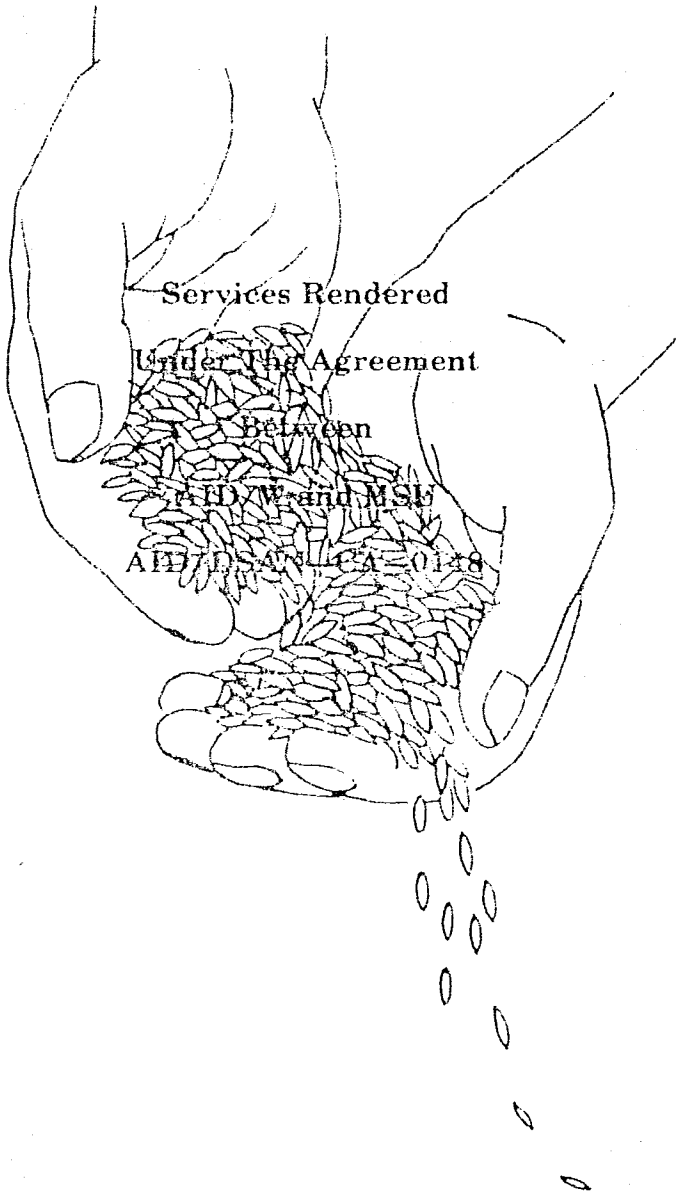
93/0203

REPORT TO:

USAID/SL, AID/W
ACRE/GOSL

PD AAQ-057 TA-83-5
ISN 36578

# INSTALLATION OF SEED DRYING AND STORAGE ROOM DEHUMIDIFICATION EQUIPMENT AT ACRE PROJECT SIERRA LEONE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AID/DSAN-CA-0148


SEED TECHNOLOGY LABORATORY
MISSISSIPPI STATE UNIVERSITY
MISSISSIPPI STATE, MISSISSIPPI

REPORT

TITLE: Installation of Seed Drying and Storage Room Dehumidification Equipment at ACRE Project Sierra Leone

CONTRACT: AID/DSAN-CA-0148 with Mississippi State University

CONSULTANT: Dr. G. Burns Welch, Agricultural Engineer, Seed Technology Laboratory, MAFES, Mississippi State University

PERIOD OF OVERSEAS CONSULTATION: November 6-19, 1982

## Background

In April 1980, Dr. Howard C. Potts visited Sierra Leone at the request of USAID/SL to assist in the planning and design of a small capacity seed dryer and storage facility for the ACRE project located at Njala University College. After his return, plans for a small bag-type seed dryer and a climatic controlled storage room were drawn at the Seed Technology Laboratory. A copy of these plans and a list of necessary equipment were sent to AID/Sierra to be forwarded to the appropriate persons at ACRE. The fan, heater, and controls for the dryer, and the four air conditioners and one dehumidifer for the storage room were ordered and arrived at Njala in mid-1982. By this time the building in which the dryer and storage room are located was completed along with the storage room and the plenum chamber for the bag-type dryer.

## Installation of Equipment

In October 1982, USAID/SL made a second request to the Seed Technology Laboratory for assistance in the installation of the equipment for the dryer and the storage room. In response to the request, Dr. G. Burns Welch traveled to Sierra Leone and supervised the installation and checked out the operation of the equipment.

The equipment was operating satisfactorily at the time of my departure but there were several things I recommended being done before the facility was put into use.

1. Add three inches of insulation below the ceiling in the storage room and paint the ceiling with two coats of aluminum paint. The present insulation is inadequate.

2. Cover the hole in the ceiling with same thickness of insulation, seal cracks, and paint.

3. Repair rubber gasket under the door.

4. Seal cracks around air conditioners with tape.

5. Construct drain trough under air conditioners to discharge water outside the building.

6. Connect 15 inches of asbestos covered wire to heater terminals and extend out of transition about 6 inches to connect to plastic insulated wire.

7. Lower the wall at the end of the dryer room to the top of the fence to prevent rain from blowing in.

## Description of the Operation of the Dryer

The dryer is an eight position bag-type dryer. The fan and heaters are electrically operated. A schematic of the electrical system is shown in Figure 1. The fan is operated on 110 volts. The source of power for the fan is from a 220 volt wall plug which is fed from the fuse box. The current to the fan is controlled by the manual switch no. 1 and the magnetic relay. When switch no. 1 is closed, the magnetic relay is also closed and current goes to the 220-110 volt transformer. There the 220 volts are reduced to 110 volts for driving the fan. The fan runs as long as the current is on and switch no. 1 is closed.

The current for the heaters is fed from the fuse box to the magnetic relay no. 2, then to the circuit breakers and then to the heaters. The magnetic relay controls the 220 volts current to the circuit breakers and heaters. The magnetic relay is made to close or open by the manual switch no. 2, the air-flow switch, and the thermostat which are connected in series. The air-flow switch is closed only when the fan is running. If the fan should stop, the air-flow switch will open to prevent the heaters being on while the fan is not running. The thermostat switch is closed when the air temperature is below 110F. But if the temperature goes above 110F the thermostat switch opens and cuts the heaters off which prevents the temperature going above 110F.

To start the dryer, the fan is turned on first, and then the heater manual switch no.2. The circuit breaker switches must also be at the "on" position. Each heater strip is connected through a separate

circuit breaker. If all the heater strips are not needed, any one can be turned off by moving its circuit breaker to the "off" position.

## Description of the Operation of the Storage Room

The temperature and the relative humidity inside the room will be maintained at levels below the outside conditions. A condition such as 65F temperature and 60% relative humidity would be satisfactory for storing seeds for 18 months.

The storage room is equipped with four through-the-wall air conditioners to cool the room. Two of the air conditioners operating at the same time can probably maintain the desired temperature. The other two will serve as standbys in case one or two of the air conditioners should stop operating and need repairing. Each air conditioner is controlled by its individual thermostat which will have to be adjusted to the desired temperature.

The lower relative humidity inside the room is maintained by both the air conditioners and the dehumidifier. The air conditioners will lower the relative humidity several percentage points which is evident by the amount of water condensing on the cooling coils in the air conditioners. But to lower the relative humidity to the desired lower level it is necessary to use an additional dehumidifier. The dehumifier is a duel-bed desiccant type. In operation the moist air from inside the room is blown through a bed of desiccant which absorb the moisture and then the dry air is returned to the room. At the same time the other bed is being dried or reactivated by heating it and circulating

outside air through it to take out the moisture. The beds alternate automatically from dehumidification to reactivation about once each hour. The dehumidification is controlled by a humidistat inside the storage room.

## Maintenance of Equipment

All the equipment is of good quality and should give years of trouble-free service if properly maintained. The most likely problem to occur will be with the electric motors and the compressors in the air conditioners. The voltage from the power line was below the rated voltage of the motors and this can cause a motor to burn out. If this should occur, a search should be made in Freetown for a shop that might be able to rewind a motor. If this service is not available, it will be necessary to obtain a new motor in Freetown or import one.

If a description of any problem that might arise could be sent to the Seed Technology Laboratory, it might be possibly to analyze the problem and make recommendations for correcting it.

An instruction manual for the dehumidifier will be sent to the persons in charge of the equipment.

## Acknowledgement

I greatly appreciate the excellent help from the persons who assisted me in obtaining wiring materials and doing the installation work. It was their cooperation that enabled us to complete the installation in my scheduled time.

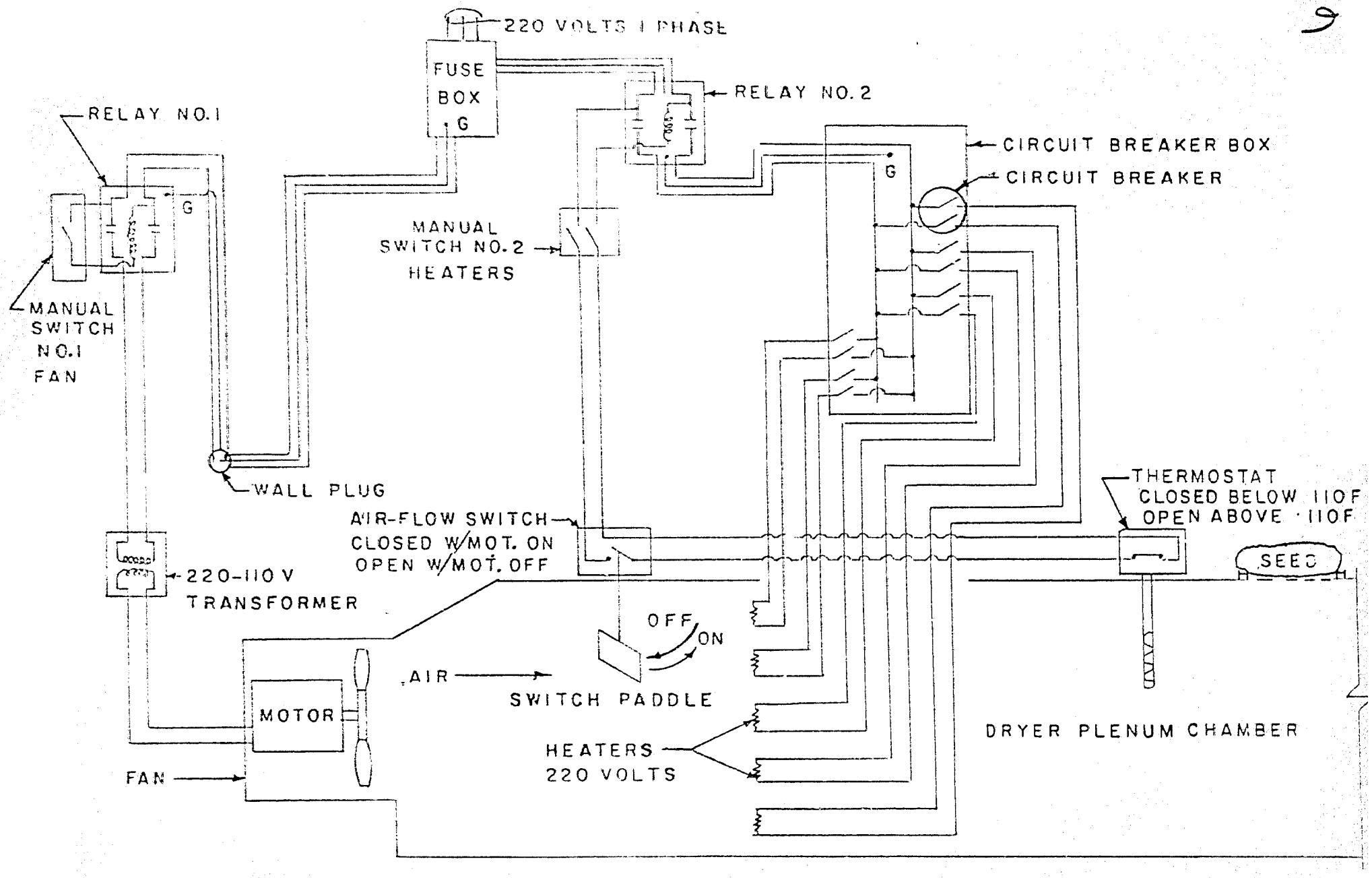


FIGURE 1. WIRING DIAGRAM FOR BAG DRYER AT ACRE PROJECT, SIERRA LEONE