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Heating, Ventilating, and Air Conditioning (HVAC) for Indoor Plant Environments without Sunlight

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0 Introduction

This Engineering Practice provides growers with the foundational information that will a) facilitate the understanding of HVAC equipment options that can be used to manage the indoor plant environment (IPE) and b) allow the grower to communicate knowledgably with engineers, contractors, manufacturers, investors, and other growers.

The HVAC system selected, and air quality measures employed, affect plant growth and development.

To help facilitate the selection and design of the HVAC systems, it is important to establish the design criteria of the IPE. The mechanical engineer, in consultation with the grower, is responsible for sizing and selecting the HVAC equipment based on the psychrometrics of the IPE. The crop will determine the design criteria, including target temperature and humidity ranges, plant transpiration, irrigation control, lighting design and operation, and the envelope assemblies (wall, ceiling, etc.).

HVAC systems can be selected to control a single parameter (e.g.: temperature, humidity, air flow or air quality). There are also integrated HVAC systems that can perform multiple functions to control two or more parameters within the IPE. The selection of the HVAC systems will influence space planning, energy use, the number of different systems needed, and the ability to respond to changing conditions in the IPE.

1 Purpose and Scope

1.1 This Engineering Practice sets forth guidelines describing the plant shoot zone environment and the interactions with plants grown indoors without sunlight.

1.2 This Engineering Practice establishes criteria that will promote the cultivation of plants, with a focus on the thermodynamics and air quality of the indoor plant environment.

1.3 The intended audience of this Engineering Practice is the owner and operator of the indoor plant environment (i.e.: “the grower”).

1.4 This Engineering Practice presents design considerations associated with selecting HVAC equipment currently available and commonly used to manage the temperature, humidity, and air quality in the indoor plant environment.

1.5 Excluded from this Engineering Practice are: HVAC systems serving water-cooled LED lighting; HVAC condensate drainage capture, treatment and reuse; thermal storage; and phase change building materials.