lorry, also jacket cooled. These plants were then held until the main stores were restarted in November and were then transferred. We transplanted this stock in January, 1970 and achieved a 70% take. We then potted 25 of the remaining plants on the 19th May, 1970 and of these 24 have survived. I have a sample of these plants for members to see, also a sample of the original plants as first stored in December, 1968. The temperature of the store was held at 32° F. and humidity at 94 to 96%. Although this trial only covered one species we were quite pleased with the results. Obviously much more information is needed on other species before any large storage of plants can be carried out.

Storage was another question about which we needed to know more. We had been storing conifers in racks in an upright position, as this was recognized practice. The drawback to this method is that a lot of storage space is lost. As we had large numbers of *Picea sitchensis* we decided to use crates to store the plants. The bare-root plants were tied in bundles of 50 and stacked horizontally in the crates. Size of crates was 2 ft. x 2 ft. x 3 ft. 10 inches, in order to fit our lorries. The crates were stacked 5 high on 5 in. floor pallets so as to permit a hand stacker to handle the crates. The stacks of crates were three deep with a gangway wide enough to handle the stacker. The plants were stored quite safely for five months. Using this method plants can be brought out of the store on the stacker 2 to 3 crates high and taken straight to the lorries where they are transferred to rollers fitted to bed of lorry. The crates are then pushed to front of the lorry and stacked.

We have had no major trouble with stock stored in this manner. It is important to ensure that stock is brought into the store with the foliage as dry as possible, and that plants with damage caused by lifting should be watched as mould can form on damaged parts. Thiram dust is blown through the store by hand blower to control mould.

I have with me several plants which have been in cold store for up to eight months for members to see.

GENERAL INFORMATION ON COLD STORAGE OF NURSERY PLANTS IN JACKET-COOLED STORES

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In 1956 the first jacket-cooled store room for nursery plants was erected for the nursery exporting company, Danplanex, of Rødekro, Denmark, and today cold storage of nursery plants has become indispensable for the modern European nurseries. During the past

years valuable individual experiences have been achieved in cold storage of all nursery plants.

Before the jacket cooling system was developed, some very primitive experiments were made in storing plants in normal direct-cooled cold stores, but to avoid drying up the plants it was necessary to pack the plants into airtight bags or boxes because of the very low humidity and the air circulation in these stores. The demand today is storing lifted (and well-ripened) plants from autumn until the normal (or extended) time of next year's planting or lining out with complete preservation of growing abilities without the necessity of wrapping up the plants.

A suitable low temperature (0° C or 32° F) is required to keep the plants dormant without any risk of frost damage to the fine root fibers, and a suitable high relative humidity (95 — 98%) causes the plants not to dry up, and it keeps the loss of weight down to a minimum. To fulfil these demands a completely uniform temperature all over the cold store has to be established, the relative humidity must constantly be kept close to the saturation point, and at the same time there must be no movement in the room air inside the store.

The cooling down of a room is normally achieved by mounting a cooling coil in the insulated room in connection with a compressor (condensing) unit outside the room, which evaporates and condenses respectively, one in the pipe system circulating refrigerant. The bigger the cooling surface of the coil the less the difference becomes between the coil temperature and the room temperature, and the less the air is dehydrated. With traditional direct cooling it is difficult to bring this temperature difference below 6° C (10° F); this is to say that the air that leaves the cooling coil is —6° C (22° F) when the room air is 0° C (32° F). The cold air must be prevented from blowing directly on the plants, therefore it is necessary to establish a safety zone with no plants, which means a heavy loss of storage room. To avoid this low temperature airstream in the store, jacket-cooling is preferred.

A jacket-cooled store is an insulated room with a built-in box made of asbestos plates, which have a high heat transmission. The cold air from the coil circulates between the asbestos jacket and the insulated walls, ceiling and floor. This airstream must not be so cold that condense drops or ice is formed on the inside of the jacket. Therefore a constant air circulation is established over the jacket and, in the mixing chamber, the refrigeration system provides for the adding of a suitable quantity of cooled air to the constantly circulating air, by which the temperature difference between the jacket surface and the room air is decreased to about 1½° C (3° F), and internal condensation ice is avoided. The refrigeration unit is automatically working and does not need daily inspection.

At the end of the sorting time and when the quantity of stored plants is reduced, it may be necessary to add moisture to the air. At a temperature of about the freezing point very little added water is enough to saturate the air. The most simple way to do this is to sprinkle water on the floor (never on the plants!). The best indication for need of sprinkling is when the concrete floor becomes white dry.

When the plants are to be stored it is very important that they are well ripened and that growth has ceased; deciduous plants should have lost their leaves. If the plants are stored in the early spring they need to be brought in before they start growing. A healthy plant is not damaged from direct cooling, but an unripened or bad plant will not become any better from cold storage.

The plants must be surface dry when they are brought in as wet plants might contribute to the possibility of fungal attack.

When the plants are being brought in the room temperature must fall at an even rate (as in nature!). Once 0° C (32° F) is achieved this temperature is maintained until the plants are taken out again.

It is possible to grade, cut back and pack during the storage time, which is important to nurseries where lifting machines are used and great numbers of plants accumulate in a short time. The consignment of plants for bigger orders can be packed and kept in the cold store until dispatch without any risk of disease.

When the cold store is empty it should be thoroughly cleaned out and ventilated, including the shelves, pallets, boxes and anything else used in the store.

The use of a cold store is of great importance to practically all nurseries. It is possible to extend the grafting season until there is a convenient time for it, because the cutting material can be held back in the cold store. Seedlings can be held back to be lined out when the conditions are good. Orders can be sent off when the customers (and the plants) are ready. Bigger orders can be collected in the cold store for later dispatch. In other words, the work load can be spread more evenly over the year, thus reducing wasted labor to a minimum.

When the cold store is to be erected, it is necessary to establish a close co-operation between the architect, the building contractors and the supplier of the cooling system, because the cooling unit has to be exactly proportioned to the building.