

Heat Stress Abatement in Holding Pens with Nelson and Senninger Nozzles ***J.P. Harner¹, J.F. Smith¹, G. Boomer² and M. Brouk¹***

Research Studies on Heat Stress in Holding Pen

- Study 1: Body temperature decreased 3.5°F and milk production increased 1.7 pounds per cow per day when cows were cooled
- Study 2: Milk production increased 5 lbs per day when cows were cooled for 30 minutes five times per day in the holding pen

Facts on Heat Generation

- Cows produce about 4,500-6,000 BTU's per hour depending on the level of milk production
- A cow's heat production is similar to a 1,500 W hair dryer during a one-hour period
- The heat produced by a cow in one day is equivalent to the heat produced when 1.2 gallons of propane is burned

Management strategies to reduce heat stress in holding pen

- Reduce group size to minimize time in holding pen
- Alter milking times if the parlor is not used at full capacity or milk low producing and heifers during hottest part of the day
- Open up the sidewalls and ridge vents to enhance natural ventilation
- Install fans to mechanically ventilate the holding pen during hot weather
- Install a soaker system to increase the evaporative cooling from cows

Enhancing Natural Ventilation

- Sidewalls with at least 60 percent opening
- Remove ridge caps or open up ridge vents
- Ridging opens a minimum of 2 inches per 10 foot of pen width

Fans Specifications

- Option 1: One 36-inch fan per 10 cows or 150 square feet in the holding pen
- Option 2: One 48-inch fan per 20 cows or 300 square feet in holding pen
- Ideal distance between rows-20-24 feet for 36-inch fans and 30-36 feet for 48-inch fans
- Maximum distance between rows – 30 feet for 36-inch fans and 40 feet for 48-inch fans
- Mounting Height – bottom of the fan as low as possible allowing adequate head space to operate equipment
- Mount fans such that air flow is away from milk parlor
- Thermostat turns fans on when holding pen temperature reaches 72°F

Soaker System

- Approximate system capacity = 1 gallons per 150 square foot of pen space
- On-off cycle – 1 minute on and 5 minutes off
- Thermostat turns soakers on when holding pen temperature reaches 72°F
- Mounting height – at least 8 feet above the floor
- Pressure in distribution line should be 15 to 20 psi.

Utilities Required

- Electrical service for additional fans – ¾ kVA per fan horsepower
- Water supply – 1 gallon per 10 cows per cooling cycle

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List of Suppliers

Nozzles

<http://www.nelsonirrigation.com/apps/solidset.cfm>

<http://www.nelsonirrigation.com/products/index.cfm?id=12&specificproductquery=34>

<http://www.nelsonirrigation.com/data/products/nozzlesheet.pdf>

<http://www.nelsonirrigation.com/data/products/D3000.pdf>

<http://www.senninger.com/>

<http://www.senninger.com/pages/pv-ldn.html>

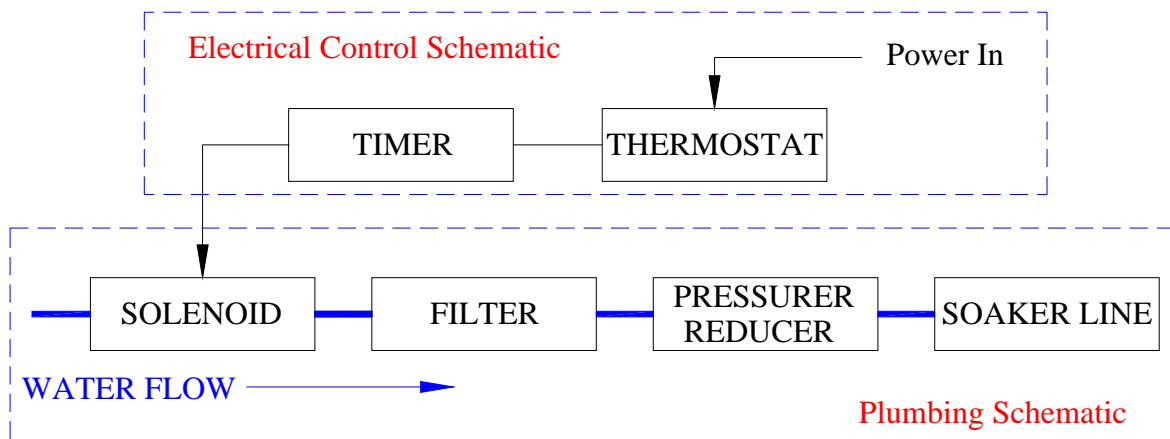
Controllers

http://www.agselect.com/ED/showprod.cfm?&DID=11&CATID=2&ObjectGroup_ID=4

<http://www.meter-man.com/agprods.html>

<http://www.farmtek.com/>

Schematic of Electrical Control and Plumbing



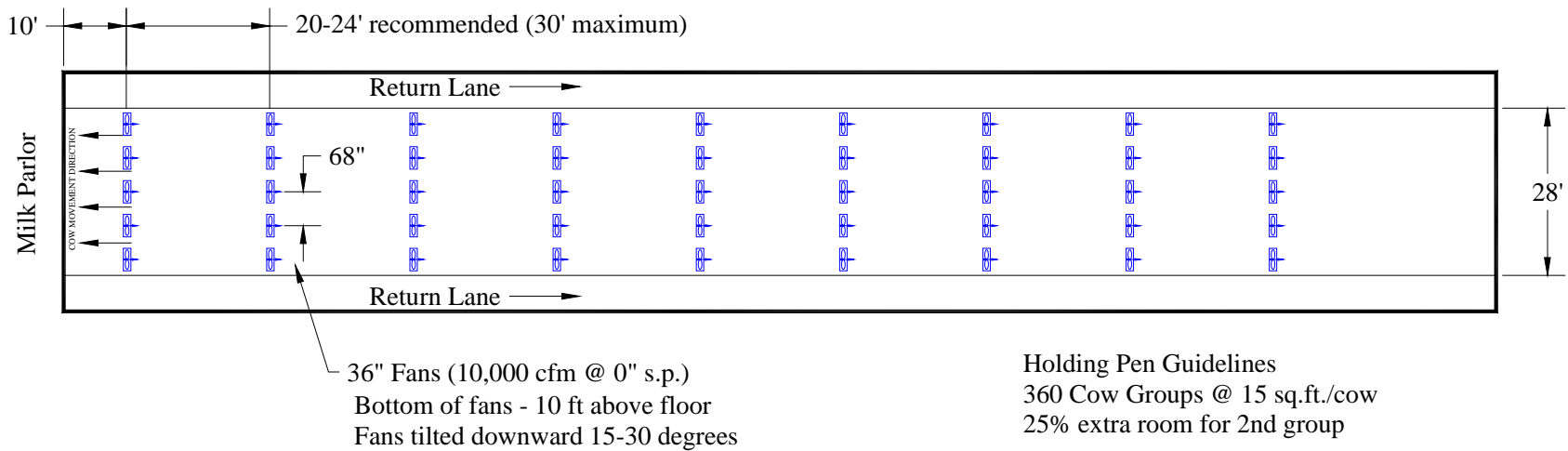
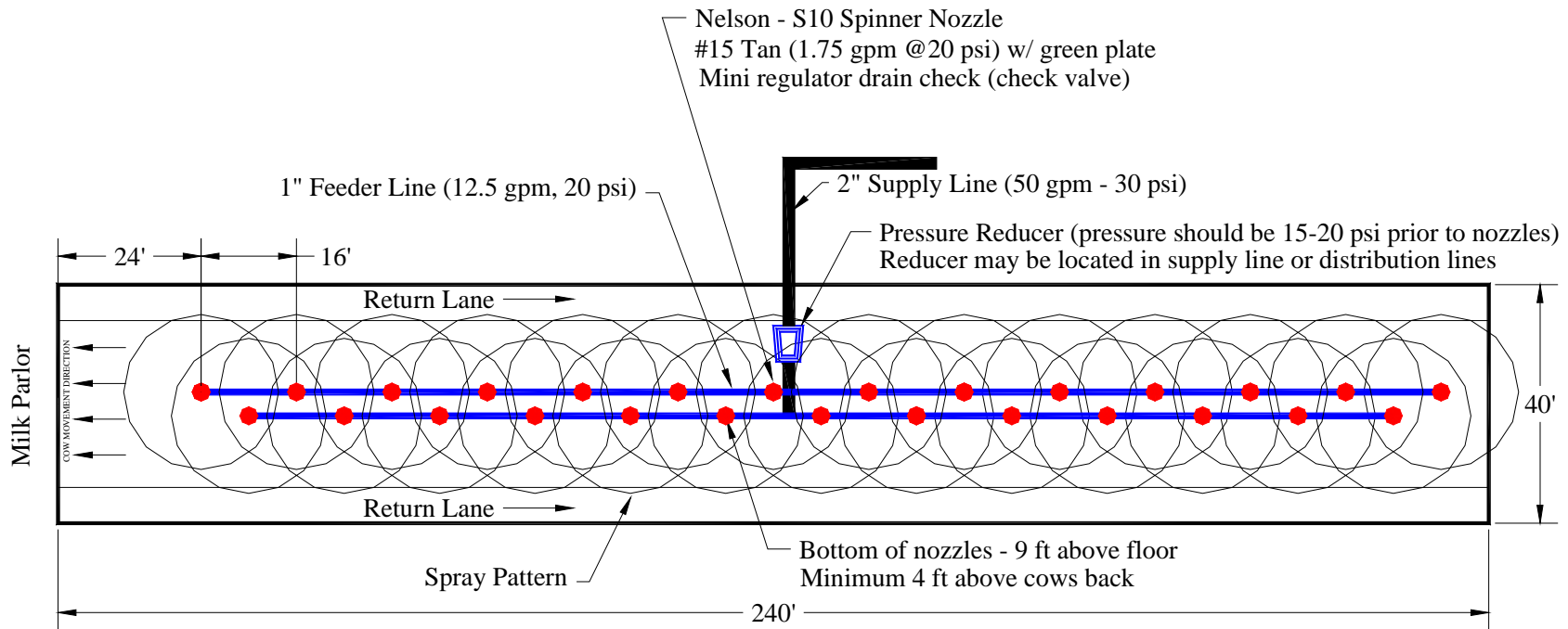
References

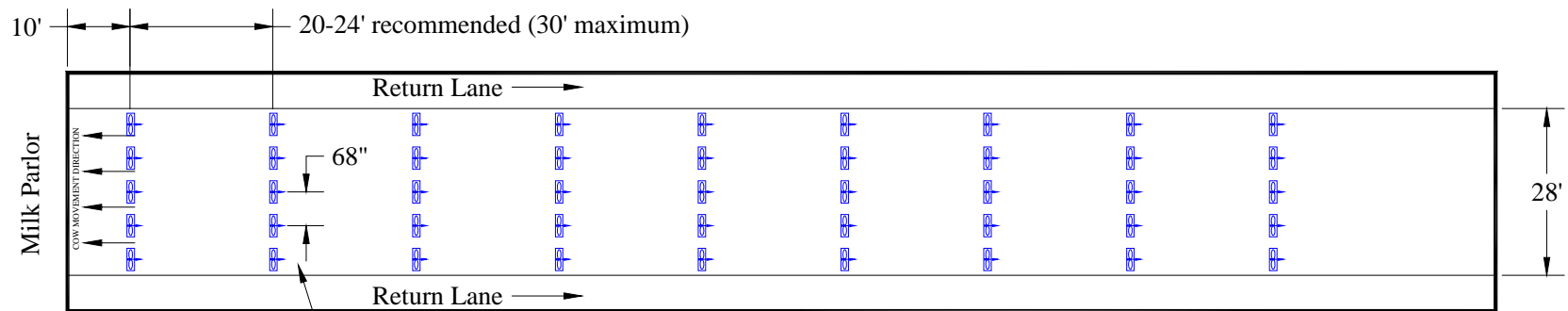
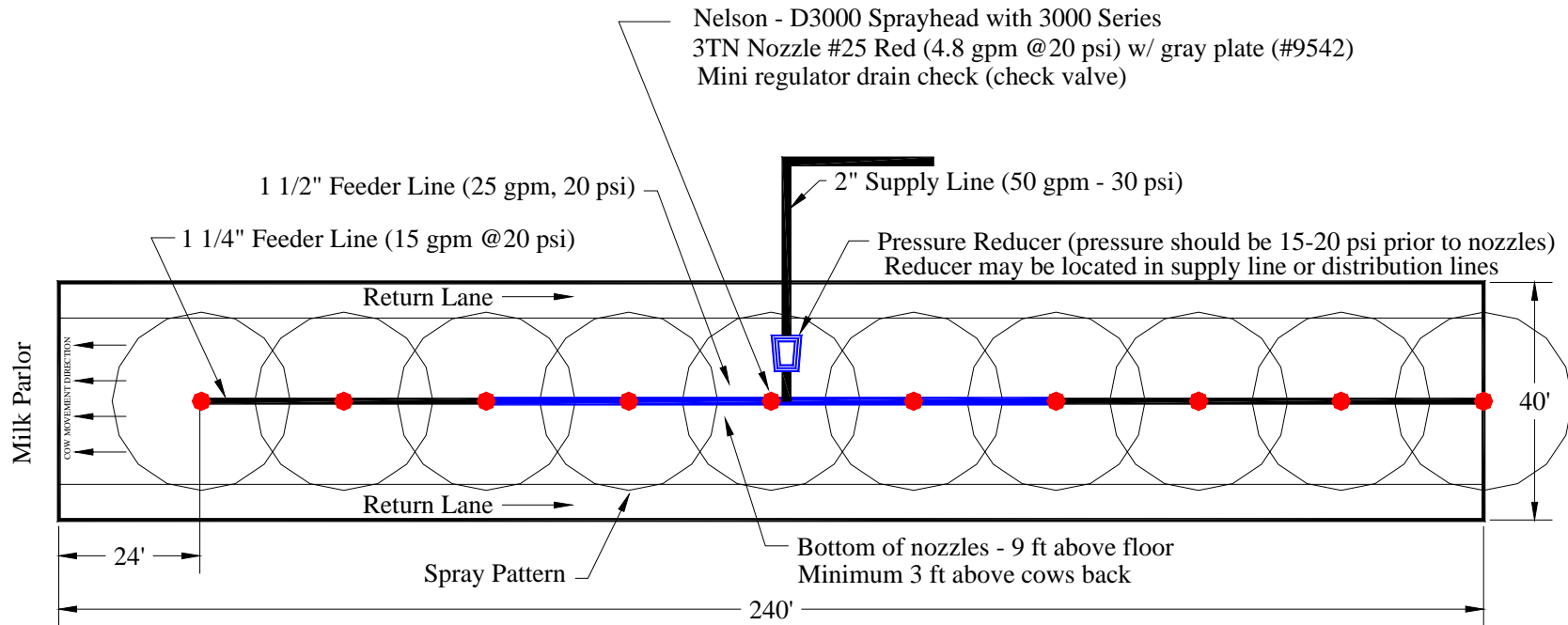
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Flamenbaum, I. Et. Al. 1986. Cooling dairy cattle by a combination of sprinkling and forced ventilation and its implementation in the shelter system. J Dairy Sci. 69:3140-3147.

Wiersma, F. and D.V. Armstrong. 1983. Cooling dairy cattle in the holding pen. ASAE Paper No. 83-4507, St. Joseph, MI.

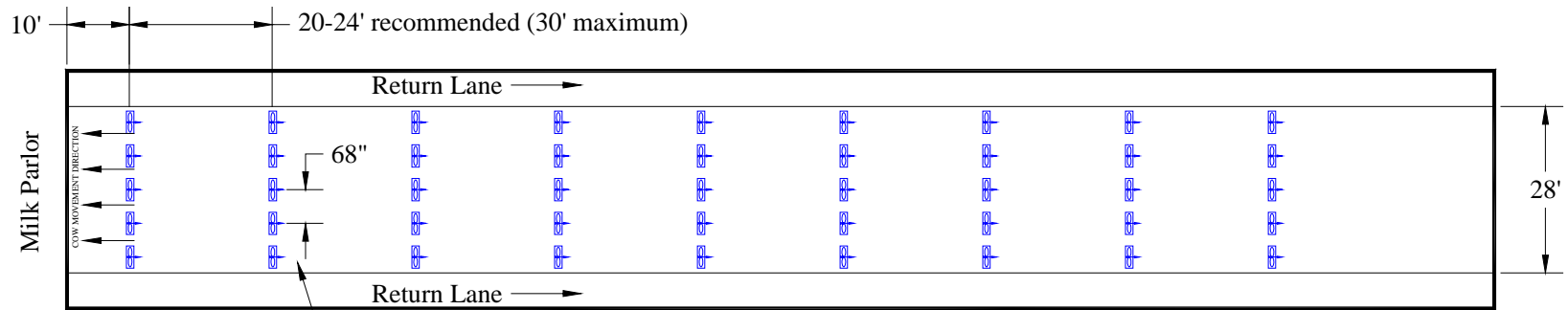
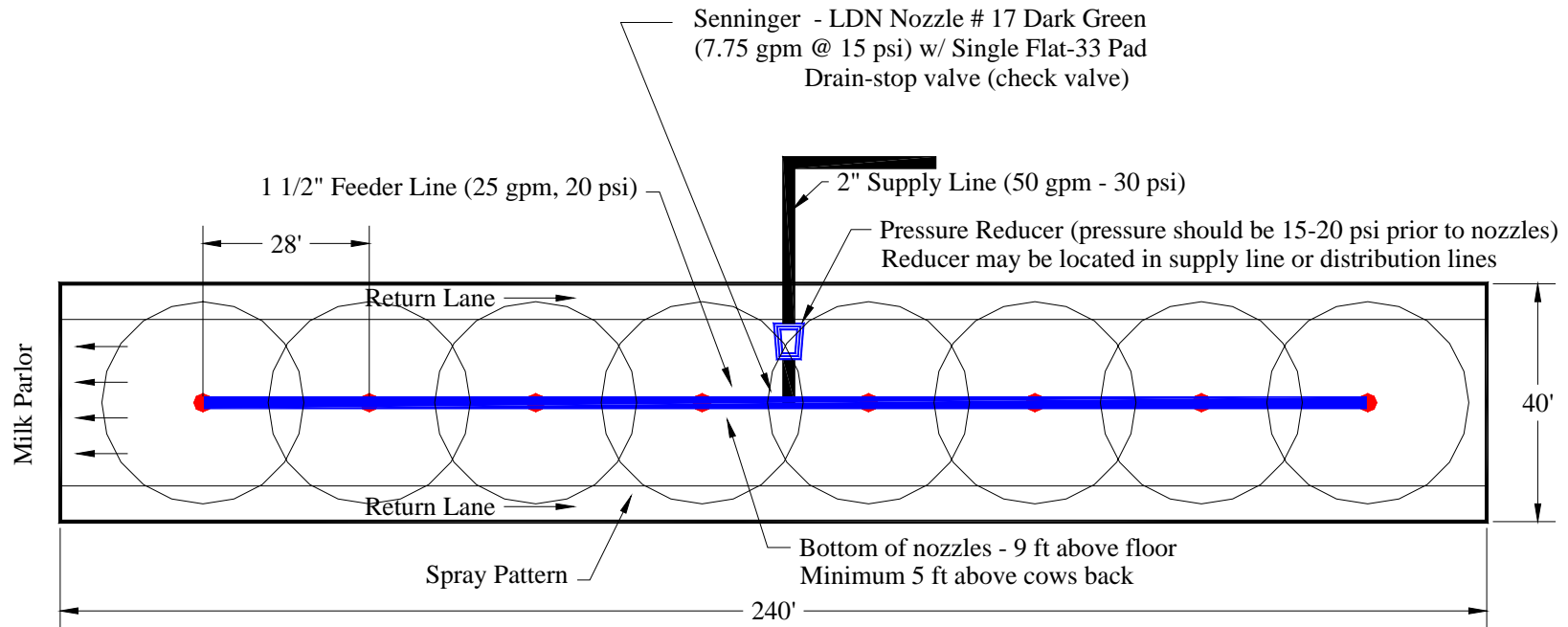
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36" Fans (10,000 cfm @ 0" s.p.)
Bottom of fans - 10 ft above floor
Fans tilted downward 15-30 degrees

Holding Pen Guidelines
360 Cow Groups @ 15 sq.ft./cow
25% extra room for 2nd group



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