, records of all related training, job experience and job description for Trevor Nichols Research Center, the original of the Standard Operation Procedures and records for former employees will be archived.

2. All the above information will be logged into the Archiving Data Log Sheet (see attached sheet). This will include; a description of the data, the general location and the name of the personnel logging the data.

3. The archive area will be located in a designated office at the Trevor Nichols Research Center and will be sufficient in size to accommodate all of the records and raw data required by Good Laboratory Practice standards.

4. The file cabinets will remain locked at all times and only the Main Archivist and the Back-up Archivist will have keys to enter the cabinets.

5. All archived material will be indexed for expedient removal.

6. A Sign-in and Sing-out Log Sheet will be in the designated office to record all movement of the archived data (see attached sheet).

TREVOR NICHOLS RESEARCH CENTER
ARCHIVING DATA LOG SHEET

Description of Data	Archive Location	Name and Date of Archivist

TREVOR NICHOLS RESEARCH CENTER
SIGN-IN AND SIGN –OUT LOG SHEET

Date	Time –In	Time-Out	Name	Data Removed and Entered

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Soil Sampling for Soil Characterization

SOP Number: A.003.08
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.003.07 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that representative soil samples are obtained and handled properly when gathering information on the general nutrient level and physical properties of soils.

EQUIPMENT DESCRIPTION:

A suitable tube-type soil sampler, long enough to sample at the appropriate depth. A plastic bucket large enough to hold soil samples. A soil sample box or bag to hold soil samples during delivery to the laboratory and a map of the orchard or area you are sampling.

PROCEDURES:

The designated personnel that will conduct the collecting of soil samples will refer to the following SOP to ensure the integrity of the samples.

SOIL SAMPLING PROCEDURES FOR SOIL CHARACTERIZATION:

1. Using a map of the orchard or area, locate the test site that requires a soil sample.

2. Using a tube-type soil sampler, take a minimum of 5 core samples within the test plot area. Make sure all debris is removed from the spot of the soil sample to ensure the integrity of the samples.

3. Place all samples in a clean bucket and mix all the sample material together to ensure the composite sample is representative of the entire plot. The sample size should be large enough for the lab to run an accurate test.

4. Place the sample in the laboratory box or bag and mark the container to correspond with the sample area. Fill out all the requested information needed on the container and send a list of soil analyses needed to ensure the sample will get processed correctly. Ex. % sand, % clay, % silt, soil type, pH....).

5. The sample should be sent out as soon as possible to the appropriate lab.
6. Document the day the samples were taken and the day they were sent to the lab and received from the lab.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Recording of Raw Data

SOP Number: A.004.10
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.004.09 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that the recording of raw data is done in compliance with Good Laboratory Practices.

EQUIPMENT DESCRIPTION:

Blue or black ink pen will be used to record all raw data.

PROCEDURES:

The designated personnel that will conduct the recording of raw data will refer to the following outlined SOP to ensure the integrity of the data.

RECORDING OF RAW DATA PROCEDURES:

1. Raw data must always be recorded in blue or black ink pen.

2. The name of the person making the entry will always be signed or initialed and dated on raw data.

3. White-out is not to be used. Original entries should be used. If transcriptions are used the location of the original data will be noted.

4. Corrections are permissible as long as the error is crossed-out with a single line, initialed, dated, and a reason given for the change. Correction codes can be used as follows: ME = math error; SE = spelling error; WE = wrong entry. Correction codes will be circled so as not to be confused with initials of person making the correction.

5. An appropriate logbook will be used for recording of data for site-specific logs. That logbook will be retained at the facility and archived.

6. Data recorded in sponsor provided notebooks will be documented according to instructions for notebooks.

7. Limited raw data that relates to multiple studies will be photocopied as raw data and verified as an original copy or exact copy.

8. Sponsor provided notebooks and logbooks will be kept in a locked fire-proof cabinets when not in use.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Tank Sampling Procedures

SOP Number: A.005.09
Submitted by: Matthew Daly
Title: Farm Manager

Supersedes: A.005.08 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To insure that true representative sample of tank mixture is produced when it becomes necessary to obtain tank samples for residue trials.

EQUIPMENT DESCRIPTION:

The sprayer and spray tank that will be used with the proper test material added to the tank. A water source, such as a well or other water source will be used.

PROCEDURES:

The designated personnel that will be collecting the tank sample will refer to the following outlined SOP to ensure the integrity of the sample.

TANK SAMPLING PROCEDURES:

1. Begin with a clean sprayer.

2. Fill with the proper amount of water. On multiple tank sprayers, proceed with 1 tank only, start to finish. Making sure the spray system is routed to correct tank, start agitation, and add spray material. If liquid, rinse container with water from the tank and return rinse water to tank. If a powder is used, rinse container with water from the tank.

3. Agitate long enough to ensure mixing takes place prior to the sampling.

4. The tank samples will be taken with adequate properly labeled containers specified by provided protocol.

5. Always take samples from the sprayer pump return system.

6. Protocol procedures will be followed for storage and shipping.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Measuring of Wind Speed and Direction

SOP Number: A.006.09
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.006.08 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-15

PURPOSE:

To ensure that the wind speed and direction recorded represents the actual weather at the test site.

EQUIPMENT DESCRIPTION:

A Dwyer Wind Meter is a hand held portable anemometer that reads the wind MPH.
A standard compass will be used to find the correct wind direction.

PROCEDURES:

The designated personnel that will conduct the collecting and recording of wind speed and direction will refer to the following outlined SOP to ensure the integrity of the data.

MEASURING OF WIND AND DIRECTION PROCEDURES:

1. Prior to the application of a test material to a trial site, the wind speed and direction must be known before the proper spray procedures can be initiated.

2. Standing in the center of the trial site, decide which way the wind is coming from, if necessary, use a compass to obtain the direction of the wind. Hold the wind meter at eye level with the back of the wind meter facing the direction the wind is blowing.

3. The white ball in the tube will rise to the MPH of the wind. For wind speeds exceeding 10 MPH, cover the hole at the extreme top of the wind meter with your finger and read the wind MPH on high scale.

4. The wind speed and direction will be recorded in the appropriate Field Data Book.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Signature Log

SOP Number: A.009.07
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.009.06 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To provide a signature record of all Trevor Nichols Research Center (IR-4 Field Research Center) personnel involved in Good Laboratory Practice trials.

EQUIPMENT DESCRIPTION:

None

PROCEDURES:

The designated personnel that will sign the signature log will refer to the following outlined SOP to ensure the integrity of the trial.

SIGNATURE LOG PROCEDURES:

1. All personnel who are directly involved in GLP field residue trials will sign, initial and date a signature log. (see attached sheet)
2. Personnel involved in GLP field trials will review SOP's and document the review on the signature log.
3. This signature log will be part of the logbook which will be archived at the completion of field residue trials.

TREVOR NICHOLS RESEARCH CENTER
MICHIGAN STATE UNIVERSITY

SIGNATURE LOG

The following individuals are participants in conducting residue trials and reviewed the SOP's at Trevor Nichols Research Center.

FULL NAME (PRINT)	SIGNATURE	INITIALS	DATE

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

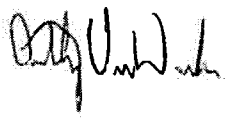
STANDARD OPERATING PROCEDURES

Curriculum Vitae

SOP Number: A.010.08
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.010.07 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

Trevor Nichols Research Center (IR-4 Field Research Center) will have as a part of their permanent records, curriculum vitae of all personnel involved in all residue trials to assure that procedures are done with qualified participants.

EQUIPMENT DESCRIPTION:

None

PROCEDURES:

The designated personnel that will participate in GLP trials will refer to the following outlined SOP to ensure the integrity of the data.

CURRICULUM VITAE PROCEDURES:

1. Personnel will maintain curriculum vitae's that will contain name, title, education, work experience and special training or qualifications, or accomplishments.

2. Vitae's will contain job descriptions.

3. Personnel will write their name, date and initials as they would initial data or any other type of information that would be archived or pertaining to GLP. The curriculum vitae's will be reviewed and updated annually.

4. CV's of personnel who no longer work at Trevor Nichols Research Center will be archived and kept indefinitely.

5. The following information must be provided in the blanks (see attached sheet) or a CV document may be attached following the attached sheet.

Curriculum vitae

Trevor Nichols Research Center – Michigan State University

Name: _____ Date: _____

Title: _____

Job Description: _____

_____

_____

_____

Education: _____

_____

_____

_____

Work Experience: _____

_____

_____

_____

Special Training, Qualifications or Accomplishments: _____

_____

_____

_____

_____

Signature: _____ Initials: _____ Date: _____

Anthony VanWoerkom, Field Research Director: _____ Date: _____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Master Trial Schedule

SOP Number: A.012.07
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.012.06 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To provide a master schedule that shows all trials being conducted at Trevor Nichols Research Center.

EQUIPMENT DESCRIPTION:

None

PROCEDURES:

The designated personnel that will complete the master trial schedule for Trevor Nichols research Center will refer to the following outlined SOP to ensure the integrity of the trials.

MASTER TRIAL SCHEDULE PROCEDURES:

1. The Master Trial Schedule shall contain the following information: (see the attached sheet)
    - Coded test substance
    - Trevor Nichols Research Center assigned residue number
    - Sponsor identity number
    - Test system (crop)
    - Nature of study (R)
    - Sponsor Study Director
    - Current status – Active (A); Inactive (I); Field portion completed (FPC)
    - Test initiation date
2. The Master Trial Schedule will be maintained by Trevor Nichols Research Center personnel.
3. A copy of the original Master Trial Schedule will be available at the Trevor Nichols Research Center for the contracted Quality Assurance Unit.
4. Any updating of information to the Master Trial Schedule will be given to the Quality Assurance Unit, so they may update their schedule.
5. The Master Trial Schedule will be placed in the archives upon completion of field season.

Trevor Nichols Research Center

Master Trial Sheet

Test Substance Code	TNRC residue No.	PR No.	Test System (Crop)	Nature of Study	Current Status A = Active I = Inactive FPC = Field Portion Completed	Study Director	Test Initiation Date

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Weather Data

SOP Number: A.013.06
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.013.05-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To provide weather data that is necessary as raw data for GLP field residue trials.

EQUIPMENT DESCRIPTION:

Enviro-Weather is an on-site weather station. (www.agweather.geo.msu.edu/mawn/)

PROCEDURES:

The designated personnel that will conduct the weather monitoring for field residue studies will refer to the following outlined SOP to ensure the integrity of the weather data.

WEATHER DATA PROCEDURES:

1. Weather data will be obtained from Enviro-Weather that is located at the Trevor Nichols Research Center. The weather data is downloaded to the Enviro-Weather website where the data can be copied.

2. The weather station location will reasonably reflect the climatic conditions of the residue trials that are conducted on TNRC orchards and plantings.

3. The data will be retained and filed in the archives.

4. The Trevor Nichols Research Center is not responsible for maintenance, repair, or calibration of the weather station. The Michigan State University Department of Geography/ Climatologists are responsible along with archiving all records of doing so.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

EPA Audit or Inspection

SOP Number: A.014.07
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: A.014.06 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-15

PURPOSE:

To establish a procedure, to be followed when the EPA provides an advance noticed of an inspection/audit of contracted study done at Trevor Nichols Research Center, Michigan State University.

EQUIPMENT DESCRIPTION:

None

PROCEDURES:

The designated personnel that will participate in an EPA audit or inspection will refer to the following outlined SOP to ensure the integrity of the study.

EPA AUDIT OR INSPECTION PROCEDURES:

1. Upon notification of an inspection/audit by the EPA and/or the company for which the study was done, the Quality Assurance Unit will be notified immediately by phone, and will follow up by sending a copy of the Notice of Inspection.

2. Communication will be made with the company whose study is being inspected/audited; to make sure they are aware of the visit.

3. The related Quality Assurance Unit will ensure the reason and background for the audit/inspection is understood, and will assess what, if anything needs to be prepared for the inspection/audit.

4. Raw data reviewed and set aside for the audit/inspection by study personnel will be placed in the archives.

5. Upon arrival at Trevor Nichols Research Center, the inspector will be met by the Field Research Director or at least one member of the study personnel and the Quality Assurance person.

6. If a non-compliance issue is raised by the EPA inspector that can be readily resolved, then the study personnel should take steps to correct the deficiency and to inform the inspectors.

7. All inspection activities will be coordinated by the Field Research Director or other designated study personnel for the duration of the inspection/audit.

8. All Trevor Nichols Research Center study personnel will be cooperative and respond positively to specific request and questions posed by the auditor.

9. Information will be gathered as to how the inspectors wish to proceed with their activities, and a timetable determined for those activities.

EPA AUDIT OR INSPECTION CONT.:

10. Trevor Nichols research Center's policy is that cameras and reorders are not to be used on the premises without expressed written permission for each occasion.

11. Notes will be taken of the procedures watched and documented requested.

12. Whenever possible, the EPA inspector's request will be accommodated, provided that the request is reasonable and is required under current regulations, or in the "spirit of the law".

13. Study personnel will provide the EPA auditors photocopied documents where appropriate. Duplicated copies will be made, retaining one copy for our Quality Assurance records.

14. The Quality Assurance person will check credentials, badge numbers, and office addresses and record this information. The Quality Assurance person will accept the "Notice of Intent to Inspect" and request the specific purpose of the visit.

15. At the exit interview, the auditor will discuss their findings and discuss timetable for response to findings.

16. At the unannounced audit/inspections, if appropriate study personnel are not available, the audit team will be asked to return at a later date.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Sponsor Visit or Audit

SOP Number: A.015.07
Submitted by: James W. Johnson
Title: Research Technician II

Supersedes: A.015.06 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To establish a procedure, to be followed when a Sponsor provides an advance notice of an inspection/audit of contracted study or facilities at the Trevor Nichols Research Center, Michigan State University.

EQUIPMENT DESCRIPTION:

None

PROCEDURES:

The designated personnel that will participate in a Sponsors visit or audit will refer to the following outlined SOP to ensure the integrity of the study.

SPONSOR VISIT OR AUDIT PROCEDURES:

1. Upon notification of an inspection/audit by the Sponsor to the Field Research Director of Trevor Nichols Research Center, the Research Technician and Quality Assurance unit will be immediately notified by phone.

2. The Master Trial Schedule, a copy of appropriate SOP's, C.V.'s, training records, organizational chart, or other pertinent materials, will be sent to the Sponsors representative upon request.

3. The Field Research Director and/or other appropriate Trevor Nichols Research Center personnel will meet the Sponsor representative at the designated time and date.

4. All Trevor Nichols Research Center personnel will be cooperative and respond positively to specific request and questions posed by the Sponsor representative.

5. Information will be gathered to determine what areas will be inspected and/ or audited, and the time table determined for those activities.

6. At an exit interview, a copy of written findings will be requested, and an appropriate response will be made as requested by the Sponsor. A copy of these findings and the response will be provided to the Quality Assurance Unit.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Rounding Off Numbers

SOP Number: A.016.09
Submitted by: John Wise
Title: Research Technician II

Supersedes: A.016.08-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure when calculations are being done for residue calculation and calibration sheets, there is a rounding off procedure to follow.

EQUIPMENT DESCRIPTION:

None

PROCEDURES:

The designated personnel that will conduct the rounding of numbers will refer to the following outlined SOP to ensure the integrity of the data.

ROUNDING OFF NUMBERS PROCEDURES:

1. Calculations done for the residue calculation sheet (SOP A.018.06) and Calibration sheet (SOP M.005.14) will be carried to 2 decimals; except for the final "test substance per plot" the value will be carried only to one decimal point.

2. If the first digit to be dropped is less than 5, round down. For example, 0.434 is rounded to 0.43.

3. If the first digit to be rounded is 5 or greater round up. For example, 0.258 is rounded to 0.26.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

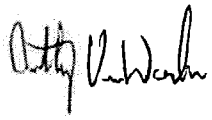
STANDARD OPERATING PROCEDURES

Developing the Residue Calculation Sheet

SOP Number: A.018.06
Submitted by: Jason Seward
Title: Research Technician II

Supersedes: A.018.05 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

Record all needed information from the research protocol, SOP M.005.15 (Calibration of FMC 1029 and FMC 1030 Airblast Sprayers) and Field Data Books to a form usable for personnel measuring and applying experimental products.

EQUIPMENT DESCRIPTION:

The appropriate Field Data Book, protocol, and the Residue Calculation Sheet (See the attached sheet) will be used.

PROCEDURES:

The designated personnel that will conduct the developing of the residue calculation sheet will refer to the following outlined SOP to ensure the integrity of the data.

DEVELOPING THE RESIDUE CALCULATION SHEET PROCEDURES:

1. Using the Residue Calculation Sheet (see attached sheet), record the following information from the sponsored protocol:
    A. The trial number, product name, formulation of the treatment chemical, and protocol rate.
    B. The assigned treatment number and the application timing.

2. Using the Residue Calculation Sheet (see attached sheet), record the following information from the assigned Field Data Book:
    A. The plot information for the selected treatment site, including the orchard, crop, plants per treatment (Plants/Trt.), width between the rows in feet (Row Width), plant spacing within the row in feet (Plant Spacing), and the target gallons of spray water per acre (GPA).

3. Using the Residue Calculation Sheet (see attached sheet), record the following information from the sponsored protocol to determine the amount of formulated treatment chemical to be used per acre (Form. Prod./Acre) by one of the following: (Note that all Form. Prod./Acre and Form. Prod./Tank values will be converted into metric units during the residue process.)
    A. Use the amount of Form. Prod./Acre specified in the protocol.
    B. If the rate is specified as amount of active ingredient per acre, calculate the Form. Prod./Acre as follows:

DEVELOPING OF THE RESIDUE CALCULATION SHEET PROCEDURES CONT.:

$$\text{Form. Prod./Acre} = \frac{\text{Rate of Active Ingredient per Acre}}{\text{Amount of Active Ingredients per Unit of Form. Prod.}}$$

4. Use of the Calibration Sheet (SOP M.005.15) to determine and record to the Residue Calculation Sheet the gallons per minute per side (GPM) from:
    A. The Average Amount of water to refill sprayer tank (Ave. Amount to Refill), Average time sprayed (Ave. Time Sprayed) and 60.0 seconds.
    B. All values are transcribed from the most recent Calibration Sheet (SOP M.005.15) and for the appropriate application and treatment.

$$\text{GPM} = \frac{\text{Ave. amount to refill}}{\text{Ave. time sprayed}} \times 60.0 \text{ seconds}$$

5. Use the Calibration Sheet (SOP M.005.15) to determine and record to the Residue Calculation Sheet the gallons per Acre (GPA) from:
    A. The Average Amount to refill, Average Time Sprayed, Square Feet per Acre, Swath width, Course length and Average Time to Travel the Course.
    B. All values are transcribed from the most recent Calibration Sheet (SOP M.005.15) and for the appropriate application and treatment.

$$\text{GPA} = \frac{\text{Ave. amount to refill x Ave. Time Sprayed x 43560 SQ FT/A}}{\text{Swath Width/Course Length/Average Time to Travel}}$$

6. Use the Calibration Sheet (SOP M.005.15) and Residue Calculation Sheet (see attached sheet) to determine and record to the Residue Calculation Sheet the amount of water in the spray tank (Tank Solution) to be used for this application form:
    A. The Gallons per Acre (GPA), Plants per Treatment (Plants/Trt.), Row Width, Plant Spacing, and Square Feet per Acre.
    B. All values are transcribed from the most recent Calibration Sheet (SOP M.005.15) and the Residue Calculation Sheet (see attached sheet) for the appropriate application and treatment.

$$\text{Tank Sol.} = \frac{\text{GPA x Plants/Trt. X Row Width x Plant Spacing}}{\text{43560 SQ FT/A}} + \text{*Primer}$$

*The amount of water to keep sprayer in operation

DEVELOPING OF THE RESIDUE CALCULATION SHEET PROCEDURES CONT.:

7. Using the Residue Calculation Sheet (see attached Sheet) determine the amount of product to be used for the appropriate treatment from:
    A. The Formulated Product per Acre (Form. Prod./Acre), gallons of water in tank and the Gallons per Acre (GPA).
    B. All Values are transcribed from the most recent Calculation Sheet (see attached sheet) and for the appropriate application and treatment.

$$\text{Amount of Product} = \frac{\text{Form. Prod./Acre x Gallons in Tank}}{\text{GPA}}$$

8. The researcher or calibrator will check all the values and calculations to verify the accuracy. The researcher or calibrator will sign and date the Residue Calculation Sheet and the day of completion.

9. The original Residue Calculation Sheet will be placed into the appropriate Field Data Book and a copy will be made and placed in the on-site logbook and archived appropriately and timely. All raw data will be recorded and archived according to SOP A.004.10 (Recording of Raw Data).

Residue Calculation Sheet Trial Number:_____

Product Name:_____ Formulation:_____ Protocol Rate:_____

Treatment Number:_____ Application Number:_____
Treatment Number:_____ Application Number:_____

_____A.I./Acre _____=_____Form. Prod./Acre

Plot Information:

Plants/Trt.		Crop:
Row Width	(ft)	Orchard:
Plant Spacing	(ft)	Target GPA:

Information from Calibration Sheet **One Side Delivery**

Spray Rate:

GPM=Ave. Amount to Refill_____(gal)/ Ave. Time Sprayed_____(Sec) x 60.0 (sec)=_____GPM

GPA= Ave. Amount to Refill_____(gal) x Ave. Time Sprayed_____(sec) x 43560 Sq. Ft./Acre
Swath Width_____(ft) / Course Length_____(ft) / Ave. Time Traveled_____(sec)

=GPA_____

Tank Solution:

GPA_____ x Plant/Trt._____ x Row Width_____(ft) x Plant Spacing_____(ft)
43560 Sq. Ft. / Acre

=_____(gal) + Primer _____(gal) = _____(gal) Tank Solution

Amount of Product:

Trt. #_____ App. #_____: Form. Prod. / Acre _____ x Gal. in Tank _____ / GPA_____

= Amount of Product_____

Signature:_____ **Calculation Date:**_____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Data archiving, retention and Quality Control Review

SOP Number: A.019.00
Submitted by: Bernard Zandstra
Title: Field Research Director

Supersedes: none
Revised by: Anthony VanWoerkom
Date: 1/21/16

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that data collected from a field trial is archived at IR-4 Headquarters and updated data is maintained at Michigan State University Trevor Nichols Research Center IR-4 Field Office.

DATA ARCHIVING, RETENTION AND QUALITY CONTROL REVIEW PROCEDURES:

1. The official archive for original raw data will be located at IR-4 Headquarters.

2. The Field Research Director or GLP Coordinator will make an exact copy of the original raw data including completed Field Data Books, logs, weather data, personnel forms, etc. These copies will be retained in a secure location at Michigan State University Trevor Nichols Research Center IR-4 Field Office.

3. All information in the Field Research Director's file should be clearly identified.

4. All original raw data not included in a Field Data Book (e.g. logs, weather data, personnel forms, etc.) will be archived at Michigan State University Trevor Nichols Research Center IR-4 Field Office.

5. All completed Field Data Books will be submitted to the Regional Field Coordinator to review for completeness and accuracy. The Regional Field Coordinator or designee will follow up to obtain any missing data or correct deficiencies with the Field Research Director's consent.

6. The Field Research Director or GLP Coordinator will add any additional or changed pages to the Field Data Book copy on file and these updated pages will be used for all subsequent quality assurance audits.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

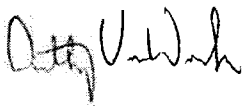
STANDARD OPERATING PROCEDURES

Using Borrowed Equipment

SOP Number: A.020.00
Submitted by: Anthony VanWoerkom
Title: Field Research Director

Supersedes: none
Revised by: Anthony VanWoerkom
Date: 3/23/16

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

Contains information on the procedures for borrowing or leasing any equipment for use in IR-4 GLP trials.

USING BORROWED EQUIPMENT PROCEDURES:

1. If the current piece of equipment is not working properly, disabled, broken, or is in a location of desired field location for trial (differentiation between trials), a similar or equivalent piece of adequate equipment may be borrowed or leased from another source.

2. Make sure that the proper GLP equipment form is filled out to include the: equipment ID (serial #, brand, and make/model) and trial ID which the equipment is used for. This form will be placed in the logbook.

3. Any maintenance and calibrations will be recorded in SOP M.001.12, M.004.10, and M.005.15.

Date equipment borrowed /Initials of Borrower	
Date equipment borrowed/ Initials of whom borrowing from	
Equipment ID (Serial #, Make/ Model)	
Trial ID the Equipment is used for	
Use of the equipment	
Date equipment returned/ Initials of Borrower	
Date equipment returned/ Initials of whom borrowing from	

Date equipment borrowed /Initals of Borrower	
Date equipment borrowed/ Initals of whom borrowing from	
Equipment ID (Serial #, Make/ Model)	
Tial ID the Equipment is used for	
Use of the equipment	
Date equipment returned/ Initials of Borrower	
Date equipment returned/ Initals of whom borrowing from	

Date equipment borrowed /Initals of Borrower	
Date equipment borrowed/ Initals of whom borrowing from	
Equipment ID (Serial #, Make/ Model)	
Tial ID the Equipment is used for	
Use of the equipment	
Date equipment returned/ Initials of Borrower	
Date equipment returned/ Initals of whom borrowing from	

Date equipment borrowed /Initals of Borrower	
Date equipment borrowed/ Initals of whom borrowing from	
Equipment ID (Serial #, Make/ Model)	
Tial ID the Equipment is used for	
Use of the equipment	
Date equipment returned/ Initials of Borrower	
Date equipment returned/ Initals of whom borrowing from	

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Receipt, Storage, and Disposal of Test Substance

SOP Number: C.001.16
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: C.001.15- 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that the test substance for each residue program are received, properly stored, and properly disposed of to insure the integrity of the test substance.

EQUIPMENT DESCRIPTION:

The Hobo temperature alarm system is a 120 volt AC standard outlet powered system with battery backup designed to record real time temperature data for the test substance. The system includes temperature sensors to collect the temperature data, data nodes to collect the temperature data from the sensors, and a receiver to collect the data from nodes and send it to the Hobo pro computer software. The system provides temperature change notifications via text message and email. The temperature data is collected every 2 minutes. For installation and maintenance refer to the Equipment Manual (SOP M.014.10).
Minimum/Maximum Thermometers will be used as back-up devices.

PROCEDURES:

The designated personnel that will conduct the Receipt, Storage, and Disposal of Sample Test Substance procedures will refer to the following outlined SOP and Equipment Manuals for the Hobo temperature alarm system.

RECEIPT AND STORAGE OF TEST SUBSTANCE PROCEDURES:

1. Upon the arrival of a test substance, the arrival date (month, day, and year) and personnel initials will be marked on the primary container.

2. If test substance arrives and the temperature system is not activated, the test substance will be placed in the residue facility office until the temperature system is activated and placed in the long term storage area.

3. All test substance will be opened and logged into the IR-4 Fields Data Books and Test Substance Receipt and Removal Log. (See attached sheet) The Project Number, Cont. ID /Lot number, Name and Amount of the Test Substance Received, Amount Removed, Purpose for Removal and the Date and Initials of the person who logged and removed the Test Substance will be entered.

4. If the trial had multiple test substance containers that need to be identified; the containers will be identified as Cont. #1, Cont. #2 and so on, until, all containers are identified for that study.

5. Shipping papers will be retained for raw data and placed in Field Data Books. The MSDS will be stored in the residue facility office for the duration of the trial.

6. All chemicals will be stored in original containers approved for that use and will be appropriately labeled.

RECEIPT AND STORAGE OF TEST SUBSTANCE PROCEDURES CONT.:

7. All test substance will be kept in a location that is exclusively for the storage and handling of residue test substance. This area is heated and properly ventilated. If chemical storage conditions fall out temperature range indicated in the MSDS, the study director will be notified.

8. Refer to label, Technical Data Sheet, or MSDS for specific handling and storage conditions.

9. This facility will remain locked when not in use or when Trevor Nichols Research personnel are not on site.

10. Only temperature readings will be kept for test substance storage. Refer to the Hobo temperature system manual for proper installation and maintenance (SOP M.014.10). A minimum/maximum thermometer will be in place for secondary temperature devices to ensure temperature does not fall out of range.

11. The Hobo temperature sensors will be activated in the designated test substance area within 1 day of the logging in of the test substance. The Hobo temperature sensors are programmed to record constant real time temperatures every 2 minutes. The temperature maximum and minimum range will be recorded to represent the protocols requirements.

12. The reading will be downloaded from the Hobo software and saved to an excel file. The data will be saved as a Pesticide Storage Room file. A printed summary and graphical form of all data pages will be dated and initialed and placed into the appropriate Field Data Book. An exact copy will be placed into the on-site Log Book.

13. There is a battery power gauge on the Hobo program which indicates how much battery life is left. The backup batteries that power the data nodes will be replaced at approximately 50% full (+/- 5 %) to assure the test substance temperature data is securely documented.

14. The Hobo temperature system will be recalibrated yearly (+/- 30 days) by comparing outdoor temperatures with a standard alcohol indoor/outdoor thermometer. For calibration information refer to SOP R.006.04. Calibration paperwork will be placed in the on-site Log Book and later archived.

15. In case temperature system malfunction, a separate or back-up data logger will be on hand and started to ensure the temperature is recorded and the Study Director will be notified. All routine and non-routine maintenance will be documented; see SOP R.003.14 for log entry.

16. In case of power outage to the TNRC, a backup battery will continue to power the internet capability and computer in order to continue temperature data collection without data loss. On-site personnel will give power outage notifications.

RECEIPT AND STORAGE OF TEST SUBSTANCE PROCEDURES CONT.:

17. If the temperature falls below 41 degrees (±5 degrees) Fahrenheit, an email and text message notification will be sent to the field technician and action will be taken to keep the integrity of the compounds. If the temperature does manage to fall out of range of the Protocol, the Study Director will be informed.

DISPOSAL OF TEST SUBSTANCE PROCEDURES:

1. Unused sample test substance will be returned according to the request of the individual companies or calculated sample amounts will be logged to general maintenance.

2. Empty containers will remain on site for the duration of the study or will be returned to the sponsor for retention. Every three years all sample containers will be reviewed and any trials that are completed the containers will be disposed of.

Trevor Nichols Research Center

Test Substance Receipt and Removal Log

Date Received/ Removed	Amount (Units) Received	Amount (Units) Removed	Purpose: include trial ID #, name of test substance, brief description of entry	Initials and Date

Trevor Nichols Research Center

Test Substance Container Disposal Log

Test Substance	Container Protocol Number	Date Disposed and Initials

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Measuring Liquid Chemicals

SOP Number: C.002.10
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: C.002.09-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To insure that accurate measurement of liquid chemicals is made before mixing and use for a residue trial.

EQUIPMENT DESCRIPTION:

Use appropriate graduated cylinder to measure liquid chemicals or if needed, disposable syringes for small amounts.
Chemical resistant gloves should be worn.

PROCEDURES:

The person measuring the test substance will follow the following SOP to guarantee the precise amount and the right test substance is being measured that corresponds with the trial.

MEASURING LIQUID CHEMICAL PROCEDURES:

1. The measuring device should be graduated in increments small enough to read to accuracy within +/- 2.0% of the total volume being measured.

2. Make sure the graduated cylinder is on a level surface. Always wear chemical resistant gloves when measuring out test material.

3. Measure the required amount of liquid into the graduated cylinder to where the bottom of the meniscus is at the desired amount. Record the amount removed from the test substance container to the Field Data Book and the Test Substance Receipt and Removal Log (SOP C.001.16).

4. If using disposable syringe, draw the liquid up the barrel past the desired amount, and push on the syringe plunger until the test substance meniscus is at the desired amount. Make sure the reading is taken at the bottom of the meniscus. Record the amount removed from the test substance container to the Field Data Book and the Test Substance Receipt and Removal Log (SOP C.001.16).

5. Walk the graduated cylinder to the spray tank holding area; follow SOP M.013.08 for proper tank filling procedures. **With liquid test substance, a separate container must have a pre-measured amount of water to ensure graduated cylinder is rinsed.**

6. Pour the total amount of product into the appropriate tank. Using the pre-measured water, rinse the graduate cylinder to remove all the test substance.

MEASURING LIQUID CHEMICAL PROCEDURES CONT.:

7. At the completion of each residue trial, the log will be retained and filed as raw data and archived.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

AND EK-4100*i* Electronic Balance Calibration

SOP Number: C.003.10
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: C.003.09- 10/16/15
Revised by: Anthony VanWoerkom
Date: 10/16/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

This Standard Operation Procedure is intended to outline the calibration of the AND EK-4100*i* Electronic Balance and general maintenance for the balance.

EQUIPMENT DESCRIPTION:

The balance should be operated on a level, vibration free, solid support surface away from drafts. The balance and weighing pan should be kept clean. Never weigh chemicals directly onto pan. If the balance is stored, make sure it is placed in a case designed to protect it from damage.

EQUIPMENT NEEDED FOR CALIBRATION:

1. Calibrated and verified Standard Mass Set
2. Forceps or tweezers
3. Latex gloves

PROCEDURES:

Before weighing chemicals for a residue trial, complete the following calibration procedure. If two or more trials are weighed concurrently or sequentially, the calibration needs only be done before the first weighing. Refer to the owner's manual for proper installation and maintenance (SOP M.014.10).

ELECTRONIC BALANCE CALIBRATION PROCEDURES:

1. Turn on balance, and allow machine to reach internal equilibrium according to manufacturer's manual.

2. Select the weighing unit by hitting the MODE key. Choose the weighing unit (example g = grams) that is appropriate for the product that will be weighed.

3. Select two Standard Masses in the range of the chemical to be weighed. Always use forceps or tweezers when handling Standard Masses.

4. Record the following information in the Balance Log: (see attached sheet) Date, test number being weighed. Weight set number, weight of Standard Mass set used, weight measured for each Standard Mass and the initials of the person doing the calibration.

5. If the measured weights of both Standard Masses are within +/- 2% of the Standard Mass Size, proceed with weighing the chemical. See SOP C.004.08.

6. If the measured weight of either the Standard Mass differs by more than+/-2% Standard Mass Size, recalibrate the balance according to manufacturer's operation manual.

ELECTRONIC BALANCE CALIBRATION PROCEDURES CONT.:

7. If after recalibration the measured weight of both Standard Masses is within +/-2% of the Standard Mass Size, record the weight in the Balance Log and proceed with weighing the chemicals.

8. If after recalibration the measured weights of both Standard Masses are not with +/-2%, weigh a third Standard Mass to determine if the problem is the Standard Mass, rather than the balance. If the measured weight if the third Standard Mass is within +/-2% of the Standard Mass Sizes, record the weights in the Balance Log and proceed with the chemical weighing.

9. If after calibration the measured weights of two of the three Standard Masses differ by more than +/-2% from the Standard Mass Size, record the measured weights in the Balance Log, and do not use the balance for weighing chemicals until it has been professionally replaced.

TREVOR NICHOLS RESEARCH CENTER
MICHIGAN STATE UNIVERSITY

BALANCE LOG

Date (mm/dd/yy)	Test Number	Weight Set #	Standard Weight Sizes 2 Weights	Measured Weights of Standard Weights Use Brackets [ ]	If Recalibration Necessary Measured Weights of Standard Weights	If Third Standard Weight Necessary Standard Weight Size	Measured Weight of Standard Weight	Initials

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Weighing Non-Liquid chemicals on a AND EK – 400*i* Electronic Balance

SOP Number: C.004.09
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: C.004.08 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To outline the procedures used to weigh non-liquid GLP chemicals on the AND EK-400i Electronic Balance.

EQUIPMENT DESCRIPTION:

The AND EK-400i Electronic Balance is the standard balance powered by an AC adapter. For installation and maintenance refer to the Equipment Manual. (SOP M.014.10) All disposable containers used in the weighing of residue trials will be clean and have a secure lid for transport to the designated filling area.

PROCEDURES:

The designated personnel that will conduct the chemical weighing for the residue trials will refer to the following SOP and the Equipment Balance. (SOP M.014.10)

WEIGHING NON-LIQUID CHEMICAL PROCEDURE:

1. Scale should be on a flat and level surface free from drafts.

2. Be sure that the power source is properly established.

3. Press the on/off key to turn the balance on. After the power is turned on, a test of all essential functions will run automatically. The self-test ends with an appropriate read-out obtained from the program code setting. (Example 0.0g)

4. Place the container in which the non-liquid test substance will be measured on the balance, then press the re-zero control to zero the display.

5. After the display shows 0.0, measure the appropriate test substance until the required amount is reached. Record the amount removed from the test substance container into the Field Data Book and the Test Substance Receipt and Transfer Log.

6. Seal the disposable container in which the test substance was weighed, and proceeds to weigh out the next desired amount following the above steps.

7. Written on the container top will be the PR number, amount of test substance and the name of the test substance.

8. Carry the sealed test substance to the spray tank holding area; follow SOP M.013.08 for proper tank filling procedures and pour the test substance into the prefilled spray tank.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

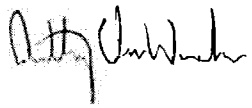
STANDARD OPERATING PROCEDURES

Receipt, Storage, Use, and Disposal of Adjuvants

SOP Number: C.005.01
Submitted by: Anthony VanWoerkom
Title: Research Technician I

Supersedes: C.005.00- 3/17/15
Revised by: Anthony VanWoerkom
Date: 10/16/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To assure that the adjuvants for each residue program are received, properly stored, properly used, and properly disposed of to insure the integrity of the adjuvant.

EQUIPMENT DESCRIPTION:

The Hobo temperature alarm system is a 120 volt AC standard outlet powered system with battery backup designed to record real time temperature data for the adjuvant. The system includes temperature sensors to collect the temperature data, data nodes to collect the temperature data from the sensors, and a receiver to collect the data from nodes and send it to the Hobo pro computer software. The system provides temperature change notifications via text message and email. The temperature data is collected every 2 minutes. For installation and maintenance refer to the Equipment Manual (SOP M.014.10).
Minimum/Maximum Thermometers will be used as back-up devices.
New unopened graduated pipettes of many sizes
Clean beakers of many sizes.

PROCEDURES:

The designated personnel that will conduct the Receipt, Storage, Use, and Disposal of Adjuvant procedures will refer to the following outlined SOP and Equipment Manuals for the Hobo temperature alarm system.

RECEIPT, STORAGE, AND USE OF ADJUVANT PROCEDURES:

1. Upon the arrival of an adjuvant, the adjuvant name, concentration, storage conditions, arrival date (month, day, and year), expiration date, and personnel initials will be marked on the primary container.

2. If temporary storage containers are used (i.e. subsample dispensed from the purchased container or a properly labeled secondary container, they should be used only for measuring or preventing contamination purposes. They should be adequately labeled to insure the product is appropriately identified. Excess material poured into a temporary container should be discarded, not used for subsequent trials and not returned to the original or secondary container.

3. Secondary containers are permitted for storage (ex. A 1 gallon container subdivided into 100 mls containers for ease of use and transport to remote sites) but must be properly labeled as per the original container and now take on all the requirements and properties of an "original container".

4. If adjuvant arrives and the temperature system is not activated, the adjuvant will be placed in the residue facility office until the temperature system is activated and placed in the long term storage area.

RECEIPT, STORAGE, AND USE OF ADJUVANT PROCEDURES CONT.:

5. All adjuvants will be opened and logged into the IR-4 Field Data Books and Adjuvant Receipt and Removal Log. (See attached sheet) The Cont. ID /Lot number, Name and Amount of the Adjuvant Received, Amount Removed, Purpose for Removal and the Date and Initials of the person who logged and removed the adjuvant will be entered.

6. If multiple adjuvant containers need to be identified for a single shipment and same adjuvant; the containers will be identified as Cont. #1, Cont. #2 and so on, until, all containers are identified.

7. Shipping papers will be retained for raw data and placed in Field Data Books. The SDS will be stored in the residue facility office for the duration of the trial.

8. Adjuvants will be in good condition prior to use i.e. the physical characteristics of the adjuvant should not have changed from purchase or be compromised (i.e. different color, consistency (cloudy, darkened) or have the appearance of rancidity).

9. Spray adjuvants must be handled in a manner to prevent cross contamination with test substances and spray adjuvants. Two suggested options are provided below.

    - Spray adjuvants will be dispensed into a temporary container (such as a beaker) prior to being used in a GLP residue trial. The spray adjuvant once dispensed will not be used for a different trial or returned to the original or secondary container; it will be discarded.
    - Spray adjuvants are dispensed from the original or secondary spray adjuvant container using a factory sealed newly opened pipette. After this pipette is used it is discarded and never used again. This pipette never returns to the spray adjuvant container. The test substance is also dispensed by a different newly opened pipette, discarded after use.
    - The critical element to both of these examples is: No "double-dipping" into an original or secondary container. No measuring device will be placed directly into a spray adjuvant original or secondary container and then directly into a spray tank or container intended to hold GLP test substance and revisit the spray adjuvant container. Other methods that prevent double-dipping into the original or secondary containers are also acceptable.

10. Expectations of moving "old" spray adjuvants (those which have not been monitored, and labeled as per above) into current use.

    - Spray adjuvants that have directly dispensed with a measuring device that has been placed directly into a container with GLP test substance, or any pesticide

tank mix and placed again into a spray additive container will no longer be used for GLP residue studies.

RECEIPT, STORAGE, AND USE OF ADJUVANT PROCEDURES CONT.:

- All spray adjuvants must be labeled as per GLP reagent requirements (name, concentration, storage conditions, and expiration date). If an expiration date is not available (i.e. on the label or SDS) then the FRD should assign one that does not exceed 5 years from the purchase date. It is also recommended that the FRD include the date the container was opened as a helpful reference date.
- Spray adjuvants will be in good condition prior to use, i.e. the physical characteristics of the adjuvant should not have changed or be compromised (i.e. different color, consistency (cloudy, darkened) or appearance of rancidity). If the spray adjuvant demonstrates any of these characteristics it should be removed from the use in GLP residue trials.
- Monitoring of spray adjuvants, to document and thus assure that the storage conditions have been met should be in place for 2015 GLP field trials and beyond.
- If there are any questions or concerns about the integrity or condition of the spray additive it should be removed from the use for GLP residue trials.

11. All adjuvants will be kept in a location that is exclusively for the storage and handling of residue test substance and adjuvants. This area is heated and properly ventilated. If chemical storage conditions fall out temperature range indicated in the SDS, the study director will be notified.

12. This facility will remain locked when not in use or when Trevor Nichols Research personnel are not on site.

13. Only temperature readings will be kept for adjuvant storage. Refer to the Hobo temperature system manual for proper installation and maintenance (SOP M.014.10). A minimum/maximum thermometer will be in place for secondary temperature devices to ensure temperature does not fall out of range.

14. The Hobo temperature sensors will be activated in the designated test substance area within 1 day of the logging in of the adjuvant. The Hobo temperature sensors are programmed to record constant real time temperatures every 2 minutes. The temperature maximum and minimum range will be recorded to represent the protocols requirements.

15. The reading will be downloaded from the Hobo software and saved to an excel file. The data will be saved as a Pesticide Storage Room file. A printed summary and graphical form of all data pages will be dated and initialed and placed into the appropriate Field Data Book. An exact copy will be placed into the on-site Log Book.

16. There is a battery power gauge on the Hobo program which indicates how much battery life is left. The backup batteries that power the data nodes will be replaced at approximately 50% full (+/- 5 %) to assure the adjuvant temperature data is securely documented.

RECEIPT, STORAGE, AND USE OF ADJUVANT PROCEDURES CONT.:

1. The Hobo temperature system will be recalibrated yearly (+/- 30 days) by comparing outdoor temperatures with a standard alcohol indoor/outdoor thermometer. For calibration information refer to SOP R.006.04. Calibration paperwork will be placed in the on-site Log Book and later archived.

2. In case temperature system malfunction, a separate or back-up data logger will be on hand and started to ensure the temperature is recorded and the Study Director will be notified. All routine and non-routine maintenance will be documented; see SOP R.003.14 for log entry.

3. In case of power outage to the TNRC, a backup battery will continue to power the internet capability and computer in order to continue temperature data collection without data loss. On-site personnel will give power outage notifications.

4. If the temperature falls below 41 degrees (±5 degrees) Fahrenheit, an email and text message notification will be sent to the field technician and action will be taken to keep the integrity of the compounds. If the temperature does manage to fall out of range of the Protocol, the Study Director will be informed.

DISPOSAL OF ADJUVANT PROCEDURES:

1. Unused adjuvants amounts will be calculated and be logged to general maintenance.

2. Empty containers will be properly disposed of.

Trevor Nichols Research Center

Adjuvant Receipt and Removal Log

Date Received/ Removed	Amount (Units) Received	Amount (Units) Removed	Purpose: name of adjuvant, brief description of entry	Initials and Date

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

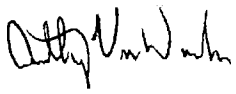
STANDARD OPERATING PROCEDURES

Maintainence and Cleaning Airblast Sprayers – FMC 1029 and FMC 1030

SOP Number: M.001.12
Submitted by: Doug Kronemeyer
Title: Research Technician II

Supersedes: M.001.11 -3/18/16
Revised by: Anthony VanWoerkom
Date: 3/18/16

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To assure that equipment is properly free from contaminates and to assure optimum performance of equipment.

EQUIPMENT DESCRIPTION:

The FMC 1029 and FMC 1030 Airblast Sprayers are PTO powered sprayers, which has a series of belts that operate the piston pump, the fan, and the mechanical agitation. The FMC 1029 and FMC 1030 have 2 stainless steel tanks (right and left) and has a series of electric valves that controls the manifolds, the drains, the return lines, and the tank to be used. The controls for the electric valves for the sprayer are in the cab of the tractor so the operator can control the sprayer output, tank to be used, and the spray manifolds. The spray nozzles used are numbered ceramic disks and whirl plates to achieve the desired output. An integral part of this SOP is the FMC 1029 and FMC 1030 manual No. 5266018. Proper personal protective equipment should be worn.

PROCEDURES:

The designated personnel that will conduct the maintenance and cleaning of the FMC 1029 and FMC 1030 airblast sprayers will refer to the following SOP and equipment manual (SOP M.014.10) to ensure the integrity of the equipment.

CLEANING OF THE AIRBLAST SPRAYER – FMC 1029 PROCEDURES:

1. Before applying any test substance or when changing compounds or formulations, spray tanks will be cleaned by triple rinsing with clean water.

2. The spray system will be flushed with clean water according to SOP M.005.15. The whirl plates and ceramic disks will be checked and cleaned.

3. The exterior of the sprayer will be cleaned as needed with a high pressure washer and soap.

4. The designated personnel conducting the routine cleaning of the FMC 1029 and FMC 1030 airblast sprayers will record all procedures done to the sprayer in the equipment maintenance log sheet (see attached sheet).

ROUTINE MAINTENANCE OF THE AIRBLAST SPRAYER – FMC 1029 PROCEDURES:

1. The designated personnel that will maintain the FMC 1029 and FMC 1030 airblast sprayers will conduct the appropriate routine maintenance according to the operating manual. See SOP M.014.10 for designated personnel and the operating manuals needed.

2. A visual inspection will be conducted of the FMC 1029 and FMC 1030 airblast sprayers to ensure the sprayers working mechanisms are in satisfactory conditions. Some examples of these mechanisms are the belts, hoses, tank covers, electrical valves, nozzles, and fan.

ROUTINE MAINTENANCE OF THE AIRBLAST SPRAYER – FMC 1029 PROCEDURES CONT.:

3. The designated personnel conducting the routine maintenance of the FMC 1029 and FMC 1030 airblast sprayer will record all procedures done to the sprayer in the equipment maintenance log sheet (see attached sheet).

NON-ROUTINE MAINTENANCE OF THE AIRBLAST SPRAYER – FMC 1029 and FMC 1030 PROCEDURES:

1. In case of non-routine maintenance to the FMC 1029 and FMC 1030 airblast sprayers, action will first be taken to rectify the malfunction or failure on site. The date and repair procedures will be recorded in the equipment maintenance log sheet (see attached sheet).
2. If the repairs are too major for the designated personnel, then an outside source will be contacted to repair the malfunction on site. The date and the repair procedures will be recorded in the equipment maintenance log sheet (see attached sheet).
3. If repairs cannot be done on site, then proper mechanics or professionals will be called for their expertise. The equipment will be transported to the most qualified company to assure quality and efficient work. The date and the repair procedures will be recorded in the equipment maintenance log sheet (see attached sheet).

Trevor Nichols Research Center
Application Equipment and Maintenance Log Sheet

Type of Equipment: Orchard Airblast Sprayer **Model Number of Type: 1029 and 1030**
Manufacturer: FMC **Serial Number: 265949**

Maintenance Activity

A. Cleaning by use of power washer
B. Lubrication
C. Nozzles and or screens cleaned or replaced
D. Valves and gauges checked for proper operation
E. Liquid spray system flushed, tanks triple rinsed
F. Fittings checked for tightness, elimination of leaks
G. Safety equipment checked and in good operating condition
H. Tanks, covers, ect., checked for soundness, fit, ect.
I. Non-routine maintenance

Maintenance Activity Performed

DATE	TIME	CIRCLE ACTIVITY PERFORMED	INITIALS	ADJUSTMENTS OR REPAIRS
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
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TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Verification of Electronic Digital Water Meter

SOP Number: M.003.10
Submitted by: Matthew Daly
Title: Farm Manager

Supersedes: M.003.09 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

This Standard Operating Procedure outlines the steps to be taken to calibrate the Electric Digital Water Meter and the re-check procedures used.

EQUIPMENT DESCRIPTION:

The Electronic Digital Water Meter is a battery powered meter that is designed for measuring water flow. The 5.00 gallon Large Calibration Container is a calibrated container use to measure the amount of water that has flowed out of the digital meter. For use and calibration refer to the equipment manuals in the black equipment manuals folder located in the TNRC archive office (SOP M.014.10).

PROCEDURES:

The designated personnel that will conduct the field calibration and re-check procedure of the digital water meter will refer to the following outlined SOP and the equipment manual (SOP M.014.10). The field calibration of the Electronic Digital Water Meter will be done prior to the spray season and re-checked the day of any residue trail.

FIELD CALIBRATION PROCEDURES:

1. Place the 5.00 gallon large calibration container on a level surface.

2. Run water through the meter to check for any leaks and to ensure meter is working properly. Refer to the electronic digital water meter owner's manual for field manufacture calibration procedures.

3. Follow the Dispense-Display Field Calibration Procedures in the owner's manual for proper field calibration. Start filling the calibrated 5.00 gallon Large Calibration Container making sure that the water is dispensed at full flow.

4. As the water rinses in the container, try stopping the water flow at the 5.00 gallon mark, making sure that flow stopped as quickly as possible. Once the water has been shut off, read the actual container amount.

5. Record the actual reading from the container into the Field Calibration Water Meter Verification Sheet (see attached sheet). The original Field Calibration Water Meter Verification sheet will be logged into the on-site log book and archived according to SOP A.004.10.

6. Clear the water meter readout and empty the container and place it back on the level surface. With this SOP, procedure 2 -6 must be repeated to achieve field calibration average output.

7. During the field calibration procedure, if any one data point is more than a ±5% error from the mean (the average of the three calibration runs) then an explanation will be required to ensure the accuracy of the calibration.

FIELD CALIBRATION PROCEDURES CONT.:

8. If an explanation cannot ensure the integrity of the calibration, a new field calibration will be done to achieve the most accurate calibration for the meter.

RECHECK FIELD CALIBRATION PROCEDURES:

1. Place the large 5.00 gallon calibrated container on a level surface.

2. Using the calibrated meter, fill the 5.00 gallon Large Calibration Container, read the digital display from the meter, stopping the flow exactly at 5.00 gallons as quickly as possible.

3. Record the amount of water in the 5.00 gallon Large Calibration Container to the re-check log sheet (see attached sheet). If the re-check is within ±5% of the calibrated meter then no further re-checks are needed. If the re-check is out of the ±5% range, a new field calibration will be done.

4. Record the date, initials, target volume, and the amount to refill on the Re-Check Log Sheet.

Field Calibration
Water Meter Verification Sheet

Date:_____

Meter Name:_____

Location of the Meter:_____

Calibrated Container Volume:_____

Reading from the Calibrated Meter:

Reading 1:_____

Reading 2:_____

Reading 3:_____

Average:_____

Error and Percent Error Calculations:

Error=Experimental value_____ - Target Value_____ = _____ Error

Percent Error=Error_____ / Target Value_____ * 100 = _____ Percent Error

Signature and Date of the Personnel Calibrating the Meter

_____

Calibration Recheck Log Sheet

Date	Initials/Name	Target Volume	Actual Reading	Within ±5% Yes or No

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Routine Maintenance of Farm Tractors

SOP Number: M.004.10
Submitted by: Matthew Daly
Title: Farm Manager

Supersedes: M.004.09 -3/23/16
Revised by: Anthony VanWoerkom
Date: 3/23/16

Approved by: Anthony VanWoerkom
Title: Field Research Director

Anthony VanWoerkom

Approval Date:

4-14-17

PURPOSE:

To assure that equipment is properly free from contaminates and to assure optimum performance of equipment.

EQUIPMENT DESCRIPTION:

Model John Deere 5510N (75Hp) Narrow Tractor, 24x Speed Transmission with Hi-Low shift, 380/70R28 and 280/70R18 Wheel Equipment with radial tires, 2x rear SCV valves, three point hitch, front crash frame and air conditioned cab with carbon spray filters fitted for spray applications.

Model John Deere 5520N(75Hp) Narrow Tractor, 24x Speed Transmission with Hi-Low shift, 380/70R28 and 280/70R18 Wheel Equipment with radial tires, 2x rear SCV valves, three point hitch, front crash frame and air conditioned cab with carbon spray filters fitted for spray applications.

Model John Deere 5093EN(75Hp) Narrow Tractor, 24x Speed Transmission with Hi-Low shift, 380/70R28 and 280/70R18 Wheel Equipment with radial tires, 2x rear SCV valves, three point hitch, front crash frame and air conditioned cab with carbon spray filters fitted for spray applications.

PROCEDURES:

The designated personnel that will conduct the maintenance and cleaning of the farm tractor will refer to the following SOP and the equipment manual (SOP M.014.10) to ensure the integrity of the equipment.

ROUTINE MAINTENANCE OF FARM TRACTOR PROCEDURES:

1. The designated personnel that will maintain the farm tractors used for GLP field residue work will conduct the appropriate routine maintenance according to the operating manuals. See SOP M.014.10 for designated personnel and the operating manuals needed.

2. A visual inspection will be conducted of the farm tractors to ensure the tractors working mechanisms are in satisfactory conditions. Some examples of these mechanisms are the belts, hoses, tire pressure, PTO drive, and 3-point hitch.

3. A visual inspection of the cab will be conducted to ensure all gauges, controls, and all safety equipment is in satisfactory condition.

4. The exterior of the farm tractors will be cleaned as needed with a high pressure washer and soap.

5. The designated personnel conducting the routine maintenance of the farm tractors will record all procedures done to the tractors in the tractors maintenance log sheet (see attached sheet).

NON-ROUTINE MAINTENANCE OF FARM TRACTORS PROCEDURE:

1. In case of non-routine maintenance to the farm tractors, action will first be taken to rectify the malfunction or failure on site. The date and repair procedures will be recorded in the tractor maintenance log sheet (see attached sheet).

2. If the repairs are too major for the designated personnel to repair, then an outside source will be contacted to repair the malfunction on site. The date and repair procedures will be recorded in the tractor maintenance log sheet (see attached sheet).

3. If repairs cannot be done on site, then proper mechanics or professionals will be contacted for their expertise. The equipment will be transported to the most qualified company to assure the quality and efficient work. The date and repair procedures will be recorded in the tractor maintenance log sheet (see attached sheet).

Trevor Nichols Research Center
Tractor Maintenance Log Sheet

Type of Equipment: Tractor **Model Number of Type: 5093 EN**
Manufacturer: John Deere **Serial Number: LVSG 097009505 (SG097)**

Maintenance Activity

A. Cleaning by use of power washer
B. Check oil level
C. Gauges checked for proper operation
D. Fittings checked for tightness
E. Tire pressure (if applicable) checked
F. Safety equipment checked and in good operating condition
G. Non-routine maintenance

Maintenance Activity Performed

DATE	TIME	CIRCLE ACTIVITY PERFORMED	INITIALS	ADJUSTMENTS OR REPAIRS
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
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		A B C D E F G		

Trevor Nichols Research Center
Tractor Maintenance Log Sheet

Type of Equipment: Tractor **Model Number of Type: 5510 N**
Manufacturer: John Deere **Serial Number: LVSG 059003115 (SG059)**

Maintenance Activity

H. Cleaning by use of power washer
I. Check oil level
J. Gauges checked for proper operation
K. Fittings checked for tightness
L. Tire pressure (if applicable) checked
M. Safety equipment checked and in good operating condition
N. Non-routine maintenance

Maintenance Activity Performed

DATE	TIME	CIRCLE ACTIVITY PERFORMED	INITIALS	ADJUSTMENTS OR REPAIRS
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
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		A B C D E F G		
		A B C D E F G		

Trevor Nichols Research Center
Tractor Maintenance Log Sheet

Type of Equipment: Tractor **Model Number of Type: 5520 N**
Manufacturer: John Deere **Serial Number: LV 5520N358491**

Maintenance Activity

O. Cleaning by use of power washer
P. Check oil level
Q. Gauges checked for proper operation
R. Fittings checked for tightness
S. Tire pressure (if applicable) checked
T. Safety equipment checked and in good operating condition
U. Non-routine maintenance

Maintenance Activity Performed

DATE	TIME	CIRCLE ACTIVITY PERFORMED	INITIALS	ADJUSTMENTS OR REPAIRS
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
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TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

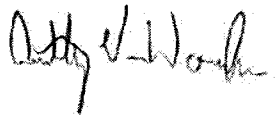
STANDARD OPERATING PROCEDURES

Calibration of FMC 1029 and FMC 1030 Airblast Sprayers

SOP Number: M.005.15
Submitted by: Doug Kronemeyer
Title: Research Technitian II

Supersedes: M.005.14 – 3/18/16
Revised by: Anthony VanWoerkom
Date: 3/18/16

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

This Standard Operating Procedure is intended to provide a uniform procedure for the calibration of the FMC 1029 and FMC 1030 Airblast Sprayers according to the information obtained from the sponsors protocol.

EQUIPMENT DESCRIPTION:

The FMC 1029 and FMC 1030 Airblast Sprayer are PTO powered sprayers, which has a series of belts that operates the piston pump, the fan, and the mechanical agitation. The FMC 1029 and FMC 1030 have two stainless steel tanks (right and left) and has a series of electric valves that controls the manifolds, the drains, the return lines, and the tank to be used. The controls for the electric valves for the sprayer are in the cab of the tractor so the operator can control the sprayers output, what tank to be used, and the spray manifolds. The spray manifolds used are numbered ceramic disks and whirl plates to achieve the desired output. An integral part of this SOP is the FMC 1029 and FMC 1030 manual No. 5266018 and the Operators Manual for the 8200 Hiniker Meter. These manuals are located in the black manual folder found in the TNRC archive office.

PROCEDURES:

The designated personnel that will conduct the field calibration will follow SOP's M.014.10 (Designated Personnel), M.001.12 (Maintenance and Cleaning of FMC 1029 and FMC 1030 Airblast Sprayers), M.004.10 (Maintenance of Farm Tractors) and M.006.09 (Hiniker Spray Monitor) to ensure the proper actions are taken.

FIELD CALIBRATION OF THE FMC 1029 and FMC 1030 AIRBLAST SPRAYERS PROCEDURES:

1. With the FMC 1029 and FMC 1030 Airblast Sprayers parked on the spray pad use the FMC manual No. 5266018 to select the optimum pressure setting, tips, whirl plate, nozzle positions, and RPM to obtain the target GPA and GPM. The nozzle selection should be targeted for adequate canopy coverage. Record the ceramic disk and whirl plates that will be used on the Calibration Worksheet (see the attached sheet).

2. Using the calibrated electronic digital water meter (SOP M.003.10), fill the left tank to the level full and record the amount of water to fill the left tank on the Calibration Worksheet (see the attached sheet). Add water to the right tank for priming and flushing out of the sprayer system. The operator then will drive the sprayer out of the spray pad to a designated area to run the calibration sequence.

3. At the designated area, set the parking break and put the tractor in neutral. Select the proper RPM for the calibration.

4. Using the sprayer controls in the cab of the tractor, check to make sure the right tank and right return line are being used. Using the proper control switch, turn on the right manifold to prime the sprayer. While doing this look at the Hiniker flow monitor to make sure you are spraying close to the target gallons per minute rate and the pressure gauge to determine

5. pressure setting. (Hiniker flow meter is designed as a guide for the spray operator) When sufficient time has passed to prime the system, turn off the right manifold.

FIELD CALIBRATION OF THE FMC 1029 and FMC 1030 AIRBLAST SPRAYERS PROCEDURES CONT.:

6. Using the sprayer controls in the cab of the tractor, switch from the right tank to the left tank and the right return line to the left return line. The left tank is the primary tank for residue applications.

7. With the left tank ready and at the selected pressure settings turn on the left manifold and begin timing (60.0 sec...). While the sprayer is running, monitor the pressure gauge and the Hiniker flow monitor to ensure calibration is done correctly. When the desired time has reached, turn off the left manifold, lower the RPM's and drive the tractor back to the spray pad to record the pressure setting, RPM's, and the amount of time sprayed.

8. Using the calibrated water meter, fill the left tank to the level full and record the amount of water it took to refill on the Calibration Worksheet (see attached sheet).

9. A total of three calibration runs are required to achieve the proper spray calibration for the residue studies. The average of the three spray calibrations will be used for the trial. If there are any equipment malfunctions during any of the calibration runs, the proper actions will be taken to ensure the integrity of the trial.

10. During the calibration procedure, if any one data point is more than a 20% deviation from the mean (the average of the three calibration runs) then an explanation will be required to ensure the accuracy of the calibration. If an explanation cannot ensure the integrity of the calibration, a new calibration will be done to achieve the most accurate calibration for the trial.

Spray Rate Calculations:

GPM = Amount to Refill_____ / Time Sprayed_____ x 60.0 = _____GPM

Speed Procedure:

1. Determine the target MPH you want to travel.

2. The operator will drive the tractor to the pre-measured course. The course will be measured and a marker will be placed at each end of the course. The course should represent similar terrain of the actual plot.

3. Just before the first marker, the operator will set the tractor in its appropriate gear and set the RPM's for the desired speed. The operator will then set the speed on the Hiniker, so MPH will register on the Hiniker monitor.

4. Start driving the tractor at the pre-selected gear and RPM. Start timing when you reach the first marker and stop timing when you reach the second marker. Watch the Hiniker monitor for the desired MPH.

5. Record the time, gear selection, distance of course, and RPM's used onto the Calibration Worksheet (see attached sheet). Calculate the speed as follows:

$$\text{Speed} = (\text{MPH}) = \frac{(\text{distance in feet}) \times 60}{(\text{time in seconds}) \times 88}$$

6. A total of three calibration runs are required to achieve the proper speed calibration for the residue studies. The average of the speed calibrations will be used for the trial. If there are any equipment malfunctions during any of the calibration runs, the proper actions will be taken to ensure the integrity of the trial.

7. The original Calibration Worksheet will be placed into the appropriate Field Data Book, and a copy will be made and placed in the on-site logbook and archived appropriately and timely. All raw data will be recorded and archived according to SOP A.004.10 (Recording of Raw Data).

Trial ID: Appl. #: Date: Time: Initials:

1. Select the optimum pressure setting, tips, whirl plate, ceramic disk, nozzle positions, and RPM to obtain the target GPA and GPM.

2. Ceramic disks/whirl plates: (one side, top to bottom)

Ceramic Disk / Whirl Plate
_____/_____
_____/_____
_____/_____
_____/_____
_____/_____
_____/_____

3. Pressure = 1._____psi
2._____psi
3._____psi

4. Terrain of calibration course:

Speed 1. 2. 3.

1. Tractor RPM _____ _____ _____

2. Tractor gear_____ _____ _____

3. Distance of course – marker to marker_____(feet)

4. Time to drive course in seconds 1._____(sec) 2._____(sec) 3._____(sec) Ave=

1. _____(mph) 2._____(mph) 3._____(mph)

5. Speed (MPH) = $\frac{\text{(distance in feet) x 60}}{\text{(time in seconds) x 88}}$

6. Ave. Speed (MPH) = _____

Flow Rate

1. Gallons to fill tank 1. _____(gal) 2. _____(gal) 3. _____(gal)

2. Time Sprayed 1. _____(sec) 2. _____(sec) 3. _____(sec) Ave=

3. Gallons needed to refill tank 1. _____(gal) 2. _____(gal) 3. _____(gal) Ave=

4. Amount to refill tank 1. _____(gal) 2. _____(gal) 3. _____(gal)
divided by time sprayed, 1. _____(sec) 2. _____(sec) 3. _____(sec)
multiplied by 60.0 seconds.
= GPM

5. Ave. GPM _____(GPM) 1. _____(gal) 2. _____(gal) 3. _____(gal)

Signature of calibrator and Calibration Date: _____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

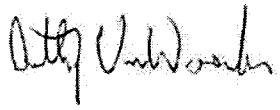
STANDARD OPERATING PROCEDURES

Hiniker Spray Monitor

SOP Number: M.006.09
Submitted by: Doug Kronemeyer
Title: Research Technitian II

Supersedes: M.006.08 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To check the accuracy of direct read-out of gallons/minute (GPM) and miles/hour (MPH) by the use of a flow meter and distance sensor of the FMC 1029 and FMC 1030 airblast sprayers.

EQUIPMENT DESCRIPTION:

Hiniker computerized flow control monitor

HINIKER SPRAY MONITOR PROCEDURES:

1. Check the flow meter by monitoring during spray calibration (SOP M.005.15) flow rate selection. If read-out on the monitor and actual sprayer output compare, then proceed. If there is no comparison, have flow meter serviced my manufacturer.

2. Check speed sensor by monitoring mile/hour (MPH) read-out during speed calibration. (SOP M.005.15-speed section) If miles/hour (MPH) read-out agrees with speed calibration miles/hour (MPH), proceed. If the monitor is incorrect, reset according to the Hiniker manual. See the Hiniker equipment manual (SOP M.014.09).

3. Calibration information will be recorded in the maintenance log book.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

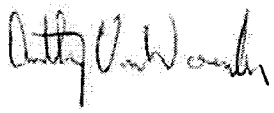
STANDARD OPERATING PROCEDURES

Test Systems Observation, Preparation, and Care

SOP Number: M.008.08
Submitted by: Janis Howard
Title: Research Technitian II

Supersedes: M.008.07 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To assure that test system area preparation and test system care is provided to have the crop quality maintained at an acceptable level.

EQUIPMENT DESCRIPTION:

None

TEST SYSTEMS OBSERVATION PREPARATION AND CARE PROCEDURES:

1. Cultural Practices
    a. Provide accepted cultural practices for the particular test system.
    b. Provide accepted controls for the major pests and diseases that may affect the quality of the test system.

2. Maintenance Chemicals
    a. Pesticides applied to the test system will be done according to label use directions.
    b. Maintenance chemicals will be applied to all treatments, including the control, unless otherwise specified in the protocol.
    c. No pesticides will be applied to the test system that will interfere with the chemical analysis.
    d. Sponsors will provide information on restricted or otherwise non-compatible chemicals.

3. Rodent Control
    a. Test system areas will be protected from unacceptable damage caused by rodents.
    b. Pellets or bait treated with zink phosphide will be spread in the test system areas according to label rates.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Calibration of Co_2 Backpack Sprayer

SOP Number: M.009.07
Submitted by: Matthew Daly
Title: Farm Manager

Supersedes: M.009.06 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

This Standard Operating Procedure is intended to provide a uniform procedure for calibration of a CO_2 backpack sprayer according to information obtained from protocols.

EQUIPMENT DESCRIPTION:

The CO_2 backpack sprayer consists primarily of a tank to hold the spray mix, a CO_2 tank that provides the pressure, a hand held wand with a trigger valve and pressure gauge, and a nozzle/nozzles to deliver the chemical in the desired spray pattern. The CO_2 backpack sprayer has a pressure regulator which allows delivery of the spray mix to maintain at a constant pressure for consistent spray rates.

A stopwatch will be used to record the time for the speed calculation and volume calibration. A clean container suited to catch the spray volume and a graduated cylinder to record the amount caught.

PROCEDURES:

The designated personnel will conduct the calibration and follow SOP's M.012.06 (Cleaning CO_2 Backpack Sprayer), M.014.10 (Designated Personnel) and M.016.06 (Measurement of Water for Test Substance Application) to ensure the proper actions are taken.

EQUIPMENT PREPARATION PROCEDURES:

1. Using the nozzle manufacturers' tables for various nozzles, select the best nozzle based on desired spray pattern, pressure, speed (miles per hour [MPH]), and output (gallons per acre [GPA]). If two are more nozzles are used, record the spacing between them.

2. Install nozzles, strainers, caps, ect... on boom to achieve desired spray rate. Record the nozzle used on the attached calibration sheet. Fill the spray tank with water and attach the spray header with a drop tube to the tank.

3. Attach CO_2 tank to the designated spray tank and slowly turn the CO_2 tank on to charge the line and the spray tank. Check the pressure regulator to ensure proper pressure.

4. Operate the sprayer to confirm the proper spray pattern. Also check pressure setting to achieve the spray output.

5. Check the sprayer for any leaks or clogged nozzles. If any problems are found, take the proper action to fix them.

SPRAY RATE PROCEDURES

1. Carefully, put on the backpack and adjust the straps for a snug and comfortable fit. Check the trigger valve positioning to fit the applicator. Check the spray pattern and pressure to ensure proper settings.

SPRAY RATE PROCEDURES CONT.:

2. Using a set period of time per nozzle, (e.g. 15 seconds) collect the output from each nozzle into a graduated cylinder for clean container that you can transfer the amount caught and record in milliliters (ml). Any nozzles that vary more than 10% from the average should be replaced. Record the amount caught on the attached calibration sheet.

3. From the average output of all nozzles, calculate the gallons per minute per nozzle and record it on the calibration sheet (see attached sheet).

4. During calibration make sure the pressure gauge is working and is at the desired psi. Record the psi on the attached calibration sheet.

5. A total of three calibration runs are required to achieve the proper spray calibration for the residue studies. The average of the three spray calibrations will be used for the trial. If there are any equipment malfunctions during any of the calibration runs, the proper actions will be taken to resolve the malfunction, and new calibrations conducted.

SPEED PROCEDURES

1. A pre-measured course should be marked out that is the same length as the test plot and is on similar terrain as the test plot.

2. Start walking before the first marker, walking with the backpack sprayer on and wand in hand. Start timing when the front of the wand reaches the first marker and walk toward the second marker. Stop timing when the front of the wand reaches the second marker. This might take several practice runs to reach the desired time for the desired plot length.

3. Once you feel comfortable with your walking speed and time, start your calibration procedure for the residue studies. The average of the three speed calibrations will be used for the trial.

Calibration of a CO_2 Backpack Sprayer

Test Number: _____
Application Date: _____

1. Sprayer: _____
2. Checked equipment for good condition of hoses ect.:_____
3. Number of nozzles: _____Type/Size:_____
   Pressure:_____ psi Nozzle spacing: _____inches

4. Nozzles Calibration:

   Time used for collecting output: 1._____sec 2. _____sec 3. _____sec

   Ave. amount caught: _____ ml

   Output per Nozzle (milliliters):

   Nozzle #1 _____ml _____ml _____ml _____Ave

   Nozzle #2 _____ml _____ml _____ml _____Ave

   Nozzle #3 _____ml _____ml _____ml _____Ave

   Total Average: _____ml

   Total Ave. _____ / _____Ave. amount caught x 60.0 sec = _____ml / min / nozzle

   GPM: ml / min / nozzle _____ / 3785 ml = _____GPM

5. Speed (mph) = $\frac{\text{(distance in feet) x 60}}{\text{(Ave. time in seconds) x 88}}$ Distance Traveled:_____ft

   Time traveled: 1. _____sec Ave. Time_____sec
   2._____sec
   3._____sec

MPH: _____

6. Notes:

Signature and date of person calibrating: _____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

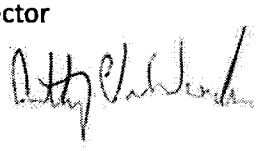
STANDARD OPERATING PROCEDURES

Calibration of Orchard Handgun Sprayer

SOP Number: M.010.07
Submitted by: Doug Kronemeyer
Title: Research Technician

Supersedes: M.010.06 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To assure that a uniform procedure is used for the calibration of an orchard handgun sprayer.

EQUIPMENT DESCRIPTION:

1. Spring loaded handgun with adjustable spray nozzle.
2. Whirl plate for spray nozzle
3. Calibrated meter for water measurement
4. Stopwatch that measures seconds

PRE-CALIBRATION PROCEDURES:

Fill spray tank with water. Operate sprayer to check for proper operation of pump, gauges, handgun, ect. Make adjustments or repairs to ensure safe and proper use of the equipment.

PROCEDURES:

Calibration and operation of the orchard handgun sprayer will be done by personnel who operate the FMC 1029.

1. Fill tank to a specified level. Make sure the tank is level.
2. Determine the required volume of water per tree.
    a. Mark off trees in the crop area that are equivalent in size of the trees to be used in the test.
    b. Spray the trees to run-off and record the time in seconds.
    c. Refill the spray tank with water to the specified level recording the refill amount (SA) in gallons.
    d. Divide the SA by the total time in seconds to attain the water needed for the total number of trees.
    e. Divide the total time by the number of trees to get the time per tree.
    f. Repeat procedure if output is not within + or – 5% of the desired output.
    g. Record all information on the calibration worksheet (see attached sheet).

PEOCEDURES USED TO CALIBRATE HANDGUN SPRAYER

1. Nozzles/whirl plates: (one side, top to bottom)

	Nozzle / Whirl Plate
	_____/_____
2. Pressure = 1._____psi	_____/_____
2._____psi	_____/_____
3._____psi	_____/_____
	_____/_____
	_____/_____
	_____/_____

Determine Spray Time per Tree

1. Spray tree to run-off and record in seconds 1._____ 2._____ 3._____

2. Ave. Time (sec) = $\frac{\text{total time}}{3}$ = _____

Flow Rate

1. Gallons to fill tank	1. _____(gal) 2. _____(gal) 3. _____(gal)
2. Time Sprayed	1. _____(sec) 2. _____(sec) 3. _____(sec)
3. Gallons needed to refill tank	1. _____(gal) 2. _____(gal) 3. _____(gal)
4. Amount to refill tank	1. _____(gal) 2. _____(gal) 3. _____(gal)
divided by time sprayed,	1. _____(sec) 2. _____(sec) 3. _____(sec)
= GPM	1. _____(gal) 2. _____(gal) 3. _____(gal)

5. Ave. GPM _____(GPM)

Operator Signature and Calibration Date: _____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Cleaning of CO_2 Backpack Sprayer

SOP Number: M.012.06
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: M.012.05 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that equipment is properly free from contamination

EQUIPMENT DESCRIPTION:

The CO_2 backpack sprayer consists primarily of a tank to hold the spray mix, a CO_2 tank that provides the pressure, a hand held wand with a trigger valve and pressure gauge, and a nozzle/nozzles to deliver the chemical in the desired spray pattern. The CO_2 backpack sprayer has a pressure regulator that allows delivery of the spray mix at a constant pressure that allows application rates to remain consistent.

CLEANING PROCEDURES:

1. Before an application, the tank and lines should be triple rinsed with clean water. See the attached sheet for proper cleaning and maintenance.

2. This information will be recorded to the attached log sheet.

Trevor Nichols Research Center
Application Equipment Maintenance Log Sheet

Type of Equipment: CO_2 Backpack Sprayer
Manufacturer: Weed Systems, Inc.

Maintenance Activity

A. Spray tanks cleaned and triple rinsed
B. Nozzles and/ or screens cleaned and/ or replaced
C. Valves, gates, gauges checked for proper operation
D. Liquid spray system flushed
E. Fittings checked for tightness, elimination of leaks
F. Spray container pressure tested and checked for soundness, fit, ect.
G. Non-routine maintenance

Maintenance Activity Performed

DATE	TIME	CIRCLE ACTIVITY PERFORMED	INITIALS	ADJUSTMENTS OR REPAIRS
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
		A B C D E F G		
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		A B C D E F G		

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Application of Test Chemical with an Airblast Sprayer

SOP Number: M.013.08
Submitted by: Doug Kronemeyer
Title: Research Technitian II

Supersedes: M.013.07 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To provide a uniform procedure for the application of GLP test chemicals to a GLP designated plot with an airblast sprayer.

APPLICATION PROCEDURES:

1. Using the calibrated water meter (SOP M.003.10), fill the left tank of the calibrated sprayer with the correct amount of water. Start the tractor and engage the PTO to start the mechanical agitation. Add calculated chemical amount to left tank and secure tank lid.

2. Using the IR-4 Field Data Book, drive the tractor to the designated plot and match the stakes with the residue calculation sheet (SOP A.018.06) information to ensure proper plot location and application.

3. Line the tractor up outside of plot so the right side manifold will spray the appropriate side of the plot row. To achieve MPH and the proper pressure setting, set the tractor to the pre-determined gears and RPM's. Give yourself sufficient distance before the plot stake to drive the tractor; to assure correct MPH and pressure setting.

4. While driving the tractor towards the plot, monitor the Hiniker to confirm MPH. Use the sprayer controls in the cab of the tractor to turn on the right manifold to start the spray. Monitor the pressure gauge and spray pattern to ensure proper coverage.

5. Monitor the Hiniker flow rate and pressure gauge during the application to ensure the proper GPA is applied.

6. When the spray pattern hits the plot stake at the beginning of the row, start timing (using a stopwatch). Continue to time until the spray pattern hits the other plot stake at the end of the row. Record the pass time in the Field Data Book in its appropriate area after each run.

7. Repeat procedures 3-6 on the other side of the row until the entire plot is sprayed and pass times are recorded.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Designated Personnel for Maintenance and Calibration

SOP Number: M.014.10
Submitted by: Doug Kronemeyer
Title: Farm Manager

Supersedes: M.014.09– 3/23/16
Revised by: Anthony VanWoerkom
Date: 3/23/16

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that personnel are designated and responsible for maintenance and calibration of the following equipment as required under GLP regulation 160.63(b).

PROCEDURES:

The designated personnel are responsible for the maintenance and calibration of the following equipment. Designated personnel will have general knowledge of equipment and have access to all equipment manuals, which are located in the black equipment manual notebook located in the TNRC archive office. Personnel will initial and date appropriate data to show who was involved in maintenance and calibration.

EQUIPMENT DESCRIPTION:

1. AND EK4100i Electronic Balance	Anthony VanWoerkom & Jason Seward
2. FMC 1029 Airblast Sprayer	Anthony VanWoerkom & Jason Seward
3. FMC 1030 Airblast Sprayer	Dan Platte & Anthony VanWoerkom
4. Hiniker Spray Monitor	Anthony VanWoerkom, Jason Seward, and Dan Platte
5. Farm Tractors	Anthony VanWoerkom, Jason Seward, and Dan Platte
6. Electronic Digital Meter	Anthony VanWoerkom, Jason Seward, and Dan Platte
7. CO2 Backpack Sprayer	Anthony VanWoerkom & Jason Seward
8. Handgun Sprayer	Anthony VanWoerkom & Jason Seward
9. Hobo Temperature system	Anthony VanWoerkom & Jason Seward
10. Kenmore Freezers	Anthony VanWoerkom & Jason Seward
11. Walk-in Cold Storage	Anthony VanWoerkom & Jason Seward
12. Dwyer Wind Meter	Anthony VanWoerkom, Jason Seward, and Dan Platte
13. Large Calibrated Container (5.00gal.)	Anthony VanWoerkom, Jason Seward, and Dan Platte
14. Oakton Temp Test/pHydrion dip sticks	Anthony VanWoerkom & Jason Seward
15. Cherry Cooling System	Anthony VanWoerkom & Jason Seward
16. PTO Driven Backup Generator	Anthony VanWoerkom & Jason Seward

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Calibration of Three Point Hitch Hydraulic Boom Sprayer

SOP Number: M.015.05
Submitted by: Matthew Daly
Title: Farm Manager

Supersedes: M.015.04– 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:
4-14-17

PURPOSE:

This Standard Operating Procedure is intended to provide a uniform procedure for the calibration of the three point hitch hydraulic boom sprayer according to information obtained from the sponsor's protocol.

EQUIPMENT DESCRIPTION:

The three point hitch hydraulic boom sprayer is a PTO powered sprayer, which drives a single piston and a belt for the mechanic agitation. The three point hitch hydraulic boom sprayer has one large tank, one spray hose that delivers the spray solution to the boom which has electrical spring loaded valves to control the spray solution. The valves are controlled by the operator in the cab of the tractor. The appropriate nozzle type and size will be determined by the spray technician.
Stop watch
Graduated cylinder large enough to catch the spray output.

PROCEDURES:

The designated personnel that will conduct the calibration will follow the SOP's M.014.10 (Designated Personnel), M.017.05 (Maintenance and Cleaning of the Three Point Hitch Hydraulic Boom Sprayer), M.003.10 (Verification of Electronic Digital Meter), and M.004.10 (Maintenance of Farm Tractors) to ensure the proper actions are taken.

SPEED PROCEDURES:

1. Determine the target MPH you want to travel.

2. The operator will drive the tractor to the pre-measured course. The course will be measured, and a marker will be placed at each end of the course. The course should represent similar terrain of the actual plot.

3. Just before the first marker, the operator will set the tractor in its appropriate gear and set the RPM's for the desired MPH.

4. Start driving the tractor at the pre-selected gear and RPM. Start timing when you reach the first marker and stop timing when you reach the second marker.

5. Record the time, gear selection, distance of course, and the RPM's used onto the calibration worksheet (see attached sheet). Calculate the speed as follows:

$$\text{Speed (MPH)} = \frac{\text{(distance in feet)} \times 60}{\text{(time in seconds)} \times 88}$$

SPEED PROCEDURES CONT.:

6. A total of three calibration runs are required to achieve the proper speed calibration for the residue trials. The average of the three speed calibrations will be used for the trial. If there are any equipment malfunctions during any of the calibration runs, the proper actions will be taken to ensure the integrity of the trial.

SPRAY RATE PROCEDURES:

1. With the three point hitch hydraulic boom sprayer parked on the spray pad, select the best disk size, type, boom height, nozzle position, GPA, and GPM that best represents the protocol requirements. Record the nozzle type, disk size, and boom height that will be used on the calibration worksheet (see attached sheet).
2. Using the calibrated electronic water meter, fill the spray tank partially full with water and run the sprayer to prime the system for calibration. Check the pressure gauge to make sure it is working properly. Make sure the tractor's parking break is set and the tractor is in neutral.
3. Once the sprayer is primed, set the pre-determined RPM's and using the controls in the tractor cab, turn the nozzle on that will be used for application. Record the pressure from the gauge to the calibration worksheet (see attached sheet).
4. Using a graduated cylinder and a stop watch, catch the spray for a determined amount of time and record the amount caught and time to the calibration worksheet (see attached sheet). Calculate the spray rate as follows:

$$GPM = \frac{\text{Ave. output / calibration time x 60 seconds}}{\text{3785 ml per gal}}$$

5. A total of three calibration runs are required to achieve the proper spray calibration for the residue trials. The average of the three spray calibrations will be used for the trial. If there are any equipment malfunctions during any of the calibration runs, the proper actions will be taken to ensure the integrity of the trial.
6. During the calibration procedure, if any one data point is more than 20% deviation from the mean (the average of the three calibration runs), then an explanation will be required to ensure the accuracy of the calibration. If an explanation cannot ensure the integrity of the calibration, a new calibration will be done to achieve the most accurate calibration for the trial.

Calibration Worksheet for the Three Point Hitch Hydraulic Boom Sprayer

"One Side Delivery"

Trial Number: _____

1. Sprayer ID:_____
2. Number of nozzles:_____ Type/Size:_____
   Nozzle Spacing:_____inches Nozzle Height:_____
3. Nozzle Calibration:

   Pressure: 1._____ 2._____ 3._____

   Calibration time used for collecting output: 1._____(sec) 2._____ (sec) 3._____(sec)

   Ave. Time _____(sec)

   Output per Nozzle per Catch (millilters):

   1. _____(ml) 2._____(ml) 3._____(ml)

   Ave. output:_____(ml)

GPM = Ave. output / calibration time x 60 seconds = _____
3785 ml per gal

4. Speed Calibration:

   Tractor Gear: 1. _____ 2. _____ 3. _____
   Tractor RPM: 1. _____ 2. _____3. _____

   Distance of Course – marker to marker: _____(ft)

   Time to Drive Course: 1. _____(sec) 2. _____(sec) 3. _____(sec)

   Speed (mph) = distance (ft) x 60.0 sec / Time in seconds x 88 1. _____(mph) 2. _____(mph) 3. _____(mph)

   Ave. Speed (mph): _____ (MPH)

   Signature and date of calibration:_____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Measurement of pH and Water Temperature for Test Substance Application

SOP Number: M.016.06
Submitted by: Jason Seward
Title: Research Technician II

Supersedes: M.016.05– 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To provide a process for taking the temperature of the water used for test substance application.

EQUIPMENT DESCRIPTION:

The Oakton TempTestr is an electronic water temperature reader.

The pHhydrion instant check dip stick pH tester.

PROCEDURES:

The designated personnel will refer to the following SOP and the Equipment manual (SOP M.014.10) for proper operation of the Oakton TempTestr and pHhydrion.

WATER TEMPERATURE PROCEDURES:

1. Using an Oakton TempTestr that has been factory calibrated, place the temperature probe in the same water that was used to carry the test substance.

2. Press the hold button to hold the reading. Press the hold button again to release it. Record the reading that is displayed on the TempTestr in the Field Data Book.

3. Press off button to turn off.

4. The Oakton TempTestr will be recalibrated following the manuafacturer's instructions upon battery replacement. See equipment manual located in the black equipment manual folder found in the TNRC archive office.

WATER pH PROCEDURE:

1. Take a small quantity of water from the source that will be used to make the test substance solution.

2. Dip the pHhydrion dip stick into the water solution and remove quickly.

3. Shake off excess water and match with the provided color chart immediately.

4. Enter the pH reading into the Field Data Book.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Maintainence and Cleaning Three Point Hitch Hydraulic Boom Sprayer

SOP Number: M.017.05
Submitted by: Jason Seward
Title: Research Technician II

Supersedes: M.017.04 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that equipment is properly free from contaminates and to assure optimum performance of equipment.

EQUIPMENT DESCRIPTION:

The Three Point Hitch Hydraulic Boom Sprayer

MAINTENANCE PROCEDURES:

1. Routine maintenance should be carried out as needed to make sure equipment is clean and operating efficiently.

2. Prior to each week's spraying, conduct a visual inspection of the sprayer. Check belts, hoses, guards, fans, ect. Repair or replace if needed.

3. In case of non-routine maintenance to the sprayer equipment, action will first be taken to rectify the malfunction of failure on site. The date and repair procedures will be logged into the maintenance log.

4. If the repairs cannot be done on site, then proper mechanics or professionals will be called for their expertise. The equipment will be transported to the most qualified company to assure quality and efficient work.

5. The information will be recorded into the equipment maintenance log (see attached sheet).

CLEANING PROCEDURES:

1. Before applying any test substance or when changing compounds or formulations, spray tanks must be triple rinsed.

2. Clean tip, whirl plates, and filter screens using general maintenance procedures.

3. Clean exterior as needed with high pressure washer and soap.

4. This information will be recorded in the equipment maintenance log (see attached sheet).

5. This information will be filed with the appropriate company and archived.

Trevor Nichols Research Center
Application Equipment and Maintenance Log Sheet

Type of Equipment: Boom Sprayer **Model Number of Type: Hydraulic Boom**
Manufacturer: Facility Fabricated **Serial Number: None**

Maintenance Activity

A. Cleaning by use of power washer
B. Lubrication
C. Nozzles and or screens cleaned or replaced
D. Valves and gauges checked for proper operation
E. Liquid spray system flushed, tanks triple rinsed
F. Fittings checked for tightness, elimination of leaks
G. Safety equipment checked and in good operating condition
H. Tanks, covers, ect., checked for soundness, fit, ect.
I. Non-routine maintenance

Maintenance Activity Performed

DATE	TIME	CIRCLE ACTIVITY PERFORMED	INITIALS	ADJUSTMENTS OR REPAIRS
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
		A B C D E F G H I		
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TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Cherry Cooling System Calibration

SOP Number: M.018.07
Submitted by: Anthony VanWoerkom
Title: Research Technician I

Supersedes: M.018.06-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that a uniform procedure is used for the calibration of the cherry cooling system.

EQUIPMENT DESCRIPTION:

1. The 5 gallon bucket cherry cooling system (SOP R.005.07).
2. Stopwatch
3. Garden hose

PROCEDURES:

Once every 30 days the designated personnel will conduct the calibration and follow SOP's R.005.07 (Cherry Cooling System) and M.014.10 (Designated Personnel) to ensure the proper actions are taken.

CHERRY COOLING SYSTEM CALIBRATION PROCEDURES:

1. There are three different rates of water flowing into the four buckets. All four buckets will use the same rate until the samples are all rinsed. Then the next rate will be used. One rate is flowing at 0.84 gallons per minute (GPM), a second rate is flowing at 0.2 GPM, and a third rate will be flowing at 0.04 GPM. Since we are using 5 gallon buckets with 0.5 gallon measurements on the buckets, there will be 1 gallon calibration procedures used.

2. Using the tarred gallon marks on the sides of the buckets, a stopwatch is used to time the period required to flow a gallon of water into the buckets by adjusting the flow control valves in the system. The time for the rate of 0.84 GPM should be 1.11 minutes for 1 gallon. The time for the 0.2 GPM is 5 minutes for 1 gallon, and the time for the 0.04 GPM rate is 25 minutes for 1 gallon of water.

3. This calibration procedure is conducted three times on all buckets and flow rate meters (see attached sheet).

4. If the water does not reach the 1 gallon mark on the buckets in an average of 1.11, 5.00, and 25.00 minutes ± 10 seconds for each bucket, the valve on the flow rate meter will be adjusted with recalibration until desired flow rate. These secondary calibrations (if needed) will be recorded on the calibration recheck sheet.

Calibration
Date/ Time/ Initials:
Water Temperature:

	1 gallon per 1.11 minutes, 0.84 gallons per minute																			
	Bucket 1					Bucket 2					Bucket 3					Bucket 4				
Rep	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.
Time (1.11 min)																				
	1 gallon per 5.00 minutes, 0.2 gallons per minute																			
	Bucket 1					Bucket 2					Bucket 3					Bucket 4				
Rep	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.
Time (5.00 min)																				
	1 gallon per 25.00 minutes, 0.04 gallons per minute																			
	Bucket 1					Bucket 2					Bucket 3					Bucket 4				
Rep	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.	1	2	3	Ave.	Diff.
Time (25.00 min)																				

Calibration Recheck
Date/ Time/ Initials:
Water Temperature:

	1 gallon per 1.11 minutes, 0.84 gallons per minute			
	Bucket 1	Bucket 2	Bucket 3	Bucket 4
Rep	1	1	1	1
Time (1.11 min)				
	1 gallon per 5.00 minutes, 0.2 gallons per minute			
	Bucket 1	Bucket 2	Bucket 3	Bucket 4
Rep	1	1	1	1
Time (5.00 min)				
	1 gallon per 25.00 minutes, 0.04 gallons per minute			
	Bucket 1	Bucket 2	Bucket 3	Bucket 4
Rep	1	1	1	1
Time (25.00 min)				

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Hobo Temperature Alarm System, Hobo System and Freezer Backup

SOP Number: M.019.02
Submitted by: Anthony VanWoerkom
Title: Field Research Director

Supersedes: M.019.01- 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

This Standard Operating Procedure is intended to assure that residue samples and test substance maintain their integrity from collection of the samples to the shipping of the samples and receiving the test substance to the end of the trial.

EQUIPMENT DESCRIPTION:

The Hobo temperature system is a 120 volt AC standard outlet powered system with battery backup designed to record real time temperature data for the storage of the residue samples. The system includes temperature sensors to collect the temperature data, data nodes to collect the temperature data from the sensors, and a receiver to collect the data from nodes and send it to the Hobo pro computer software. The system provides temperature change notifications via text message and email. The temperature data is collected every 2 minutes. For installation and maintenance refer to the Equipment Manual (SOP M.014.10).
Minimum/Maximum Thermometers will be used for secondary devices.
IR-4 pto driven generator
John Deere 5510N

PROCEDURES:

The designated personnel that will conduct the Residue Sample and Test Substance storage procedures will refer to the following outlined SOP and Equipment Manuals for the Hobo temperature system, Walk-in Cold Storage, and Kenmore Chest Freezers for operation, installation and maintenance.

HOBO TEMPERATURE SYSTEM AND FREEZER OVERVIEW:

1. Refer to the Hobo temperature system manual for proper installation and maintenance (SOP M.014.09).

2. The Hobo system will be activated before logging of product (SOP C.001.16) and will be used to record the daily temperatures for the duration of time product is held in freezers. The Hobo temperature system is programmed to record constant real time temperatures every 2 minutes. The temperature sensors will always be present in the freezers to constantly collect all real time temperature. The maximum and minimum temperature range will be recorded to represent the protocol requirements.

3. The readings will be downloaded to the Hobo software and saved to an excel file. The data will be saved as Treated Freezer 1, Backup Freezer 2, Untreated Freezer 3, and Walk-in Cold Storage 4 files.

4. A printed summary and graphical form of all data pages will be dated and initialed and placed into the appropriate Field Data Book. An exact copy will be placed into the on-site Log Book.

HOBO TEMPERATURE SYSTEM AND FREEZER OVERVIEW Cont.:

1. There is a battery power gauge on the Hobo program which indicates how much battery life is left. The backup batteries that power the data nodes will be replaced at approximately 50% full (+/- 5 %) to assure the test substance temperature data is securely documented.

2. Minimum/Maximum thermometers will be in the treated and untreated freezers to ensure temperature range integrity. The Minimum/Maximum thermometers will be re-set after they are placed into the freezers and reach current temperatures. This will reflect their current temperature conditions.

3. The Hobo temperature alarm system will be recalibrated yearly (+/- 30 days) by comparing outdoor temperatures with a standard alcohol indoor/outdoor thermometer. For calibration information, refer to SOP R.006.04. Calibration paperwork will be placed in the on-site Log Book and later archived.

4. In case of power outage at the study site (TNRC), a backup battery will provide immediate short-term power for the internet capability, computer, and Hobo system in order to continue temperature data collection without data loss. Upon notification of power interruption, research station personnel will activate an on-site backup generator as an alternate power source for the GLP freezers and related equipment. This backup generator is pto driven, thus will be run off an onsite tractor. This generator is checked annually for maintenance and data is logged (see attached sheet). Coolers and ice are also available for backup.

5. In case of mechanical failure for specific freezers or walk-in cold storage, the samples will be transferred to the backup freezers and all movement will be documented.

6. In case temperature system malfunction, a separate or back-up data logger will be on hand and started to ensure the temperature is recorded and the Study Director will be notified. All routine and non-routine maintenance will be documented; see SOP R.006.04 for log entry.

7. If the temperature rises to 15 degrees (±5 degrees) Fahrenheit, an email and text message notification will be sent to the field technician and action will be taken to keep the integrity of the samples. If the temperature does manage to fall out of range of the Protocol, the Study Director will be informed.

8. A freezer/Hobo temp. system activity log sheet will be used to record all routine and non-routine activities done during the duration of the trial. (see attached sheet).

TESTING ALL BACKUP SYSTEMS:

Hobo Temperature System

1. Unplug the backup battery which powers the Hobo temperature alarm system and computer that runs the program. This simulates an actual power outage.

2. The backup battery should begin powering the computer and Hobo temperature system. Record in log (see attached sheet) whether the backup battery is working properly.

3. If the battery is working properly move on to step 4. If not working properly the backup battery should be replaced. If the battery was replaced record in log (see attached sheet) whether it was replaced and works properly.

4. Plug the backup battery back into the wall and make sure the battery still powers the computer and Hobo. If not, then have the battery replaced and record in log (see attached sheet).

Treated Freezer 1, Backup Freezer 2, Untreated Freezer 3

1. Make sure there are at least 6 extra 9 volt batteries on hand.

2. Go to the freezers and unplug all the freezers. This is to make sure that the 9 volt battery backup is working properly. Record in log (see attached sheet) whether the backup batteries are working correctly. If not, record whether the batteries were replaced (see attached sheet). Leave out backup batteries and plug the freezers back in for the next steps.

3. Go to the Hobo computer and change the alarm temperature 5 degrees higher than what the temperature is currently. Record the current temperature and the temperature Hobo was set to 5 degrees above the current temperature in the log (see attached sheet).

4. Take the Hobo temperature sensors out of all three freezers and set them on top of the freezer lid with the freezer closed.

5. Check the Hobo computer and see if the temperature rise sets off the alarm. Record information in log (see attached sheet). Check email and text message to make sure alarms got sent to the correct locations at the right time and record information in log (see attached sheet).

Treated Freezer 1, Backup Freezer 2, Untreated Freezer 3 Cont.:

6. If the alarm system did not work correctly then a recalibration of the Hobo temperature system will need to take place (SOP R.006.04).

7. Change back the temperature alarm down 5 degrees to the initial temperature.

8. Put the Hobo sensors back into the freezers. Check Hobo computer to make sure the temperature is going back down to the correct temperature safe for samples and record in log (see attached sheet). If not, check the backup temperature gauge. If the backup is correct then the Hobo will have to be recalibrated. If the Backup says the temperature is too high then the freezer will have to be repaired. Record in log (see attached sheet).

Walk-in Cold Storage 4

9. Go to the Hobo temperature alarm system and change the alarm temperature to 5 degrees higher than what the temperature is currently. Record the current temperature and the temperature Hobo was set to 5 degrees above the current temperature in the log (see attached sheet).

10. Go to the walk-in cold storage and pull the Hobo sensor out of the cold room and tape it to the outside of the door anywhere.

11. Check the Hobo computer and see if the temperature rise sets off the alarm. Record information in log (see attached sheet). Check email and text message to make sure alarms are sent to the correct locations at the right time and record information in log (see attached sheet).

12. If the alarm system does not work correctly then a recalibration of the Hobo temperature system will need to take place (SOP R.006.04).

13. Change back the temperature alarm down 5 degrees to the initial temperature.

14. Go back to the walk-in cold room and put the Hobo sensor back in on the wall. Check Hobo computer to make sure the temperature is going back down to the correct temperature safe for samples and record in log (see attached sheet). If not, check the backup temperature guage. If the backup is correct then the Hobo will have to be recalibrated. If the Backup says the temperature is too high then the freezer will have to be repaired. Record in log (see attached sheet).

Trevor Nichols Research Center
Testing All Backup Systems
<u>Hobo Temperature System</u>

Backup battery powering computer? (yes, no)	Backup battery powering Hobo? (yes, no)	Backup battery replaced? (yes, no)	Initials	Date

Trevor Nichols Research Center
Testing All Backup Systems
<u>Treated Freezer 1, Backup Freezer 2, Untreated Freezer 3, and Walk-in Cold Storage 4</u>

Freezer ID	Backup 9 volt status (live, dead) replaced? (yes, no)	Initial temp (°F)	5 degree higher temp set (°F)	Alarm set off? (yes, no) Temperature which set off alarm (°F)	Email, text message sent? (yes, no)	Temp set back down to initial? Freezer repair? (yes, no)	Int.	Date
	/			/	/	/		
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Trevor Nichols Research Center
Freezer #/Hobo Temp. System Activity Log

Freezer #/Hobo system	Activity Performed (turn on, turn off, cleaned, backup check performed)	Date and Initials

Trevor Nichols Research Center
Testing All Backup Systems
Backup pto driven Generator

Generator runs smoothly? (yes, no)	There is power coming from generator? (yes, no)	Generator repair? (yes, no)	Initials	Date

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

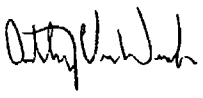
STANDARD OPERATING PROCEDURES

Collecting Residue Samples

SOP Number: R.001.10
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: R.001.09 -3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To assure that samples taken for residue analysis will represent the protocol requirements and the integrity of the samples will remain intact during the samples process.

EQUIPMENT DESCRIPTION:

Clean buckets or Ziploc bags large enough to accommodate the crop. Coolers will be used when necessary with blue ice packs. The equipment used will vary depending on the sample type. Disposable Nitrile gloves or something similar should be used. IR-4 sample bags or bags that are provided by individual sponsors should be used when appropriate.

PROCEDURES:

The designated personnel that will conduct the sample collecting will refer to the following outlined SOP to ensure the integrity of the samples.

COLLECTING RESIDUE SAMPLE PROCEDURES:

1. Specific samples requested, including growth stage, sample size, sample amount, and pre-harvest intervals are outlined in the protocols.

2. Samples will be typical of a commercially grown commodity.

3. Except when specified from individual protocols, samples will be taken from at least 3 individual plants, collected in a manner to ensure impartial sample that represents the entire plot (except from plot ends). Collect samples from high/ low, exposed/ sheltered, and inside/ outside of the plant canopy.

4. Clean Nitrile gloves will be worn during sampling and changed between sampling to prevent contamination. Sample the untreated plots first. Then sample the treated plot, starting with the lowest rate to the highest rate. Use the appropriate PPE when harvesting the fruit.

5. Samples will be harvested in clean buckets, Ziploc plastic bags, or plastic-lines IR-4 cloth bags. Place samples into their appropriate freezer as soon as possible. If samples cannot be placed into a freezer within approximately one hour, then the samples will be placed into coolers with blue ice packs to ensure the integrity of the sample. Avoid contamination from vehicles, clothing, or other samples.

6. All samples will be labeled according to individual protocols.

7. For 0 day sampling, allow the fruit and plant to dry before harvest.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

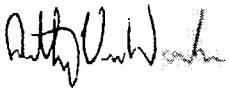
STANDARD OPERATING PROCEDURES

Packing and Shipping of Residue Samples

SOP Number: R.002.09
Submitted by: Janis Howard
Title: Research Technician I

Supersedes: R.002.08 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-15

PURPOSE:

To assure frozen residue samples are removed from freezer storage and shipped to the appropriate analytical laboratory without loss of sample integrity.

EQUIPMENT DESCRIPTION:

Cardboard boxes large enough to accommodate sample size and weight.
Plastic Ziploc bags should be used when it is needed to ensure integrity of the samples.
Packing tape strong enough to secure boxes for transport.
Freezer truck (ACDS) Bill of Lading forms; Location of Bill of Lading forms is the IR-4 residue storage area and freezer storage room.

PROCEDURES:

The designated personnel that will conduct the packing and shipping of Residue Sample procedures will follow the outlined SOP and appropriate protocols.

PACKING AND SHIPPING PROCEDURES

1. Frozen residue samples will be transported to the designated analytical lab by way of freezer truck (ACDS). It is the responsibility of the Field Research Director or staff to arrange the time and date the residue samples will be picked up by freezer truck company.

2. Prior to freezer truck arrival, boxes should be constructed using packaging tape and outside of boxes properly labeled. The labels must have the following information: treated and untreated identification, sample ID, lab address, shipping numbers, and box numbers (ex. 1 of 2, 2 of 2) should be written on the outside of the box for delivery.

3. All chain of custody paperwork for ACDS should be filled out prior to arrival.

4. Samples will be packed according to individual trials. Untreated and treated samples will be packaged separately.

5. Upon arrival of freezer truck, remove frozen samples and place them into the properly labeled boxes.

6. Place exact copies of the Field Data Book shipping paperwork into the appropriate boxes and tape shut for transport.

7. Receive shipping invoice from driver and place into the appropriate FDB.

8. Once samples are given to the transporter, fill out the appropriate FDB paperwork and fax, email, or mail the appropriate FDB shipping papers to the Study Director and Regional Field

9. Coordinator. Also, call the appropriate analytical lab to inform them the samples have been sent.

PACKING AND SHIPPING PROCEDURES CONT.:

10. If samples are to be shipped with dry ice, the Field Research Director or staff will follow the protocol for proper shipping requirements to insure the integrity of the samples.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Storage of Residue Samples

SOP Number: R.003.14
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: R.003.13-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-15

PURPOSE:

This Standard Operating Procedure is intended to assure that residue samples maintain their integrity from collection of the samples to the shipping of the samples.

EQUIPMENT DESCRIPTION:

The Hobo temperature system is a 120 volt AC standard outlet powered system with battery backup designed to record real time temperature data for the storage of the residue samples. The system includes temperature sensors to collect the temperature data, data nodes to collect the temperature data from the sensors, and a receiver to collect the data from nodes and send it to the Hobo pro computer software. The system provides temperature change notifications via text message and email. The temperature data is collected every 2 minutes. For installation and maintenance refer to the Equipment Manual (SOP M.014.10).
Minimum/Maximum Thermometers will be used for secondary devices.

PROCEDURES:

The designated personnel that will conduct the Residue Sample procedures will refer to the following outlined SOP and Equipment Manuals for the Hobo temperature system, Walk-in Cold Storage, and Kenmore Chest Freezers for operation, installation and maintenance.

STORAGE OF RESIDUE SAMPLES PROCEDURES:

1. The harvested samples should be transported, as soon as possible, from the field to the residue freezer area in clean containers.

2. Transport residue samples in non-contaminated vehicles.

3. Store or freeze samples in non-contaminated areas.

4. Untreated samples will be stored separately from treated samples.

5. Refer to the Hobo temperature system manual for proper installation and maintenance (SOP M.014.10).

6. The Hobo system will have been already activated (before logging of product, SOP C.001.16) and will be used to record the daily temperatures. The Hobo temperature system is programmed to record constant real time temperatures every 2 minutes. The temperature sensors will always be present in the freezers to constantly collect all real time temperature. The maximum and minimum temperature range will be recorded to represent the protocol requirements.

STORAGE OF RESIDUE SAMPLES PROCEDURES Cont.:

7. The readings will be downloaded to the Hobo software and saved to an excel file. The data will be saved as Treated Freezer 1, Backup Freezer 2, Untreated Freezer 3, and Walk-in Cold Storage 4 files. A printed summary and graphical form of all data pages will be dated and initialed and placed into the appropriate Field Data Book. An exact copy will be placed into the on-site Log Book.

8. There is a battery power gauge on the Hobo program which indicates how much battery life is left. The backup batteries that power the data nodes will be replaced at approximately 50% full (+/- 5 %) to assure the test substance temperature data is securely documented.

9. Minimum/Maximum thermometers will be in the treated and untreated freezers to ensure temperature range integrity. The Minimum/Maximum thermometers will be re-set after they are placed into the freezers and reach current temperatures. This will reflect their current temperature conditions.

10. The Hobo temperature alarm system will be recalibrated yearly (+/- 30 days) by comparing outdoor temperatures with a standard alcohol indoor/outdoor thermometer. For calibration information, refer to SOP R.006.04. Calibration paperwork will be placed in the on-site Log Book and later archived.

11. Freezers will be locked while samples are being held.

12. Samples will be logged in chronological order to ensure tracking of samples (see attached sheet).

13. In case of power outage to the TNRC, a backup battery will continue to power the internet capability and computer in order to continue temperature data collection without data loss. On-site personnel will give power outage notifications.

14. In case of electrical failure that might jeopardize the integrity of the samples, an alternate power source will be used for the freezers.

15. In case of mechanical failure, the samples will be transferred to the backup freezer and all movement will be documented.

16. In case temperature system malfunction, a separate or back-up data logger will be on hand and started to ensure the temperature is recorded and the Study Director will be notified. All routine and non-routine maintenance will be documented; see SOP R.006.04 for log entry.

17. If the temperature rises to 15 degrees (±5 degrees) Fahrenheit, an email and text message notification will be sent to the field technician and action will be taken to keep the integrity of

STORAGE OF RESIDUE SAMPLES PROCEDURES Cont.:

the samples. If the temperature does manage to fall out of range of the Protocol, the Study Director will be informed.

18. A freezer/Hobo temp. system activity log sheet will be used to record all routine and non-routine activities done during the duration of the trial (SOP M.019.02).

Trevor Nichols Research Center
Residue Sample Inventory Log Sheet

Crop Fraction	PR Number	Date In	Int.	Date Out	Int.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Residue Test Plot Design

SOP Number: R.004.07
Submitted by: Janis Howard
Title: Research Technician II

Supersedes: M.004.06 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure that all of the protocol guidelines for a GLP test system design will be met.

EQUIPMENT DESCRIPTION:

Durable large markers/stakes: stakes should be large enough to write out all appropriate information and durable enough to persist for the duration of the trial.
Peel-off China Markers or other suitable permanent maker.
A tape measure long enough to measure the plot length.
A hammer to drive the stakes into the ground.

PROCEDURES:

The designated personnel that will conduct the test system design procedures will refer to the following outlined SOP and the protocol to ensure the integrity of the plot design.

TEST SYSTEM DESIGN PROCEDURES:

1. The test system site will be selected in the geographic area where the crop is commercially grown.

2. Each test system site will consist of: one untreated and one or more treated plots. The untreated control plot should be placed up-wind (based on prevailing winds) of the treated plot to reduce the risk of contamination from drift. Employ adequate buffer zones between each plot to prevent contamination from drift.

3. Each test system site will be adequate in size to ensure that no more than 50% of the sampled area will be needed to provide the necessary plant material. Select a test site that had been maintained following good agricultural practices for the production of the necessary plant material.

4. The test system design plot should be adequate in size to accommodate the application equipment to be used.

5. Using the markers/stakes and peel-off China markers (or similar permanent marker), write all the appropriate information needed, which includes the minimum of: Field ID, treatment, and the test material to be applied. Stakes will be placed at the plot row ends.

6. Starting at one plot row end, hammer in the stake and measure the proper distance using the tape measure and hammer in the second stake. The distance between both stakes should be the exact plot length. This distance will be used for actual pass times, which will determine the amount of product to be applied to the plot. (SOP M.013.08)

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

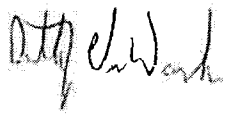
STANDARD OPERATING PROCEDURES

Cherry Cooling System

SOP Number: R.005.07
Submitted by: Anthony VanWoerkom
Title: Research Technician I

Supersedes: R.005.06-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To demonstrate residue levels directly from field harvest in comparison with fruit that undergoes a simulation of the cold water wash typical for processed tart cherries.

EQUIPMENT DESCRIPTION:

The 5 gallon bucket cherry cooling system. The system includes rubber hoses, water flow rate meter with hose connection, and mesh for the tops of the buckets.

A digital water temperature reader (pHydrion dipstick).

Stopwatch

PROCEDURES:

The designated personnel that will conduct the sample rinsing will refer to the following outlined SOP to ensure the integrity of the samples.

CHERRY COOLING SYSTEM PROCEDURES:

1. Prior to sample collection the water temperature is taken to assure that water temperature is 60 degrees Fahrenheit or less.

2. After sample collection, cherry samples are held in plastic bags until they are dumped into 5-gallon cooling buckets, one bucket for each sample. Each bucket has a hose inlet near the bottom, such that when well is running the water will overflow the top of the buckets. Flow rate calibrations are done prior to sampling (SOP M.018.07).

3. After the cherries are dumped into the buckets, the mesh tops are tied to the tops of the buckets so the cherries stay inside while the water is running out.

4. Set the flow rate valve to deliver water at gallons per minutes designated in the protocol.

5. Get the stopwatch ready and turn the water on for the duration of time requested in the protocol.

6. These buckets are designated for treated/ untreated samples. Samples not of the same trial are cooled in separate buckets. All buckets are run simultaneously, then triple rinsed before being used for a second set of samples. Buckets designated for untreated samples are never used for treated samples. All buckets are triple rinsed after use.

7. After cooling, all the cherries are processed by pitting with hand-pitters, placed in plastic bags, and frozen.

Trial ID: Sample #: Date: Time after wash: Initials:

1. Select the optimum flow rate settings to obtain the target GPM on the buckets being used.
2. Record the flow rate and the time taken to wash the samples.

Sample ID, Bucket #	1	2	3	4
Flow Rate (GPM)				
Time Elapsed				

Water Temperature:

Signature:_____

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

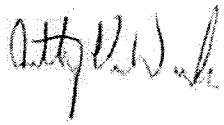
STANDARD OPERATING PROCEDURES

Check and Calibration of the Hobo Temperature System

SOP Number: R.006.04
Submitted by: Anthony VanWoerkom
Title: Research Technician I

Supersedes: R.006.03-3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director



Approval Date:

4-14-17

PURPOSE:

To ensure that the Hobo temperature alarm system will be recording accurate temperate data throughout the season for all sample freezers and pesticide storage areas.

EQUIPMENT DESCRIPTION:

A standard ACU-RITE indoor/ outdoor red dyed alcohol temperature gauge and the Hobo Temperature Alarm System.

PROCEDURES:

The Hobo temperature system will also be checked on a weekly basis starting from activation (±1 day) to make sure the computer system is recording correctly and the battery power is sufficient in the receiver and nodes. If the computer is not recording temperatures the system will be reset and calibrated.

The designated personnel will conduct a yearly comparison of the outdoor temperature with the ACU-RITE temperature gauge and the Hobo temperature system. Both temperature gauges and/ or sensors will be kept out of direct sunlight for 20 minutes. Then temperature readings will be recorded for both systems every 15 minutes for one hour. The temperatures will be compared and the 4 temperatures will be averaged. If the difference in the average temperatures for the 2 systems are ± 5.0 degrees Fahrenheit, the Hobo temperature sensors will be tested a second time in an alternate location. If temperatures are still ± 5.0 degrees Fahrenheit the sensors will be replaced with new sensors and tested a third time. If temperatures are still not comparable between the two systems, the computer will be checked for updates and/ or replaced with a backup computer.

CHECK PROCEDURES:

1. Go to the IR-4 computer and log in to see if the Hobo program is running.

2. Check the temperature recordings to make sure that the data nodes are active and receiver is connected. Make sure the system is consistently collecting data every 2 minutes with a good signal.

3. If everything looks good nothing check the good box. If there are missing or disconnected signals written in red, and/ or the battery power in the receiver or nodes is below 50% (+/- 5 %) (SOP C.001.16), then check the bad box and the system must be restarted, recalibrated, or batteries replaced (see attached sheet).

CALIBRATION PROCEDURES:

1. Take the ACU-RITE temperature gauge from the TNRC archiving office and bring it outside to the IR-4 freezer room door.

2. Hang the ACU-RITE gauge on the designated hook outside the door under the window, which is in the shade.

CALIBRATION PROCEDURES CONT.:

3. Leave the ACU-RITE gauge hang for 20 minutes to get acclimated to the temperature.

4. Take the Hobo temperature sensors out of their designated freezers and put them outside next to the standard outdoor gauge.

5. Check the computer which is running the Hobo temperature alarm system to make sure it is running properly and record (see attached sheet).

6. After 20 minutes of the ACU-RITE outdoor temperature acclimation, compare temperatures of the two systems. First check the computer for the current hobo temperature by recording the temperature and the time that it occurred on the attached sheet. Within three minutes check the ACU-RITE gauge.

7. Check the ACU-RITE gauge temperature and record the temperature and the time in which it occurred on the attached sheet.
8. After 15 minutes record the temperature and time at which it occurred for both systems.
9. Repeat step 8 three more times until 4 temperature and time recordings are taken.
10. Take the mean of the four temperatures for both systems and compare those means. If those two numbers are greater than 3.0, then changes will be made according to the procedures.

Trevor Nichols Research Center
Hobo Temperature System Check Log

Date	Initials	Running Properly	
		Yes	No

Trevor Nichols Research Center
Hobo Temperature System Calibration Log

Initials of Recorder	Temperature Recording Number	Date Temp. Taken	Time Temp. Taken	Computer System Running Properly (yes or no)	Hobo Temperature (F)	Ave. Hobo Temperature (F)	ACU-RITE Temperature (F)	Ave. ACU-RITE Temperature (F)	Difference of Temp. Averages
	1								
	2								
	3								
	4								

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Safety and Safety Inspection

SOP Number: X.001.05
Submitted by: Janis Howard
Title: Research Technician

Supersedes: X.001.04 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure the health and safety of the Trevor Nichols Research Center Personnel.

SCOPE:

Management will provide and maintain safe and healthy working conditions and will promote safe work practices to protect the health of the employees.

Trevor Nichols Research Center is an off-campus research facility under the direction of Michigan State University. Safety inspections are a part of Michigan State University's responsibility.

a. Safety inspections are conducted yearly by Michigan State University through the office of the Department of Public Safety.

b. The inspections include, but are not limited to, the monitoring of the working environment of the employees, controlling and eliminating safety, health, fire, and other hazards, and preserving/ improving environmental factors, which contribute to improved health and safety protection.

c. After the inspection, the Department of Public and Safety responds to the farm manager of Trevor Nichols Research Center and reports any violations that may have been found.

d. A written response to the Department of Public Safety will be given with a plan of action to take care of any violations that were cited.

TREVOR NICHOLS RESEARCH CENTER

MICHIGAN STATE UNIVERSITY

STANDARD OPERATING PROCEDURES

Treated Crop Destruct

SOP Number: X.002.04
Submitted by: Jason Seward
Title: Research Technician II

Supersedes: X.002.03 – 3/17/15
Revised by: Anthony VanWoerkom
Date: 3/17/15

Approved by: Anthony VanWoerkom
Title: Field Research Director

Approval Date:

4-14-17

PURPOSE:

To assure the leftover treated crop has been destroyed or handled in such a way that it cannot be consumed as a human food or animal feed.

PROCEDURES:

1. Field residue trials are conducted on private University property, with a full time employee living on the station to assure against unauthorized human contact.

2. After all treated and untreated samples have been harvested, the remaining crop load will be left on the plant to drop to the ground and decompose by natural means.

3. All treated and untreated crop will remain on the Trevor Nichols Research Center. No fruit from the station will enter the commercial food market.