NOTES: These drawings are not complete building plans – rather, their intent is to show concepts, selected design recommendations and application differences based on recent USDA research and field experiences. These drawings in turn can be used in preparation of more complete, individually engineered designs. Consult a registered engineer to prepare your plan.

General Design:
1. Floor foundation design is from USDA calculation. A soil-bearing capacity of 2000 lbs./sq. ft. was used with a concentrated truck wheel load of 4500 lbs.
2. Potato specific weight of 42 lbs. per cubic foot (98 lbs./cu.ft.)
3. Clean, well-sanded, smooth-sloped, rounded potatoes (e.g., smooth) that exert a horizontal wall pressure of an Equivalent Fluid Density of 12 lbs. per cubic foot.
4. Maximum potato depth of 17 ft. with binwall stud height of 10 ft. on 1 ft. high foundation.
5. Lumber bending stress (Fb = 1735 psi) was more critical than horizontal shear stress (Fv = 35 psi) for studs. The allowable compression force used was 925 psi perpendicular to grain.
6. Lumber design allowable stresses were not adjusted for moisture or temperature as permitted by the 1960 National Design Specifications.
7. No special design conditions were used for areas or wind loads. The design snow load was 25 lbs. per sq. ft. of roof.
8. Vapor barriers must be correctly installed (no insulation stays dry) caulked along edges with nailed and taped joints.

Ventilation Design:
1. Ventilation duct airflow of 1 cu. ft. per minute per CWT (1 CFM/CWT).
2. Vent duct maximum speed of 1000 feet per minute (17 mps).
3. “Through” type ventilation with ¼ the needed airflow for potatoes along each sidewall and ¼ through the bottom-center of the bin. Extra duct capacity is required for exit venting the single-wall designs.
4. Single-wall inside shell ventilation rate of 1 cu. ft. per minute per sq. ft. of wall surface with airflow regulated by restriction at top and vent opening.
5. All vent duct transitions, a downstream duct cross-section area of 0.75 to 0.87 minimum of upstream cross-section duct area.
6. A 1.3 approximately ratio of gross duct cross-section area to exit area of a effective area to duct cross-section area of 0.61.
7. Experience is limited with the plywood-covered berm ducts. Under extreme conditions of wet, muddy, small potatoes and very large ducts a center slot in the plywood may be needed to let air through - then design for a slot instead of $.
8. See USDA Circular A5-55, “Potato Storage Ventilation,” for all heating design recommendations or the most up-to-date publication.

POTATO STORAGE - 88,000 CWT DOUBLE EXTERIOR WALL: Intended for use with more detailed planning, these drawings show the major construction and ventilation features for a 88’ x 204’ building with 8 storage bins and a cross-alley work area. These major features change with changes in storage size. Two other sets of drawings are available for storage capacities of 88,000 CWT single exterior wall and for 88,000 CWT single exterior wall 90’ x 172’.
Ventilation Design:

1. Ventilation duct airflow of 1 cu. ft. per minute per CWT (1 CFM/CWT).
2. Vent duct maximum speed of 1500 feet per minute (17 mph).
3. "Through" type ventilation with 1/2 the needed airflow for potatoes along each side wall and 1/2 through the bottom-center of the bin. Extra duct capacity is required for wall ventilation in the single-wall designs.
4. Single-cell inside shell ventilation rate of 1 cu. ft. per minute per sq. ft. of wall surface with airflow regulated by restriction at top wall vent opening.
5. Air velocity transitions, a downstream duct cross-sectional area of 0.75 to 0.77 minimum of upstream cross-sectional duct area.
6. A 1.5 approximate ratio of gross duct cross-sectional area to air exit slot area or an effective slot area to duct cross-sectional area of 0.75.
7. Experience is limited with the plywood-covered leaker ducts. Under extreme conditions of wet, muddy, small potatoes and very large ducts a center slot in the plywood may be needed to let some air through - then design for 3 slots instead of 2.
8. See USDA Circular AS-86, "Potato Storage Ventilation," for air heating design recommendations at the most up to date publication.

NOTE: Changing dimensions of potato bin will change ventilation requirements.

BIN VENTILATION DIAGRAM

Scale: 1/4" = 1'-0"
NOTE: Proper slope size is critical to provide uniform air distribution.

NOTE: Changing dimensions of potato bin will change ventilation requirements.