



FOOD TECHNOLOGY FACT SHEET

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Solar Dehydrator Construction Plans

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Introduction

A solar dehydrator collects energy from the sun to heat air, which in turn, is used to dehydrate food and agricultural products. Dehydrated foods have a low moisture content, which helps to make them shelf stable and lightweight. Nutritional properties and health benefits of dehydrated foods are mostly retained compared to fresh. Dehydrated foods span a broad range of products from fruits to vegetables to nuts and meats. Popular dehydrated foods include beef, grapes, apples, prunes, peanuts, coffee and carrots. Dehydrated agricultural products include wood, flowers, hay, plants and insects. The objective of this fact sheet is to provide construction plans for a large-scale, home-use, solar dehydrator for foods and agricultural products.

Implementation

The solar dehydrator construction plans are intended to serve as a guideline for construction, rather than as a rigid instruction set. Available materials, intended use, capacity, skills of the builder and other factors should be considered in plan implementation. For example, the dehydrator could be set on wheels to facilitate movement to sun-exposed areas, metal or fiberglass might be substituted for some or all of the wood structure, and size of the dehydrator may be increased or decreased.

Some photos of the dehydrator under construction and after completion are provided in the construction plans to help the builder to visualize the process. Page 6 of the construction plans describes how the solar collector should be angled to face the sun to capture the most rays. An example angle (measured from vertical)

of 77 degrees is shown. Online solar angle calculators are available to compute the angle, based on the site location and the time(s) of year the dehydrator may be used. A solar angle calculator may be found at <http://solarelectricityhandbook.com/solar-angle-calculator.html>. The optimum angle for a solar collector used primarily in the spring and fall at Stillwater, Oklahoma, is 54 degrees (measured counterclockwise from the 6 o'clock, or vertical, position).

The builder should consider personal safety while constructing the dehydrator. Follow safety instructions and good manufacturing practices for the tools and materials selected. Organize tools, supplies and instructions to decrease opportunities for mistakes. Secure and protect the job site to prevent accidents from trip and slip hazards, trash and debris, electrical cords and unexpected visitors.

Food Safety

Food safety is a top priority for dehydration of edible materials. Dehydration naturally protects food products but will not inactivate all bacteria, spores, eggs, toxins or chemicals. Cleaning and maintaining clean food products is the best means to producing high-quality, safe, dehydrated foods. Wash and sanitize foods prior to preparation for dehydration. Wash hands thoroughly prior to handling food and frequently during processing. Clean and sanitize all utensils and food contact surfaces prior to use. Keep food products covered and protected from flies and other insects at all times. Store dehydrated foods in airtight containers in a cool place that is not exposed to the sun.

SOLAR DEHYDRATOR PLANS



by:

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Built and tested in classrooms in rural Nicaragua, 2016

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ROBERT M. KERR

Food & Agricultural
Products Center

Based on a design by: D. Scanlin, Mother Earth News.
2014. Available at: <http://www.motherearthnews.com/diy/tools/solar-food-dehydrator-plans-zm0z14jjzmar>.

TITLE		DESCRIPTION	
SOLAR DEHYDRATOR		COVER PAGE	
DRAWN BY	DATE	SCALE	PAGE
TJ BOWSER	5/16/2017	NA	1 OF 7



TRAY WITH FOAM STRIP



ASSEMBLY



INSULATED COLLECTOR



PAINTING LATH



BENDING LATH



INSTALLING LATH



ADDING PLASTIC



FINISHED DEHYDRATOR WITH
DECORATIVE LID/VENT

Images were taken by the author at three construction locations in Nicaragua, June 2016.



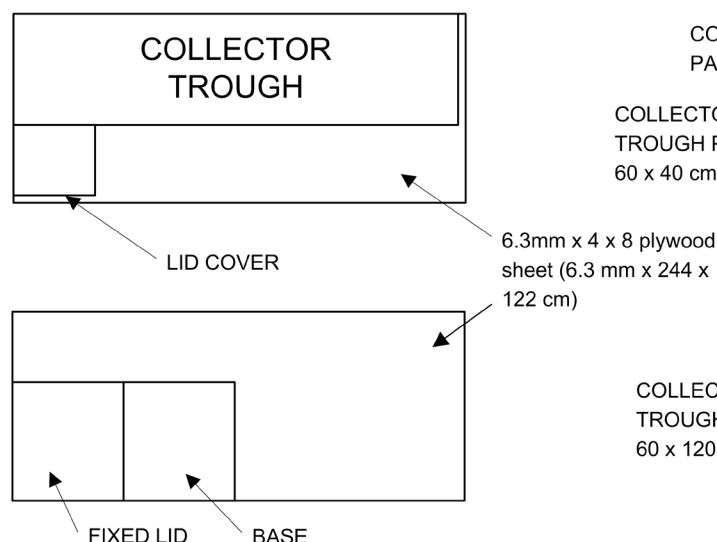
TITLE		DESCRIPTION	
SOLAR DEHYDRATOR		CONSTRUCTION IMAGES	
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TJ BOWSER	5/16/2017	NA	2 OF 7



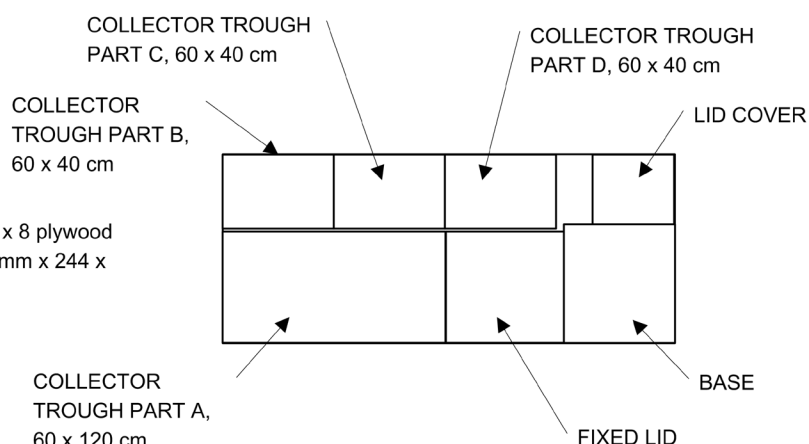
WOOD MATERIALS		
ITEM	QTY.	DESCRIPTION
1	17	1 X 4 X 60 cm board (19 x 89 x 600 mm) trays & collector
2	2	1 X 8 X 80 cm board (19 x 184 x 800 mm) for base
3	2	1 X 8 X 60 cm board (19 x 184 x 600 mm) for base
4	2	1 x 8 x 2.4 m board (19 x 184 x 2,440 mm), collector
5	4	2 X 4 X TBD board (38 x 89 x TBD mm) base legs
6	2	2 x 4 x 17 cm board (38 x 89 x 170 mm) for base
7	2	2 x 4 x TBD board (38 x 89 x TBD mm) collector legs
8	1	6.3 mm x 60 x 64 cm plywood board for base
9	1	6.3 mm x 60 x 240 cm plywood board for collector
10	1	6.3 mm x 64 x 60 cm plywood board for fixed lid
11	1	6.3 mm x 44 x 38 cm plywood board for sliding lid cover

OTHER MATERIALS		
ITEM	QTY.	DESCRIPTION
1	4	Mesh screen (cut to size, approximately 60 x 64 cm) for trays
2	1	Mesh to cover air intake (approx 12 x 60 cm) for collector
3	1	Mesh screen (cut to size, approximately 40 x 40 cm) for lid
4	960 cm	Foam strip (cut to size), self-adhesive or other, for trays
5	TBD	Duct tape or other material to seal joints in base
6	4	58 x 235 cm metal lath or screen, painted black
7	Roll	Reflective insulation, approx. 1 x 2.5 m, trim to fit collector
8	1	U.V. stable 6-mil plastic sheet (approx. 0.6 x 2.5 m), collector
9	TBD	Nails, 6 d or similar for trays, base and other, about ½ lb.
10	TBD	Nails, 2 d or similar for plywood, about ¼ lb.
11	10	Nails, roofing or similar with wide head, for lid
12	TBD	Staples tacks or brads to fasten mesh screen & foam
13	4	Metal lath or screen 58 x 235 cm, painted black

ALTERNATIVE A: TWO PLYWOOD SHEET CUT PLAN



ALTERNATIVE B: SINGLE PLYWOOD SHEET CUT PLAN

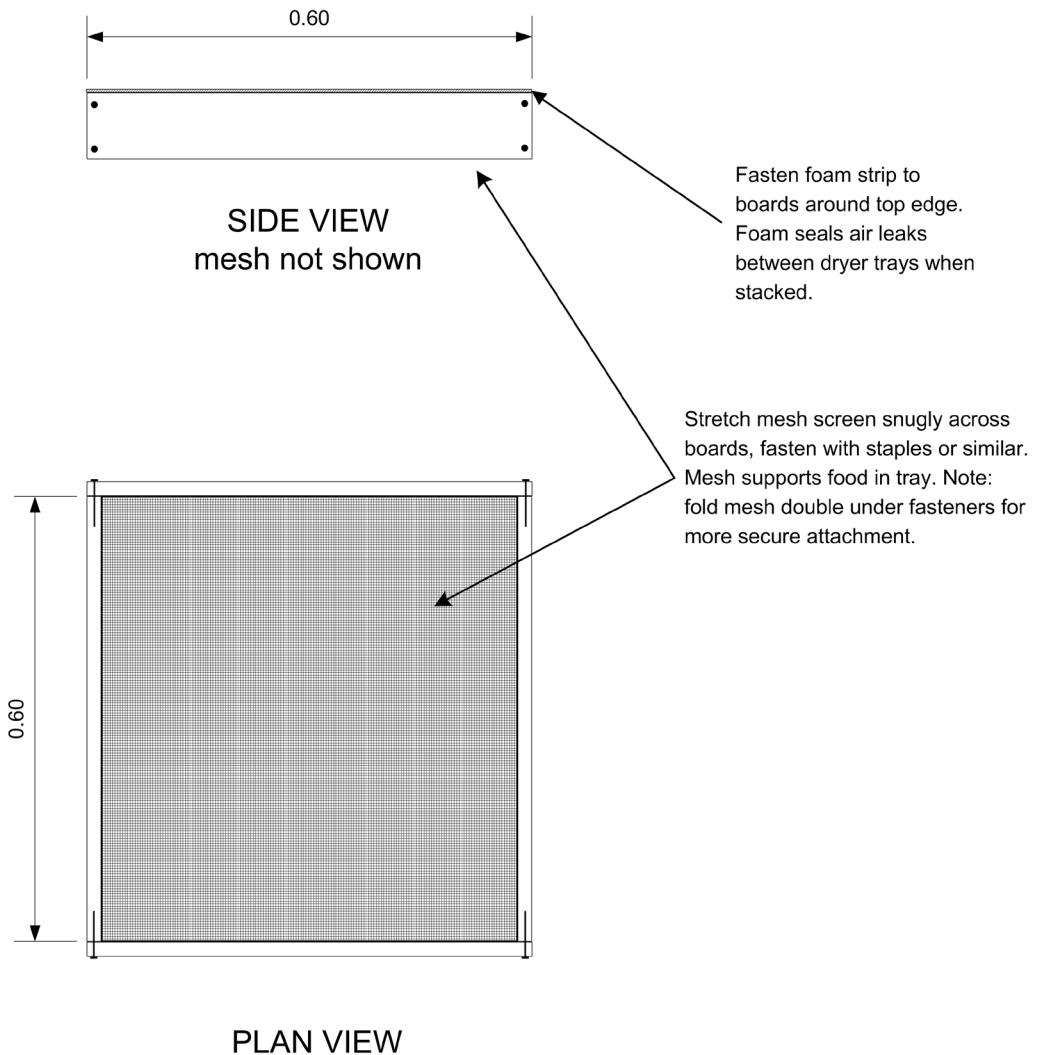


NOTE: COLLECTOR TROUGH BASE CUT IN FOUR SEPARATE PIECES (A TO D SHOWN) AND ASSEMBLED TO 60 X 240 mm

The cut & supplies sheet lists suggested materials needed for the project. Substitutions are encouraged based on cost, availability and imagination.

TITLE		DESCRIPTION	
SOLAR DEHYDRATOR		CUT & SUPPLIES SHEET	
DRAWN BY	DATE	SCALE	PAGE
TJ BOWSER	5/16/2017	1: 40	3 OF 7

MATERIALS		
ITEM	QTY.	DESCRIPTION
1	16	1 X 4 X 60 cm board (19 x 89 x 600 mm)
2	24	Nails, 6d or similar
3	4	Mesh screen (cut to size, approximately 60 x 64 cm)
4	960 cm	Foam strip (cut to size), self-adhesive or other
5	TBD	Staples tacks or brads to fasten mesh screen & foam

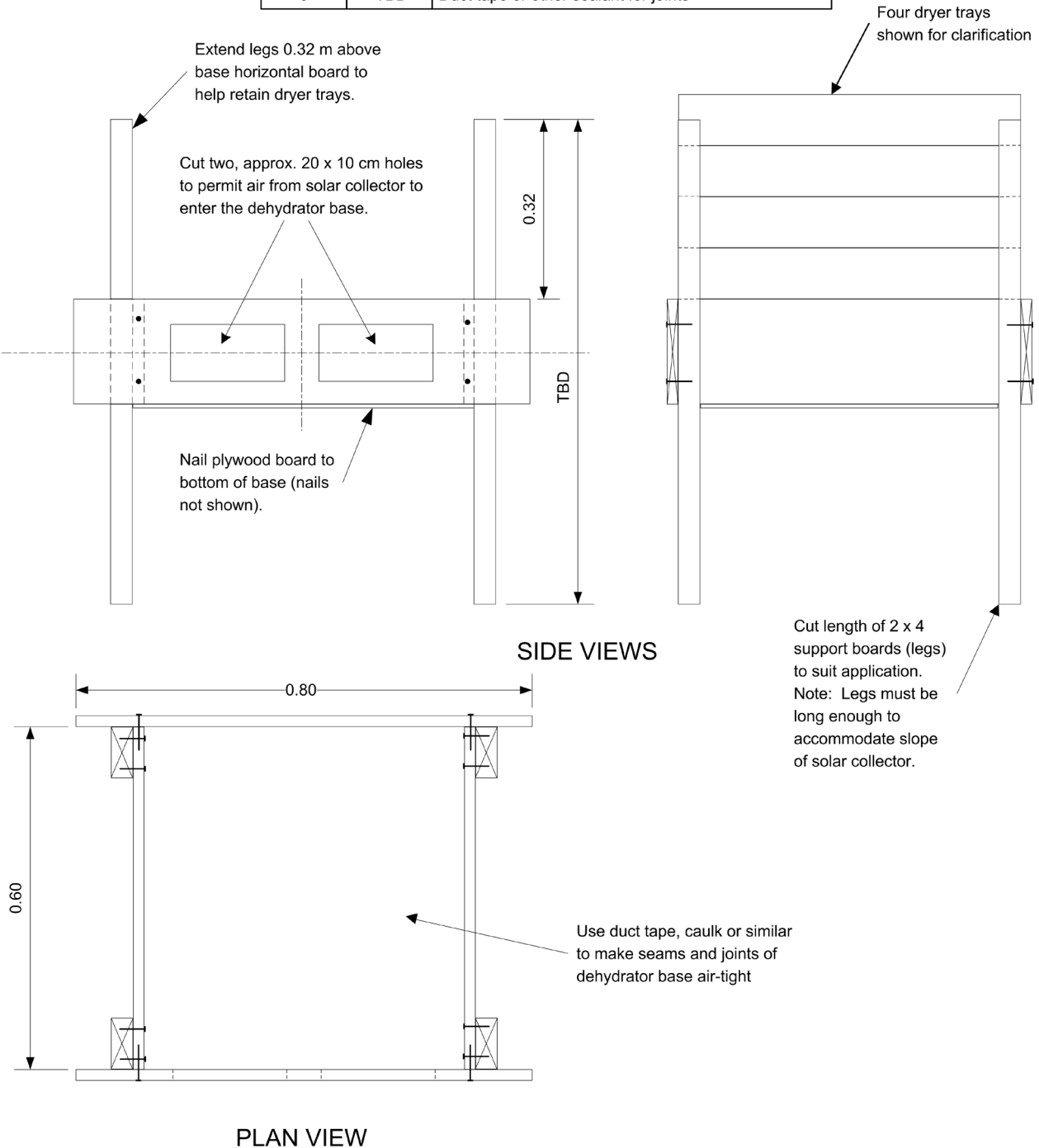


Dehydrator trays are stacked on the base and hold product during the dehydration process.



TITLE SOLAR DEHYDRATOR		DESCRIPTION DRYER TRAY	
DRAWN BY TJ BOWSER	DATE 5/16/2017	SCALE 1: 10	PAGE 4 OF 7

MATERIALS		
ITEM	QTY.	DESCRIPTION
1	2	1 X 8 X 80 cm board (19 x 184 x 800 mm)
2	2	1 X 8 X 60 cm board (19 x 184 x 600 mm)
3	4	2 X 4 X TBD cm board (38 x 89 x TBD mm)
4	1	6.3 mm x 60 x 64 cm plywood board
5	TBD	Nails, 2d or similar
6	TBD	Duct tape or other sealant for joints



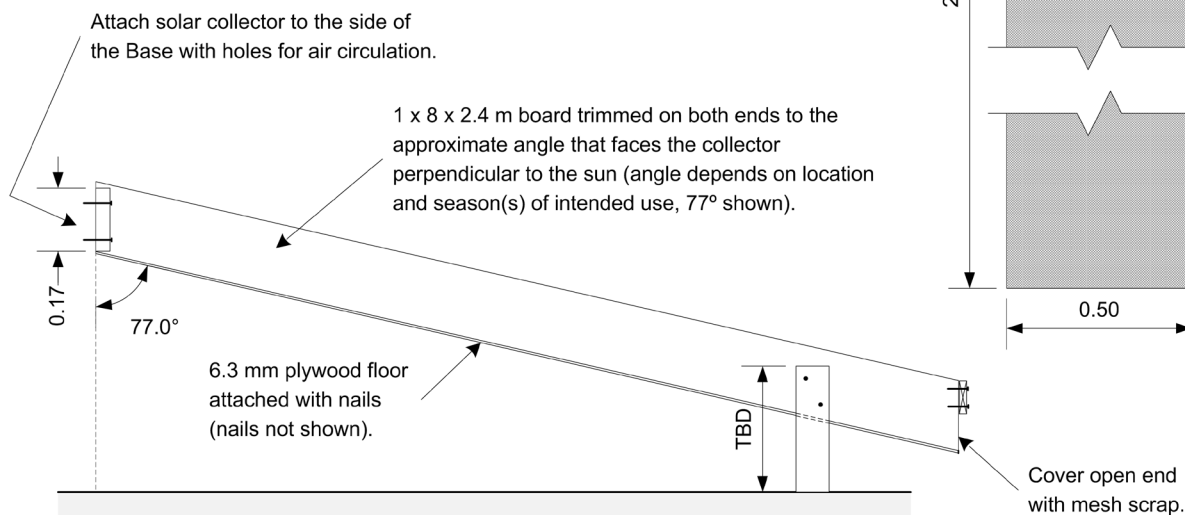
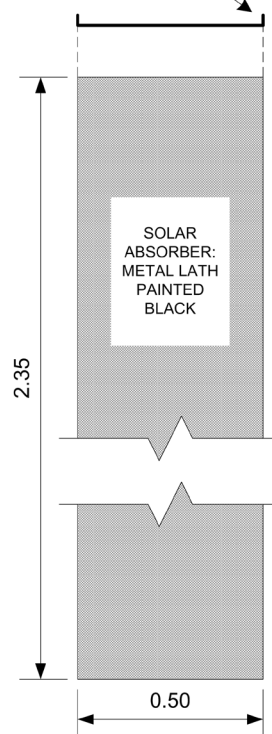
Dehydrator base supports trays and solar collector.



TITLE		DESCRIPTION	
SOLAR DEHYDRATOR		DEHYDRATOR BASE	
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MATERIALS		
ITEM	QTY.	DESCRIPTION
1	2	1 x 8 x 2.4 m board (19 x 184 x 2,440 mm)
2	2	2 x 4 x 17 cm board (38 x 89 x 170 mm)
3	2	2 x 4 x TBD board (38 x 89 x TBD mm)
4	1	6.3 mm x 60 x 240 cm plywood board
5	4	Metal lath or screen 58 x 235 cm, painted black
6	Roll	Reflective insulation, approximately 1 x 2.5 m
7	TBD	Nails, 6d and 2d or similar
8	TBD	Staples or similar fasteners for plastic sheeting
9	1	U.V. stable 6 mil plastic sheeting (approx 0.6 x 2.5 m)
10	1	Mesh to cover air intake (approx 12 x 60 cm)

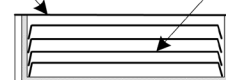
Fold down ends about 4 cm to fit into body of collector (see section A-A).



SIDE VIEW

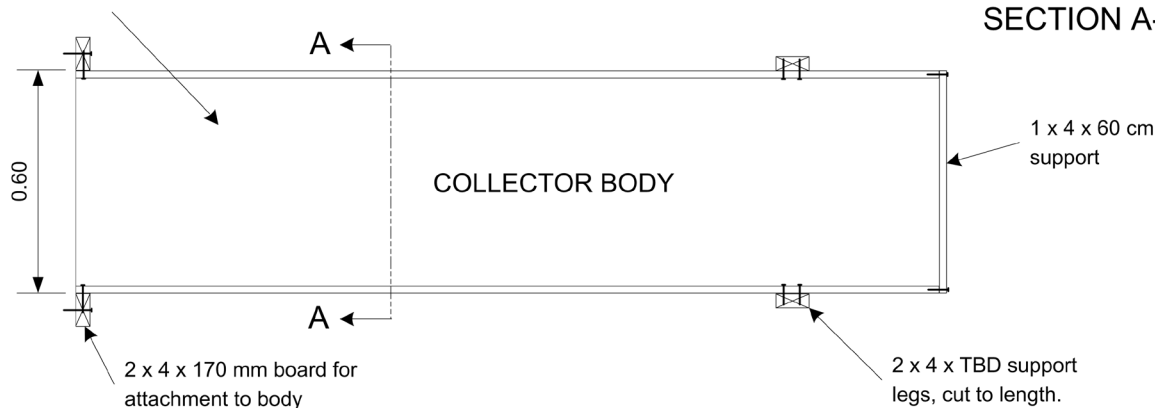
Note: metal lath, plastic and insulation not shown on side and plan views

Staple plastic over collector body.
Metal lath, stacked to permit air flow.



SECTION A-A

Line body of collector with reflective insulation attached with staples.



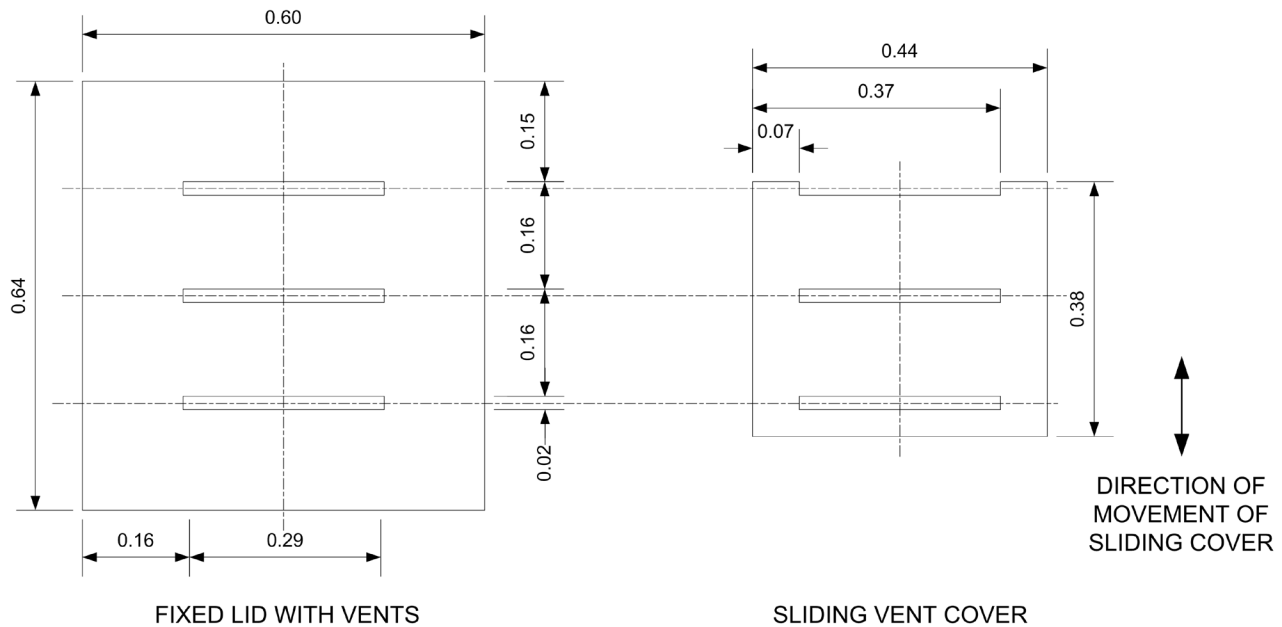
PLAN VIEW

Solar collector warms air with sunlight and transfers warm air to dehydrator.

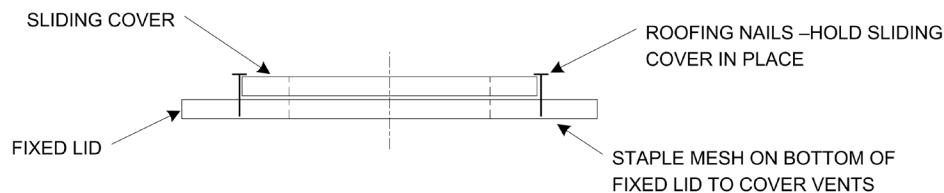


TITLE		DESCRIPTION	
SOLAR DEHYDRATOR		SOLAR COLLECTOR	
DRAWN BY	DATE	SCALE	PAGE
TJ BOWSER	5/16/2017	1: 20	6 OF 7

MATERIALS		
ITEM	QTY.	DESCRIPTION
1	1	6.3 mm x 64 x 60 cm plywood board
2	1	6.3 mm x 44 x 38 cm plywood board
3	1	Mesh screen (cut to size, approximately 40 x 40 cm)
4	10	Roofing nails, or similar, to retain sliding cover
5	TBD	Staples or similar fastener for mesh screen



PLAN VIEWS



ASSEMBLED END VIEW

NOTE: BOARD THICKNESS NOT TO SCALE, MESH NOT SHOWN

Set vent opening size using a thermometer to measure air temperature. Typical air temperatures do not exceed 57 °C.

Lid covers dehydrator and permits control of air flow.



TITLE		DESCRIPTION	
SOLAR DEHYDRATOR		LID WITH VENTS	
DRAWN BY	DATE	SCALE	PAGE
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