

The Heifer Facility Puzzle: The New Puzzle Pieces

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Changes Impacting the Facility Puzzle



Traditional Puzzle Shape

Non Traditional Puzzle Shape



On-going Changes



Traditional

- Hutches
- Manual Feeding
- Seasonal variability
- Standard breeding



- Focus on Stress
 - Social
 - Feed ration
 - Environment

Non Traditional

- Groups
- Automated Feeding
- Steady state
- Cross breeding



Calves & heifers represent the best genetic potential for milk production on a well-managed farm.



Successful Heifer Rearing

- Appropriate nutrition
- Proper health care
- Exceptional husbandry
- First-rate environment



Replacement Heifer Facility Goal



Provide an environment and management opportunity to raise healthy, well-grown calves and heifers that are ready to enter the milking herd between 22 to 24 months of age.



Calf & Heifer Facilities



- Healthy, comfortable environment for animals
 - Appropriate nutrition
 - Proper health care
 - First-rate environment
 - Freedom to exhibit normal behaviors
- Heifers ready to breed at production weight & height goals
 - Ability to accurately measure physical dimensions
 - Proper calf rearing program (feed / housing / health, etc)
- Safe, convenient working environment for caregivers
 - Consideration of task performance
 - Safety and welfare of employees and animals
 - Seek to minimize stress



Facility Requirements for Calves & Heifers to Thrive



- Plenty of fresh, dry air
- Draft protection
- Clean, dry, comfortable resting area
- Convenient access to feed & water
- Confident footing
- Protection from weather extremes



Factors that Enhance Caregiver Performance



- Good observation
- Easy feeding & care
- Simple animal handling, isolation & restraint
- Convenient cleaning & manure removal
- Proper lighting



Changes in Dairy Industry Impacting Heifer Facilities



- Sex Semen
- Automated Feeders
- Animal Welfare Audits
- Technologies / Grouping
- Dairy Linkages

Impact of Sex Semen



- Past design based on 47 % heifers
- Current 47 to 75 % heifers
 - 5 to 50 % increase in heifers
- Options
 - Facility expansion
 - Culling at earlier age (8 – 12 weeks / hutches)



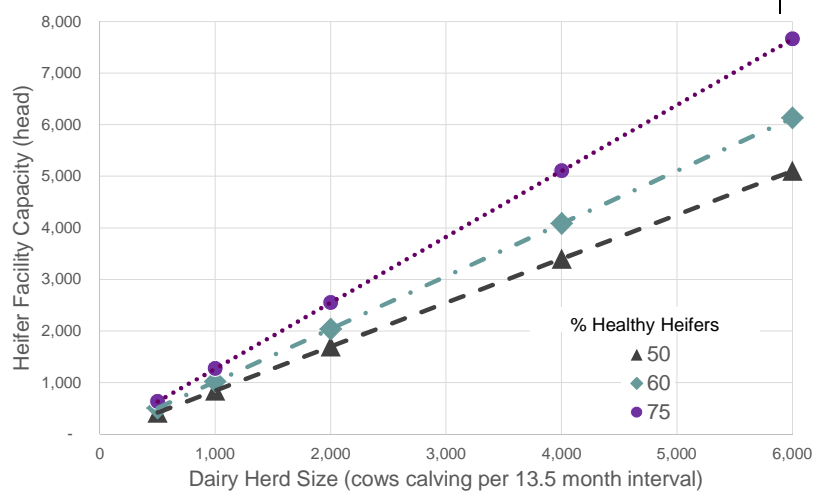
Impact of sex semen on heifer supply and demand



| Percent Heifers | Annual Culling %age | |
|-----------------|---------------------|------|
| | 30 % | 40 % |
| 47 % | 72 % | 96 % |
| 60 % | 56 % | 75 % |
| 75 % | 45 % | 60 % |

Assumes 9.9 million dairy cows (since 1985) & 13 ½ month calving interval

Impact of Sex Semen on Heifer Facility Capacity



Automated Feeders

- Increments begin at 20 – 25 head per group
 - Previous design based on 1 - next 8-12 head
 - Hutches for 7 to 10 days then grouping
- What do with science and research
- Grouping at earlier age –
 - Next group size 50 hd +

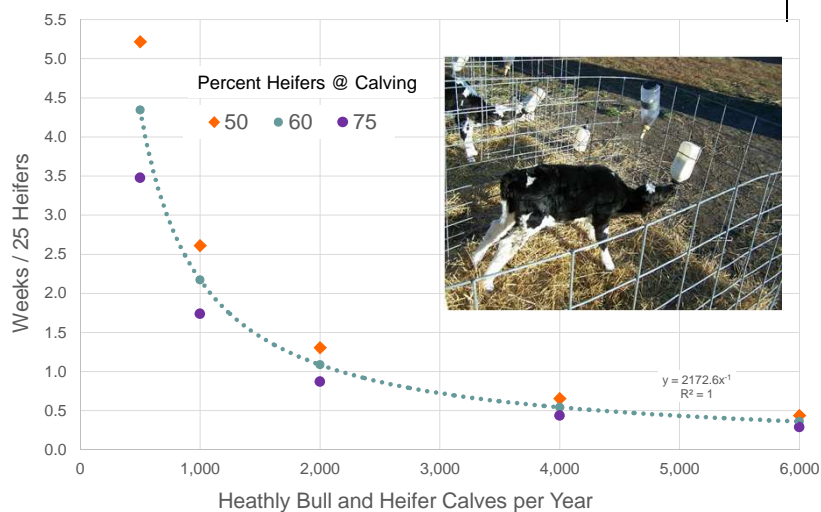


Suggested Dairy Replacement Groups

| Group | Name | Typical or Estimated Age | Maximum Animals per Group | Maximum Age Spread | Maximum Weight Spread in Group |
|-------|-----------------|----------------------------------|---|--------------------|--------------------------------|
| 1 | Baby calf | Birth to 2 months | 1 | | |
| 2 | Transition calf | 2 to 6 months | 8 | 1 month | |
| 3 | Heifer | 6 to 8 months | Based on management ability and calving rate ↓ | 4 months | 200 lbs |
| 4 | Heifer | 8 to 12 months | | ↓ | ↓ |
| 5 | Heifer | 12 to 16 months | | | |
| 6 | Heifer | 16 to 20 months | | | |
| 7 | Heifer | 20 months to 1 month pre-calving | | | |

Source: Adapted from Graves et al., 2008

Weeks / 25 Heifer Calves



Animal Welfare Audits

- Pen, resting and feeding minimum spaces
- Stocking density
 - 1 stall / 1 feed space per heifer
 - 3-row heifer pens - audit recommendations??
- Air quality – measurement ???
- Open lots – shade and wind protection
 - 10,000 heifer open lot ranch (spring 2016)
 - Cost estimate \$12,000,000 (shade and windbreak)
 - Cost estimate \$8,000,000 (without structures)

DCHA vs Penn State Recommendations



| Group ID | DCHA Grouping | | Penn State Grouping | |
|----------|---------------|--------------------------|---------------------|--------------------------|
| | Age (months) | Pen Space (sq. feet/ hd) | Age (months) | Pen Space (sq. feet/ hd) |
| 1 | 0 to 2 | | 0 to 2 | |
| 2 | 2 to 4 | 34 | 2 to 4 | |
| 3 | 4 to 6 | 40 | 4 to 8 | 40 |
| 4 | 6 to 12 | 45 | 8 to 12 | 40 |
| 5 | 12 to 18 | 50 | 12 to 16 | 50 |
| 6 | 18 to 3+ wks | 60 | 16 to 20 | 60 |
| 7 | 3+ wks | 100 | 20 to 1+ wk | 80 |
| 8 | | | 3+ wks | 120 |

DCHA Gold Standard Recommendations



| Age (months) | Pen Space (sq. feet/ hd) | Free Stall (w x l) | Feed Space (inches) | Water Space (inches/ 10 hd) |
|--------------|--------------------------|--------------------|---------------------|-----------------------------|
| 2 to 4 | 34 | | | 12* |
| 4 to 6 | 40 | | | 12 |
| 6 to 12 | 45 | 30 x 54 34 x 60 | 18 | 12 |
| 12 to 18 | 50 | 36 x 69 | 20 | 12 |
| 18 to 3+ wks | 60 | 40 x 84 | 24 | 12 |
| 3+ wks | 100 | 43 x 96 | 30 | 12 |

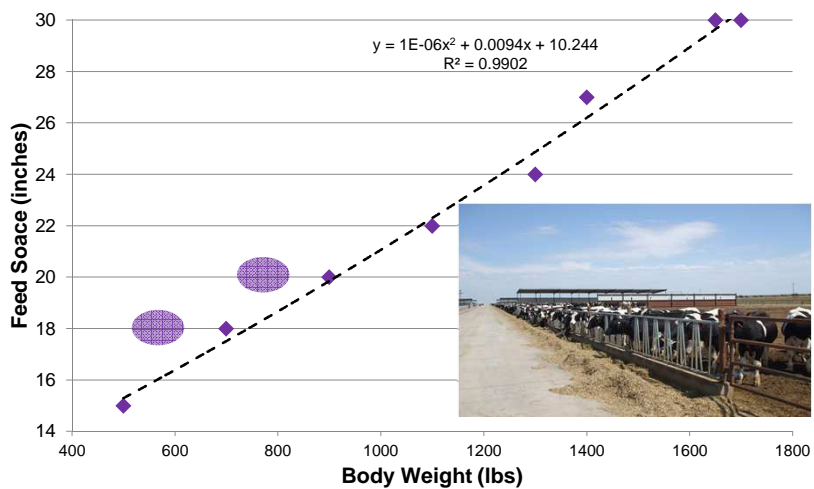
*1 automatic water / 20 head & at least 2 waterers /pen

Penn State vs DCHA

| Weight (Penn State) | | Age (DCHA Gold Standard) | |
|---------------------|-------------------|--------------------------|----------------|
| Weight (lbs) | W x L (inches) | Age (months) | W x L (inches) |
| 300-500 | (30-32) x (48-54) | 6 to 9 | 30 x 54 |
| 500-700 | (34-36) x (60-69) | 9 to 12 | 34 x 60 |
| 700-900 | (38-40) x (75-84) | 12 to 18 | 36 x 69 |
| 900-1100 | (41-43) x (90-96) | 18 to +3 wks | 40 x 84 |
| | | + 3 wks | 43 x 96 |



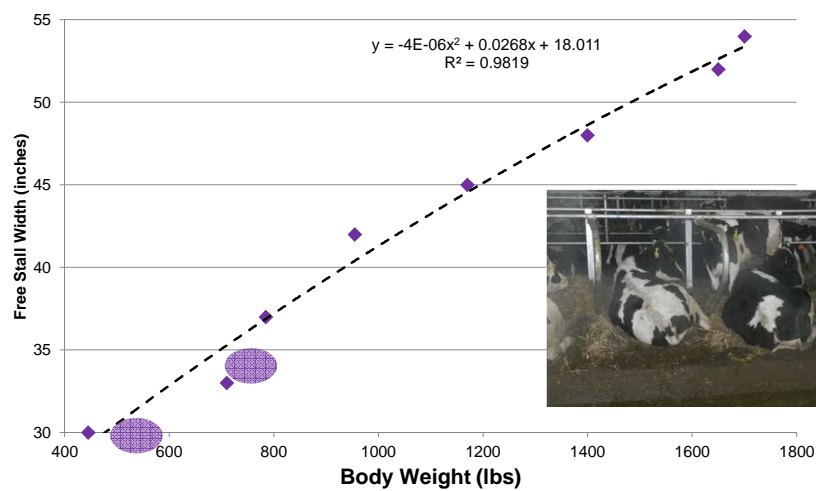
Body Weight vs Feed Space



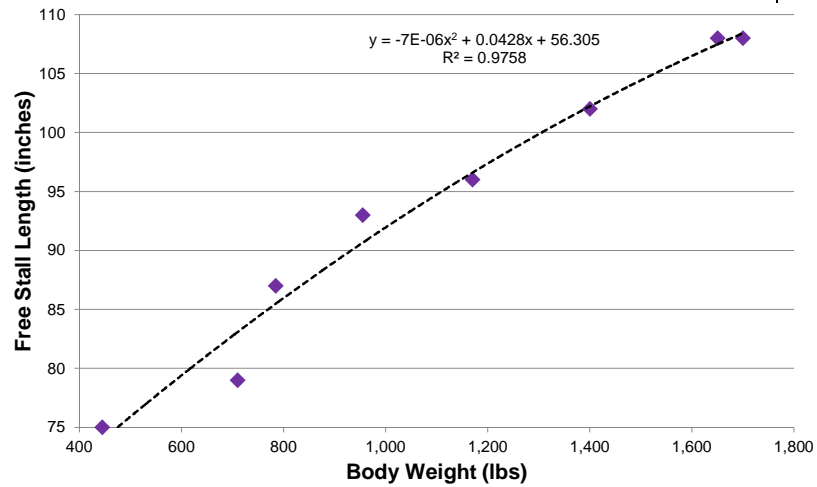
Feed Line Options



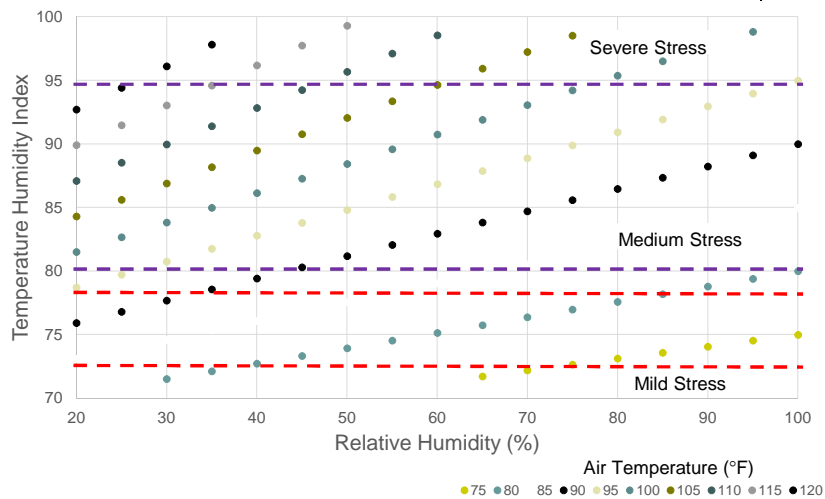
Body Weight vs Free stall Width



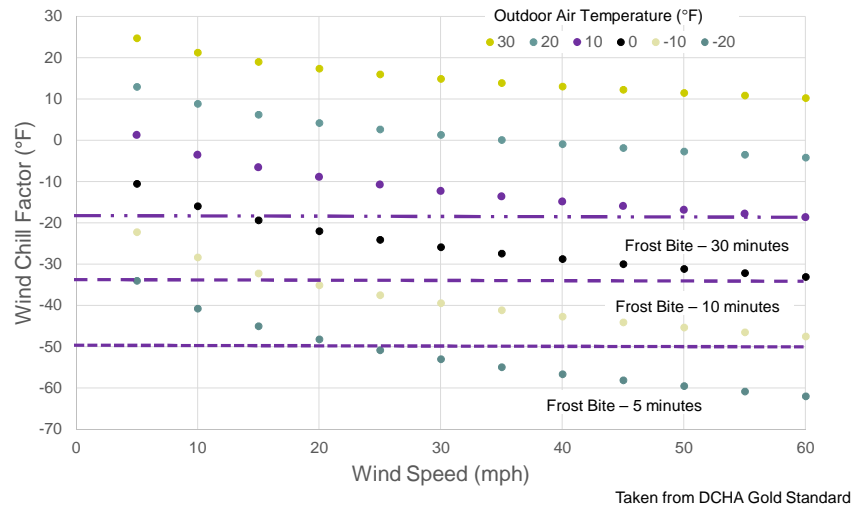
Body Weight vs Free stall Length



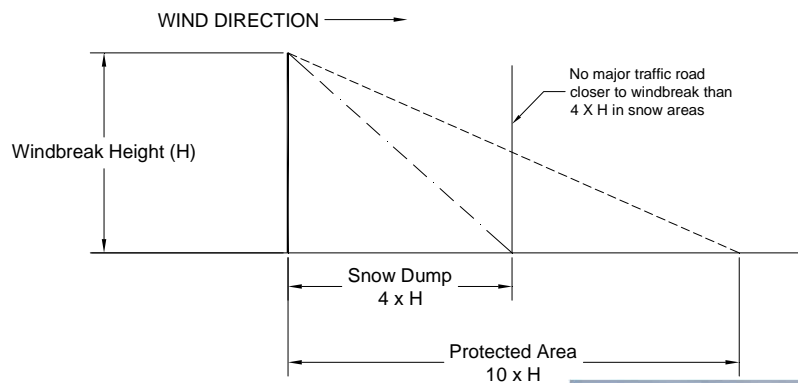
Temperature Humidity Index



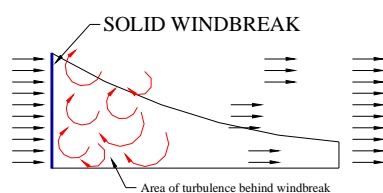
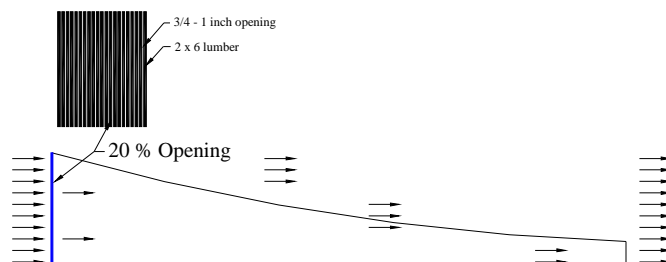
Wind Chill Factor



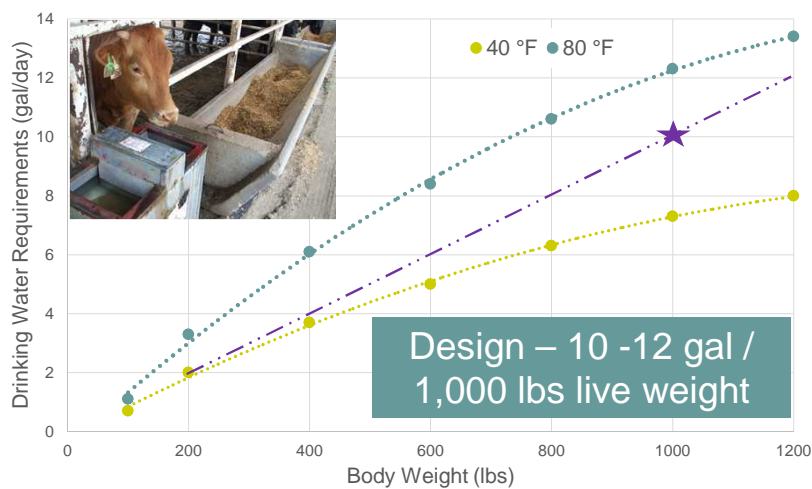
Windbreak Design



Windbreak Considerations



Calf & Heifer Drinking Water Requirements



Grouping Strategies

- Current recommendations based on age
 - Weeks or Months (is a month 4 wks or 4.3 wks)
- Facility recommendations based on weight
- Accelerated feeding programs weight based
- Breeding physical dimensions vs age

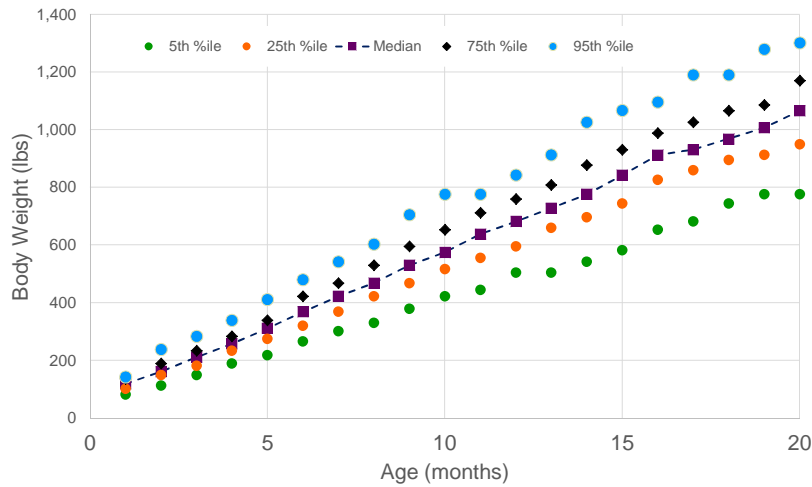


Recommended Grouping for Holstein Dairy Replacements

| Group | Name | Typical or Estimated Age | Typical or Estimated Weight (lb) |
|-------|-----------------|----------------------------------|----------------------------------|
| 1 | Baby calf | Birth to 2 months | BW – 175 |
| 2 | Transition calf | 2 to 6 months | 175 - 400 |
| 3 | Heifer | 6 to 8 months | 400 - 500 |
| 4 | Heifer | 8 to 12 months | 500 - 700 |
| 5 | Heifer | 12 to 16 months | 700 – 900 |
| 6 | Heifer | 16 to 20 months | 900 – 1,100 |
| 7 | Heifer | 20 months to 1 month pre-calving | 1,100 – 1,300 |

Source: Adapted from Graves et al., 2008

Variability Body Weight vs Age

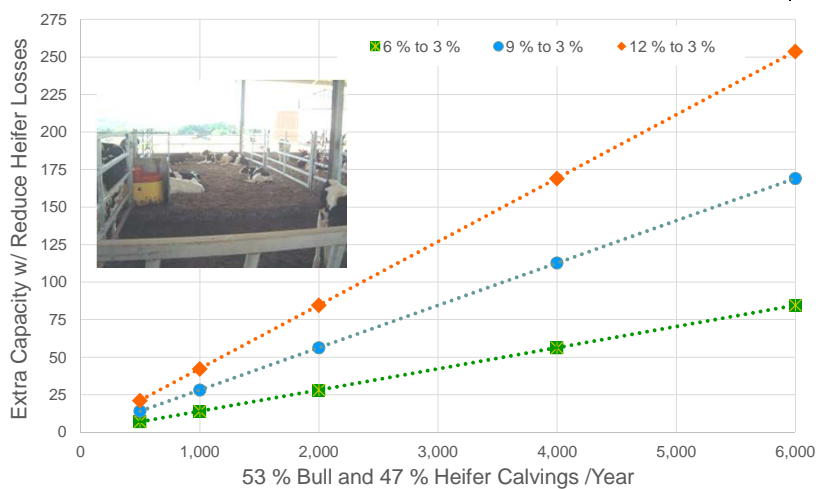


| Age (mo) | 5th %ile | 25th %ile | Median | 75th %ile | 95th %ile |
|----------|----------|-----------|--------|-----------|-----------|
| 1 | 82 | 102 | 119 | 136 | 143 |
| 2 | 113 | 149 | 161 | 189 | 238 |
| 3 | 149 | 182 | 211 | 234 | 284 |
| 4 | 189 | 234 | 258 | 284 | 339 |
| 5 | 218 | 275 | 311 | 339 | 411 |
| 6 | 266 | 320 | 369 | 422 | 480 |
| 7 | 301 | 369 | 422 | 468 | 542 |
| 8 | 330 | 422 | 480 | 530 | 603 |
| 9 | 379 | 480 | 542 | 596 | 705 |
| 10 | 422 | 542 | 603 | 653 | 776 |
| 11 | 480 | 603 | 682 | 712 | 776 |
| 12 | 542 | 682 | 728 | 760 | 843 |
| 13 | 603 | 728 | 776 | 809 | 913 |
| 14 | 682 | 776 | 843 | 878 | 1026 |
| 15 | 728 | 826 | 895 | 931 | 1067 |
| 16 | 776 | 860 | 913 | 988 | 1096 |
| 17 | 826 | 895 | 969 | 1026 | 1191 |
| 18 | 860 | 913 | 1007 | 1066 | 1191 |
| 19 | 895 | 950 | 1066 | 1086 | 1279 |
| 20 | 913 | 988 | 1086 | 1170 | 1302 |
| 21 | 950 | 1026 | 1148 | 1191 | 1372 |
| 22 | 1026 | | | 1235 | 1420 |

DESIGN for
75th - 95th Percentile

National Heifer
Survey Evaluation

Impact of Exit Strategies



Dairy Linkages

- 500 + 1,500 + 3,000 head dairies equals a 5,000 linked calf ranch
 - Centralized calving ranch
 - Specialized team focused on heifer production
 - Optimize facility design

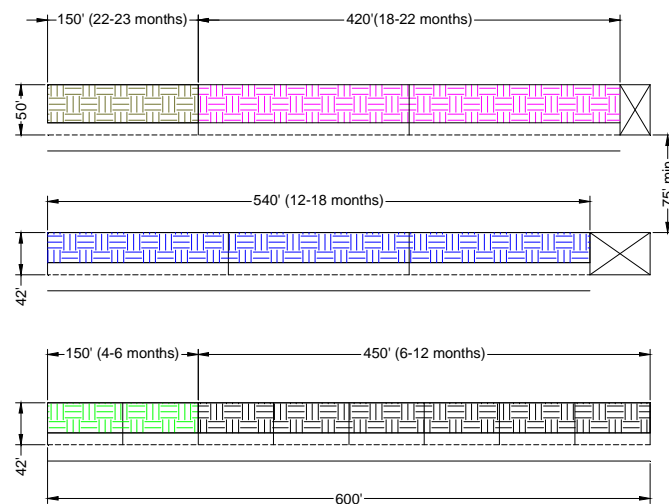


Design Criteria

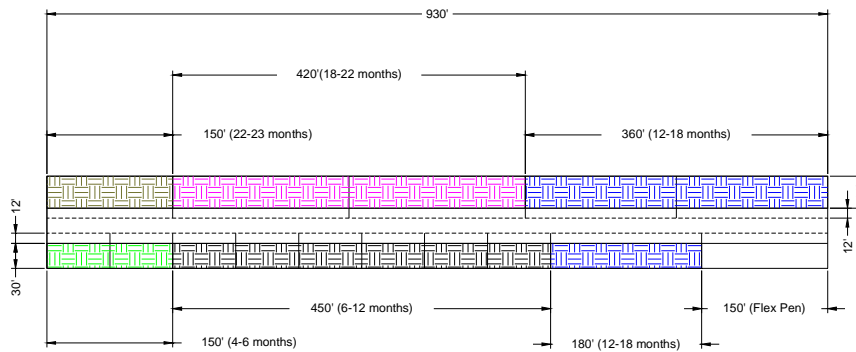
- 50 heifer calves per month
- 16 ft feed road for mono slope and 18 ft for gable & free stall
- Attempt to optimize construction and alleys
- Extra capacity varies in each building



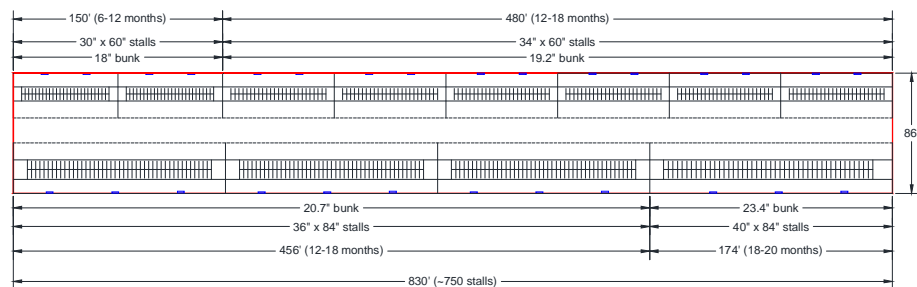
Mono Sloped Pack Barn (50 Heifers / Month & 6 to 22 months)



Gable Sloped Pack Barn (50 Heifers / Month & 6 to 22 months)



2 Row Heifer Barn (50 Heifers / Month & 6 to 20 months)



DCHA recommends stocking density of 1 stall & 1 feed space per heifer

Comparison of Building Options

square feet of space per head



| | Gable Pack | Mono Pack | Free stall |
|---------------------|-----------------------|-------------------------------|------------|
| Extra Capacity | ~ 8 % | ~ 5 % | < 1 % |
| 4 to 6 months | 63 | 63 | 48 |
| 6 to 12 months | 63 | 63 | 51 |
| 12 to 18 months | 85 | 76 | 62 |
| 18 to 22 months | 105 | 105 | 70 |
| Feed Road/Stall | 17 | 28 | 15 |
| Overall / Optimized | 102 (Feed covered) | 84 / 91 (Feed not covered) | 72 |

Assumptions

- 50 heifer calves per month
- 16 ft feed road for mono slope and 18 ft for gable & free stall
- Attempt to optimize construction and alleys
- Extra capacity varies in each building

Open Lot Recommendations



| Age (months) | Pen Space (sq. feet/ hd) | Feed Space (inches) | Shade Space (sq ft / hd) | Windbreak (sq ft / hd) |
|--------------|--------------------------|---------------------|--------------------------|------------------------|
| 4 to 6 | 375 | 18 | 25 | 48 |
| 6 to 12 | 500 | 20 | 25 | 64 |
| 12 to 18 | 500 | 24 | 30 | 96 |
| 18 to 3+ wks | 600 | 24 | 40 | 96 |
| 3+ wks | 600 | 30 | 45 | 144 |

Recommend water space of 2 to 3.5 inches per head depending on age



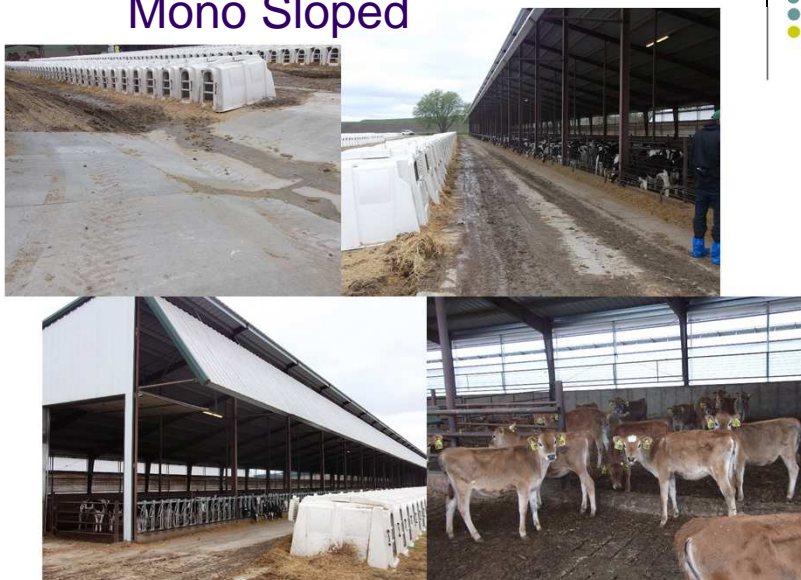
Open Lot Recommendations



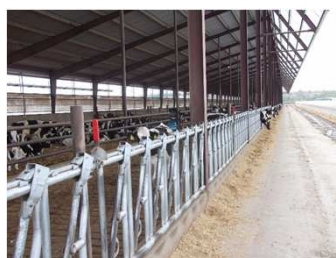
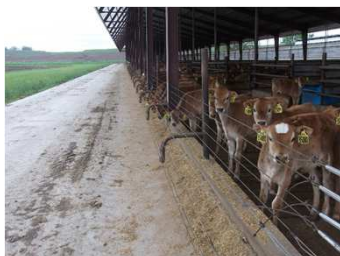
| Age (months) | Weight | Throat Hgt (inches) | Neck Rail Hgt (inches) | Headlocks (inches) |
|--------------|-----------|---------------------|------------------------|--------------------|
| 6 to 8 | 350-500 | 14 | 28 | 17 (7/10) |
| 9 to 12 | 500-650 | 16 | 30 | 20 (6/10) |
| 13 to 15 | 650-800 | 17 | 34 | 20 (6/10) |
| 16 to 24 | 800-1,200 | 19 | 41 | 24 (5/10) |
| 3+ wks | 600 | 30 | 45 | 30 (4/10) |

Recommend throat height is 3 inches lower if headlocks are used

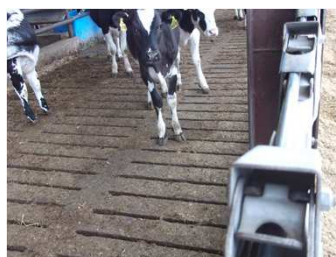
Midwest Heifer Facility Mono Sloped



Feeding



Pen Configuration



Take Home Messages



- Develop long term flexible plan – at least on paper (does not have to be build immediately)
- Fully evaluate impact of sex semen on heifer facilities and develop strategy for extras
- Develop exit strategy for calves / heifers which do not meet physical or health goals – (5-15 % increase in capacity)
- Lowest investment to increase facility capacity is to utilize current data available
- Prepare for animal welfare audits and facility changes
- Many different options – must work with your management style and production goals

THANKS

