
51063-BK
VITA TECHNICAL BULLETIN

SOLAR CONVECTION GRAIN DRYER

This Technical Bulletin contains plans and information for a natural convection solar grain dryer. The design is best suited for use in tropical or other climates where relative humidity of more than 80 percent and temperatures about 27 [degrees] C are not uncommon.

The dryer was designed and tested as a corn dryer since corn is one of the heaviest of grains. The dryer's proven effectiveness with corn should be reflected when it is used for smaller, lighter grains. The design consists of a primary collector, a drying bin area, a secondary collector, and a chimney. The dryer is capable of drying, in eight hours, enough grain to fill a 55-gallon drum.

This dryer was developed and tested by University of Maryland students under the supervision of VITA Volunteer Clifford L. Sayre, Jr. members of the study were: M. Bagera, J. Chesnutis, P. Christis, W. Flensburg, T. Morse, and E. Platt.

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VITA Technical Bulletins offer do-it-yourself technology information on a wide variety of subjects.

The Bulletins are idea generators intended not so much to provide a definitive answer as to guide the user's

thinking and planning. Premises are sound and testing results are provided, if available.

Evaluations and comments based on each user's experience are requested. Results are incorporated into subsequent editions, thus providing additional guidelines for adaptation and use in a greater variety of conditions.

SOLAR CONVECTION GRAIN DRYER

INTRODUCTION

There is a need in many countries for an effective, inexpensive means for drying grain. Grain drying is a critical step in preparing grain for storage. Drying grain prevents germination of seeds, inhibits bacterial growth, and reduces insect damage. The drying process also drives off insects, while killing larvae and eggs. Since grain kernels become harder during the drying process, they are less subceptible to insect attack. Dried grain can also be stored in air-tight containers, protecting it from rodent and insect damage.

Currently, the most common method of grain drying is to spread the grain on slabs of concrete or on the ground to dry. This method, however, simply increases the chances of insect or weather damage. More modern grain-drying methods often consist of using equipment requiring some form of forced ventilation and/or fuel-burning heating systems. This causes a problem in many parts of the world because of the high cost and scarcity of fuels.

These factors contribute to the need for a low-cost grain dryer designed to use the natural convection flow of forced air as the principal drying mechanism.

MATERIALS

*** Drums, petroleum, 55-gallon (7)**
*** Lumber, 61cm X 122cm (34 meters)**
*** Lumber, 30.48cm X 61cm (20 meters)**
*** Plywood, .95cm thick (12 square meters)**
*** Particle board (27 square meters)**
*** Aluminum, corrugated (72 square meters)**
*** Plastic film, 4 mil thick (72 square meters)**
*** Netting, mosquito (244 square cm)**
*** Nails**
*** Tacks**

TOOLS

* Saw
* Hacksaw
* Hammer

CONSTRUCTION OF THE DRYER

The Primary Collector

Cut a 244cm X 6.7 meter piece of particle board to form the base of the collector.

Using 5.08cm X 10.16cm lumber, frame the particle board.

Nail corrugated aluminum to the collector base to form the absorber plate.

The surface of the collector is covered with a sheet of plastic film. The air passages at the foot and head of the collector should be 30.48cm long X 9.20cm high. If plate glass is available, it can be used in place of the plastic film.

The Drying Bin

The base is made of plywood, 122cm long X 244cm wide X .95cm thick. It is framed with 5.08cm X 10cm lumber.

The bin is 2.4 meters square and should be approximately 61cm high.

The drying bin is large enough to hold four drying trays. Each tray should be made from 2.54cm wooden framing, supporting nylon mosquito netting. The outside dimensions of each frame should be 122cm X 122cm. The trays slide into the bin area on wooden guides.

The roof of the bin is also made of plywood.

The Secondary Collector

The secondary collector is built the same way as the primary collector. It should be 244cm wide x 4.8 meters long.

The Chimney

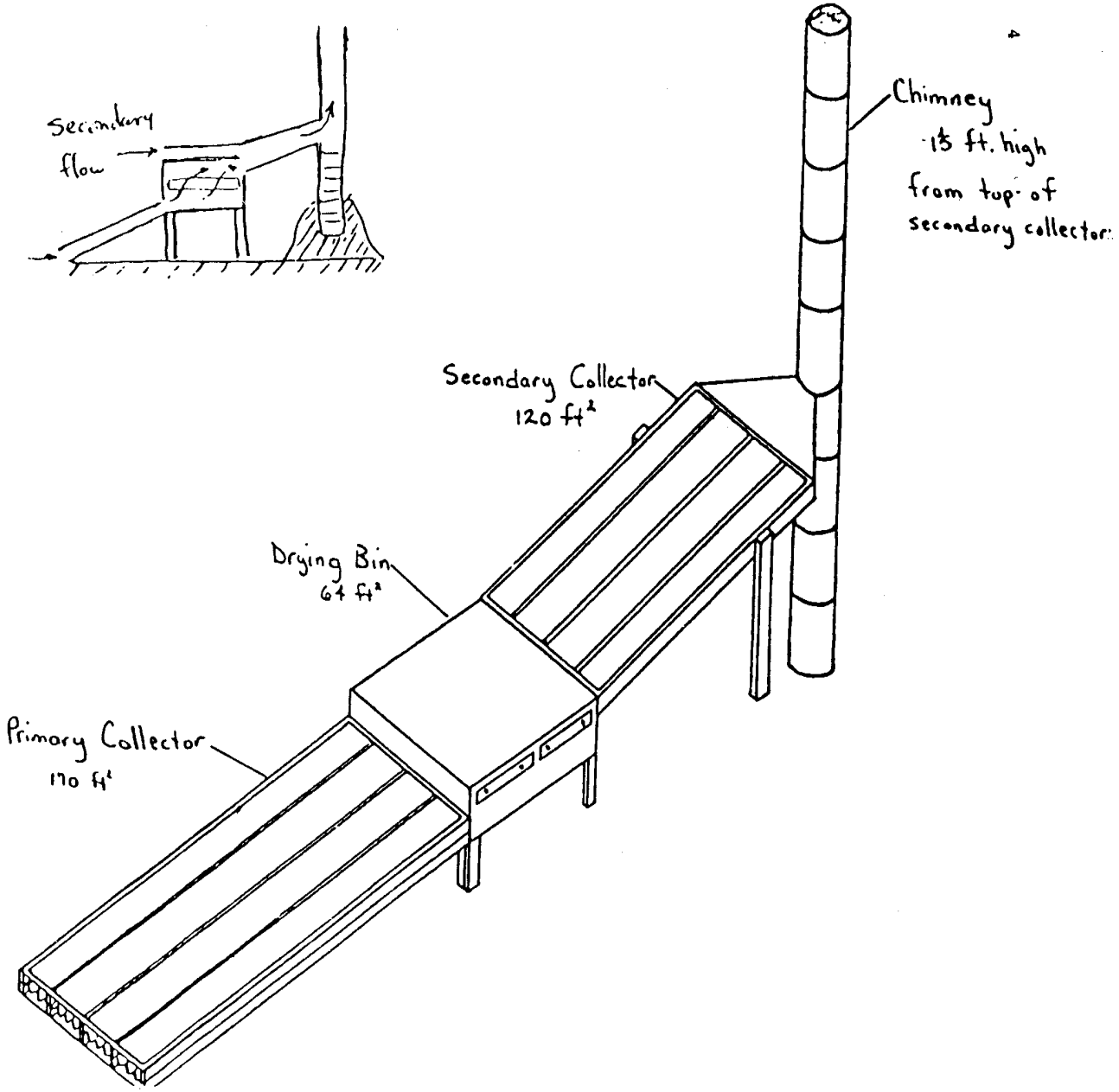
The chimney is made from 55-gallon drums that are welded together, with the tops and bottoms removed from the five used for the chimney. Each of the drums should be painted black.

The secondary collector is attached to the bottom of the chimney where an inlet hole has been cut. Two additional drums can be used to form the base of the chimney below the collector. The chimney extends 4.5 meters above the top of the collector.

The completed dryer is shown on the following page.

<FIGURE 1>

57p03.gif (600x600)



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