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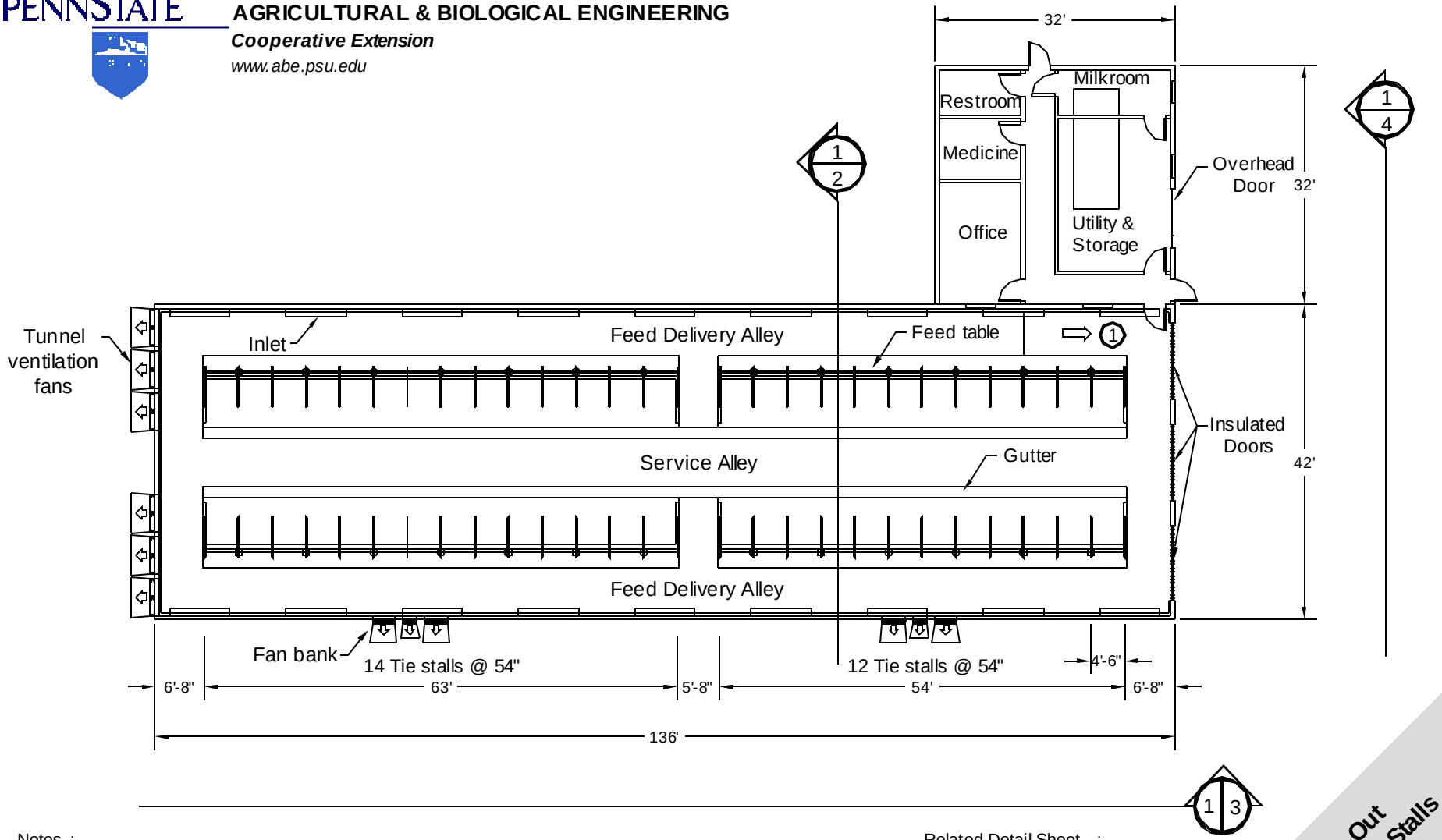

Notes :

1. Walkway from service alley and milkhouse floor are at same level as service alley to increase clearance below milk pipeline. Slope feed delivery alley down to walkway in front of last 3 stalls.
- Floor may be sloped to milkhouse end to correspond to milk pipeline.
- Consult with milking system designer/supplier to minimize conflicts between building components, worker and animal traffic and the milk pipeline.
- Structural details to be designed and constructed in accordance with local codes and conditions.
- **Contact milk inspection agency when developing plans for milking cows.**
- Stall Width W_S:
  - 1200 lb: 48 - 51 in
  - 1400 lb: 51 - 54 in
  - 1600 lb: 54 - 57 in

Related Detail Sheet :

- DIP 823 Cow Tie Stall and Details

Tie Stall Barn, Face-Out Mechanical Ventilation 52 Stalls

Graves, McFarland, Tyson, Wilson

Date: 11/13/07

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No. DIP 301

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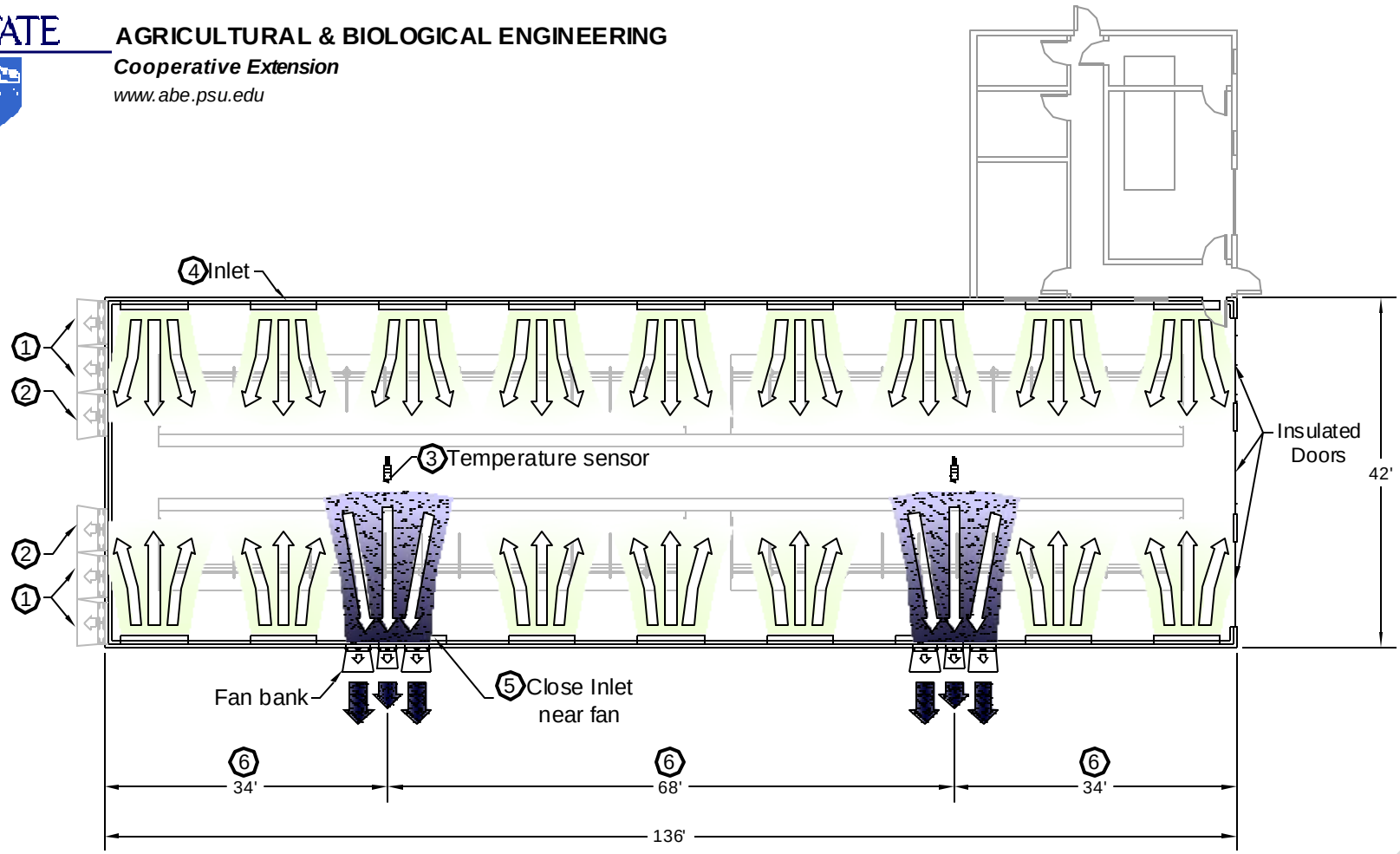

Cold/Cool Weather Ventilation

Notes :

1. Disable summer tunnel fans and seal louvers with insulated cover to minimize unwanted air entry. Service fans before winter shutdown to increase fan life.
2. Two middle tunnel fans may be left operational with automatic control for use as the highest stage in the cool/cold weather slot inlet ventilation system. One or more of these fans may also be variable speed for more flexibility.
3. Locate temperature sensors in center portion of the barn opposite fans they control.
   Mount temperature sensors to prevent damage from barn activities and cows, and away from ceilings, posts or other obstructions that may influence their operation.
   Control and monitoring devices that require observation or adjustment must be accessible and readable by operators.
4. Maximum distance of air travel from an inlet to exhaust fan during winter operation is 75'.
5. Close or otherwise modify inlets within 8-10 feet of operating exhaust fans.
6. Locate fans at quarter points and one half stable length apart or a maximum of 60' from ends and maximum of 120' apart.

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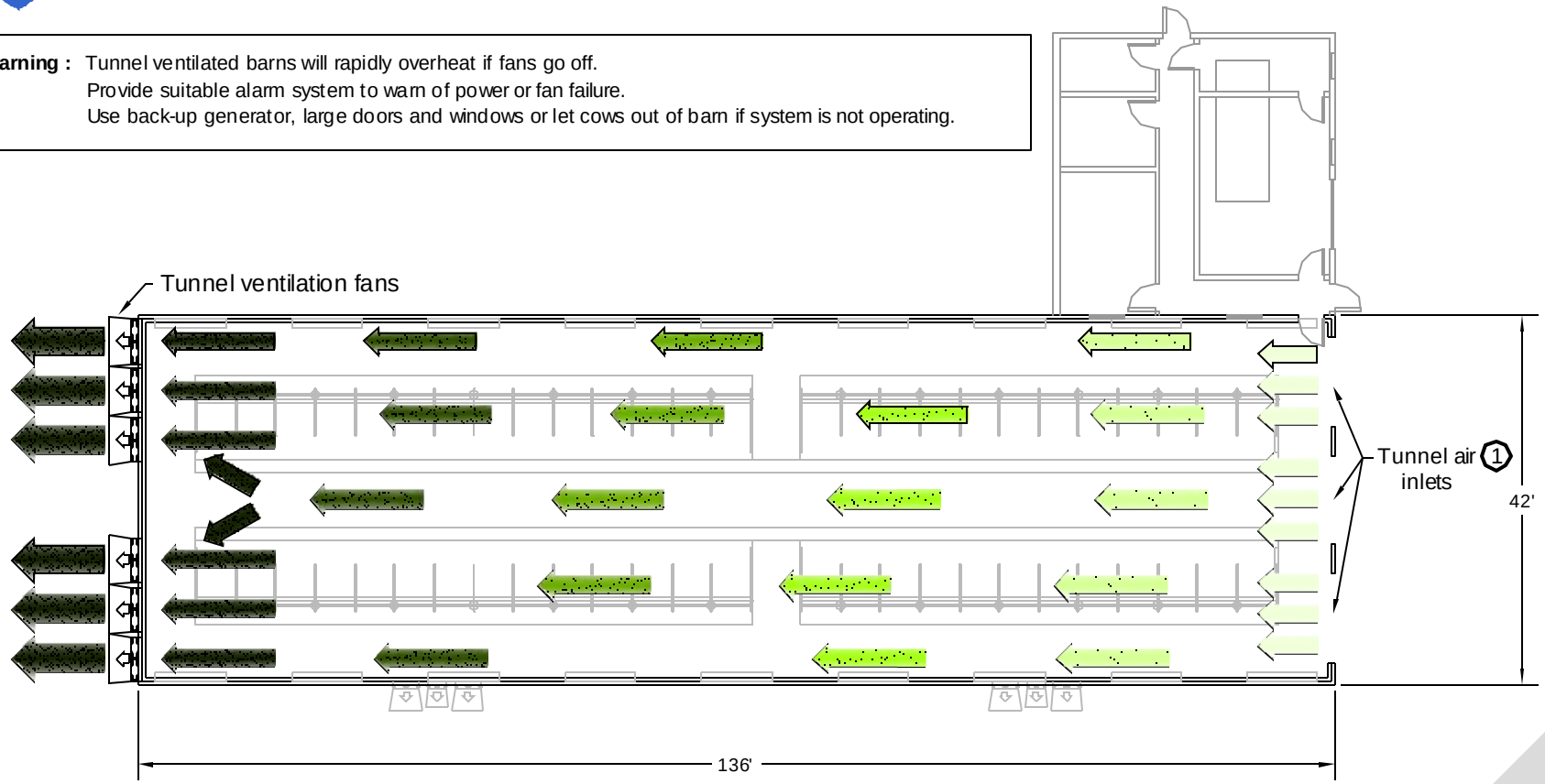
Warning : Tunnel ventilated barns will rapidly overheat if fans go off.
Provide suitable alarm system to warn of power or fan failure.
Use back-up generator, large doors and windows or let cows out of barn if system is not operating.



Hot Weather Tunnel Ventilation

Notes :

1. Three 8' high by 10' wide insulated garage doors. Adjust door opening to provide desired air flow.

- Tunnel ventilation provides a combination of high air exchange rates and high speed air flow to aid in summer heat stress relief. Several large exhaust fans are placed on one end of the barn and large inlet openings provide fresh air at the other end.
- **Tunnel ventilation systems do not provide adequate air distribution at low ventilation rates and are not suitable for winter ventilation conditions.**
- Tunnel ventilation designs are based on the cross-sectional area of the barn and air velocity.
- Design for minimum air velocities inside the barn of 300 fpm and check to assure that the air exchange per animal is at least 1000 cfm or 45 second air exchange.
- Provide 2 sq ft of inlet area per 1000 cfm when the inlets are at cow level as in this plan.

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General ventilation notes for Tie Stall Barn Plan

Provide an appropriate, automatically controlled, power ventilation system to remove moisture, odors and foul air, introduce and distribute fresh air and to regulate inside temperature to assure a healthy and productive environment for cows and workers and aid in production of quality milk. A complete ventilation system consists of a properly built and insulated barn, controlled air inlets, rated exhaust fans sized for changing ventilation requirements and thermostats or other control systems.

Design and install ventilation systems according to accepted livestock ventilation practices.

Ventilation designer/installer to develop appropriate system design and specifications, inspect and commission all aspects of the ventilation system after installation and provide written operating and maintenance instructions.

Locate one or more thermometers in barn to allow monitoring of automatic controls.

Select energy efficient fans rated at 0.100 - 0.125 inches of water static pressure.

All fans to be installed and wired according to National Electric Code for animal barns, local code requirements and to include disconnect and appropriately sized over current protection at each fan.

Provide and install all necessary guards, louvers and hoods to protect workers, visitors (especially children) and animals from access to and injury from moving blades, belts and pulleys.

Ventilation System References

- Mechanical Ventilation of Dairy Tie-Stall Barns. Dairy Practices Council. DPC44. www.dairypc.org
- Tunnel Ventilation for Tie Stall Dairy Barns. Agricultural and Biological Engineering Fact Sheet G 78 The Pennsylvania State University. www.abe.psu.edu/extension/
- Inlets for Mechanical Ventilation Systems in Animal Housing. Agricultural and Biological Engineering Fact Sheet G 91 The Pennsylvania State University. www.abe.psu.edu/extension/
- Self Adjusting Baffle Inlet to Improve Air Distribution. Agricultural and Biological Engineering Fact Sheet G 92 The Pennsylvania State University. www.abe.psu.edu/extension/
- Selecting Rated Ventilation Fans. Agricultural and Biological Engineering Fact Sheet G 85 The Pennsylvania State University. www.abe.psu.edu/extension/
- Selecting Tunnel Ventilation Fans. 2004. Agricultural and Biological Engineering Fact Sheet G 103 The Pennsylvania State University. www.abe.psu.edu/extension/

Typical Air Exchange Rates : cubic feet per minute (cfm)
For a 1400 pound cow, these values become

Season	Add	Total
Basic cold weather rate (a)	--	50
For mild weather (b)	150	200
For warm weather (b)	300	500
For hot weather (c)	500	1000 (d)

(a) Continuous minimum barn ventilation.
(b) Temperature controlled in 2 to 3 stages.
(c) Tunnel ventilation system recommended in hot weather (see Tunnel Ventilation).
(d) 1050 cfm per critical AU or 1500 cfm per head is recommended in southern states.

Definitions of Seasons(outside temperature):

- Cold weather : 40°F or less
- Mild weather : 40°F to 55°F
- Warm weather : 55°F to 65°F
- Hot weather : 65°F or more

Adjustable Air Inlet Sizing

Proper sizing, placement and management of fresh air inlet area is critical to the proper operation of a mechanical ventilation system. The table below outlines the inlet size needed based on the ventilation rate per cow housed in the barn.

Locate and adjust inlets so all cows receive fresh air

Ideal slot inlet opening widths. (provides for 2 sq ft per 1000 cfm)
slot length per cow

cfm/cow	2 ft.	3 ft.	4 ft.
50	$\frac{5}{8}$"	$\frac{3}{8}$"	$\frac{5}{16}$"
75	$\frac{7}{8}$"	$\frac{5}{8}$"	$\frac{7}{16}$"
100	1-$\frac{3}{16}$"	$\frac{13}{16}$"	$\frac{5}{8}$"
150	1-$\frac{13}{16}$"	1-$\frac{3}{16}$"	$\frac{7}{8}$"
200	2-$\frac{3}{8}$"	1-$\frac{5}{8}$"	1-$\frac{3}{16}$"
300	3-$\frac{5}{8}$"	2-$\frac{3}{8}$"	1-$\frac{13}{16}$"
500	6"	4"	3"
1000	12"	8"	6"

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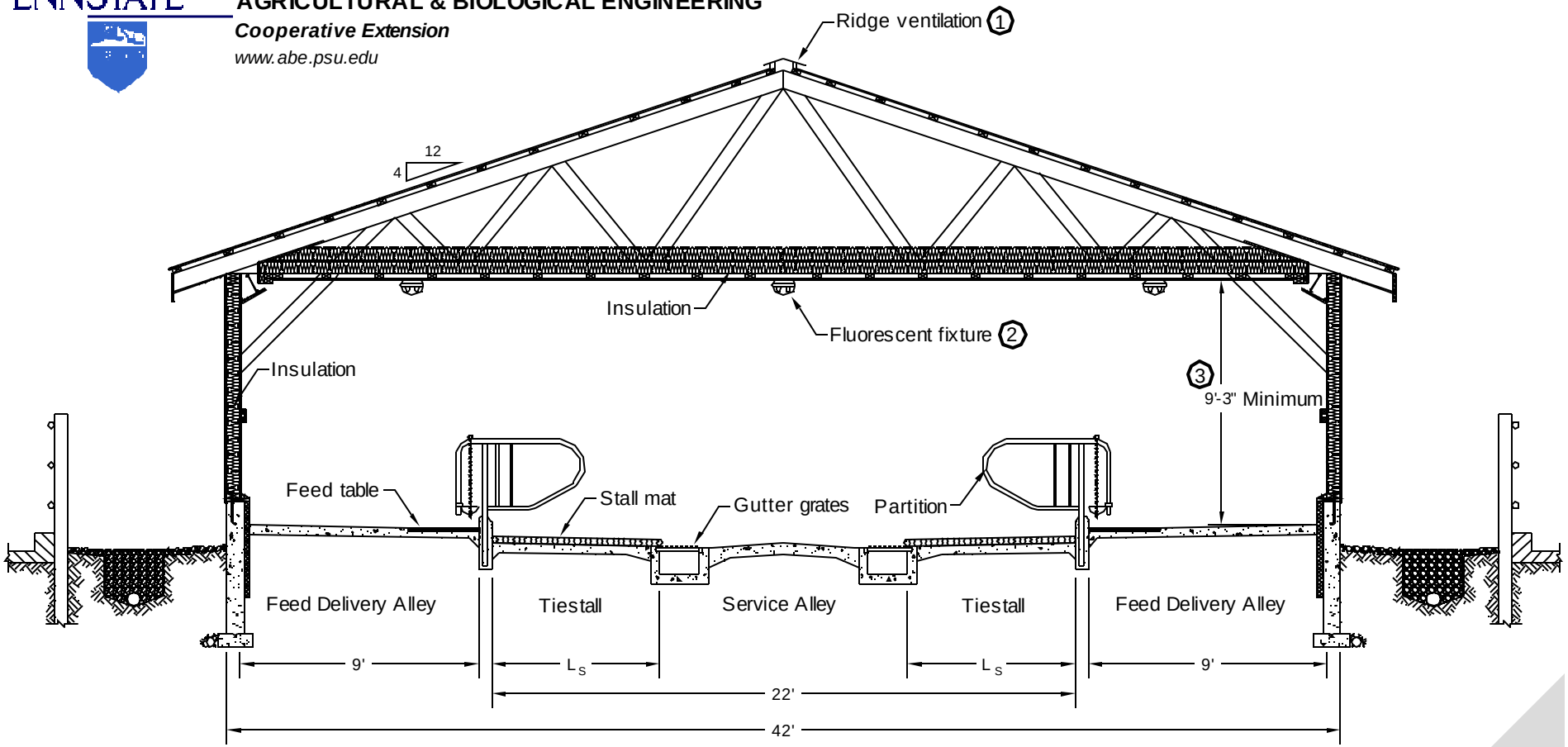

Cross Section 1/2

Notes :

1. Provide raised ridge vent or cupola with total free air outlet area of 46 sq inches per foot of building length.
2. Provide 3 rows of energy efficient fixtures suitable for damp locations.
3. Height will vary along barn length in barns with slopping floors.

- Floor may be sloped to milkhouse end to correspond to milk pipeline.
- Consult with milking system designer/supplier to minimize conflicts, between building components, worker and animal traffic and the milk pipeline.
- Structural details to be designed and constructed in accordance with local codes and conditions.
- **Contact milk inspection agency when developing plans for milking cows.**
- Stall Width W_S:
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Related Detail Sheet :

- DIP 805 Insulated Side Wall - Post Frame
- DIP 806 Insulated Side Wall - Stud Frame
- DIP 823 Cow Tie Stall and Details

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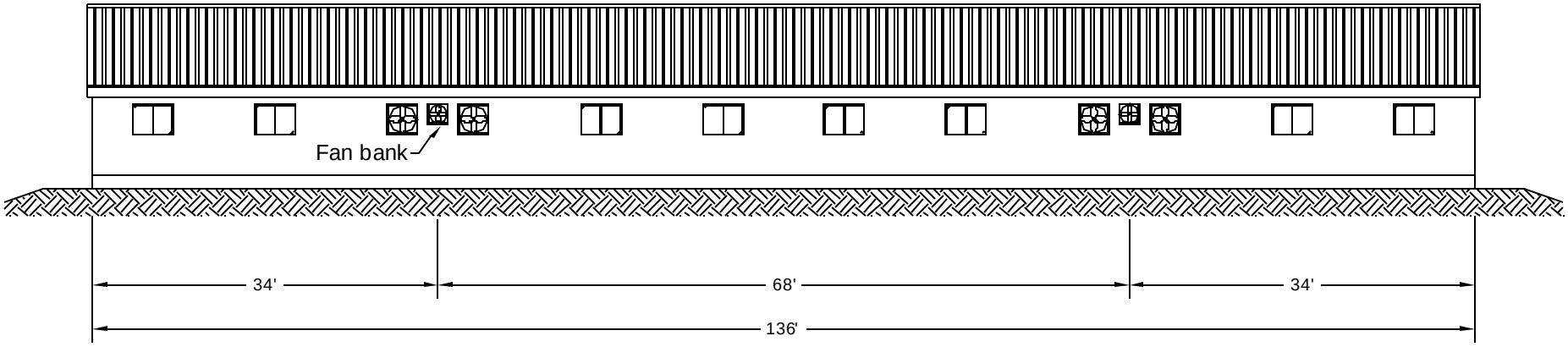
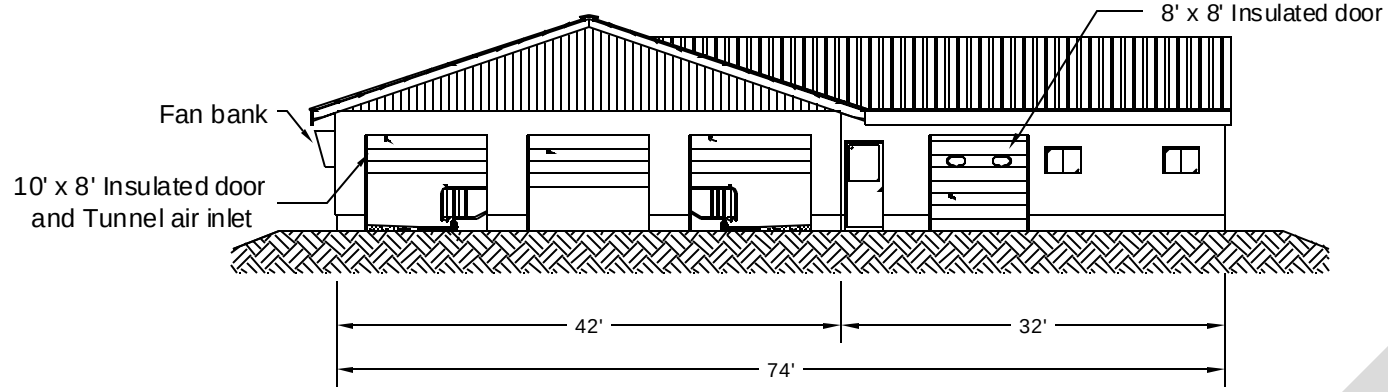


Fan Side Wall Elevation 1/3



Front View 1/4

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