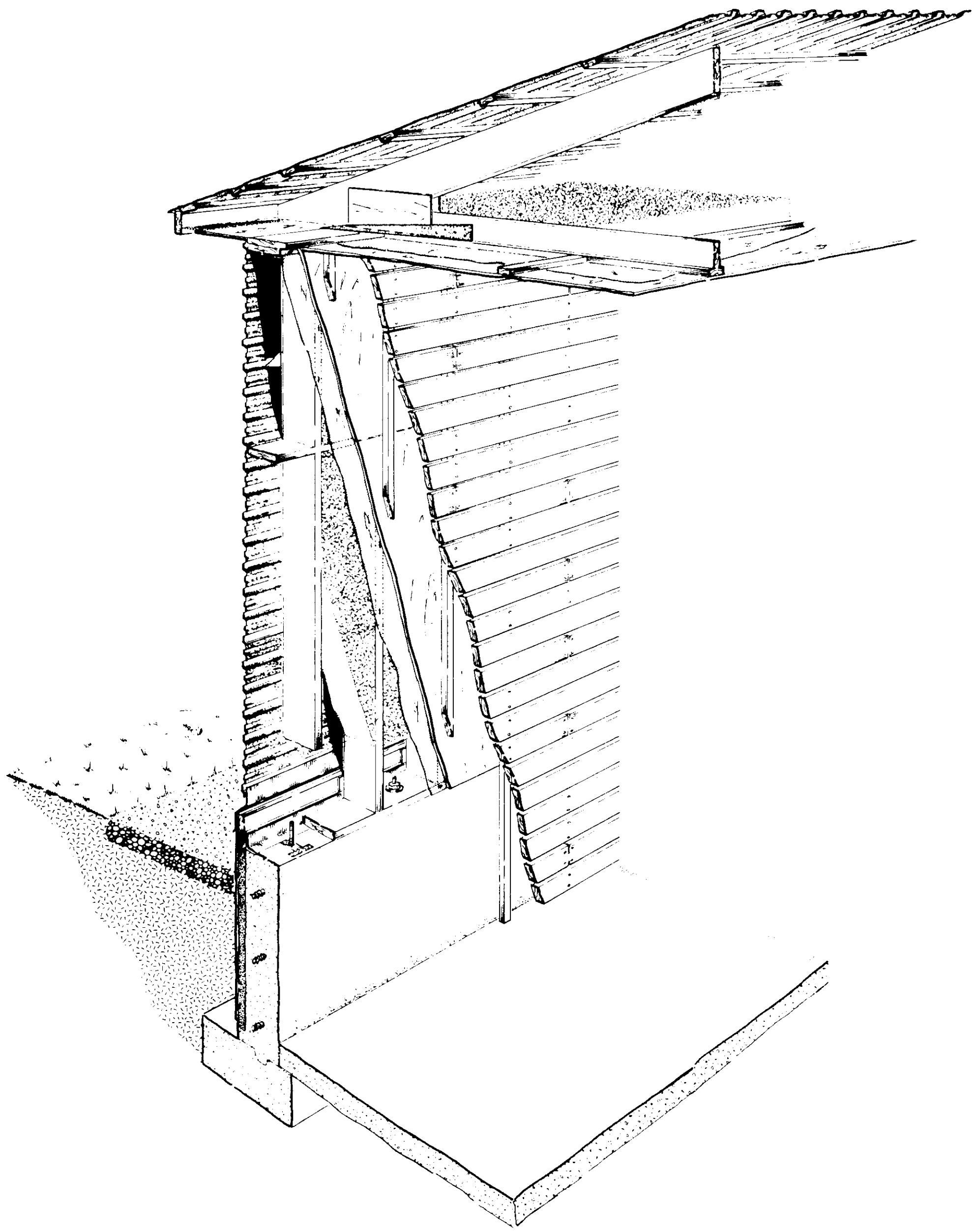
BULK VEGETABLE STORAGE WALL (NOT REFRIGERATED)



CANADA PLAN SERVICE

The Canada Plan Service prepares detailed plans showing how to construct modern farm buildings, livestock housing systems, storages and equipment for Canadian Agriculture.

This leaflet gives management information and describes one of these detailed plans. To obtain a copy of the Canada Plan Service detailed plan, contact your local provincial agricultural engineer or extension advisor.

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PLAN 6110 REVISED 83:04

This plan is to be used as a component for large commercial winter storage of bulk fruits and vegetables, where the outside temperature is almost always cooler than the controlled temperature inside the storage. This condition permits the least-cost insulated construction possible using friction-fit fiberglass insulation to fill the wall space, and a single vapor barrier at the "warm" (or storage) face of the insulation.

If you use refrigeration to extend the storage period into warm weather, a vapor pressure reversal will occur whenever warm humid weather arrives. This can push atmospheric moisture into the insulated wall spaces, and this moisture will condense on the cooled insulation side of the vapor barrier, soaking the insulation. In this case, a more expensive moisture-resistant insulation (such as foamed-in-place polyurethane) should be used; see Plan 6111, Refrigerated Bulk Vegetable Storage Wall.

The plan provides for building wood stud framed walls from 10 ft to 18 ft high, measured from the concrete foundation. Since bulk potatoes and other similar crops exert considerable pressure against the wall, the plan has special engineered details for the foundation, walls, ceiling and their connections.

FOUNDATION A special L-shaped foundation of reinforced concrete handles the combined vertical and horizontal forces expected from bulk-stored potatoes. Earth backfill packed against the outside of the foundation helps resist the overturning force from the stored produce, and the mass of potatoes (bearing on the concrete floor slab inside) holds down the "heel" of the footing. Do not change the dimensions and arrangement of this system without special advice from a consulting engineer.

If the site is well-drained, it maybe feasible to place the floor level considerably below natural grade, provided the site has enough slope to put the floor slightly above grade at the loading doors. On flat or poorly-drained sites, it is better to place the floor entirely above grade; this requires extra backfill around the outside of the foundation to provide frost-protection and lateral support for the wall.

Perimeter insulation is an essential part of the foundation design. The best way to do this is to tack polystyrene insulation board (Dow SM, or equal) to the inside face of the outside concrete forms. Use finishing nails so that they will pull easily through the insulation when the forms are stripped, leaving the insulation firmly bonded to the hardened concrete.

A special, proven connection is required between the wall studs and the foundation. Heavy steel angle (with special "toe-holds" welded to it) is bolted into the concrete foundation. This prevents the butt of each stud from 'kicking out' due to storage pressure. Note that the perimeter insulation (mentioned above) extends to the top of this steel angle, to control winter heat loss and sweating from the humid storage inside.

STUD WALLS Moisture often collects at the cool interface between the base of the stud wall and the concrete, providing ideal conditions for the rapid growth of wood-decaying fungus and mold. Wood sills should be pressure-treated with CCA-type wood preservative, and the studs should be butt-soaked in similar preservative, to prevent decay and early failure. Stud size and spacing tables are given in the detailed plan.

To hold against storage pressures at the top of the wall, each stud is tied to the plate above by a steel "joist hanger." The doubled wall plate is, in turn, tied to the roof truss lower chords with galvanized steel strapping and nails. Be sure to advise your truss fabricator, giving him the additional tension force he must consider in designing the truss lower chords and splices. At the endwalls, a special connection is required from the wall to the diaphragm ceiling; see Plan 9734 for the plywood ceiling diaphragm , or Plan 6131 for the steel ceiling diaphragm.

INSULATION AND VAPOR BARRIER As mentioned above, this plan calls for low-cost fiberglass insulation. With the high humidity that is desirable for long-term vegetable storage (95% or higher), the polyethylene vapor barrier must be very carefully fitted to prevent vapor penetration into the wall and ceiling insulation, and especially into the corners where walls and ceilings meet. Avoid punching through the vapor barrier to install wiring and other services. Use one-piece rolls of plastic wide enough to extend from foundation to ceiling, and provide for generous overlaps from wall to-ceiling and ceiling-to-wall.

DIAPHRAGM CEILING FOR WIND BRACING The structural diaphragm ceiling is a superior way to stiffen the top edges of the walls, as well as to provide lateral wind-bracing for the building as a whole. The diaphragm may consist of nailed softwood sheathing plywood (Plan 9374), or screwed pre painted galvanized steel (Plan 6131). Plywood, being absorbent, is less prone to condensation and dripping, but it becomes discolored quickly by humidity and mold. Steel is easier to install, since it eliminates the extra "grid" of wood strapping that is needed for four-edge support of the plywood.