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GRAIN INSPECTION, PACKERS AND
STOCKYARDS ADMINISTRATION
FEDERAL GRAIN INSPECTION SERVICE
STOP 3630
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CHAPTER 2

NIRT EQUIPMENT

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2.1 OFFICIAL EQUIPMENT

Tecator - Infratec Models 1225, 1226, 1227, and 1229 are approved for official wheat protein, soybean protein and oil, and corn protein, oil, and starch determinations. All approved models currently being manufactured will be equipped with a hard drive. Hard drive units will need to have the official calibrations loaded into the instrument prior to testing.

2.2 CALIBRATION

a. FGIS approved calibrations are required for official NIRT instruments.

b. The ISE is responsible for maintaining and updating calibrations for official NIRT instruments. Contact ISE to obtain the approved calibration disk, standard slope settings, and reference sample sets.

c. ISE provides one disk for each NIRT instrument. This disk will contain all FGIS approved calibrations (wheat, soybeans, and corn) and the current Tecator operating system software.

d. New instruments must have their monochromator checked and the wheat sample cell pathlength standardized between 18.65 - 18.85 millimeters. Standardized instruments are issued the standard slope settings for each grain type they test. Analyze the appropriate Standard Reference Samples (SRS) twice and bias the instruments using the Level II tolerances before the instrument is used for official testing. Major instrument repair (e.g., monochromator replacement) will require that the monochromator be checked before official testing can resume. Replacing the sample cell will require that the pathlength be measured and the SRS tested to check the bias before official testing can resume. Operators must use the standard slope settings, SRS sets, and baseline values provided by ISE.

Note: Infratec 1229s that are equipped with the variable (adjustable) sample cell do not need to standardize the pathlength. They will use the software assigned pathlength of 18.00 millimeters for wheat and/or 30.00 millimeters for corn and soybeans.

e. ISE will maintain a master list of all NIRT instruments in the official system and their approved calibration information. Upon request, ISE will forward a list of all instruments and their approved calibration information to the appropriate FGIS field office or official agency.

f. FGIS field office and official agency managers shall verify the following:

(1) The serial number on the calibration disk corresponds to the serial number of the instrument;

(2) Individual instrument constants ("O", "P", slope, and intercept) have been correctly entered onto the calibration disk and none of the other instrument constants have been altered;

(3) The calibration name is identical to that currently specified by ISE;

(4) The calibration disk is the current version approved by ISE;

(5) Slope values agree with ISE records; and

(6) NIRT instruments are configured by FGIS calibration to give wheat protein readings corrected to a 12 percent moisture basis (mb), soybean protein and oil readings corrected to a 13 percent mb, and corn protein, oil, and starch readings corrected to a dry matter basis directly without further calculations.

2.3 NIRT TESTING FACILITIES

Equipment location and environmental factors can affect the performance of NIRT equipment.

a. Location of Equipment. NIRT instruments must be placed in a location conducive to a dust-free and stable environment. If the NIRT instrument is not located in its own room, all other dust-emitting devices located in the same room must be operated with a functional dust collection system. The NIRT instruments must be protected from drafts, heating and cooling vents, and windows. Also, a vibration-free table is recommended to support the NIRT instrument.

b. Environmental Requirements. The space and facilities required to perform official NIRT determinations must meet the specifications outlined below:

(1) Temperature. Temperature affects the stability of NIRT instruments. Each testing site shall install a thermometer near the NIRT instrument(s). **The temperature of the room where official testing occurs must be maintained between 60º and 80ºF (16º and 27ºC).** Official testing shall be suspended if the room temperature is outside the acceptable range. Once the temperature is restored to the acceptable range, check instrument accuracy using the SRS set and, if necessary, bias adjust the instrument.

If the room temperature changes by ±5ºF (2.5ºC) or more from the temperature recorded during the daily instrument check, retest the SRS and, if necessary, bias the instrument.

(2) Relative Humidity. **Relative Humidity (RH) must be kept between 20 and 75 percent.** Each testing site shall install a hygrometer (calibrated to ± 3 percent RH) near the NIRT instrument(s). When the laboratory's RH is outside of the acceptable range, retest the SRS and, if necessary, bias adjust the instrument based on LEVEL-I tolerances. Once the laboratory's RH returns to the acceptable range, the SRS need to be retested **only if** a bias adjustment was made while the RH was outside the acceptable range. If necessary, bias adjust the instrument based on the LEVEL-I tolerances. SRS sets collected when the RH is outside of the acceptable range may not be used for the LEVEL-II and higher tolerances. All LEVEL tolerances are listed in section 3.2 for wheat, section 3.3 for soybeans, and section 3.4 for corn.

FGIS field offices shall periodically check individual testing location(s) hygrometers using a battery powered psychrometer. Before checking the hygrometers, check the psychrometer thermometers when both are dry to determine if they are in agreement. Then check hygrometers against the psychrometer and apply a tolerance of ± 5 percentage points. Repair or replace hygrometers which deviate from the psychrometer by more than 5 percentage points.

(3) Power Supply. The power for all NIRT instruments shall be supplied by a 120 ± 10 VAC/15-20 amp dedicated circuit. A maximum of two electronic instruments (i.e., NIRT, NMR or Hardness Tester) plus their associated printers and/or computers may be placed on one dedicated circuit. No other equipment shall be used on the circuit.

NOTE: If a dedicated circuit cannot be provided, a computer grade uninterruptable power supply (UPS) with line conditioner is an acceptable alternative. Before purchasing or installing an UPS, written verification must be obtained from the NIRT instrument manufacturer that the specific model of UPS proposed is compatible with the NIRT instrument. A copy of the verification letter must be kept on file.

A power line conditioner is recommended for use if line voltage variation is a suspected problem. Before purchasing and installing a voltage regulation device, contact the instrument manufacturer to determine which device is best suited for this purpose.

An NIRT instrument may be turned off if it will not be used for at least 8 hours. After turning the instrument on, it must be allowed to warm up at least 15 minutes before testing. Outliers in the "A" or "B" position of the outlier code may be indicated as a result of insufficient warm up.

(4) Smoke and Dust. Post **"NO SMOKING"** signs in the testing area. Follow good housekeeping practices to maintain a clean and dust-free environment. Use a vacuum cleaner or brush for proper laboratory cleanup. Do not use compressed air for cleanup purposes.

2.4 SETUP

Official testing agencies and FGIS field offices must observe certain guidelines when establishing new laboratories, placing new equipment on-line, or relocating NIRT equipment.

a. Laboratory Setup. Upon request, ISE will assist official agencies in planning and preparing laboratories for official NIRT testing. Official agency managers must notify the appropriate FGIS field office manager concerning plans for a new laboratory and provide a diagram of the proposed design. The diagram should contain the proposed locations of NIRT equipment, location of major inspection equipment, and description of the power supply. Any additional information regarding the laboratory setup or equipment should also be included. The monitoring field office manager will forward a copy of all submitted information to ISE for review. Upon receipt, ISE will review the information and make recommendations to the official agency manager and monitoring FGIS field office manager to facilitate the laboratory setup.

b. Equipment Setup. Official personnel shall notify ISE and the appropriate field office when new NIRT instruments are purchased. ISE will provide the necessary samples and instructions to check the accuracy of the instrument(s). Contact ISE as soon as possible because the checkout process may take several days to complete.

When an NIRT instrument is moved to a new location, the instrument must be allowed to reach temperature equilibrium with its environment before performing official tests. Generally, the instrument should sit for at least 2 hours before use after being moved. If the instrument might have been subjected to extreme temperatures during shipment, allow the unit to sit overnight in the new location before operating it.

c. Sample Transport Mechanism. If a testing location must use the "sample transport mechanism" to handle smaller sample sizes, contact ISE for requirements and setup instructions.

2.5 EQUIPMENT MAINTENANCE

a. General.

(1) Using a brush or cloth, dust out the sample hopper and path each day.

(2) Replacement lamps for the instrument are expensive and, therefore, the lamp life should be extended as long as possible. Turning the lamp on and off frequently decreases its life. Turn the instrument off only if it will not be used for a period of 8 hours or more.

(3) Major instrument repair (e.g., monochromator replacement) will require running the monochromator check before official testing can resume. To minimize "OUT OF SERVICE" time, notify ISE to schedule the monochromator check after the instrument has been repaired.

b. Repair of FGIS-owned NIRT Equipment.

(1) Repair and service of FGIS-owned instruments are coordinated by FGIS personnel presently located at the FGIS Technical Center in Kansas City, Missouri.

(2) BAR and ISE personnel are assigned to assist field office personnel in: (a) maintaining instruments, (b) performing diagnostic tests needed to verify acceptable performance, and (c) performing circuit board replacement when required.

(3) Repair Procedures.

(a) If an NIRT instrument malfunctions, the designated field office NIRT coordinator should contact the BAR at (816) 891-0435 to report the problem.

(b) The NIRT coordinator should be prepared to answer all questions regarding the symptoms of the failure (error codes, erroneous readings, malfunctioning display, etc.,) and to perform diagnostic tests while maintaining telephone communications with the BAR.

(c) The BAR will take one of the following actions:

1 If the NIRT instrument is determined to be field repairable, the BAR will coordinate the shipment of replacement parts (boards, etc.,) to the field office.

2 If it is not field-repairable, the BAR will authorize return of the instrument to Kansas City. The field office will be responsible for shipping costs from the field to the BAR. If necessary, a replacement instrument will be furnished to the field office by the BAR. A written summary of the malfunction should be included with the field unit. Send the unit to:

USDA, GIPSA, FGIS, TSD
10383 N. Executive Hills Blvd.
Kansas City, MO 64153
ATTN: Checktest/Service

c. Repair of Other NIRT Equipment. Official Inspection Agency managers must employ only qualified technicians to perform repairs on NIRT instruments used for official testing. Operators must notify the field office NIRT coordinator and the BAR when instruments malfunction. If the BAR determines the repair is major, the instrument monochromator must be checked before it is placed back into official service.

d. NIRT Lamp Replacement. Official agencies may contact the BAR for Infratec model 1225/1226 replacement lamps. The defective lamp with lampholder must be sent to the BAR in order to obtain a replacement lamp. Fees will be assessed based on the hourly rate for repair, plus parts, and handling cost. Under normal circumstances, the total cost will not exceed $100.00.

If the replacement lamp does not work upon receipt, or if it does work but the Infratec instrument displays an error code (e.g., Error 56, "No light is reaching the detector") contact the BAR immediately.

e. Equipment Maintenance Log. Information entered into the log is used as a troubleshooting aid for repair personnel and provides the agency with a maintenance history of the instrument. Record any information pertaining to instrument repairs (e.g., lamp replacement) and other relevant information concerning unusual instrument operation.