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Indian Standard

SURFACE COVERED CULTIVATION STRUCTURES — GLOSSARY OF TERMS

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Surface Covered Cultivation Structures Sectional Committee had been approved by the Food and Agriculture Division Council.

Development of surface covered cultivation structures and greenhouse cultivation technology is of recent origin. Its usage is increasing and the technology covers large number of new equipment and systems designed, developed and manufactured in the country. Need was therefore, felt for a comprehensive terminology to avoid any ambiguity in the usage of terms and to provide their authentic definitions.

In preparation of this standard, assistance has been derived from ASAE EP 460 - 1995 Commercial greenhouse design and layout and 406.2, 1995 Heating , ventilating and cooling of greenhouses. Published by American Society of Agricultural Engineers, USA.

The composition of the technical committee responsible for the formulation of this standard is given in Annex A.

Indian Standard

SURFACE COVERED CULTIVATION STRUCTURES — GLOSSARY OF TERMS

1 SCOPE

This standard covers definition of terms relating to surface covered cultivation structure.

2 TERMS AND DEFINITIONS

2.1 Aeroponic Culture

A modified method of growing plants in which the plants are supported through a plastic cover to a closed container and the nutrients are supplied to the roots as a fine mist or fog.

2.2 Air Circulation

The process of moving or mixing air within a greenhouse to control temperature, humidity and carbon dioxide distribution.

2.3 Air Enrichment

It is the addition of suitable gases and vapours to bring the air composition in the greenhouse growing region to near-optimal level. Generally, it relates to the addition of CO_2 and moisture. However, some other specific gases could also be added depending upon the crop requirements.

2.4 Air Exchange Rate

Refers to replacement of greenhouse air with ambient air. Usually it is expressed in terms of the replacement of air volume equivalent to enclosed space in greenhouse per unit time, for example, number of air changes per minute.

2.5 Air Infiltration-Exfiltration

The air exchange between outside and inside of greenhouse expressed in the same terms as air exchange rate.

2.6 Air Inflated Greenhouse

Normally refers to two plastic film covers attached firmly to superstructure and air forced between them with the help of a blower to keep both covers separated and inflated.

2.7 Air Supported Greenhouses

These are the greenhouses in which film is wholly supported by air pressure (1 to 2 MPa). They are normally cylindrical or quonset shaped.

2.8 Aspirate

To circulate air continuously across or through an object, such as a temperature sensor.

2.9 Bow/Hoop

Pipe or tubing framework shape used to support the glazing.

2.10 Carbon Dioxide Enrichment

It is the process of increasing the concentration of carbon dioxide in the greenhouse air.

2.11 Cold Frames and Hot Beds

Cold frames are heated only by the sun whereas hot beds are artificially heated. The purpose is to start or harden off seedlings in the Spring or extend the growing season in the Fall.

2.12 Condensate

Refers to the water condensed from the air at a cold greenhouse surface.

2.13 Convection Heat Loss

Loss of heat from greenhouse as air moves in convection current to greenhouse covering.

2.14 Convection Heater

A heater that does not contain a heat exchanger. Hot gases (smoke) are carried through the length of greenhouse in a pipe which serves as heat exchanger as heat passes through its wall to the greenhouse air.

2.15 Cooling

Generally, the removal of heat from the interior of the greenhouse. However, the term may also be applied to the conversion from sensible to latent energy, as in evaporative cooling.

2.16 Curtain Wall

The non-transparent lower portion of the side walls of a greenhouse.

2.17 Double Poly Inflated

Refers to a type of greenhouse covering, where two polyethylene layers are laid over the super structure, fastened at edges and air forced between them to separate the cover.

2.18 Eave

The connection between the side wall and the roof of a greenhouse

2.19 Evaporative Pad

Refers to the wetted part of cooling system through which air is drawn by exhaust fan. Heat is extracted from air to evaporate water in pad thereby lowering the air temperature.

2.20 Even/Uneven Span Greenhouses

A Single span greenhouse with its ridge line running through the middle of the structure called an even span greenhouse. The uneven span greenhouse has its ridge line running closure to one of its sides.

2.21 Fan and Pad Cooling

A system for cooling greenhouse used during the warmer months of the year. Warm air expelled through exhaust fans in one wall is replaced by air entering through wet pads on opposite wall. The entering air is cooled by evaporation of water in pad.

2.22 Fan Tube Cooling

A system for cooling greenhouses used during cooler months of the year. Cold air entering through a louver high in the gable of greenhouse is directed along the length of the greenhouse through a clear plastic distribution tube.

2.23 Footing

The support for the foundation wall. Its size depends on the weight of the wall, structure and other gravity loads, and the supporting soil type.

2.24 Foundation

Foundation is the structural element between the greenhouse super structure and the ground. It must safely transfer gravity, uplift and overturning loads to the ground such as those from snow, crops, and wind.

2.25 Framed Greenhouse

Refers to greenhouses in which an internal superstructure is required to support the glazing material. Both gable roof and arch or curvilinear shapes are possible with this type of greenhouse.

2.26 Free Standing Greenhouses

These are also called single span or ground to ground greenhouses.

2.27 Gable

The triangular end of the greenhouse bounded by the roof on two sides and the end wall on the bottom.

2.28 Girts

Longitudinal members of the framework that support the glazing material on the walls.

2.29 Glasshouse

A term used more commonly in Europe to designate structure used for growing plants that has a transparent cover and an artificial heat source. In some places they are called greenhouses.

2.30 Glazing

It is the transparent or translucent material glass or plastic, used to cover the greenhouse which transmits the desired amount of insolation to the growing area in the greenhouse.

2.31 Gothic Arch

The internal superstructure made with Gothic arches and bound by flexible plastic film.

2.32 Greenhouse

Frames or inflated structures covered with transparent or translucent material in which crops may be grown under conditions of atleast partially controlled environment and which are large enough to allow a person to walk within them and carry out cultural operations.

2.33 Greenhouse Environment

It is the temperature, light, composition of air, humidity and the nature of the root medium in the greenhouse.

2.34 Growth Chambers

These are normally opaque structures where all the environmental parameters, including light, are artificially and precisely controlled.

2.35 Gutter

In a multi-span greenhouse it is the lowest portion of the roof construction generally shaped in the form of a wide channel to drain off rain water and to permit people walking on it for maintenance.

2.36 Gutter-Connected Greenhouse

A series of two or more single span greenhouses joined together at the eave by a drain gutter. Interior walls are usually eliminated.

2.37 Head House

A building in close proximity to or attached to a greenhouse. The building may be used for storage, pesticide room, potting area, workshop, etc.

2.38 Heating

The addition of heat to the interior of the greenhouse from any energy source including the sun.

2.39 Horizontal Air Circulation

A system utilizing fans to generate a horizontal air circulation pattern above the plant canopy.

2.40 Hydroponic Culture

It is a method of growing plants in a nutrient solution rather than in soil. Greater plant density, higher yields are possible with less consumption of water with this method.

2.41 Infiltration

Generally undesirable air exchange which occurs through small, uncontrolled openings in the greenhouse covering. These exchanges are driven by wind pressure and/or temperature differentials inside and outside the greenhouse. Infiltration rate is generally expressed in terms of internal air volume changes per unit of time.

2.42 Institutional Greenhouses

The greenhouses for academic units, rehabilitation centers, public parks or gardens are classified as institutional greenhouses.

2.43 Lean to Greenhouse

A greenhouse built against the side of another structure such that it has only one slopping roof.

2.44 Life of Glazing Material

The period for which a glazing material will retain most of its transmission qualities, optical and physical properties when continually exposed to naturally occurring weather elements.

2.45 Light Transmittance

The ratio of the light passing through a glazing material to the light incident upon it.

2.46 Mechanical Ventilation

Desirable air exchange which occurs through controlled openings when fans are used to move air into, and exhaust air out, of the greenhouse. Fans may be located either at the inlet end (positive pressure) or the exhaust end (negative pressure); however, the most common location is the exhaust end.

2.47 Multi Span Greenhouses

A type of greenhouse construction where individual houses are combined at the gutters, usually to form one open area under the entire roof. Gable shape and curved roof greenhouses are found economical for large areas of 500 to 10 000 m^2 under commercial cultivations. They are also called ridge and furrow greenhouses.

2.48 Natural Ventilation

Desirable air exchange which occurs in response to temperature and pressure variations inside and outside the greenhouse. These variations are created and maintained by solar energy, internal heat sources, and/or wind.

2.49 Night Curtain

These are movable blankets which add thermal resistance during the night time and can be stored during daylight hours. Night curtains are made of thin materials that will pleat and store in a relatively small space.

2.50 Orientation

Refers to the positioning of greenhouses in such a way so that maximum winter light is transmitted to the plants. For greenhouses above 40°N latitude the ridge in either an individual greenhouse or a gutter connected range should run east-west. The potential for uneven growth in some plants because of gutters shading the same area during each day must be balanced against general reduction in winter light, if ridges run north-south.

2.51 Over Wintering Structures

These are generally pipe framed structures of arch shape and covered with transparent polyethylene film. Generally these structures are unheated and prevent damage from frost.

2.52 Perimeter Heating System

A row of heating pipe just inside the perimeter wall of a greenhouse.

2.53 Photodegradation

Radiation in the form of ultra-violet light that contributes to decomposition of plastic material. Absorber or inhibitors must be present for longevity.

2.54 Phytotrons

The most advanced climate controlled greenhouses and growth chambers for crop research purposes.

2.55 Pier

A column of concrete, masonry, or pressure treated lumber used to support greenhouse individual frame members.

2.56 Pit Greenhouses

Greenhouses that are built partially below ground (one meter or more) often attached to another building, roofed with transparent material that faces south, and normally heated only by the sun.

2.57 Plastic Greenhouse

A greenhouse employing plastic film or sheets as glazing material.

2.58 Purlin

A component of the greenhouse frame running the length of the greenhouse which connect the trusses together.

2.59 Quonset

This greenhouse shape is achieved when the internal superstructure is made by semi-circular hoops and covered with a flexible plastic film.

2.60 Radiation Heat Loss

The radiation of heat from a warm body such as plants in a greenhouse, to a cooler body such as covering on the greenhouse or sky.

2.61 Rafter

A frame component spanning the space between the eave and the ridge.

2.62 Range

A series of single span greenhouses, usually interconnected, or two or more sections of the gutter-connected greenhouses.

2.63 Reglaze

To replace the glass or the glazing compound which seals the glass or greenhouse.

2.64 Ridge

The highest part of the roof of a greenhouse usually forming a major structural component of greenhouse.

2.65 Ridge and Furrow

A type of greenhouse construction where individual houses are combined at the gutter usually to form one open area under the entire roof.

2.66 Saw Tooth Greenhouse

It is a type of multi-span greenhouse with the top of its end projections resembling the shape of a saw serrations.

2.67 Service Road

It is the road connecting the greenhouse production facility to the public road. The service road leads directly to the stores of the greenhouse.

2.68 Shade Structures

These are framed structures somewhat lighter than those for greenhouses providing 60 to 80 percent shading and which are permeable to wind.

2.69 Shading

Refers to covering of the greenhouse with the opaque material that reduces the light intensity below 20 lux, either to lengthen the dark period or facilitate cooling of greenhouse environment.

2.70 Sill

The portion of greenhouse that rest on the curtain wall and to which the side walls sash bars are attached.

2.71 Single Span (Ground-to-Ground) Greenhouse

Greenhouses covering 100 to 500 m^2 floor area, each functioning as a separate unit.

2.72 Solar Greenhouse

The conventional greenhouses are designed primarily to capture light and they tend to over heat on sunny days, loose heat on cloudy and cold days and loose heat rapidly after sundown each day. Solar greenhouses differ in the sense that they are designed to collect and retain solar energy and thus reduce the use of fossil fuels for heating.

2.73 Spectral Transmittance

The transmittance of light in the various regions of the spectrum.

2.74 Steam-Trap

A device that allow condensate water to return to boiler, but prevent passage of steam from heating coil into the condensate return.

2.75 Temporary Greenhouse

A structure used for short term production, over watering or hardening of plants. It is usually glazed with transparent plastic film.

2.76 Thermal Radiation Transmittance

The ratio of the heat, that is, radiated through a glazing material to the thermal radiation incident upon the inside surface.

2.77 Tower Greenhouse

Multistoried greenhouses where conveyors are used to move plants from lower regions to higher regions. Tower greenhouse makes more effective use of vertical space.

2.78 Truss

A structural component of greenhouse frame spanning the width of the greenhouse and consisting of rafter, chords and struts which are welded or joined together.

2.79 Packaged Heater

A heating device with its own fan and controls. Heat may be supplied from natural gas, oil steam or electrical energy.

2.80 Ultra-Violet (UV) Stabilization

The plastic covers being susceptible to photo degradation, both polyethylene and vinyl films are affected by ultra-violet light. They become brittle and tear when exposed to solar radiation. Stabilizers are mixed to make polyethylene UV Stabilized.

2.81 Ventilation

The process of exchanging air inside the greenhouse with outside air to control greenhouse temperature, humidity, oxygen and carbon dioxide levels.

2.82 Ventilation Rate

The volume of air exchanged per unit time per unit floor area. Ventilation rate is often expressed as $m^3/s.m^2$ of greenhouse floor area (alternatively, as internal air volume changes per unit of time).

2.83 Weatherability

It is the resistance of a greenhouse glazing material to degradation due to weather effects.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

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