

# **Insect “Exclusion” Technologies**

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## **The Best Exclusion Technologies can fail**

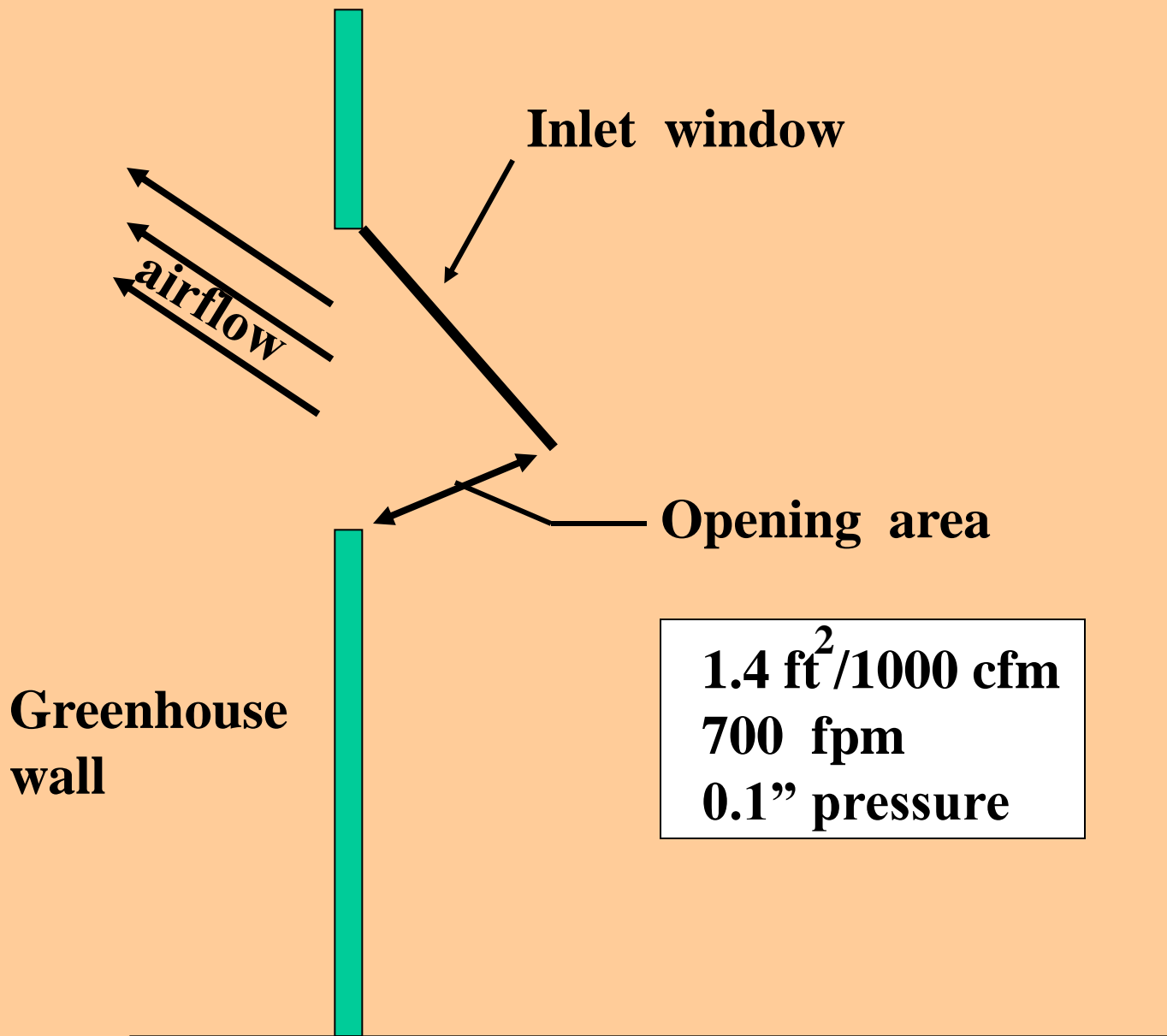
**from neglect  
with openings in structure  
with holes in screening  
transport on clothes  
without clean stock  
without adjacent sanitation  
if you do not shade**

# Effects of Screens

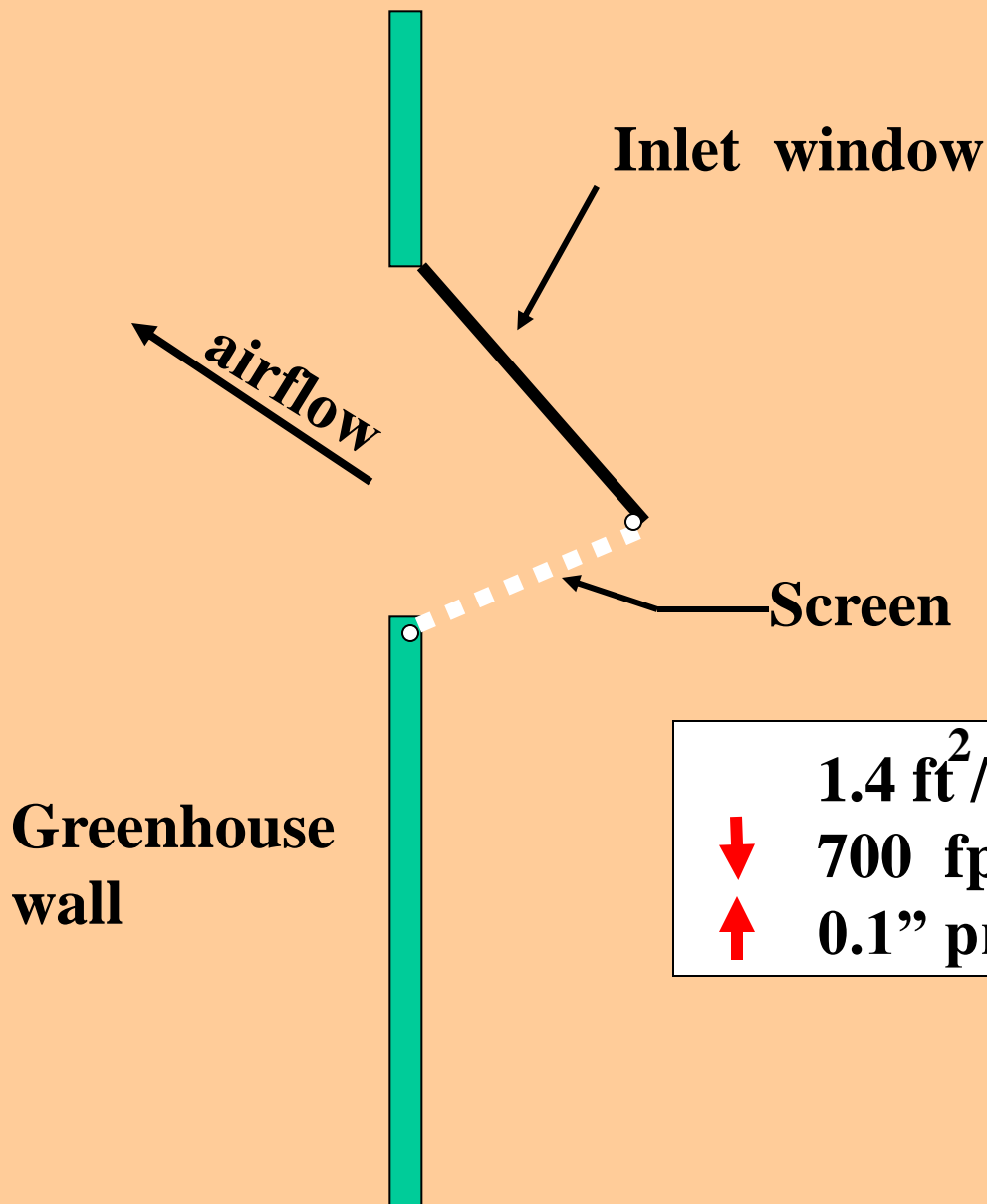
- **add resistance to airflow and air exchange**
  - + **85% reduction if natural ventilated**
  - + **reduce capacity if fan ventilated**
- **larger mesh # means greater resistance**
- **will increase resistance with use**
- **requires maintenance**
- **requires add-on structures**
  - + **drape on inlet**
  - + **screen shed at inlet**



**Inlet window screen [inside view]**



**1.4 ft<sup>2</sup>/1000 cfm**  
**700 fpm**  
**0.1" pressure**



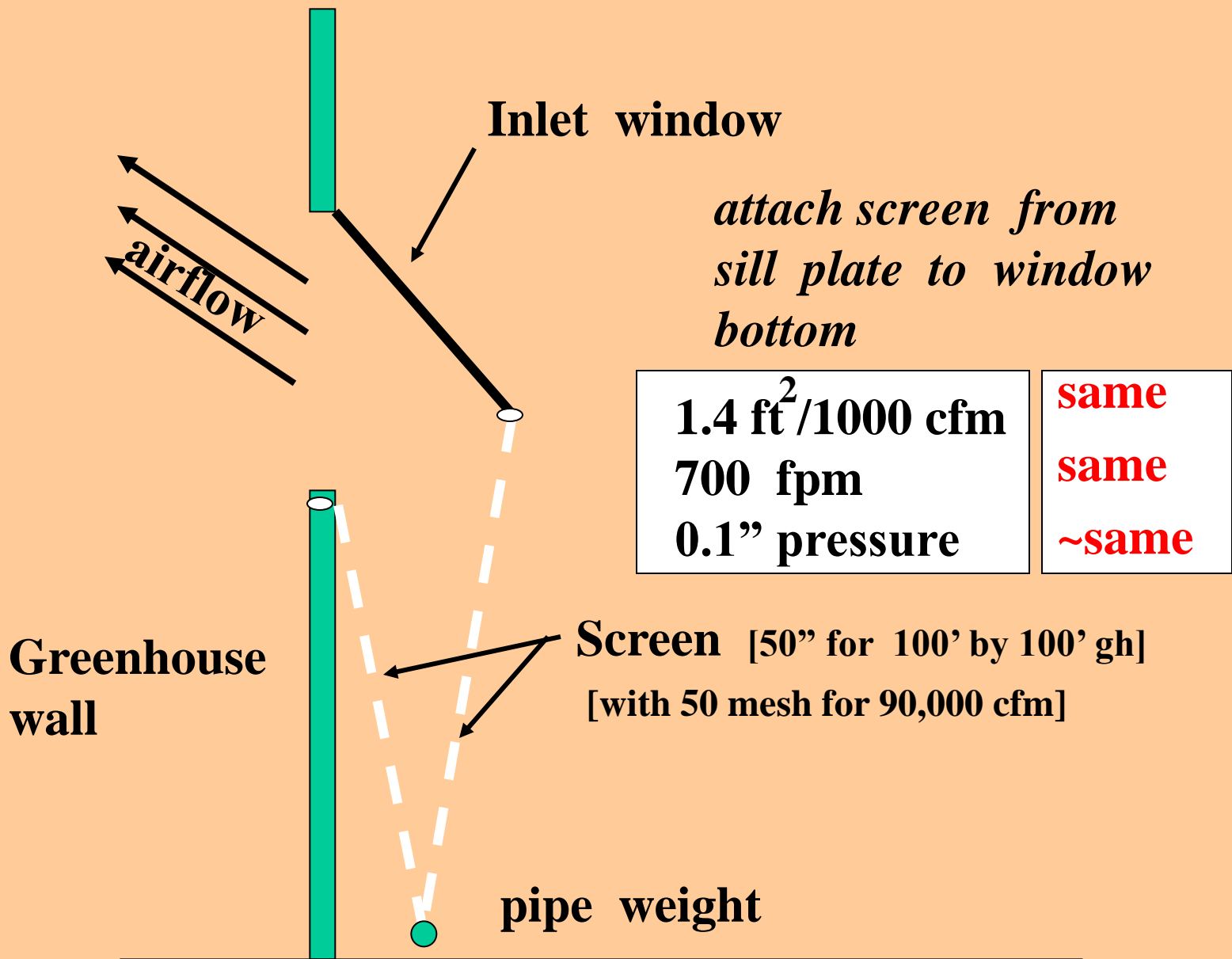
**Greenhouse  
wall**

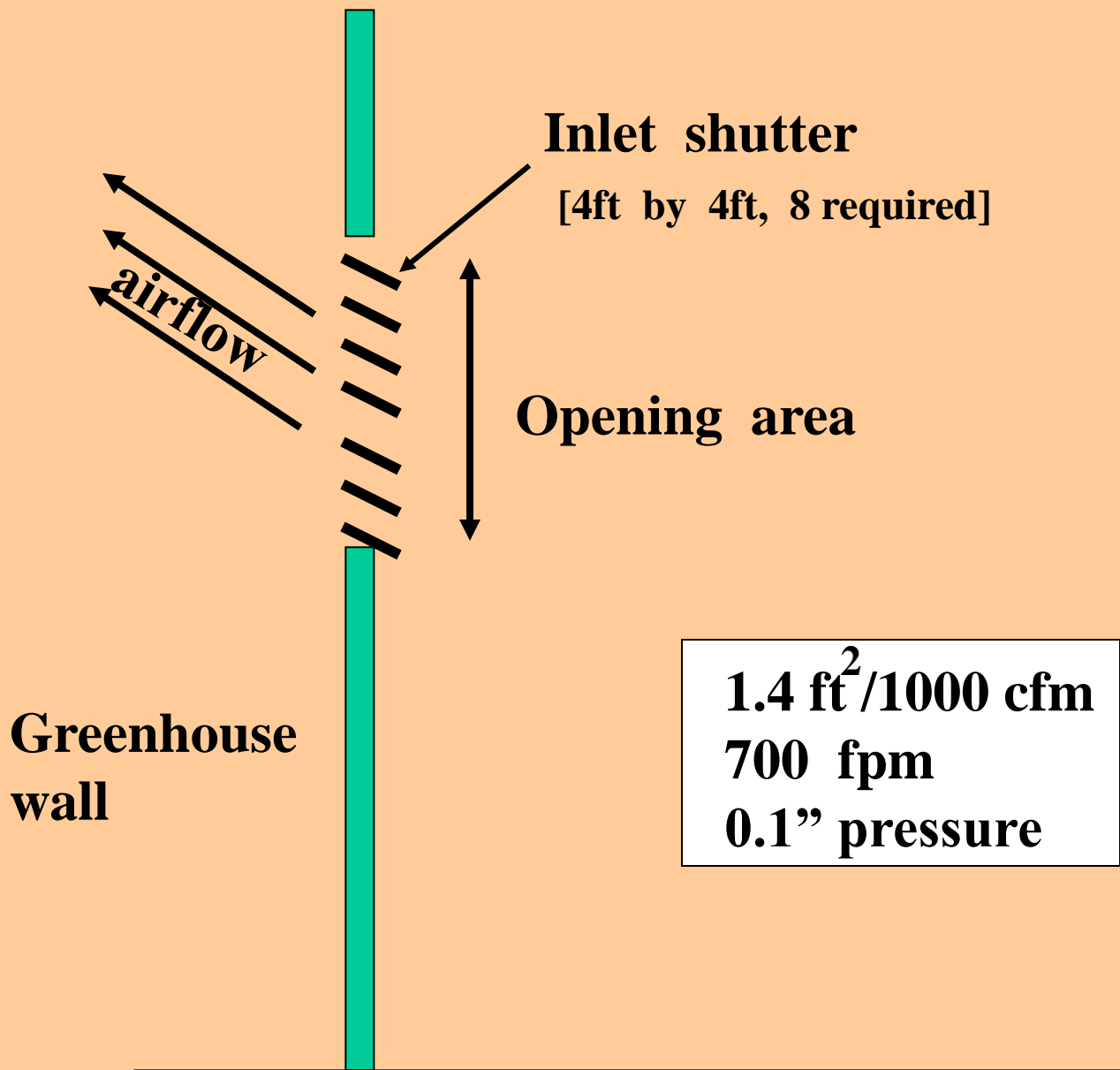
**Inlet window**

**airflow**

**Screen**

	<b>1.4 ft<sup>2</sup>/1000 cfm</b>	<b>same</b>
<b>↓</b>	<b>700 fpm</b>	<b>smaller</b>
<b>↑</b>	<b>0.1" pressure</b>	<b>larger</b>





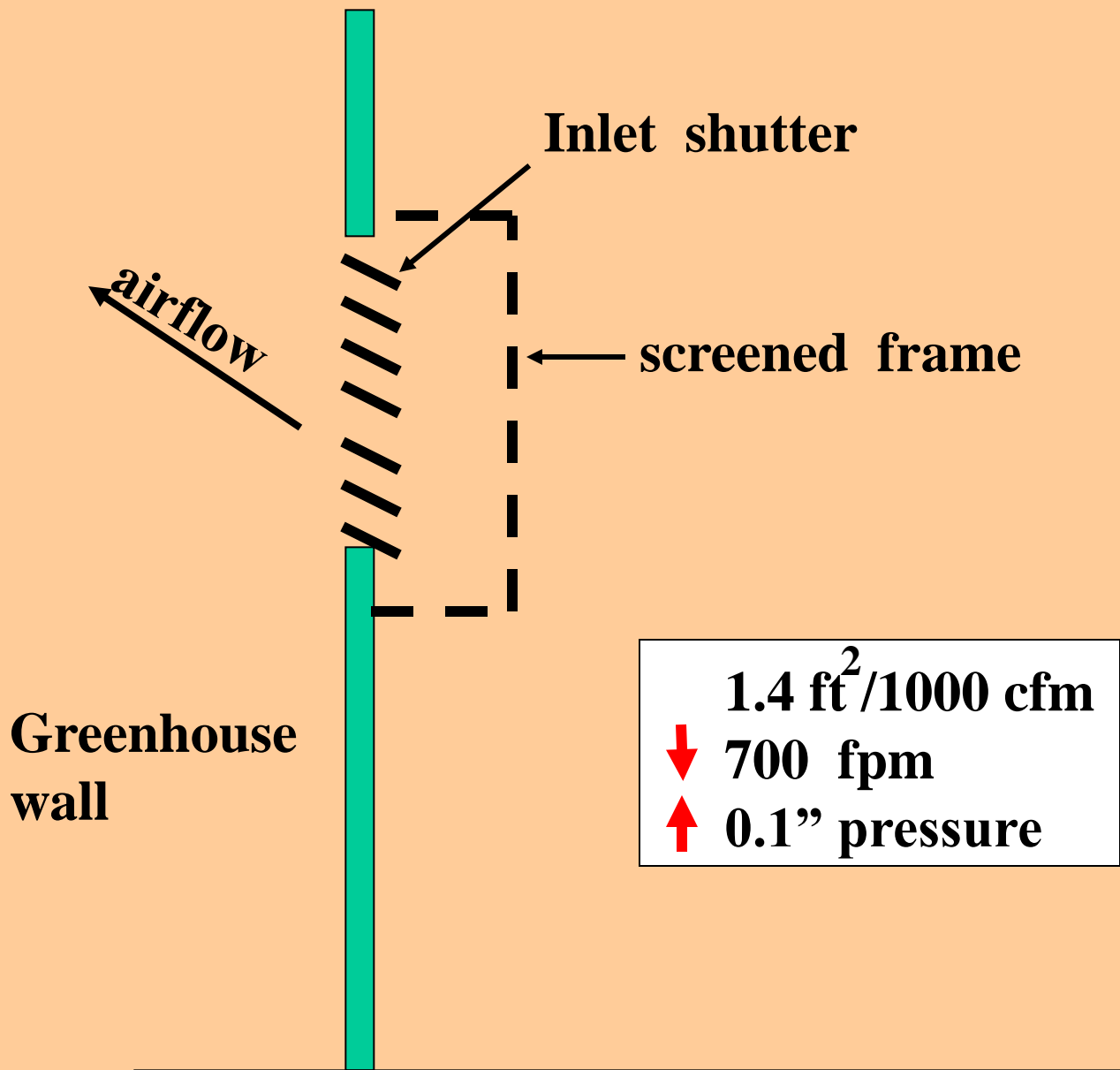
**Inlet shutter**  
[4ft by 4ft, 8 required]

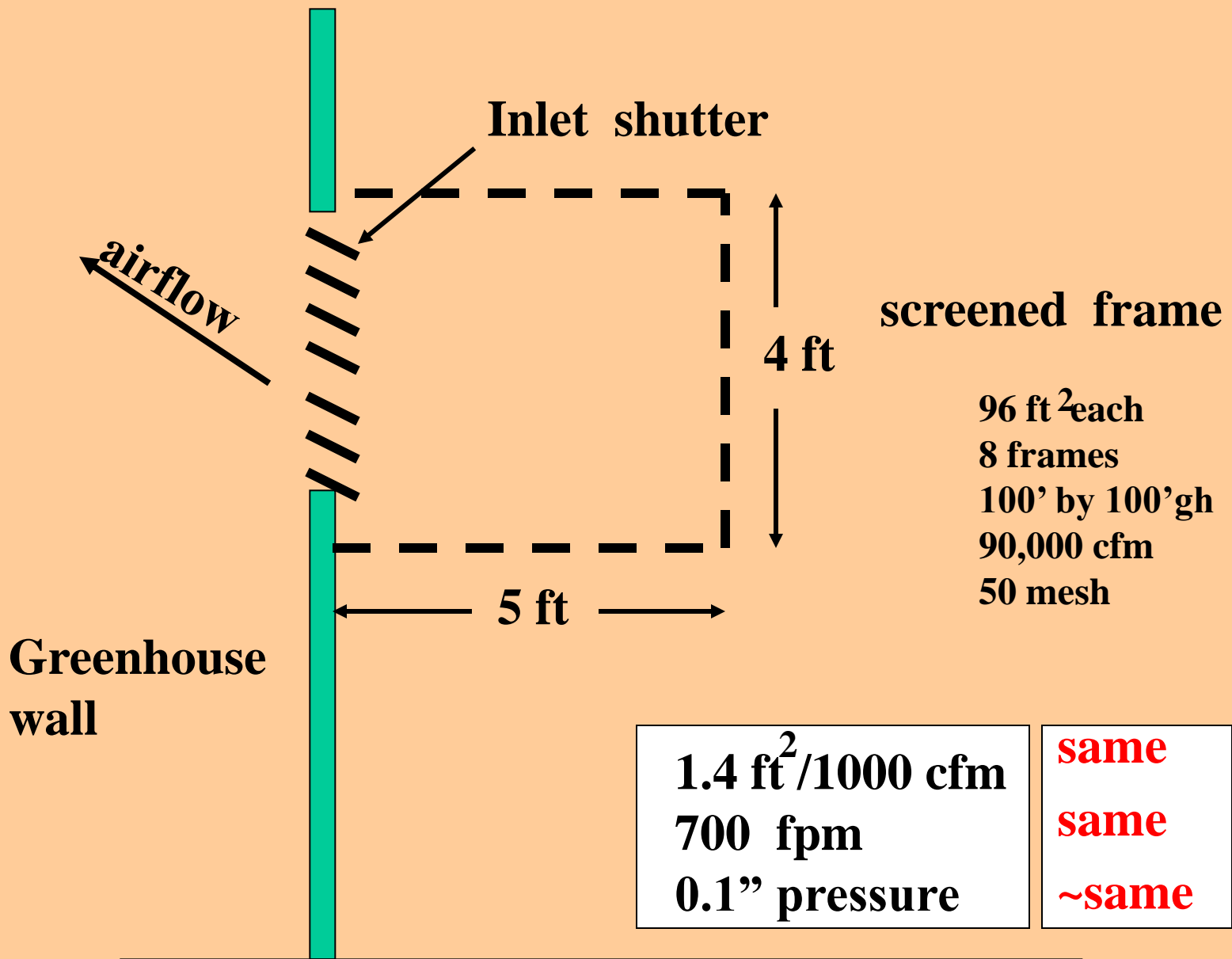
**Opening area**

**Greenhouse wall**

**1.4 ft<sup>2</sup>/1000 cfm**  
**700 fpm**  
**0.1" pressure**



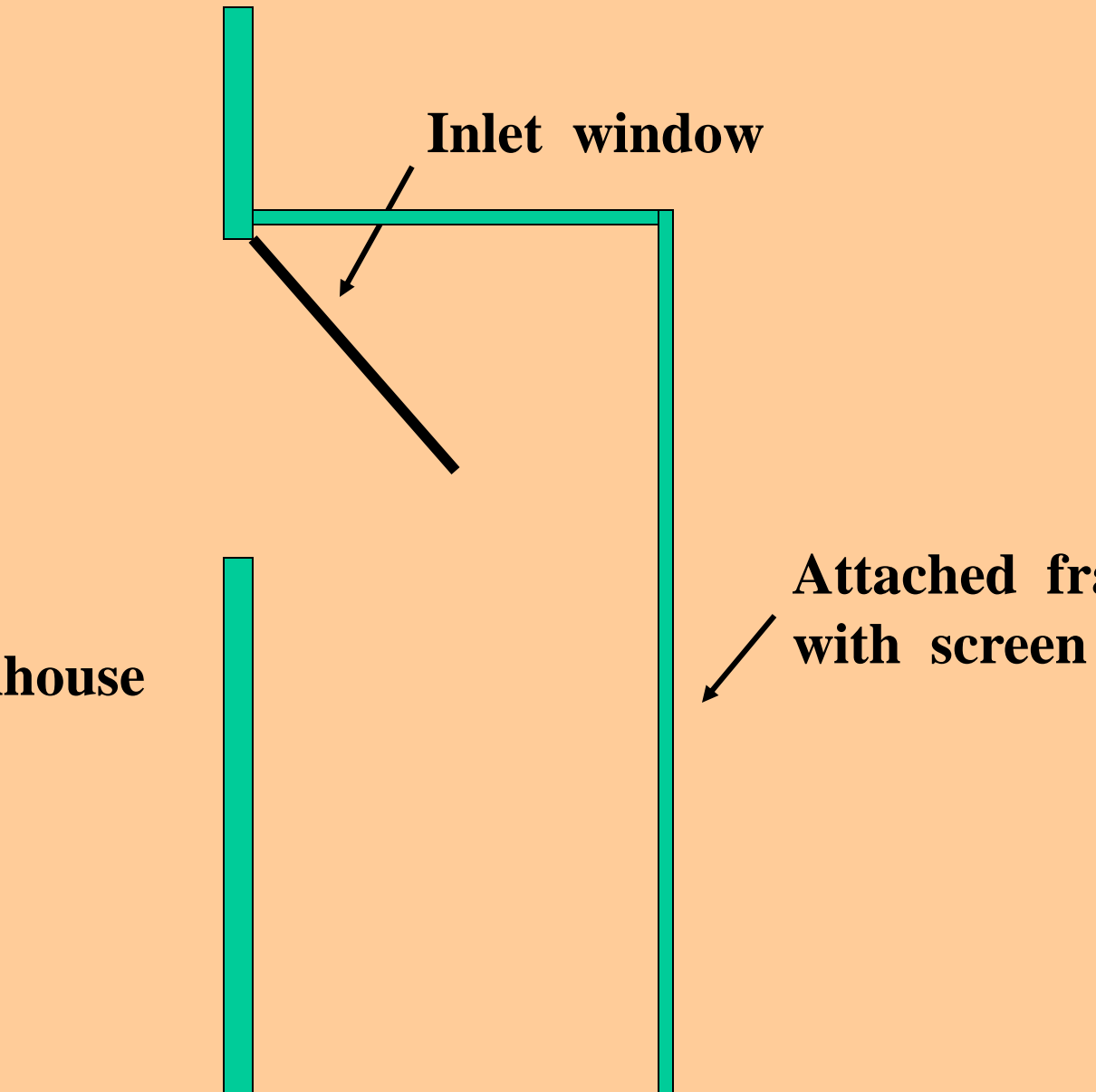




**Greenhouse  
wall**

**Inlet window**

**Attached framework  
with screen**



**Screening is selected  
based on the insect to be excluded**

**For exclusion, choose screen with these hole sizes**

<b><u>INSECT</u></b>	<b><u>INCHES</u></b>	<b><u>MESH*</u></b>
<b>Leafminers</b>	<b>0.025</b>	<b>40</b>
<b>Whiteflies</b>	<b>0.018</b>	<b>52</b>
<b>Aphids</b>	<b>0.013</b>	<b>78</b>
<b>Thrips</b>	<b>0.0075</b>	<b>132</b>

**\*threads per inch, each direction**

# Approach Velocity

[for fan ventilation]

- Air velocity through screen
- Greater velocity causes greater pressure loss
- Greater mesh causes greater pressure loss
- Allowable pressure, based on fan design

<u>Screen or Mesh</u>	<u>Allowable Approach Velocity *</u>
Chicopee, 32	336 ft per min
Stainless Steel, 60	303
Chicopee, 52	264
Nylon, 68	253
Woven Fabric, random	192
Econet T	110

\* Only at 0.03" static press.

## Determine Area of Screen Required

$$\text{Screen Area}^* = \frac{\text{Capacity of Fans}}{\text{Approach Velocity}}$$

\*Total area of screens equals the total ventilation capacity divided by the approach velocity

## **Summary**

**The type of screening is selected based on the insect to be excluded**

**Area of the screening is based on the fan capacity and the allowable velocity to keep reasonable pressure loss**

**Pressure loss is based on fan design and that the screen will get dirty**

**The fan capacity is based on the size of the greenhouse**

# SIZING THE EXHAUST FANS

- DESIGN FOR MAXIMUM COOLING LOAD

**7-8 CFM per FT<sup>2</sup> FLOOR**

- DETERMINE FLOOR AREA IN FT<sup>2</sup>  
INSTALL 7-8 CFM FAN CAPACITY PER FT<sup>2</sup>

**EXAMPLE: 24 FT by 100 FT = 2400 FT<sup>2</sup>**

**16,800 - 19,200 CFM**