

ROTHAMSTED RESEARCH CEREAL TRANSFORMATION SEED STORAGE ROOM SPECIFICATION

1.0 REQUIREMENTS

- 1.1 The research conducted at Rothamsted Research requires an accurate and reproducible controlled environment for seed storage.

For the proposed research, accurate control of temperature, relative humidity and negative pressure is needed.

For purposes of definition, the words "Seed Storage Room" will mean the total system.

A room is required for storage of seed which requires containment.

Energy consumption and lifetime costs are important to Rothamsted Research. An estimated energy usage is required for 4 situations.

- a) Room running at lowest temperature at 5°C and 10% humidity, on a mid-summer day (35°C ambient 60% RH).
- b) Room running at highest temperature at 20°C and 20% humidity, on a mid-winter night (-10°C ambient).
- c) Room running at highest temperature at 20°C and 20% humidity, on mid-summer day (35°C ambient 60% RH),
- d) Room running at lowest temperature at 5°C and 10% humidity, on a mid-winter night (-10°C).

Lifetime costs at 5 to 10 years to include maintenance and any replacement consumables (filters etc.) costs at (a)5 and (b)10 years.

The supplier should supply details and addresses of at least three seed storage room installations, with at least one of a similar design, with permission to approach the present room users.

2.0 PHYSICAL CONSTRUCTION

2.1 Materials

The seed storage room must be constructed of rustproof materials such as aluminium, stainless or coated steel, or plastic and all finishes must be non-phytotoxic. All materials must be demonstrably non phytotoxic.

2.2 Size

Due to constraints of the building design, room exterior dimensions should be a maximum of 2.54 metres wide by 3.63 metres deep and 2.75 metres high. There should be an accompanying lobby 1.3m wide by 2.54 long. Door into lobby should be at one end and door into the seed store in the centre.

2.3 Interior and Exterior Finish

The interior walls should be matt white. Walls should be smooth with a minimal number of crevices or joints. Walls will be impervious to gases or water. The walls should be of such a nature that surfaces are easily cleaned and will last at least twenty years without discolouring or corroding. Supplier will provide a list of materials suitable for cleaning the walls as well as a recommended cleaning schedule.

2.4 Insulation

The room will be well insulated with a high overall thermal resistance. The manufacturer will supply details of the thermal resistance of the whole room. Materials will be non-phytotoxic and resistant to decay or chemical breakdown, especially from water.

2.5 Floors

The seed storage room will have a floor that will have no drain. Because the floor will be exposed to water, nutrient solutions (>pH 5), soil, insect and plant matter, it must be made of material that will not rust, corrode, or otherwise deteriorate under normal horticultural use. The floor should be easy to clean with no cracks or crevices and lipped up at the sides to at least 5 cm. (except at the door).

2.6 Doors and Seals

A lockable access door is required to seed store and one to the lobby, capable of being fitted with the Rothamsted swipe card access system, Rothamsted to supply. A minimum access of 900mm wide and a height of 1800mm is required. To allow for observation of the working area without exposing them to the ambient atmosphere, the access door must have a window of at least 100mm x 100mm in size. Door seals must provide a good seal. The supplier will supply details of how to replace the seals, with the appropriate source of the seals and current purchase costs. Door seals must be non-phytotoxic.

Doors must be lockable but not from inside (i.e. if locked from outside, an individual inside can still get out)

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2.7 Shelving.

Sufficient shelving to provide a minimum 25 square metres of shelf space spread over 4 shelves at 40 cm intervals is required. The bottom shelf should be at 20 cm from floor with an upper covering 40-cm above top shelf. Total height being 1.8 metres. Shelves on one side should be open racking capable of taking 150kg per square metre of shelf. Shelving should be corrosion resistant and easily cleanable. The other side should be drawer units capable of taking 10cm wide by 13cm high seed packets. The supplier should supply options for different sized packets/configurations if possible.

2.8 Seed Storage Room Sealing

The seed storage room is a contained area and needs to be held at -30 pascals. Seals around doors and any cable entries should be appropriate.

2.9 Services

One double electrical socket, on far end wall of the seed storage room at 150cm from the floor is required, waterproof to IP 65. Costs of dehumidification in terms of parts required during a 5-year period and a maintenance schedule must be provided.

A double electric socket is required at far end of lobby with a telephone and IP connection.

A small work bench 1.3m wide, 60cm deep and 30 cm high is required at far end of lobby.

2.10 Pressurisation

The room, including the working lobby should be negatively pressured to ensure a 30 hPa pressure differential as compared to outside area. Air flow should be through the lobby into the room. Door seals etc. should be appropriate to ensure pressures are maintained.

2.11 Filtration.

Filters for any inlet and outlet air to maintain pressure should be accessible from within the room. Filtration to exclude 100 micron particles and insects or bigger should be fitted. Filters must be insect proof. Air flows and air exchange should make allowance for this.

3.0 ENVIRONMENTAL CONTROL

Temperature, humidity and pressure, must be controlled well enough to maintain the environment required for the research.

3.1 Temperature

The required seed storage room temperature range is 5°C to 20°C. The maximum differential, as measured at the point of control should be less than +/- 1.0°C as measured with a shielded aspirated temperature sensor. The supplier will provide details of the accuracy and characteristics of the sensor used.

A uniformity requirement of +/- 1.0°C with respect to the control temperature across the room at 1.5 metres from the base in the room. This will be measured with a shielded aspirated temperature sensor at 4 points in the room to be determined by Rothamsted Research.

A maximum vertical temperature gradient of +/- 1.0°C as measured at four points between the shelves in the shelved areas is required. The same uniformity requirement is required vertically and horizontally. Temperatures will be measured with a shielded, aspirated temperature sensor.

The supplier will provide documentation to support the temperature uniformity requirements for the temperature range 5°C to 20°C with lights on and off (where applicable) at intervals of 5°C.

The location of the chiller/refrigeration plant must be on the east side of the building.

3.2 Humidity

Negative humidity control to maintain relative humidity in the range 5 to 20% +/- 2% is required in the above temperature is required. A uniformity of +/- 2% humidity is required at the point of control. A NAMAS certified sensor is required and a recommended recalibration schedule should be provided. The sensor should be easily accessible for recalibration but not requiring recalibration or maintenance at less than 3-month intervals. Documentation must be provided to support the humidity range specified. The humidity sensor should be in the same location as the temperature sensor.

Dehumidification alone is required.

Dehumidification should be capable of removing at least a litre of water an hour.

Humidity stability must be achieved within 30 minutes of any control change.

3.3 Light

Only a working light(s) is required, supplying a light intensity of at least 1,000 lux. Lighting to this level to be provided in both lobby and seed store.

3.4 Pressurisation

The room should be negatively pressured with a visual indication of the negative pressure. There should be however sufficient air exchange with outside to ensure that Carbon dioxide levels from one occupant do not exceed OEL.

3.5 Airflow

There must be sufficient air movement in room to ensure temperature and humidity uniformity.

4.0 CONTROLS, MONITORING AND RECORDING

Reliability of the control system is of utmost importance and it must be of high quality and proven design. At least three examples of control systems in use must be provided by the supplier with addresses and permission to approach the user.

4.1 Temperature, negative humidity, and pressure, with each variable independently settable is required.

4.2 The controller(s) used will be capable of standalone operation independent of any external overseeing computer control and monitoring system. Any set points will be settable from the seed storage room. Visible displays of current temperature, humidity, negative pressure and set points where applicable, for these to be available on the front of the room.

4.3 The system must be capable of resuming operation automatically on restoration of mains power after a break. Due to high switching loads etc. within the building the controllers must be capable of withstanding anomalous power spikes etc. The controllers on each room should have the capability of being programmed from a host computer to permit programming and operation from a central location. However, each room controller(s) must have the necessary memory capacity to maintain control of the room if the host computer is not operating.

4.4 The controllers should have a proven reliability record.

4.5 The supplier will provide details of the accuracy of the systems used and the cost of spare controllers.

4.6 Full documentation and user training of software will be provided. The cost of a spare controller should be priced separately. The cost of training should be priced separately.

4.7 Room will require an energy monitor.

4.8 All software must be capable of interfacing over the Rothamsted Intranet with various Rothamsted users providing a record of conditions logged at user defined intervals and stored in an Excel compatible format for further analysis by users.

5.0 ALARM SYSTEMS AND OTHER EQUIPMENT

The seed storage room control panel should have a visual and audible alarm that is triggered by the high and/or low limit control(s) if their temperature, humidity or pressure settings are violated. A set of "volt free" contacts is required for connection to a remote alarm system, energised by an electrical system separate from that of the seed storage room.

5.1 Other Equipment

The controls, relays, or solid-state components, such as circuit boards and circuit breakers, must be easily accessible for service.

5.2 An emergency alarm is required to actuate a visible and audible trapped alarm outside the room (above door). A volt free contact to link into the Rothamsted alarm system is also required.

6.0 OPERATING CONDITIONS

The seed storage room will be housed in a building where the temperature will be 5 to 40°C. Humidities would be in the usual UK ranges.

7.0 INSTALLATION

Installation will be by the seed storage room manufacturer. An agreed plan for services and base layout will be provided. A timetable of works, including commissioning will be agreed prior to work commencing. Installation should be completed by June 2018.

7.1 All instructions and manuals including 4 hard copies of each will be provided to cover the operation of the room. A list of spares that should be held at Rothamsted with costs must be supplied. The supplier will provide training for a Rothamsted service engineer and one other on the supplier's equipment.

8.0 REFRIGERATION SYSTEM

A refrigeration supply for the room is required. A Chilled water system is preferred but consideration will be given to alternatives. The refrigerant used must have a GWP of 2000 or less.

9.0 STANDARD OF PERFORMANCE AND ACCEPTANCE OF EQUIPMENT

The specifications as laid out above will constitute the performance specifications to be met. Acceptance will only be made when testing performed by the supplier has been accepted by Rothamsted staff, which will be within a month of completion of installation by the supplier. If the performance specification has not been met, the appropriate modifications or repairs will be made by the supplier and any tests required accepted by Rothamsted staff.

10.0 TESTS DURING ACCEPTANCE PERIOD

When the equipment is installed the tests required to gain acceptance, temperature control, relative humidity control will be made. While this testing is underway, pressure and uniformity tests will be made.

11.0 WARRANTY

The warranty period and requirements should be clearly specified.

An indication of the support availability, expected time for an engineer to be on site and expected modes of resolution of a problem is required.