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TOOLBOX

GREENHOUSE CONSTRUCTION AND SAFE OPERATION

Developed by Osborn Consulting Engineers and RMCG and funded by Hort Innovation using R&D levy funds, the VG16004 Toolbox aims to improve industry awareness and knowledge of the regulations of greenhouse construction and compliance.

What is the Toolbox for Greenhouse Construction and Safe Operation?

The Toolbox for Greenhouse Construction and Safe Operation is specifically designed for growers and the protected cropping industry. It provides practical design, planning and fire/risk prevention measures if you are wanting to establish, expand or modify a greenhouse or grow structure.

The toolbox provides a central information hub for growers to find information based on a particular farm activity or issue including:

1. Getting the basics right (see next page)
2. Overview of proposed changes to the 2019 National Construction Code
3. Local government approval processes
4. Fire prevention and safety
5. Working at heights and risk management
6. General design considerations
7. Wind loads
8. Resistance of materials
9. Access and egress
10. Construction of exits
11. Fire (access and egress)
12. Cladding and membrane light diffusion

Defining your greenhouse

Greenhouses or grow structures are intensive horticultural structures for growing or propagation of plants, flowers and vegetables and excludes retail and wholesale nurseries and conservatories.

There are three broad categories of greenhouses and grow structures referred to throughout this series of toolbox fact sheets. This helps to define the types and structures, and therefore the most likely common problems and solutions for each. The definitions are outlined below.

High technology:

High level greenhouses have a wall height of at least 4 metres, with the roof peak being up to 8 metres above ground level.

These structures offer superior crop and environmental performance.

High technology structures will have roof ventilation and may also have side wall vents. Cladding may be plastic film (single or double), polycarbonate sheeting or glass. Environmental controls are almost always automated.

Medium technology:

Medium level greenhouses are typically characterised by vertical walls more than 2 metres but less than 4 metres tall and a total height usually less than 5.5 metres.

They may have roof or side wall ventilation or both.

Medium level greenhouses are usually clad with either single or double skin plastic film or glass and use varying degrees of automation.

Low technology:

These greenhouses are less than 3 metres in total height. Tunnel houses, or “igloos”, are the most common type.

They do not have vertical walls and have poor ventilation.

This type of structure is relatively inexpensive and easy to erect. Little or no automation is used.

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FACT SHEET SAMPLE
Getting The Basics Right

Some of the most important initial considerations in establishing, expanding or modifying a greenhouse or grow structure development are covered below. These include site selection, as well as siting and design techniques.

Site Selection

Protected cropping enterprises must comply with a range of regulations that are designed to protect the environment, including the local amenity as well as the health and welfare of human occupants.

Appropriate siting can be considered the most cost-effective way of maximising environmental performance and reducing amenity issues such as odour, dust, noise, storm water management, visual prominence and the protection of surface water and ground water.

The following checklist identifies some of the factors you may wish to consider in selecting the correct site.

Farm Location

Amenity and environmental protection:

- Avoid locations that are in close proximity of towns, rural residential estates and hobby farms to reduce the likelihood of off-site impacts, objections to the application and having more conditions placed on the planning permit.
- Ask Council where future residential development is proposed to avoid encroachment issues in the longer term.
- Avoid locations within Declared Water Supply Catchments or land subject to flooding.
- Avoid locations with extremely reactive soils. Extremely reactive soils may result in deep, highly reinforced concrete foundations and slabs (where applicable).

Planning policy:

- The land should be zoned either Farming or Rural Activity Zone.
- Avoid land that has been identified for future residential development or development of earth resources.

Surrounding land use:

- Consider surrounding land uses and whether there is potential for cumulative impacts such as odour, dust, visual amenity, water quality, due to proximity to similar protected cropping enterprise farms.
- Areas worthy of consideration would generally have large scale farms, few rural houses and be surrounded by vegetation.

Site Layout and Size

Amenity and environmental protection:

- Consider the location, topography, size and shape of the site relative to neighbours taking into consideration prevailing weather conditions, particularly wind direction and potential risk of conflict with neighbours due to odour and noise issues.
- Sites for buildings and infrastructure should avoid rare or threatened species or ecological communities, areas of cultural heritage significance, drainage to waterways and wetlands.
- It is beneficial to purchase enough land to accommodate separation distances or buffers from sensitive uses within the property boundaries.
- The site for greenhouses and ancillary infrastructure should be relatively flat, cleared of native vegetation, setback from drainage lines and waterways and positioned in the landscape so that the topography provides natural screening or a vegetation screen is provided around exposed sites.
- Buildings and works are designed and constructed to minimise their visual impact.
- Close proximity to power and water connections will reduce infrastructure augmentation costs.

Infrastructure

Site access:

- Road and bridge infrastructure that provides access to the farm should support B-double transport
- Direct connection to major transport routes
- Routes that avoid urban and residential areas
- Design of access may be regulated by Council or Roads Authority
- Appropriate drainage and outside flooding zones or overlays.

IMPORTANT QUESTIONS TO ASK

- What relevant Toolbox fact sheets should I read before proceeding with a development?
- What do I need to consider when choosing the farm location, site layout and size?
- What are the infrastructure requirements for the type of structure I want to develop?
- Where should I locate the structures on my site?
- How should my proposed structure be designed and built?
- Who should I contact to discuss the siting and design requirements? (e.g. Local Council, roads, environment protection, natural resource management, water &/or fire referral authorities).

Vehicle access points:

- Should provide for safe, all-weather entry and exit for the number and types of vehicles with consideration for local road and traffic conditions.
- Located to minimise noise and light impacts on neighbours.
- Location of access points may be stipulated by Council or Roads Authority.

Internal roads and parking:

- Designed and sited to minimise noise and light impacts on neighbours.
- Designed and constructed to shed water to appropriate drainage. If relevant, Council may stipulate design requirements in Development Approval (DA).

Power:

- Three phase power is generally required for medium to high technology greenhouses.
- Natural gas is essential for medium to high technology greenhouses.

Water:

- Reliable supply of suitable quality water.
- Appropriate areas for storage of water for general use and/or fire fighting.
- Avoid locations near town storm water systems.

Siting and Design Techniques

The next important step is to think about where the structure(s) will be located on the site and what it will be built from after selecting an appropriate site. The aim should be to improve design outcomes and reduce the potential impact of large structures.

Siting of Structures

To achieve this, it's preferable the structure is located on land that fits with the surrounding gradient (topography) and considers other features such as vegetation characteristics, erosion prone areas, bush fire hazard areas, key views and local amenity.

On flat land it's important to:

- Locate structures with sufficient setback from roadsides and adjoining property boundaries.
- Utilise existing vegetation on the site to provide natural screening.
- Avoid siting structures directly in the view line of adjacent roads and dwellings.

If the structure has to be on hilly land then you may need to:

- Restrict development in areas that are visually prominent or highly exposed.
- Maintain existing ridge line planting and site structures.
- Avoid siting structures on very steep slopes (greater than 1 in 5)
- Locate structures to follow the contours of the land.

These siting guidelines assist in ensuring minimal earthworks and drainage design and construction is required, as earthworks can be a costly element of any construction project.

Design and Materials

It's essential to maintain a high standard of amenity and presentation with all protected cropping structures. This can be achieved for:

- Low and medium technology greenhouses or grow structures: through regular maintenance and replacement of the plastic and frames.
- High technology greenhouses or grow structures: by reducing building bulk, using non-reflective materials that blend with the dominant colours and textures of the surrounding environment.

Another key aspect is to mass, or group, structures together to limit the scattering of structures across the site.

This can be assisted by:

- Avoiding structures adjacent to roadsides and dwellings on adjoining land.
- Keeping the footprint of the structures below 60% of the total site area.
- Providing enough adjoining open areas to allow structures to be extended if required.
- Ensuring sufficient distances between buildings to reduce risk of fire spreading.
- Maintaining vehicle access points and doorways to easily service the structure.

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