Biosecurity—A New Term for an Old Concept—How To Apply It

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This article is dedicated to the memory of my Agricultural Engineering friend and colleague Donald W. Bates for his many contributions to the animal industry and to veterinary medicine.

New concepts necessitate new terminology, however, new terms used to redefine old concepts often lead to confusion for the listener or the reader. The term biosecurity is an example of redefinition. It is often misunderstood and as a result, it is not readily implemented by livestock producers.

Basic biosecurity measures have been known for years. A variety of veterinary textbooks published in the early 1900's repeatedly cite the need for cleanliness, disinfection and isolation of herd replacements and sick animals. Although these authors did not have our present-day knowledge of pathology and microbiology, they did recognize a cause and effect relationship in animal contact and disease.

In recent years, modern science has produced a wide variety of products and techniques to treat clinical diseases. An equally impressive array of vaccines have been manufactured to prevent diseases. These products and vaccines, impressive as they are, in some ways are part of the problem in implementing biosecurity measures. Antibiotics and vaccines are often perceived as solutions to all disease problems. As a result, disease prevention by proper building design and management is viewed as unnecessary. Further, additional confusion is created by unqualified individuals who offer "traditional" or "I think it will work" type of building construction or renovation information. In these situations, little or no credence is given to on-farm or off-farm disease control measures. In this context, the term biosecurity appears to be neither understood nor utilized by many livestock producers, lending agencies, building contractors, farm employees, tour groups, service providers, and a host of other individuals who have daily contacts on livestock operations. We live in a world which is inhabited by many unseen microorganisms. Because they are not observable with the naked eye, they are usually not regarded as existing, until disease strikes. These "bugs", as they are often called, are either friendly or unfriendly, i.e., non-pathogenic or pathogenic. Non-pathogens can become pathogenic as well, given the right circumstances. Infection by an organism is dependent on three very important factors, all of which are directly dependent on environmental design, i.e., exposure potential:

1) Size of inoculum—the number of "bugs" shed by chronic recovered carrier animals

2) Virulence of the organism—the ability or the aggressiveness of a "bug"—virulence is increased by passage from animal to animal

3) Stress on the animal—weather variability—high humidity with wide temperature variations (wind chill effect), shipping or transport, grouping, etc.

Microorganisms also have threshold levels (in numbers of organisms) which govern their infectivity. These levels are affected by stress, virulence, and the level of immunity, if any, that an animal possesses. Above the threshold level, clinical disease becomes apparent. Below this level, immunity is established as a result of only sub-clinical disease. **This principle does not apply with diseases like Johne's, BVD, and bovine leucosis.** If a sub-clinical disease does manifest itself, it usually goes unnoticed by animal attendants.

Buildings which are properly designed take advantage of each of these parameters. Utilizing this information allows a low rate of exposure of animals on the farm to the resident flora, thereby developing immunity rather than clinical disease. Vaccination programs augment this immunity. Further, after over 35 years of observing this entire process, coupled with antibody testing to document these observations, one major factor has become very apparent. Consistently, vaccines produce a better immune response when animals are reared in properly designed, properly ventilated, and properly maintained buildings. Vaccine package inserts explain, in various ways, that "this product is designed for use in normal, healthy animals capable of producing an immune response." Vaccines are not intended to treat

disease, only prevent it. Animals with damaged lungs or lesions of chronic disease are not normal and healthy. By following these basic parameters, genetic potential will be allowed to express itself to the fullest extent. The future of any dairy enterprise is in replacement stock. In abbreviated terms, health is what pays the bills and generates profit.

Disease in the non-immune animal occurs as a result of exposure to high numbers of infectious agents. These are present in manure, urine, expired air from the respiratory tract, ocular discharge, nasal discharge, milk, or blood. Needles and surgical equipment (including dehorning and castration instruments) should be thoroughly disinfected between animals. Other sources of pathogens from infected animals include saliva, semen, uterine fluids, fetal tissue and membranes, and tissues and exudates from live or dead animals. Any or all of these sources can contain potential pathogens spread by contact or as contaminants of feed and water supplies and should be treated as such.

Internal and external parasite levels should be closely monitored. This is done by routine monthly fecals on selected animals and close visual observation for lice and mange.

Correct building placement and design, as well as feed bunk and water trough design, is essential. Further, routine water trough and feed bunk maintenance should be used to minimize microbial and parasite transmission within the herd.

Bulk milk tank samples should be obtained minimally every month unless more frequent tests are indicated, i.e., milking machine malfunction, personnel changes, increased somatic cell counts, increased clinical mastitis, etc.

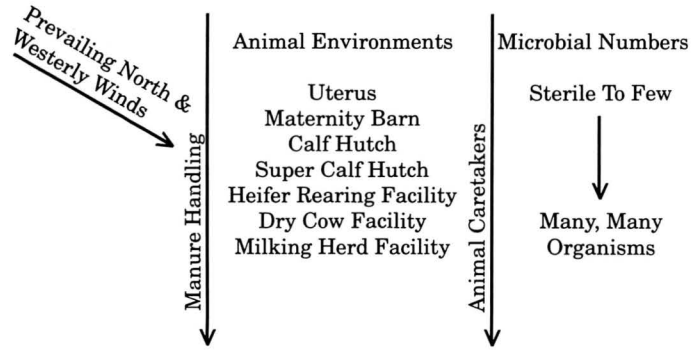
Vaccination programs which are properly designed are the cornerstone of an on-farm biosecurity system. These programs should be designed specifically for each individual herd because of wide variations in management styles between herds. The attending veterinarian should be the architect of this plan because of previous and on-going knowledge of disease entities in the herd. These plans should also be subject to change when documented need is found. In addition the herd veterinarian is well aware of diseases in adjacent herds. Veterinarians may also employ a herd serological profile to document need for a specific vaccine and/or a change in management procedures. Serologic profiles have been utilized in this practice for over 25 years with excellent results. The plan for vaccination should be coordinated with moves that occur within animal flow patterns in the herd. This will ensure immunization of every individual animal in each group. Adequate restraint chutes are necessary to implement all of these procedures to ensure the safety of both the animals and the operators.

Prevention of disease introduction is of utmost importance with incoming replacements or with resident cattle. To ensure herd longevity and to maximize productivity, the resident herd and herd additions should be tested serologically for Johne's, BVD, and for bovine leucosis, in addition to other required tests. An alternative is to purchase heifers from herds with excellent vaccination programs and from Johne's and bovine leucosis free herds. Further, isolation facilities should be provided to keep replacement animals separated from the main herd for a minimum of 30 days. This also allows time to vaccinate the replacements against diseases resident in the herd. Off-site empty or vacated feedlots which have been cleaned and disinfected are excellent alternatives for isolation. They are preferable to on-site housing for isolating herd replacements.

In addition to carrier animals, disease microorganisms are also conveyed from sources by vehicles, feeding and manure handling equipment, by birds, insects, rodents, and by fellow humans. Prevailing winds and fans exiting livestock units are vectors as well. Each of these conveyors of disease should be considered in designing a herd biosecurity program. An on-farm evaluation should be conducted by the herd veterinarian to design a mutually agreeable biosecurity system. These systems may vary from total security to little or no security, with a variety of levels in between. The level chosen is dependent on the goals of each individual herd owner.

The remainder of this discussion is devoted to on-farm biosecurity as it relates to building site selection and to building design in general terms. The flow pattern concept is used as an organizational format.

Dairy Animal Flow Pattern



This model is representative of a dairy unit that is resident on one site. Wide variations exist with this plan as a result of off-site calf rearing or off-site dry cow facilities. What is important in discussing this model is the concept of air flow and manure handling. Further, animal caretaker contact must be included in explaining that all movement, whether it is air flow, manure handling, or care of the animals, must be from the younger toward the older. On large dairies, it is there-

fore essential that individuals be given responsibility for various areas of the dairy. By delegating the authority for segments of the operation, disease control methods can be instituted to minimize or prevent contact. In addition, overall management procedures will also improve because responsibility and rewards, both verbally and monetarily, improve communication and productivity.

Maternity Barn

A clean, properly immunized pre-partum cow enters a clean, disinfected single maternity pen, which is well bedded. This pen should be located in a building designed for maternity use only **(NOT A SICK PEN)**. The site selection for this structure should be upwind from all other livestock housing. It should be readily accessible for people and animals—close to the pending parturition dry cow lot, but not in it. Ventilation of this structure in some areas of the country will be by natural ventilation. Other areas require mechanical ventilation. Be certain older animals are not housed on the air intake side of a mechanically ventilated building or on the prevailing wind side of naturally ventilated units. Fenced lanes are preferred to move cows to and from this building to separate the close-up dry lot from the maternity area. Closed circuit TV cameras are very cost effective in these units to allow for frequent surveillance. Although it is more labor intensive, separate feed tubs and water pails work very well for cows in these units to facilitate observation of feed and water intake. Pen size should be a minimum of 9'6" x 12'6", with a stanchion or head gate for restraint which opens completely to the bottom to prevent suffocation if the cow is recumbent during an assisted calving. The entry for the cow into the pen should have a gate hinged **on the head gate support** to facilitate and direct cow movement into the head gate. See the enclosed plan (Figure 1) for design and ventilation of a mechanically ventilated separate maternity facility for a 200 cow herd. In continuous calving herds, one maternity pen should be furnished for each 25 cows in the herd. In seasonal calving operations, one pen is necessary per 10 cows in the herd.

Calf Dryer Unit

Following calving in a cold, naturally ventilated unit, a calf dryer unit is very beneficial. Occasionally, a calf is chilled in even moderate environments if it is not well attended by its dam. A dryer and warming unit is also helpful here. Cleanliness in this unit is facilitated by doors which open at the base of the unit for cleaning (Figure 2). Routine cleaning and disinfection is very important because of potential spread of organisms from calf to calf.

Calf Coat

The Thinsulate® insulated calf coat was developed and tested by a research team at the University of Minnesota in the mid-1970's. These coats are very beneficial when used during cold weather for the first 10-12 days of a calf's life in an outside individual calf hutch.

Calf Hutch

Individual calf hutches are a well accepted method to house young dairy calves. The concept was researched on a variety of dairy farms since the early 1960's and it continues to provide practical isolation and disease prevention. For these needs the hutch will remain the ideal structure for rearing young calves. Calf hutches should be clean and well maintained. In winter, always check the underside of the commercial hutch roof for frost. Plywood hutches do not collect frost unless the front is completely closed. If any frost is present, ventilation needs to be improved. In summer, monitor the inside temperature of the calf hutch with an electric thermometer. Some hutches gain heat with sunlight to as high as 125°F; this is not acceptable. The inside temperature in the summer should be close to the outside temperature and the hutch should be well ventilated. In addition, the calf should be fed and watered outside to keep the interior bedding in the hutch as clean and dry as possible (Figure 3[ab]).

The calf hutch will remain the standard for disease prevention; however, some producers have elected to rear calves in a variety of less labor intensive units. The reason for doing this is usually to provide a more protected environment for both the calf and the caretaker. These buildings are constructed from a variety of materials including wood, steel, and plastic covering for metal hoops. These buildings should all be naturally ventilated with a roof ridge opening of at least 2" per 10 linear feet of building width. This building should also have continuous perimeter wall openings, curtains, or doors, which will allow total opening of the wall in summer. An adequate eave overhang should also be provided to minimize moisture entry by diverting the rain run off. When buildings of this type are constructed, they should always allow a minimum of 250 cubic feet of spatial volume per calf housed. Buildings which allow sunlight entry must be protected in summer from heat gain by roof sun shields. In winter, if not properly ventilated, day to night temperature swings of 70°F are common. Conversely, moisture accumulates in winter on the underside of uninsulated roofs above livestock. This is caused by the buoyant effect of warm air rising. When frost appears on the underside of the roof, ventilation must be improved immediately to alleviate the prob

[a] For Plans "Building and Managing Calf Hutches, please refer to the University of Minnesota, Agricultural Extension Service bulletin AG-FS-0958 (revised 1985) by D.W. Bates, J.F. Anderson and R.D. Appleman, Agricultural Engineering.

[b] For Plans "You Can Control Flies Around Calf Hutches, please refer to Hoard's Dairyman, May 25, 1988.

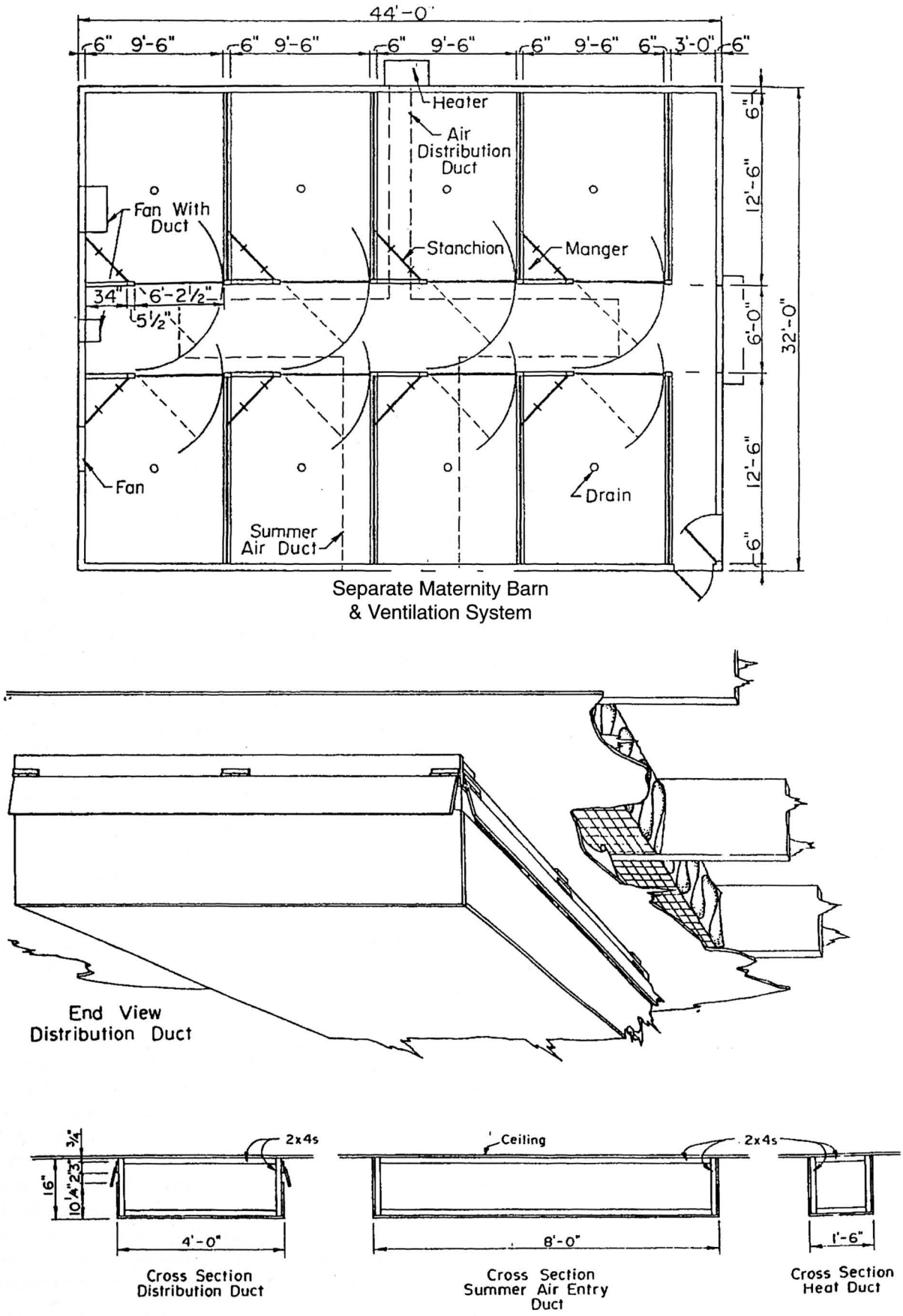
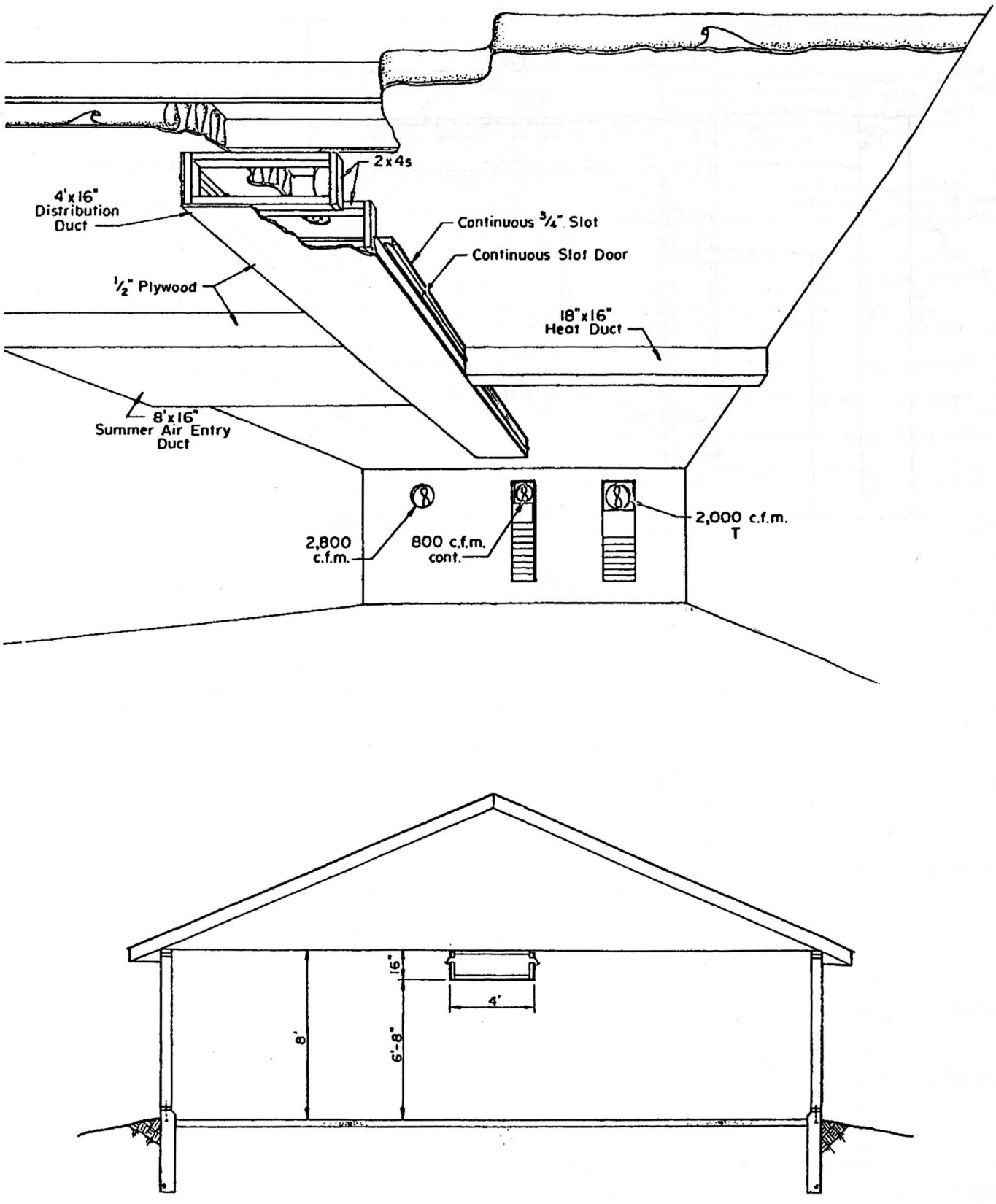
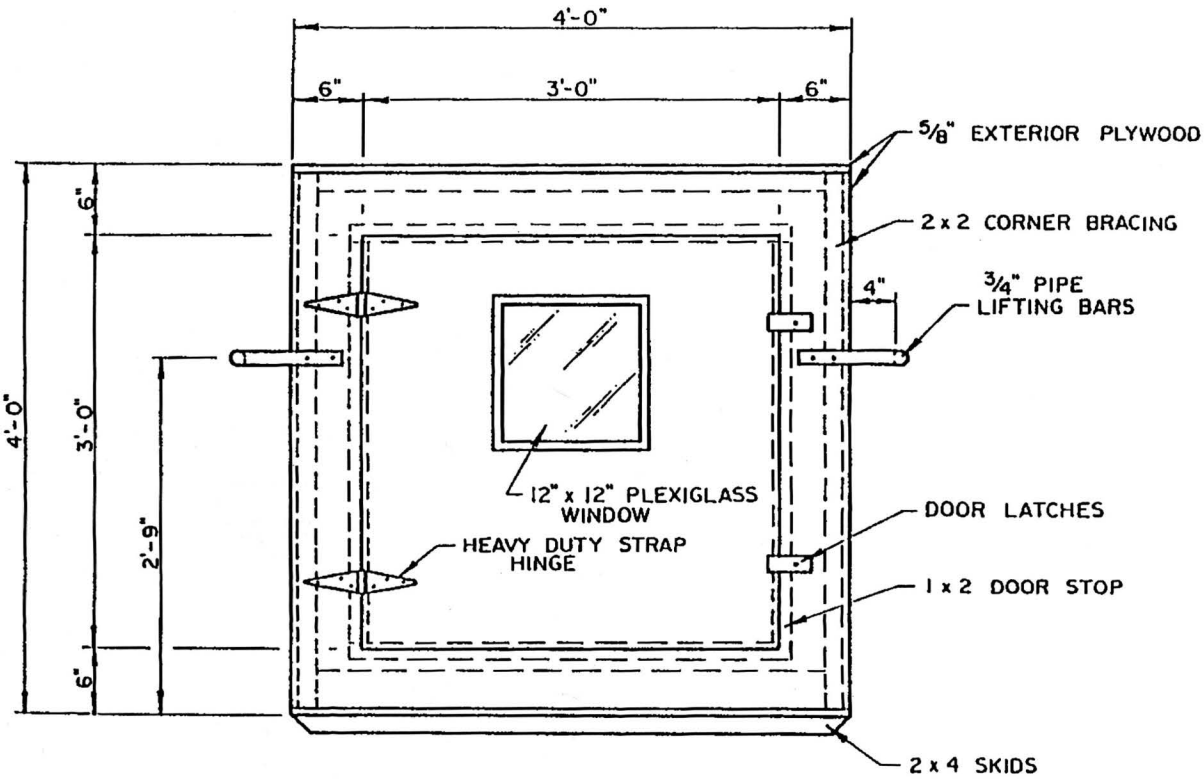


Figure 1

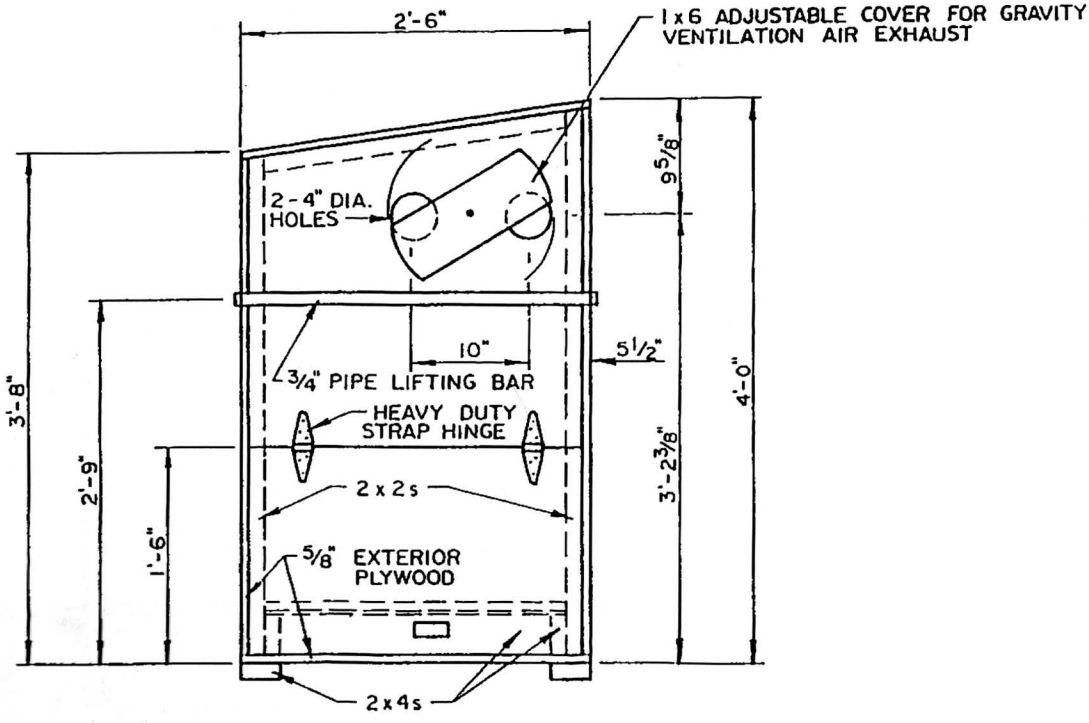


Section A-A

Figure 1

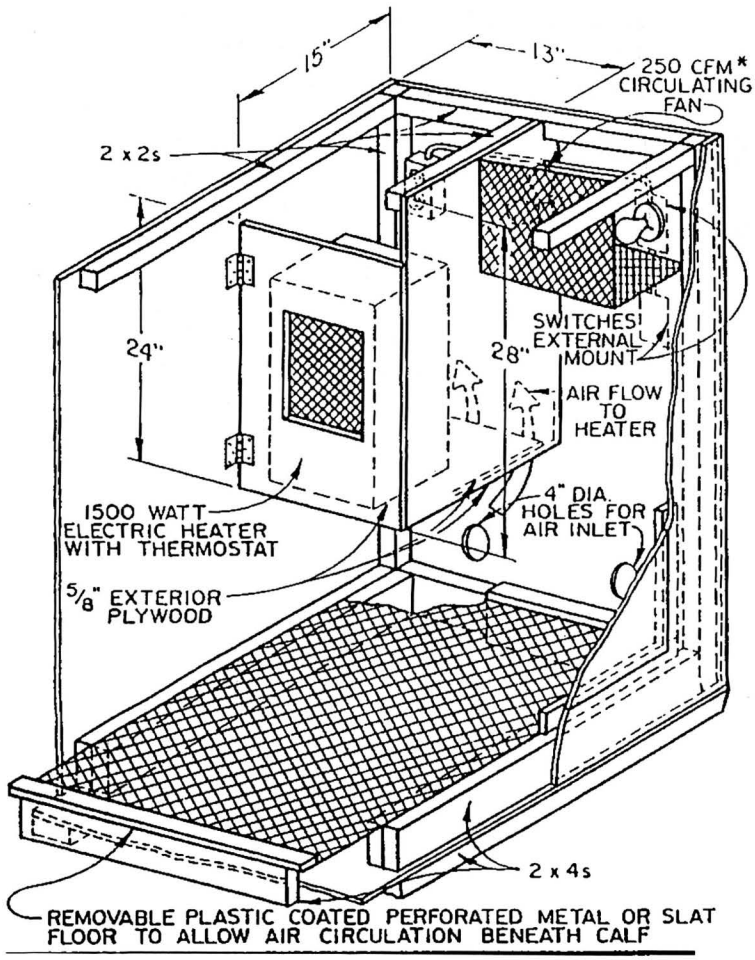


SIDE VIEW



END VIEW

Figure 2



MANAGEMENT INSTRUCTIONS

This unit was specifically designed to provide a favorable environment for weak dairy and beef calves or for those calves born under adverse temperature conditions. Use the following procedure.

1. Feed calf 2 quarts of colostrum immediately following birth and again at 6, 12 and 18 hours.
2. Administer veterinarian prescribed medication and vaccination.
3. Apply naval clip and or dip naval in iodine.
4. Place calf in prewarmed calf warming box and maintain 90°F temperature.
5. Observe calf periodically for activity and progress of drying. Remove calf when dry.
6. Brush hair coat erect.
7. Place calf in well bedded outside individual calf hutch.
8. Continue with recommended calf management program.
9. Warming box is suitable for both indoor and outdoor use.

*CFM = cubic feet of air per minute

Approximate Bill of Materials

Number	Description
4	2 x 4 x 8' – runners and floor supports
4	2 x 2 x 8' – framework
1	1 x 6 x 2' – adjustable cover
3	1 x 3 x 8' – door stop, latches and floor edge
3	5/8" x 4' x 8' exterior plywood – sides, roof and floor
2	6" heavy duty strap hinge – calf door front
2	4" heavy duty strap hinge – removal cleaning door
2	2" light duty hinges – heater door
1	1/8" expanded metal 3' x 3' – fan, light cover and heater compartment door
1	2'-2" x 3'-8" plastic coated performated metal or slat floor
2	3/4" dia. x 2'-6" galvanized pipe – lifting handles
4	3/8" dia. x 1-1/2" x 10" strap iron – lifting bar handle support
1	12" x 12" plexiglass window – calf door front
	Sufficient screws, nails and bolts for construction

Number	Description
	Electrical Components
2	SPST (single pole single throw) switch
1	Electrical handy box
2	Weather proof electrical boxes with weather proof switch covers
1	Duplex outlet (125 volt - 15 ampere)
1	Duplex cover
1	Porcelain light fixture, 60 watt bulb
	No. 14 UF cable
	Wire duplex outlet to one switch for heater and fan
	Wire light to separate switch
1	1500 watt electric heater with internal fan and thermostat
1	250 cfm fan

Figure 2

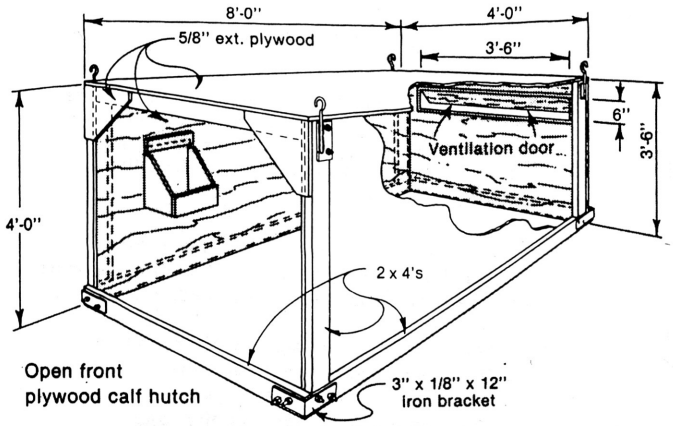


Figure 3. Open front plywood calf hutch.

lem. Frost thaws and the accumulated moisture falls on the calves. Multiple units are always better than one large unit because disease can then be confined to a small group. A disease break in a large group of calves is far more difficult to treat than when it occurs in a smaller group. Air flow **should always be from the younger toward the older animals**. Manure removal and slope of the concrete floor, or outside lots, should also always be from the younger toward the older animals as well. Site selection for these units should be upwind from older cattle (prevailing wind direction).

If you decide to build a calf barn, remember **three important facts:** 1) you have lost the individual isolation of a calf hutch, 2) you should operate the barn as a cold unit—day and night, and 3) it takes better management in a calf barn than it will ever take in a calf hutch; close observation is absolutely essential.

Super Calf Hutch

This 12' x 19' semi-portable building is built on skids. It provides semi-isolation to minimize contact with disease causing organisms shed by older animals. The super calf hutch was developed in the late 1960's to house calves after eight weeks of age when they have outgrown individual calf hutches.[c] Location of this building should be upwind from older cattle, but an off-site location is also beneficial.

Heifer Rearing Facility

These units can be placed in either an east to west or a north to south orientation where prevailing winds are north and west. However, an east to west site is preferred to take advantage of winter protection for cattle when south side open sheds are used. To keep bedding dry, feed and water the animals on a concrete slab outside the building. East to west placement of these buildings also takes full advantage of southern breezes in summer. Site selection should be upwind from older animals. Ventilation is by natural forces, i.e., continuous wall openings with an open ridge of a minimum of 2" per 10' of building width. Ridge opening width is directly proportional to concentration of animals housed in a building. The maximum opening should not exceed 4" per 10' of building width. Spatial volume in these units for heifers should range from 300–400 cubic feet per animal housed depending on their size.

Two types of buildings and an alternative outside method predominate for rearing replacements. They are:
1) South and/or east side open front sheds

a) Bedded straw packs inside the buildings

b) Feed and water animals outside the building on a concrete slab with proper slope. Feed in fence line feed bunks and water is usually supplied by automatic fountains. **No communicating** water fountains between pens until calves weigh approximately 500 lbs. (7-8 months of age). The reason for this timing of the calves' age is duration of passive immunity, and the initiation of an active immunity by well designed vaccination program between 4 and 6 months of age. The immunization program obviously begins before the calves weigh 500 lbs. Non-communicating water troughs decrease exposure potential between pens from saliva and nasal discharges.

c) Restraint—either by feed bunk lock-up, stanchions, or a centrally located head gate or restraint chute.

d) If snow entry is a problem, provide a 4' drop front beneath the eave on the south or east open side wall. This may be a temporarily installed snow fence or a section of stretched semi-permanent sun shade material. Hinged doors that swing up for summer or loader entry also work well. If snow swirls around the barn ends, and into the building, close the first bay, from the endwall to the first upright wall support post.

e) A 7' high barrier wall between the group of calves recently introduced from the super hutch and the next oldest pen of calves is **absolutely essential**. This pen of calves should be treated as an all-in and all-out group. Barrier walls under these circumstances reduce the incidence of disease and the cost of treatment by up to 75% (unpublished data). Construction of these walls should be performed using oak or elm lumber to reduce chewing by calves. Exterior grade plywood is sometimes used, but whatever type of wood is used, coat it twice initially with Treeguard®, followed by yearly applications. This product virtually eliminates lumber predation by cattle (or horses).

f) The outside concrete slab feedyard should be sloped from west to east or north to south depending on building orientation. Always slope feedyards and remove

[c] For Plans "Building and Managing Super Calf Hutches," please refer to Minnesota Extension Service, AG-FO-0416-C, revised 1993, by John F. Anderson & Donald W. Bates.

manure by the same direction—younger to older animals.

2) Slatted-floored buildings with manure storage beneath

a) East to west or north to south orientation (east to west preferred)

b) Naturally ventilated with a perimeter walk way to adjust curtains or tip-out doors and an open ridge

c) Feeding systems

1) Center drive through—bunks on both sides

2) Center bunk with conveyor belt above bunk

3) Drive through on the north or the west side of the barn. Cattle prefer facing into the wind at a feed bunk because they prefer to graze into the wind on pasture.

d) Water supply—bite button valves work well in confinement over slatted floors. One valve per 15 head—one at each end of a pen, off set so as to prevent nose-to-nose contact between pens. Water foundations can work well (non-communicating until approximately 500 lbs.) provided they are not installed or designed to predispose to injury of the shoulder or stifle.

e) Restraint—feed bunk lock-ups or a centrally located handling facility

f) Barrier wall 7' high between youngest cattle and next older pen, described in the previous section.

3) Alternative method of replacement rearing

a) Maternity barn

b) Calf hutches

c) Super calf hutches

d) Portable buildings on pasture paddocks until calves weigh approximately 500 lbs.—Central fence line feed bunk on concrete slab.

e) From 500 lbs. to calving time—No housing for the cattle; they lie on mounds with wind (north and west) protection by trees and rolling landscape.

f) Water—Non-communicating until approximately 500 lbs. body wt.—supplied at the feed bunk area by heated waterers.

g) Restraint—lock-up stanchions and two centrally located head gates

Replacement heifers and holstein steers can be raised efficiently with adequate nutrition and minimal protection from the weather. The owner of one of these dairies raises first calf heifers that calve at an average age of 23 months. The heifers weigh 1350 lbs. and the herd average is 22,200+ lbs. of milk. Animal flow pattern in this herd, and prevailing wind direction, is youngest to the oldest.

Dry Cow Facility

Depending on herd size, the dry cow group may be divided into three lots:

a) Recently dry cows—2 weeks

b) Pending parturition cows—2-3 weeks

c) Middle group—3-4 weeks

The period of time (2 weeks) on each end of the cows dry period is a time requiring closer observation. By grouping these special needs groups, observation is simplified. Outside exercise lots are very useful for dry cows; however, when lots are muddy, mastitis and foot injuries increase and cow cleanliness is more difficult to maintain. For this reason, inside bedded free stalls are very beneficial. With feed and water available in the building, cows can be indoors during inclement weather. Management of the dry cow lot pays big dividends in disease prevention. Heifers which are due to calve in two months should be housed with the dry cows for two reasons. First, their pre-calving vaccination program should be initiated when they enter this dry lot. Second, free stall utilization in the milking herd barn is markedly improved by acclimation to clean free stalls in the dry lots. Further, feed bunks and water troughs must be designed for ease of maintenance and accommodation to warm-up rations for these pre-partum cows.

Milking Herd Facilities

1) Site Selection—

a) **At least 150 to 200 ft. from other buildings, corn fields, feed storage, trees, etc.** Provide room for equipment and vehicular traffic.

b) Adequate elevation to enhance natural ventilation and drainage away from the building. If the site is the right one, earth moving may be the answer.

c) Downwind from the rest of the herd (south and east) with north and west prevailing winds—important for respiratory disease control—**Do not place calf hutches south of this facility!**

d) Plan manure disposal from this unit to prevent cross traffic to younger animals or to their feed and water—important for prevention of enteric disease transmission and parasite control.

2) Building selection

a) Narrow buildings—better ventilation

b) Multiple buildings—allows housing of first lactation heifers to be upwind (west) of adult cows

c) Narrow buildings are clear span and do not require roof supports—less costly

d) Adequate side wall height—higher sidewalls and roofs add to spatial volume per animal housed. The result is a more healthful environment due to the dilution of organisms and odors in the air.

e) For 4 and 6 row barns, always plan the milking parlor on the prevailing wind side (north) of the barn to afford some protection of the free stall barn in winter. This also allows better summer ventilation because of unhindered exposure to southerly breezes. Heifers should enter 4 or 6 row barns and be housed in the north-

west area of the unit.

f) Long axis of the barn should be east and west **unless** you are building a three row barn with an outside feeding slab on the east side. Feeding on the south side allows more exposure to the sun in summer, thereby allowing feed to heat and deteriorate when 3 row barns are sited east and west. A north side drive-through feed alley should be used on east-west 3 row barns.

g) Curtain sidewalls with two rows of curtains, which will open all the way to the base of the inside free stalls. Bottom curtain rolls up from the bottom and the top curtain rolls down to just above the lower curtain when the wall is totally open. This method of installation allows closure of the bottom curtain in late fall and the top curtain is then used for ventilation control. The eaves should be closed, utilizing only the top curtain for ventilation. In severe snow storms, the side wall on the prevailing wind side can be closed completely, preventing snow entry onto the free stalls below. This method of installation also minimizes rodent damage to the curtains when they are rolled for summer storage.

h) Open roof ridge 2" per 10' of building width minimum. Open ridge covers are often installed and they usually become completely covered with frost as a result of improper design. The opening should not be covered. If free stalls are located immediately beneath an open ridge, water or snow can be controlled by using metal roofing to fashion a large "eave trough" to convey water out one end of the barn. **Do not** install this trough so as to impede air flow to the open ridge. Another method of decreasing water entry into the open ridge is using horizontal up-stands parallel to the open ridge on the roof. These upstands direct air upward, thereby markedly reducing snow and rain entry into the open ridge.

i) Double return alleys on each side of the holding area for the milking parlor are a definite plus. An automatic self–closing head gate should be installed on the return alley which is closest to the holding area. This allows 360° access to restrained cows for examinations and/or treatments. It does not impede cow flow from the parlor via the return alley adjacent to the wall. Herd treatments move smoothly and cows do not hesitate entering this head gate. This is because they routinely use this exit when the head gate is locked in an open position to allow their passage.

j) Investigate and consider a hydraulic floor in the milking parlor to accommodate various heights and stature of milkers.

k) **DO NOT plan combined areas for sick pens and maternity pens—they are not compatible!**

l) Plan cow flow through the parlor by group size—cows should never be in the holding area away from feed and water for more than one hour, preferably a shorter time.

m) Consider a 4' perimeter walkway on the outside wall (in the free stall barn between the stalls and the wall).

Advantages

1) Allows lower curtain to be open longer in fall and opened earlier in spring. Air velocity decreases markedly 4' inside the barn wall opening.
2) Provides easy access to adjust curtains and to monitor ventilation.
3) Prevents curtain damage from inside by cows in free stalls—less cost to protect curtains.
4) Cow has a "lunge space"—held back from the wall—uses a shorter stall than normally used—6' length.
5) Heifers have fewer problems in these stalls.
6) Less rain entry onto the free stalls because of stall set-back.
7) Heat detection is more readily performed—you do not enter the cow's "space", which disrupts them.

Disadvantages

1) High cost—4' wider barn (2' on each side)

n) If barns with short eaves are to be remodeled for livestock use, one of two options should be considered. First, investigate the cost of extending the rafters, installing knee braces to support the roof extension, and the cost of installing the curtains. Second, investigate the cost of installing a hinge designed for this purpose, framing a door and cutting this door free from the inside with a reciprocating saw. Utilizing this door diverts roof rain water and snow away from the building and also ventilates the structure very well. This eliminates the need for roof extension, and the cost of curtains.

o) It is a common practice to utilize the feed not consumed by dairy cows for heifers and dry cows. This technique can contribute to disease transmission via saliva and nasal discharges. Fecal contamination can also contribute to parasite transmission to younger animals. It is important that we examine all of our "traditional" approaches to what we do in light of what we presently know about disease control.

These disease control principles have been applied on dairies in this practice for over 35 years. They have provided clients with a variety of benefits including the reduction of antibiotic usage for calf rearing by up to 95% on some dairies. Calf death losses have concurrently been markedly reduced, resulting in increased herd productivity for every client on this program.

In summary, it is becoming increasingly apparent that **everyone** involved in dairy herd expansions, including lending agencies, must be made aware of what constitutes biosecurity to prevent disease entry both from on–farm and off–farm sources. This requires a team approach and an educational program that must be recognized, understood, and subsequently implemented if this industry is going to continue to prosper.