Greenhouse Construction

Location
Orientation
Architectural structures
Roofing materials

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Location:

- **Space requirement**: What size will fit current needs and future expansion?
- **Soil**: Gentle slope good for drainage, rarely native soil is used as substrate
- **Shadows**: minimum distance = 2.5 x height to avoid shadows
- **Snow**: a 100 ft boundary for tree line to avoid snow drifts
- **Land-use**: zoning, tax laws, urban growth problems
- **Climate**: avoid low-light areas, high winds = higher heating costs; wind breaks
- **Labor Supply**: supply / demand dictates labor costs; healthy economy = higher wages
- **Accessibility**: shipping costs, utilities available, market?
- **Water quality**: (up to 30,000 gal/acre/day and quality are important)
Orientation
Angle of incidence

- Greenhouse orientation is important for sunlight transmission into greenhouse and sunlight distribution inside the greenhouse

- Winter lighting is most important: less light and long shadows

- Angle of incidence is the angle between sunlight and imaginary line perpendicular to the surface

- Less angle of incidence is better
Orientation

Solar path

In winter sunlight is
- mostly on the southerly side
- angle of incidence is high
- low intense
Orientation

Winter light transmission
Orientation
Winter light distribution/ shadows
Orientation

• Greenhouse orientation is important for sunlight transmission into greenhouse and sunlight distribution inside the greenhouse

• Winter lighting is most important: less light and long shadows

• More transmission if incidence angle is less, more uniform light distribution if shadows from structures move inside the greenhouse

Above 40 ° latitude:
• run ridges of single-span greenhouses E-W for best light transmission
• run ridges of multi-span greenhouses N-S for best light distribution

Below 40 ° latitude:
• run ridges of all houses N-S because better light distribution is more important than optimization of light transmission
Types of greenhouse structures

Single span

- Quonset
- A frame
- Gabled
- Lean to
- Gothic

Multi span

- Ridge and furrow
- Venlo
- Saw toothed
Greenhouse roofing materials

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Glass</th>
<th>Polyethylene</th>
<th>Poly carbonate</th>
<th>Fiberglass (FRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light transmission</td>
<td>high</td>
<td>high</td>
<td>medium</td>
<td>high and uniform</td>
</tr>
<tr>
<td>Cost</td>
<td>high</td>
<td>cheap</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>weight</td>
<td>heavy</td>
<td>light</td>
<td>light</td>
<td>light</td>
</tr>
<tr>
<td>Durability</td>
<td>~25 yrs</td>
<td>~ 2 to 5 yrs</td>
<td>~ 10 yrs</td>
<td>~ 15 yrs</td>
</tr>
<tr>
<td>Other</td>
<td>lot of structure</td>
<td>double layered for heat control, IR blocker, UV inhibitor _ antifog to be added, double layered for heat control</td>
<td>less flammable, treated for UV</td>
<td>collects dust and flammable</td>
</tr>
</tbody>
</table>