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Home storage room for fruits and vegetables

construction and operation

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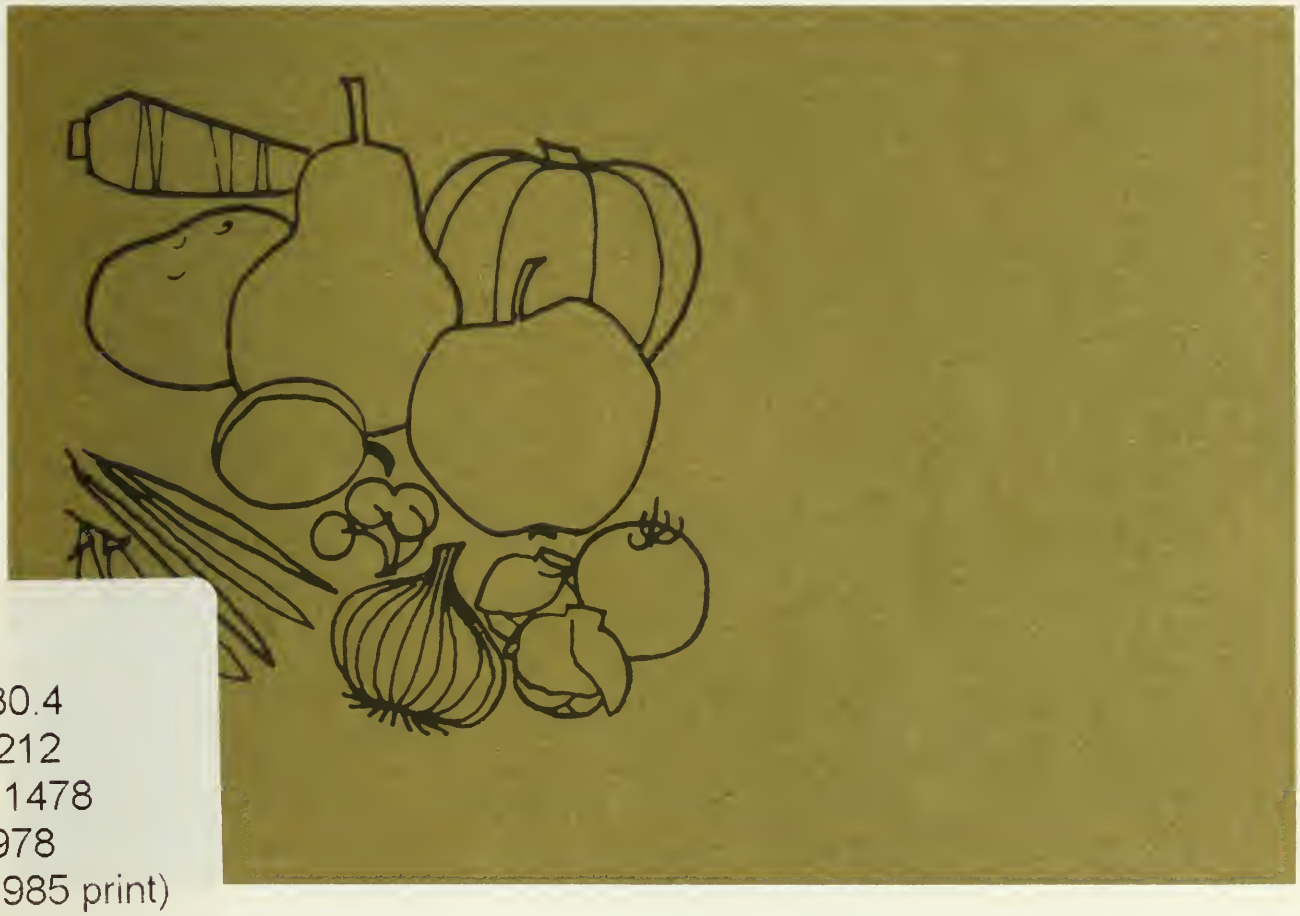

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Conservation domestique des fruits et des légumes.

Home storage room for fruits and vegetables

construction and operation

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INTRODUCTION

Many families have a surplus of fruits and vegetables from their gardens in the fall; others may wish to buy produce in bulk from local growers or roadside stands when prices are lowest. Keeping these fruits and vegetables sometimes presents a problem to the homeowner, because the basements of most homes are much too warm and dry for successful storage. However, an inexpensive storage room can be built in one corner of a basement, under a porch, front steps, or a bay window, or in part of a utility room.

Before building a storage area, consider the conditions required for each commodity you wish to store; some items such as apples need cool, moist conditions, whereas others such as pumpkins and squash need warm, dry ones. Still others, like onions or dried beans, require cool, dry conditions.

The best storage conditions for many kinds of fruits and vegetables are shown in Tables 1 and 2. The expected storage life of these products is also given in these tables. The temperature, humidity, air circulation, and ventilation should be controlled. When several kinds of fruits and vegetables are stored in one room, you cannot provide ideal conditions for each commodity, but you can try to work out the best conditions possible (Table 4). Special problems that arise from storing different fruits and vegetables together are described later in this publication.

STORAGE TEMPERATURE

Temperature is the most important factor in maintaining the quality of fresh produce in storage. Optimum temperatures are given in Tables 1 and 2. The temperature can be controlled by various methods, using either mechanical refrigeration or cool outside air. Mechanical refrigeration has the distinct advantage of providing controlled temperatures at all times, whereas cool outside air can be used only during the fall and winter months.

When you choose the method for temperature control, consider the cost and the amount of attention required to operate the storage room. Mechanical refrigeration costs more but provides the best temperature control with minimum attention. A suitable 373 W cooling unit can be purchased and installed for approximately $1000–$1500.

An automatic ventilation system is the next best method. It consists of a fan, louvers, ductwork, and a dual-control thermostat, and costs approximately $250. It usually provides good temperature control in the late fall and winter, but is not suitable for the warm spring and summer experienced in many parts of Canada. Although this method is less expensive it depends on the availability of cool outside air, and needs some attention to operate successfully.

You can obtain satisfactory temperature control very cheaply, usually for less than $75, by building a manually operated ventilating system. You need only some ductwork and sliding vents to control the airflow. With this system, though, you must be willing to spend some time checking temperatures and making the necessary adjustments to the sliding vents. It is also helpful to have a low-temperature warning device, such as a thermostat, installed in the storage room and connected to a buzzer located in your living quarters. *A reliable thermometer is essential for the proper operation of a home storage room*.

AIR CIRCULATION AND VENTILATION

Basically, nonrefrigerated storage depends on outside air being properly circulated in order to cool fruits and vegetables as quickly as possible after harvest and maintain suitable temperatures during the storage season. However, when fruits and vegetables are stored together, odors from one product may cause unpleasant flavors in another, particularly at higher temperatures. For example, odors from onions and potatoes affect the flavor of apples and other fruits if they are stored together for prolonged periods of time, and the volatile gases from apples may make carrots taste bitter. Compatibilities of fruits and vegetables for storage within a single room are described in Table 4.

If ventilation with fresh air fails to keep the storage room free from odors, you may have to keep produce in perforated polyethylene bags, or store crops such as onions or potatoes in a separate location. If the storage temperatures are maintained at 0–1°C, produce can be stored in 38 μm (1.5 mil) polyethylene bags perforated with numerous pin holes (25–50 pin holes per 20 kg of produce) to let air enter; too little oxygen may cause deterioration of fruits and vegetables. White, black, or green 38 μm (1.5 mil) polyethylene garbage bags are ideal for this purpose. Once filled with produce the bag opening can be closed either with a twist tie or by other means. The bags also help to prevent moisture loss from the produce. *However, it must be stressed that most commodities which have an optimum storage temperature above 0°C are not readily adapted for storage within perforated polyethylene bags*. Decay of produce stored in high humidity (polyethylene bags) becomes a major concern when produce temperatures are greater than 0°C (see Table 2 for recommended storage temperatures).

When the outside air temperature is unsatisfactory for ventilation you must close the vents, and this may cause odors to accumulate. You can

partly overcome the buildup by occasionally opening the storage room door until the odors subside. Usually, airing the room for 1–4 hours is sufficient.

Substantial increases in storage quality of some fruits and vegetables can be achieved by the insertion of a rotary–oscillating blade fan. A fan will circulate air within the storage room and provide a uniform temperature. This method has the advantage of making temperature control more precise, eliminating cold and warm spots within the storage. One disadvantage, however, is that the operator cannot utilize the different storage temperatures to store various temperature-sensitive produce in the appropriate temperature area.

STORAGE HUMIDITY

High humidity in the storage area is important in order to maintain high quality in many stored products. Mechanical refrigeration or cooling by ventilation causes a loss of humidity. To replace the humidity, pour water on the floor at intervals to keep the floor wet and maintain humid conditions. During the fall, when the most refrigeration or ventilation is required, the floor needs wetting more often than during the winter. A slatted duckwalk for the floor provides space for air circulation under the produce, and also keeps your feet dry when you enter the storage area.

You can reduce the loss of moisture from fruits and vegetables such as apples and cabbages by storing them in 38 μm (1.5 mil) perforated polyethylene bags (25–50 pin holes per bag). The bag opening must be closed off once the produce has been placed in the bag. This will maintain the humidity of the air in the bag at approximately 90–95%. A 38 μm (1.5 mil) perforated polyethylene sheet placed over hampers, baskets, or boxes will also help to prevent shrinkage.

SANITATION OF STORAGE ROOM

Keep the storage room free from any decaying fruits and vegetables, because molds and bacteria can spread to the sound produce. Also, the decayed material may stick to containers and become a source of disease contamination. Thoroughly clean and wash the storage room and all storage containers with a detergent and disinfectant after each storage season. Apply two coats of moistureproof paint on the interior of the storage room to improve its appearance and provide sanitation. As a further precaution, spray the storage room and containers with a recommended fungicide. Contact your local plant pathologist or agricultural representative for the latest list of recommended fungicides.

Choose fruits and vegetables that are free from disease at harvest. Preferably, they should come from fields or gardens where good disease-control practices have been followed. Do not store cracked, bruised, or decayed produce, and handle fruits and vegetables carefully during harvest to avoid injury. During the storage season, check through your stores from time to time and remove all decayed produce to prevent the spread of

disease to sound fruits and vegetables nearby. If these precautions are not taken, serious losses from decay are likely to result.

Keep the storage room well ventilated and at a high temperature when not in use. This helps to extend its useful life.

STORAGE OF FRUITS

Most kinds of fruits require cool, moist storage conditions. A temperature of −1.1 to 0°C is suitable for all fruits listed in Table 1 except cranberries, which require 2.2−4.4°C, and early Japanese plums, which need 4.4°C. Table 1 shows the storage life expectancy for many kinds of fruits, and Table 3 shows the normal and maximum storage period for some varieties of apples. Tables 1 and 2 give the recommended storage temperatures. Refrigerated storage can provide these temperatures at all times, but ventilated storage can only provide them during the late fall and winter months. The value of a cool basement for storing soft fruits such as raspberries and strawberries should not be underestimated.

Several types of fruits show the potential for extended storage when placed in completely sealed and unperforated polyethylene bags. The storage life of sweet cherries stored at 0°C can be extended by enclosing each 10-kg lot in a tightly sealed 38 μm (1.5 mil) polyethylene bag, and the storage life of certain apple varieties, i.e. Spartan, stored at 0°C can also be extended by enclosing each 20-kg lot in a similar type of bag.

Clapps Favorite pears can be stored at 0°C until late December, but they must be packaged in groups of three or four and be tightly sealed (heat sealed preferably) in 25 μm (1.0 mil) polyethylene bags to obtain the best results.

STORAGE OF VEGETABLES

Cool, moist conditions are required for most vegetables, but some vegetables need warmer temperatures because they are easily injured by chilling.

Vegetables requiring cool, moist conditions

Only late-harvested vegetables that store best under cool, moist conditions should be placed in ventilated storage. These include beets, cabbages, carrots, celery, parsnips, potatoes, and rutabagas. Select sound, well-developed, mature vegetables and discard any showing signs of injury or decay. Root crops should be reasonably dry when placed in storage.

Root crops (beets, carrots, parsnips, and rutabagas) lose moisture readily and tend to shrink in storage. To help prevent this, keep them in perforated polyethylene bags or in containers covered with polyethylene sheets.

Cabbages should be trimmed and stored in perforated polyethylene bags to help retain moisture and color. Keeping cabbages in the dark or using black polyethylene bags also reduces moisture loss.

Celery can be stored if you lift the plants with the roots intact and set them close together in boxes of moist soil. Keep the soil moist but do not get water on the tops because this encourages decay.

Potatoes for regular home use are of better quality if you store them at a temperature of 4.4–10°C. Potatoes stored at lower temperatures tend to become sweet. To impove the quality when the temperature is below 4.4°C, remove some from storage periodically and recondition them at room tempertaure for 1–2 weeks before use. For storage at 0°C, provide an insulated bin for potatoes; this allows their own heat, produced by respiration, to protect them from sweetening. The bin should be vented to allow air to enter, because too little oxygen can cause black heart disease.

Vegetables requiring warm, dry conditions

Store green, pink, or ripe tomatoes in a warm, dry area such as a heated basement. Place them, preferably one layer deep, in shallow trays. Ripe tomatoes keep for 1–2 weeks, and green ones keep for 2–6 weeks. Inspect them at regular intervals and remove the ripe ones. Discard any tomatoes that are rotting. Green tomatoes should be kept at 12.8°C or above for satisfactory ripening, but ripe tomatoes can be stored at temperatures just above freezing for 1–2 weeks.

Store pumpkins and winter squash on shelves in a heated basement, placing them so that they do not touch one another. They should have been handled carefully and be well-matured and free from injury and decay. Cure them for about 2 weeks in a dry location at 26.5–29.5°C before setting them in storage.

Vegetables requiring a cool, dry location

Dried beans, peas, or popcorn can be kept in an attic, outside porch, or unheated room, but they should be stored in unperforated polyethylene bags or in glass jars to keep them dry.

Onions need to be cured for several weeks in a warm, dry, well-ventilated location. Let them dry until the skins rustle. If they are mature and dried, they will keep for several months in an attic or unused room where the temperature does not drop below freezing. You can also store them for a short time in a ventilated storage room, but it is best to store onions in a separate location.

KEEPING QUALITY AFTER COLD STORAGE

After fruits and vegetables have been removed from storage they do not keep as long as freshly harvested produce, because some of their shelf life is lost in cold storage. Extremely perishable kinds of fruits and vegetables have a short storage life and should be used without undue delay.

Frequently, moisture condenses on the surface of produce when it is removed from cold storage. This is known as sweating, and it should be prevented whenever possible because it encourages decay. You can avoid the sweating to some extent if you allow the produce to warm up gradually in a dry location when you remove it from storage.

SELECTION OF THE STORAGE ROOM SITE

Plans for construction of a home storage room for fruits and vegetables are provided in this publication (Figures 1–4).

The corner of a basement makes an excellent location, because you only need to build two walls and a ceiling. Other suitable locations are the "L" portion of a basement, or space under a porch, concrete slab, or bay window (see Figure 1). If there is no basement, an aboveground location such as a utility room can be used.

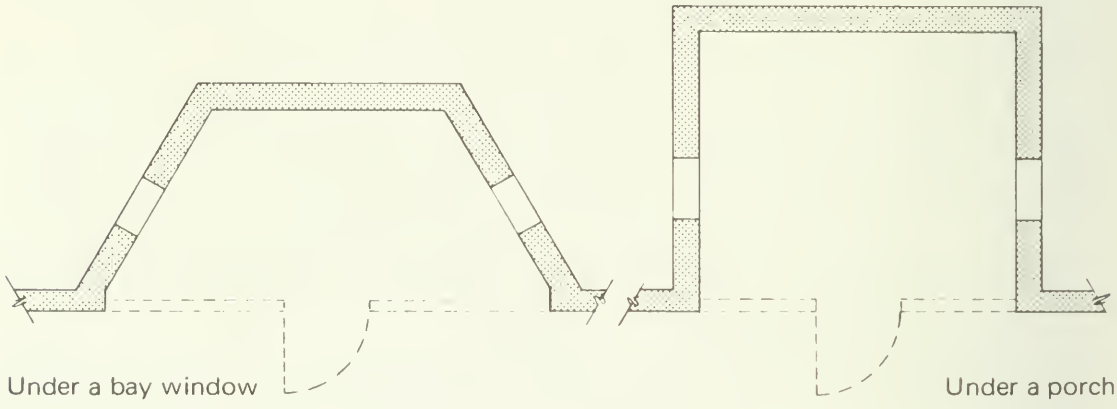

FIGURE 1 Suggested locations for a cellar storage room.

STORAGE ROOM IN BASEMENT

To provide satisfactory storage conditions, a basement storage area must be well insulated and equipped with a ventilation system for cooling. Many cellars are not suitable for storing fruits and vegetables because they are too hot and too dry. You can overcome these problems by constructing a room in one corner and providing access to outside air by venting through a window.

Size

An area 3 × 3 m (Figure 2) gives enough storage room to suit most families. You can make it larger or smaller, or divide it into separate sections for your fruits and vegetables, to suit your own needs.

Walls and door

The walls to close off the area for the storage room can be framed with 38 × 89 mm studs on a concrete footing. Place insulation between the studs and a vapor barrier on the outside (warm side) of the insulation to prevent condensation from forming in the insulation and rendering it ineffective. Batt type insulation (Figures 3 and 4) usually has a vapor barrier on one side; for insulations without a vapor barrier, use 0.1 mm polyethylene. If polystyrene board insulation is used, it can be fastened to either the inside or the outside face of the studs as long as the polyethylene vapor barrier is outside of it. When plastic insulations such as polystyrene and polyure-

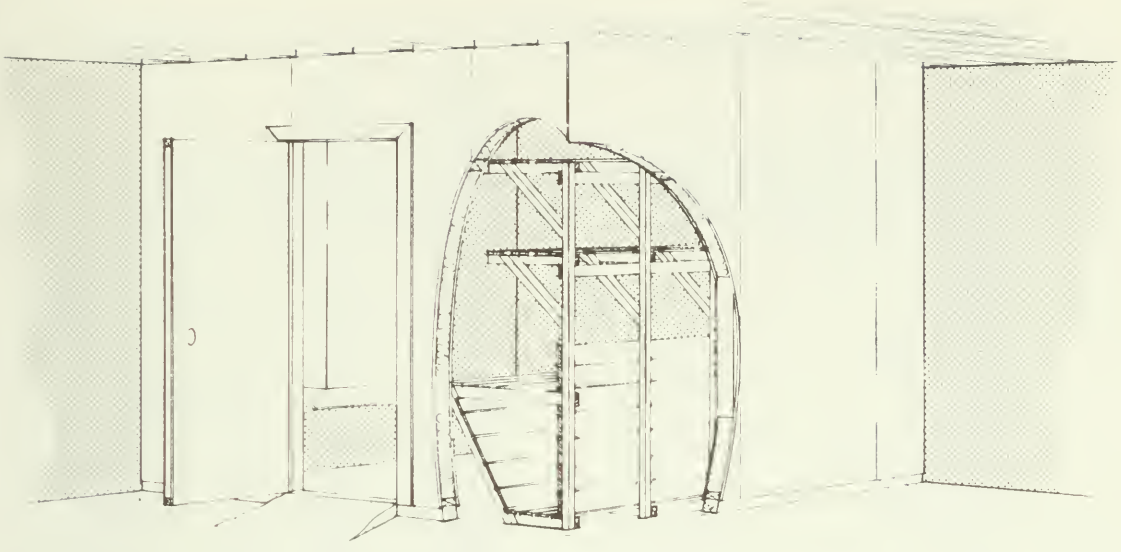

FIGURE 2 Perspective view of a storage room in a basement corner.

thane are used inside buildings, the National Building Code of Canada requires that their exposed surfaces be covered with hardboard or plywood sheathing, because plastic insulations are a fire hazard. With all types of insulation, plywood or hardboard sheathing can be placed on both sides of the wall. The resistance (R) value of the insulation should be RSI-1.76 (R-10) for the walls and RSI-3.52 (R-20) for the ceiling.

Provide an opening in one of the walls for an insulated door. Construct the door with 38 × 38 mm wood framing, cover it with 6 mm plywood, and insulate it with the same material as used in the wall. Fit the door tightly, preferably with weather stripping.

The floor plate should be 100 mm above the level of the floor (see Figure 4) on a concrete footing. This raises the wooden wall above the level of water used on the concrete floor to maintain high humidities.

If the storage area faces south, or if the cellar does not go far below ground level, you may have to insulate all walls. If mechanical refrigeration is used, all walls should be insulated and should extend to the floor. In that case, the interior face of the lower 100 mm of the walls must be damp-proofed by a pargeting of portland cement plaster, and then covered with a heavy coat of bituminous material.

Ceiling

The 0.1 mm polyethylene vapor barrier must be above the insulation (on the warm side) and lapped with the wall vapor barrier. An easy way to insulate the ceiling is by stapling the vapor barrier to the floor joists, then fastening polystyrene board insulation below it with insulation nails. Make certain that all joints in the insulation butt tight, otherwise condensation will form on the upper surface of the vapor barrier at the insulation joints. The underside of the insulation must be sheathed for fire protection. Another method is shown in Figure 4. Fasten polystyrene insulation to the bottom of the floor joists, and place batt type insulation with the vapor barrier side up between the joists. This method is more difficult and costly than the first.

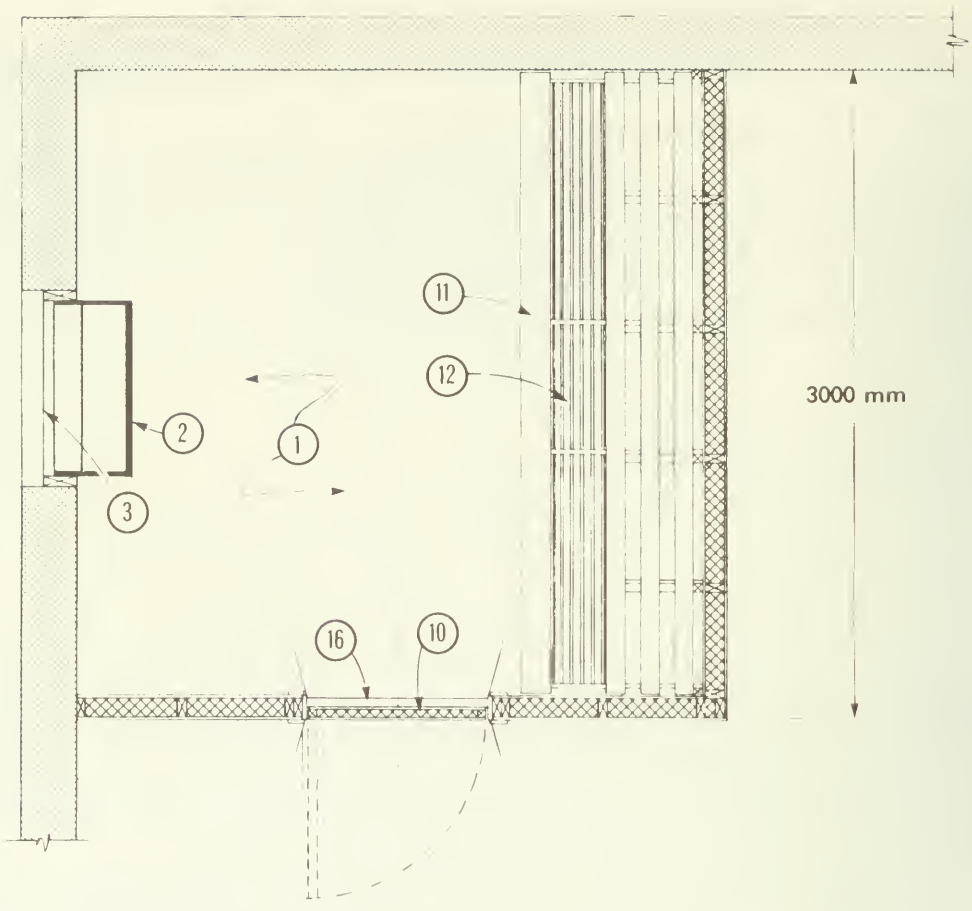

FIGURE 3 Top view of a storage room in a basement corner.

Shelves and bins

An arrangement of shelves and bins is shown in Figures 2 and 4. All shelves and bins are of slatted construction to permit good air circulation. Leave a 100-mm space between the concrete floor and the first shelf or the bottom of the bins. This protects the produce and the wooden bins from water placed on the floor to maintain humidity.

OPERATION OF A VENTILATING SYSTEM

There are three methods for operating a ventilating system: automatic, semiautomatic, and manual. The main difference between them is the ease of control, and although automatic controls are more expensive they do not need daily adjustments and they reduce losses due to human error.

Automatic system

For an automatic ventilating system, a fan and louvers are set in the upper half of a basement window. They are controlled by a differential thermostat. The lower half of the window opening is equipped with an air duct that extends 450 mm from the floor (Figure 3). Because light must be excluded from stored vegetables, cover the remainder of the window with

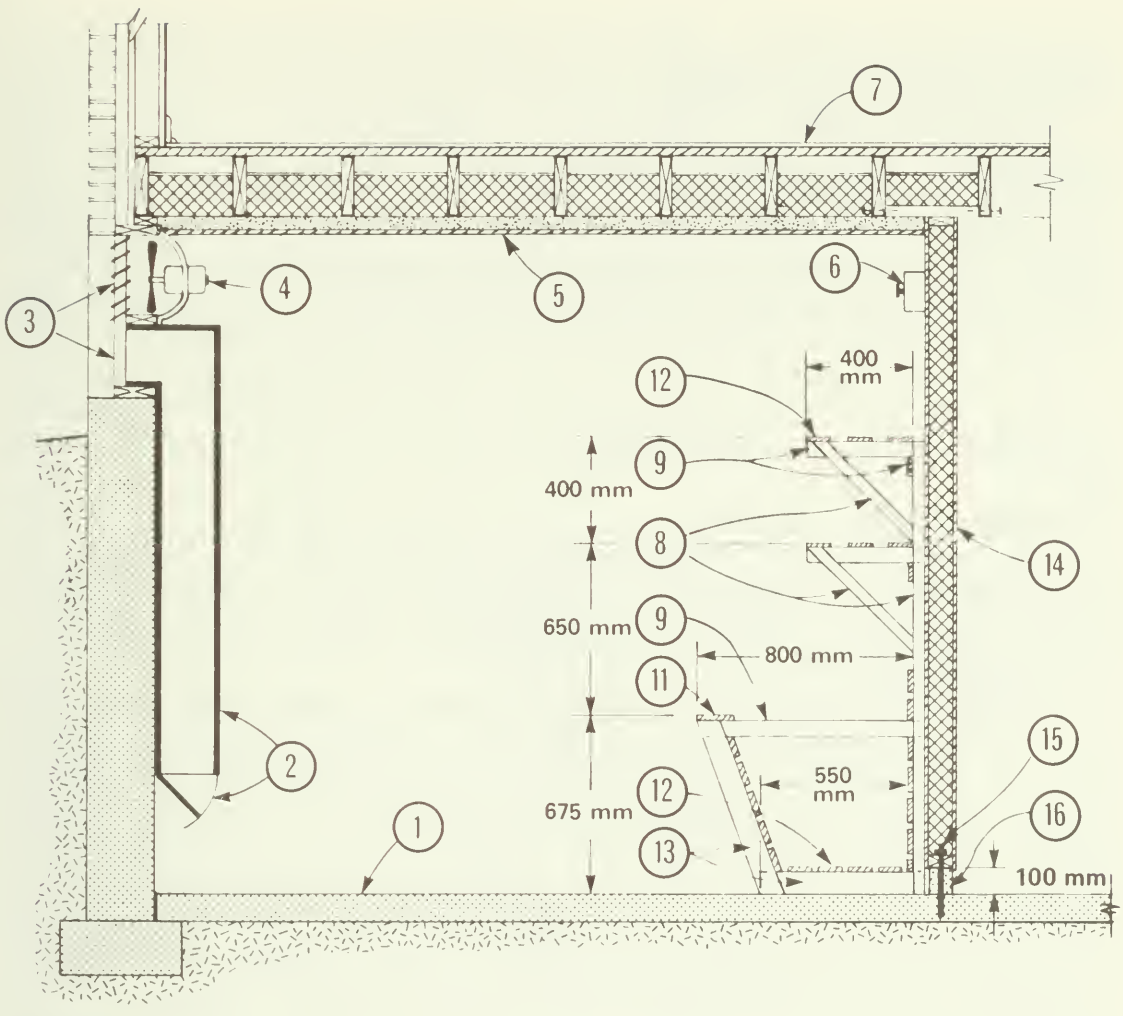

FIGURE 4 Cross section view of a storage room.

LEGEND FOR FIGURES 3 AND 4

1. existing basement floor
2. fresh air intake duct and damper
3. exhaust and intake openings to be screened
4. fan, located in basement window opening
5. 6 mm exterior graded plywood, 50 mm polystyrene insulation under floor joists, 75 mm batt type insulation between joists, vapor barrier side up
6. thermostat for fan
7. finished floor
8. 38 × 38 mm lumber
9. 19 × 64 mm lumber
10. 800 × 1950 mm insulated door
11. 19 × 140 mm bin stringer
12. 19 × 89 mm bin and shelf slats
13. 38 × 89 mm bin frame
14. 6 mm exterior grade plywood, 38 × 89 mm studs 600 mm center-to-center, 75 mm batt type insulation, vapor barrier side out, 6 mm exterior grade plywood
15. 6 mm anchor bolts into floor 1500 mm center-to-center
16. 100 mm concrete curb and ramp at door

6 mm plywood. Cover the intake and exhaust openings with screening to keep out insects and rodents.

When you install the differential thermostat, place one bulb inside the storage and the other outdoors, protected from direct sunlight. The differential thermostat starts the fan when the outside air is cooler than the inside air. Ventilation continues until the inside and outside temperatures are nearly the same, or until the inside temperature reaches whatever level you have selected. When the outside air is warmer than the storage air, the dual-control thermostat shuts off the fan and closes the louvers.

To prevent freezing during excessively cold periods, it is best to include a thermostatically controlled electric heater set to start when the temperature of the storage room air is at −1°C.

Semiautomatic system

The semiautomatic ventilating system is similar to the automatic one, except that the fan and louvers are controlled by only one thermostat and the fan and louver control must be operated manually when the outside air temperature is warmer than the storage air.

Set the thermostat controlling the fan motor to shut off the fan whenever the air in the storage room reaches the required temperature, usually 0–1.7°C. Fit both the exhaust opening and the intake opening with a set of louvers that close automatically when the fan stops. This prevents outside air from blowing into the storage room. Check the louvers after snow or sleet storms, to ensure that they are not blocked by snow or ice and that they are working properly. To minimize this difficulty, do not install the system in windows that are exposed to the prevailing winds. Provide some form of heating to prevent freezing and avoid losses of stored produce.

Manual system

A manual ventilating system is inexpensive and can be used provided you have time to check temperatures and make the necessary adjustments to vents. Instead of the fan, install a sliding vent in the exhaust opening and another one at the intake opening. When these are open, cooler air from the outside enters through the air duct and the warm air goes out through the exhaust opening. This is a less costly means of ventilation, but there is more risk of freezing injury to the stored products. To control temperatures manually in the early fall, when nights are cool and days are warm, open the vents during the night and close them during the day. When the weather becomes cooler the vents may be left partly open for continuous periods. Some form of heating is needed to prevent freezing.

MECHANICAL REFRIGERATION

To maintain controlled temperatures at all times, a suitable 373 W mechanical refrigeration cooling unit can be obtained commercially. If mechanical refrigeration is used, ventilation through a window is not required. Cooling by mechanical refrigeration has the distinct advantage of being operable during the summer months when cherries, raspberries, strawberries, and other products are available.

WARNING: If more than 1000 kg/day of new produce are to be added to the storage, a heavier unit is necessary. This system is not designed to take care of a buildup of frost on refrigerator cooling coils. Take advantage of cool night temperatures to cool produce before placing large quantities in the storage room, as this will reduce the load on the refrigeration unit.

When mechanical refrigeration is used, the door must have a safety latch so that it can be opened from the inside. It is also a wise precaution to install a buzzer or warning bell. Fit the door with a lock to keep children out.

TABLE 1 Recommended storage temperatures, relative humidities of fresh fruits, and storage life expectancies*

Fruit	Recommended storage temperature °C	Relative humidity %	Storage life expectancy
Apples	−1.1–0.0	85–90	as per variety (Table 3)
Apricots	0.0	85–90	1–2 weeks
Blackberries	same as raspberries		
Cherries			
sweet	0.0	85–90	2–3 weeks
sour	0.0	85–90	few days
Cranberries	2.2–4.4	80–85	2 months
Grapes, American	0.0	85–90	1 month
Peaches	0.0	85–90	2 weeks
Pears			
Bartlett	−1.1	85–90	2–3 months
fall and winter	−1.1	85–90	3–5 months
Plums			
early Japanese	4.4	85–90	few days
other	0.0	85–90	4–6 weeks
Raspberries	0.0	85–90	few days
Strawberries	0.0	85–90	5–10 days

*Based on information from Agric. Can. Publ. 1532, *Commercial storage of fruits and vegetables* by S. W. Porritt. 1974.

TABLE 2 Recommended storage temperatures, relative humidities of fresh vegetables, storage life expectancies, and suggested methods for extended preservation*

Vegetable	Recommended storage temperature °C	Relative humidity %	Storage life expectancy	Suggested methods for extended preservation
Asparagus	0.0	95	3 weeks	freeze or can
Beans				
green or snap	7–10	85–90	8–10 days	freeze or can
lima				
shelled	0.0	85–90	2 weeks	freeze or can
unshelled	0.0	85–90	2 weeks	
Beets				
bunched	0.0	90–95	10–14 days	
topped	0.0	90–95	1–3 months	
Broccoli				
Italian or sprouting	0.0	90–95	1 week	freeze
Brussels sprouts	0.0	90–95	3–4 weeks	freeze
Cabbage				
early	0.0	90–95	3–4 weeks	
late	0.0	90–95	3–4 months	
Carrots				
bunched	0.0–1.1	95	2 weeks	
topped	0.0–1.1	95	4–5 months	
Cauliflower	0.0	90–95	2 weeks	freeze
Celery	0.0	95+	3 months	
Corn, sweet	0.0	90–95	8 days	freeze or can
Cucumbers	7.2–10	95	10–14 days	
Eggplants	7.2–10	85–90	10 days	
Endive or escarole	0.0	90–95	2–3 weeks	
Garlic, dry	0.0	70–75	6–8 months	
Horseradish	−1.1–0.0	90–95	10–12 months	can
Kohlrabi	0.0	90–95	2–4 weeks	freeze
Leeks, green	0.0	90–95	1–3 months	
Lettuce, head	0.0	95	2–3 weeks	
Melons				
cantaloupe or muskmelon	0.0–7.2	85–90	2 weeks	
honeydew	7.2–10	85–90	2–3 weeks	
watermelon	2.2–4.4	85–90	2–3 weeks	
Mushrooms				
cultivated	0.0	85–90	5 days	freeze

TABLE 2 - Continued

Vegetable	Recommended storage temperature °C	Relative humidity %	Storage life expectancy	Suggested methods for extended preservation
Onions				
set	0.0	70–75	5–7 months	
dry	0.0	50–70	5–9 months	
Parsnips	0.0	95	2–4 months	
Peas, green	0.0	95	1–2 weeks	freeze or can
Peppers, sweet	7.2–10	85–90	8–10 days	freeze
Potatoes				
early	10	85–90	1–3 weeks	
late	3.9	85–90	4–9 months	
Pumpkins	7.2–10	70–75	2–3 months	
Radish				
spring, bunch	0.0	90–95	2 weeks	
winter	0.0	90–95	2–4 months	
Rhubarb	0.0	90–95	2–3 weeks	freeze
Rutabaga or turnip	0.0	90–95	6 months	
Salsify	0.0	90–95	2–4 months	
Spinach	0.0	90–95	10–14 days	freeze or can
Squash				
summer	7.2–10	70–75	2 weeks	
winter	7.2–10	70–75	6 months	
Tomatoes				
ripe	0–10	85–90	3–5 days	
mature green	12.8–15.6	85–90	2–6 weeks	

*Based on information from Agric. Can. Publ. 1532, *Commercial storage of fruits and vegetables* by S. W. Porritt. 1974.

TABLE 3 Normal and maximum storage periods for some common apple varieties*

Variety	Storage period	
	Normal months	Maximum months
Gravenstein	0–1	3
Wealthy	0–1	3
Grimes Golden	2–3	4
Jonathan	2–3	4
McIntosh	2–4	4–5
Cortland	3–4	5
Spartan	4	5
Rhode Island Greening	3–4	6
Delicious	3–4	6
Stayman	4–5	5
York Imperial	4–5	5–6
Northern Spy	4–5	6
Rome Beauty	4–5	6–7
Newtown	5–6	8
Winesap	5–7	8

*Based on information from Agric. Can. Publ. 1532, *Commercial storage of fruits and vegetables* by S. W. Porritt. 1974.

TABLE 4. Storage compatibility of fresh fruits and vegetables

☐ Compatible

0 Compatible if commodity requiring high humidity is enclosed in polyethylene liner.

1 Undesirable for optimal storage quality due to differing temperature requirements. Short-term holding may be possible by maintaining storage temperature at the minimum allowable for the low-temperature sensitive commodity.

2 Undesirable flavor transfer may develop in storage. This can be reduced by storing one of the commodities in a perforated polyethylene garbage bag.

3 Incompatible for long storage periods due to cross-commodity deterioration of produce quality.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm^2)	x 0.15	square inch
square metre (m^2)	x 1.2	square yard
square kilometre (km^2)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm^3)	x 0.06	cubic inch
cubic metre (m^3)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre