LELY BARN CONCEPTS

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innovators in agriculture

LELY VISION
A sustainable, profitable and enjoyable future in farming.

Foreword

A new cow-barn is always a matter for huge consideration. The ability to work comfortably and with efficient functioning of Lely's innovative concepts in the barn stands or falls with the correct design.

As consultants and representatives of Lely, you know the ins and outs of total herd management, and especially the crucial issues regarding barn design. This manual gives you a number of practical examples of how a barn – ideally – can be organized and Lely will share our knowledge and experience for these concepts. These examples will help you in your advice and clarify various options for farmers.

A sustainable, profitable and enjoyable environment, where the farmer works productively and the cow feels at home thanks to the free cow traffic concept, can be achieved by all examples in this manual.

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Lely barn concepts quick index

Freedom = happiness

After extensive comparisons among different dairy farms, we know that the most satisfied dairy farmers and cows come from farms where free cow traffic is implemented.

What types of cow traffic are there?

Forced cow traffic
Cows are forced to approach the robot by selection gates or one-way fences leading from or to the stalls or feed fence. With this system, the cows are denied one of their basic needs (lying down or eating) and have to follow a compulsory route to the robot.
On the way to the robot, they must walk through various narrow passages. This system is known by various names, depending on the direction and form of the system, for example forced, guided and feed-first.

Free cow traffic
The cows can eat, drink, rest and be milked when they want. There are a minimum number of gates, rails or obstructions and plenty of 'open' space in all areas. Cows can visit the robot whenever they wish but if they are too early for milking they are allowed out of the robot directly into the loafing area where they may choose what they want to do and where they will go. This freedom optimizes each cow's welfare, comfort and productivity.

Ten reasons to opt for Lely's free cow traffic:

1. **More milk per cow**
   more rest and higher feed intake
2. **Better claw health**
   more rest
3. **Better for low ranking cows**
   low ranking cows can eat, drink, rest and be milked when they want
4. **Better fat to protein ratio**
   higher roughage intake
5. **Higher feed efficiency and healthier rumens**
   more frequent feed intake
6. **More freedom and improved animal well-being**
   freedom to show natural behaviour
7. **More spare time for the farmer and more milk per robot**
   cows visit the robot voluntarily, more milk per cow
8. **Better udder health**
   cows can be milked more frequently and whenever they want
9. **Better social life for the farmer**
   healthy cows, more spare time, smooth milking process
10. **Lower costs, higher profit**
    no investment in gates, more milk per cow


LELY ASTRONAUT
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Space to perform

Sufficient space in a barn promotes visits to Lely Astronaut milking robot. Guidelines for a barn with sufficient space between the individual barn components are given in table 1. These dimensions are also adhered to for the intermediate distances in the Lely barn concepts in this manual.

Please keep in mind that the definition of the ideal barn differs and depends on:

- The requirements of the farmer/farm manager.
- The situation on-farm.
- Local rules and regulations.

Component	Distance (m)	Distance (in)
One Lely Astronaut milking robot and first obstacle	5	197
Two Lely Astronaut milking robots and first obstacle	7	276
Three Lely Astronaut milking robots and first obstacle	8	315
Between rows of cubicles	3	118
Between feed fence and cubicles	4.5	177
Dimensions of one cubicle* (WxL)	1.25 x 3	49.20 x 118
Dimensions of one cubicle when this is against a wall* (WxL)	1.25 x 3.25	49.20 x 128
Passageway	4	157
Passageway with drinking trough	5	197
Number of passageways	1 per 15 cubicles	1 per 15 cubicles
Feed alley **	5.5	217
Feed alley ***	4.1	161
Space required at feed fence	Feed places for minimal 70% of the herd, with a minimum width of 0.75 m per animal.	Feed places for minimal 70% of the herd, with a minimum width of 29.50 in per animal.

* one cubicle per cow available
** traditional, feeding on both sides
*** feeding on both sides with Lely Vector

Table 1. Guidelines for sufficient space in a barn

Lely barn concepts

Symbols denotation

Several areas are of importance in the design of a barn. In the Lely barn concepts manual Lely products are denoted by symbols and areas are denoted by letters.

Lely products


Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)


Lely Calm automatic calf feeder


Lely Commodus cow cubicle


Lely Cosmix concentrate feeder


Lely Discovery mobile barn cleaner


Lely Discovery loader


Lely Grazeway selection box


Lely Juno feed pusher


Lely Juno loader


Lely Light for Cows (L4C)


Lely Luna cow brush


Lely Nautilus milk cooling tank


Lely Treatment box


Lely Vector automatic feeding system (feed kitchen, mixing and feeding robot)


Lely Walkway automatic foot bath

Areas

A • Office
B • Hygiene area
C • Separation area
D • Machine area
E • Freshly calved (section of transition area)
F • Calving area (section of transition area)
G • Close-up (section of transition area)
H • Dry cows
I • Waiting area
Clean access • yellow marked area from outside the barn to the control room of the robot.

For grazing system only:
J • Training area
K • Non-milking area
L • Post-milk area
M • Concentrate area

2+2: Lots of space to move for cows

About the barn

- Lots of movement space available for the cows.
- One robot per group.
- Water troughs located on outer wall of the barn since a cow always makes a small turn. Having a water trough in the way could block the cow flow.
- Concept of enlargement from a 2+0 to a 2+2 barn.

About products and areas

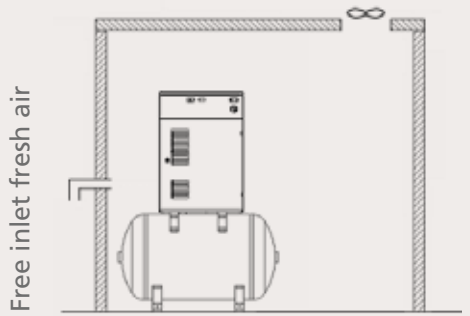
Machine room

The compressor should be placed in a separate and well ventilated, low dust, room (see picture 1). A good installation will ensure the lifetime of the compressor. Install the compressor on a level horizontal industrial floor.
Ideal ventilation for the compressor consists of:

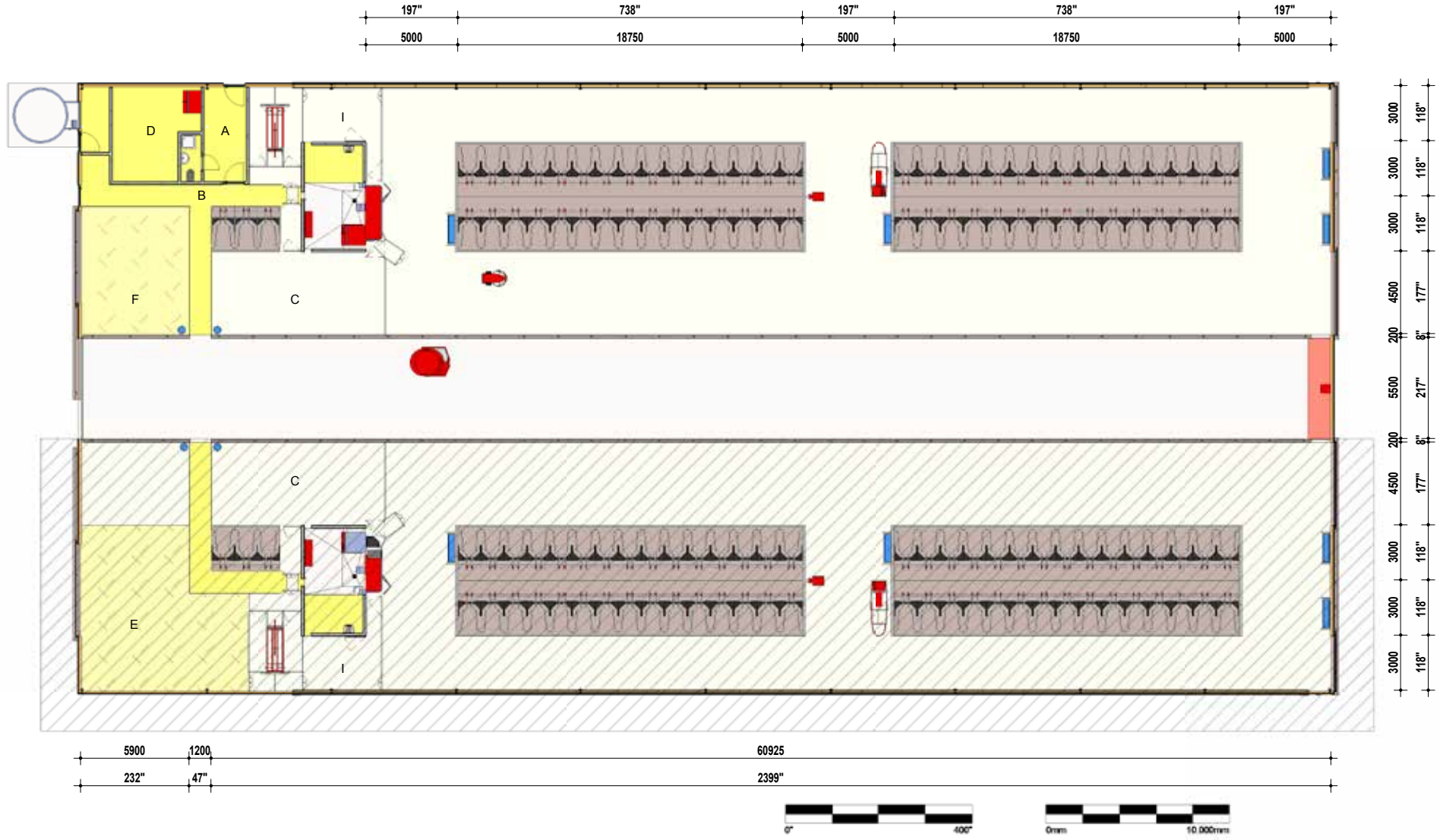
- Fresh air inlet pipe.
- Hot air extraction via a roof ventilation fan.
- No freezing in the compressor room.
- To test ventilation: install a minimum maximum thermometer.

Lely Commodus cow cubicle

The recommended measurements of the Lely Commodus cubicle depend on the body dimensions of the cow. Local rules of cubicle dimensions should always be considered.



Picture 1. A well ventilated room.



Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Commodus cow cubicle
- Lely Cosmix concentrate feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Luna cow brush
- Lely Treatment box
- Lely Vector automatic feeding system (feed kitchen, mixing and feeding robot)

A • Office
B • Hygiene area
C • Separation area
D • Machine area
E • Freshly calved (section of transition area)
F • Calving area (section of transition area)
I • Waiting area

Clean access • yellow marked area from outside the barn to the control room of the robot.

0-4-0 V1: Clear overview for the farmer

About the barn

- Lots of feeding places and movement space available for the cows.
- Management of one group.
- Close-up group is kept in a separate barn.

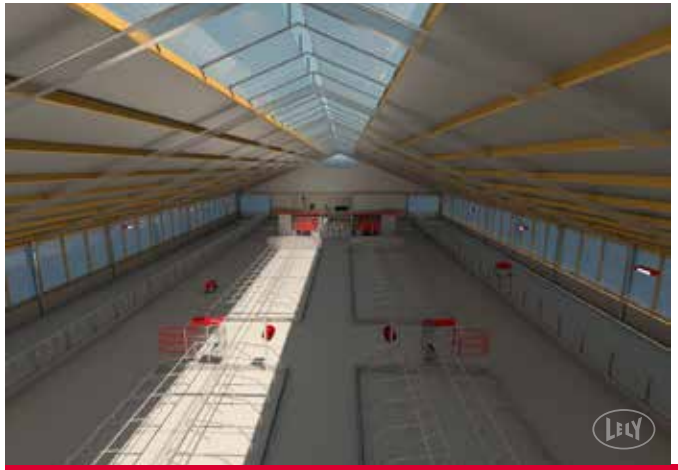
About products and areas

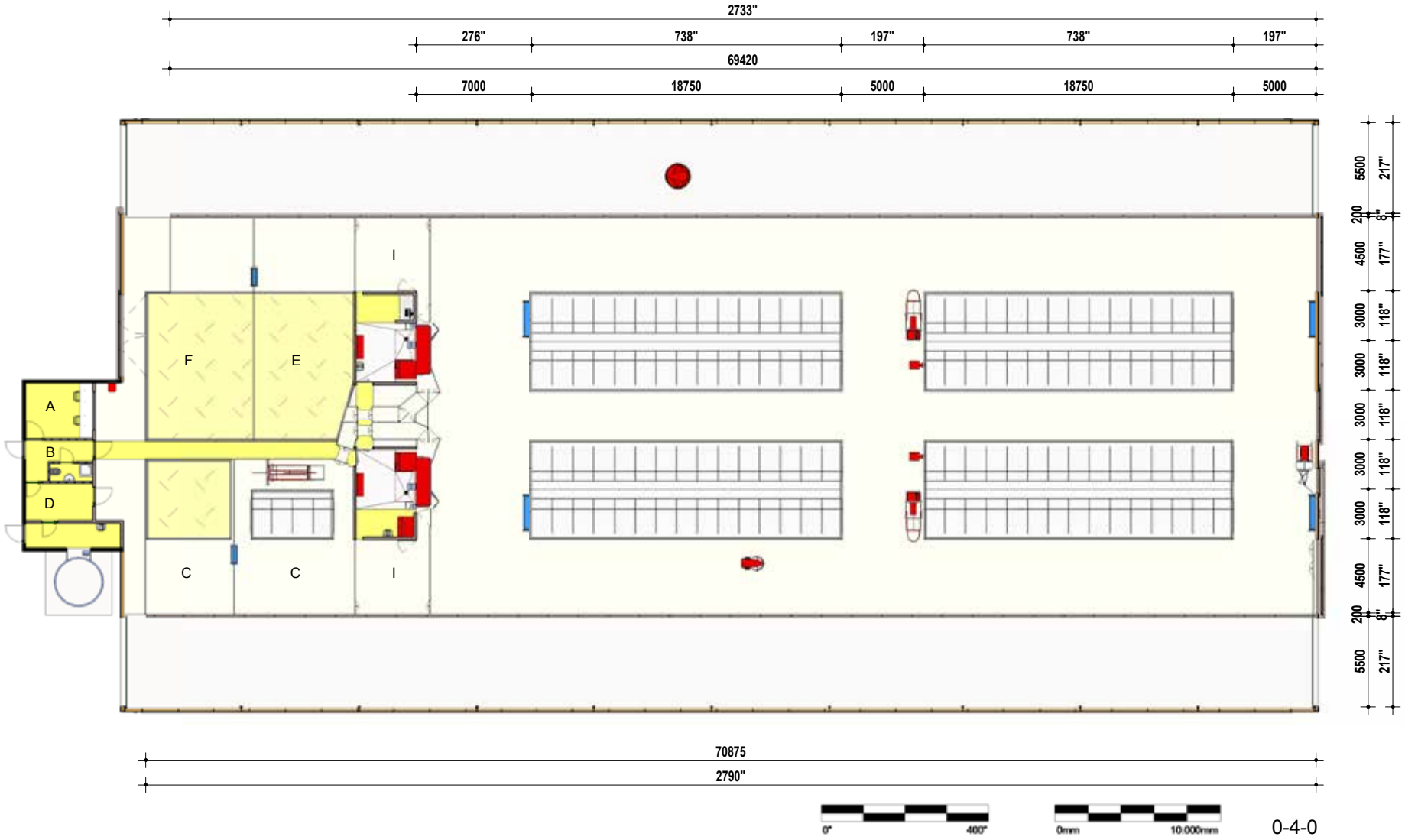
Separation area

A separation area, preferably equipped with cubicles or as a bedded pen, is an area that can be used for the short-term treatment of animals, such as insemination, or when they require extra attention. A separation area designed as a bedded pen will ideally provide 5% of the herd with an area of 15 m^2 (17.9 $yard^2$) per animal.
A treatment box should be part of the separation area.

Lely Juno feed pusher

When driving, the Juno follows a feed fence or wall. During inactiveness it is advised to have the Juno placed outside the feed alley. In this way the farmer can supply the food by using the tractor – without any obstacles.





Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Cosmix concentrate feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Grazeway selection box
- Lely Juno feed pusher
- Lely Juno loader
- Lely Luna cow brush
- Lely Treatment box

A • Office
B • Hygiene area
C • Separation area
D • Machine area
E • Freshly calved (section of transition area)
F • Calving area (section of transition area)
I • Waiting area

Clean access • yellow marked area from outside the barn to the control room of the robot.

0-4-0 V2: High flexibility in grouping

About the barn

- Barn suitable for split up of the herd in two groups (one robot per group).
- Feed alley on the outside of the barn which makes it manageable for only one person.
- The close-up group is kept in a separate barn.
- Per row of cubicles is one door available for easy access to the meadow.

About products and areas

Waiting area

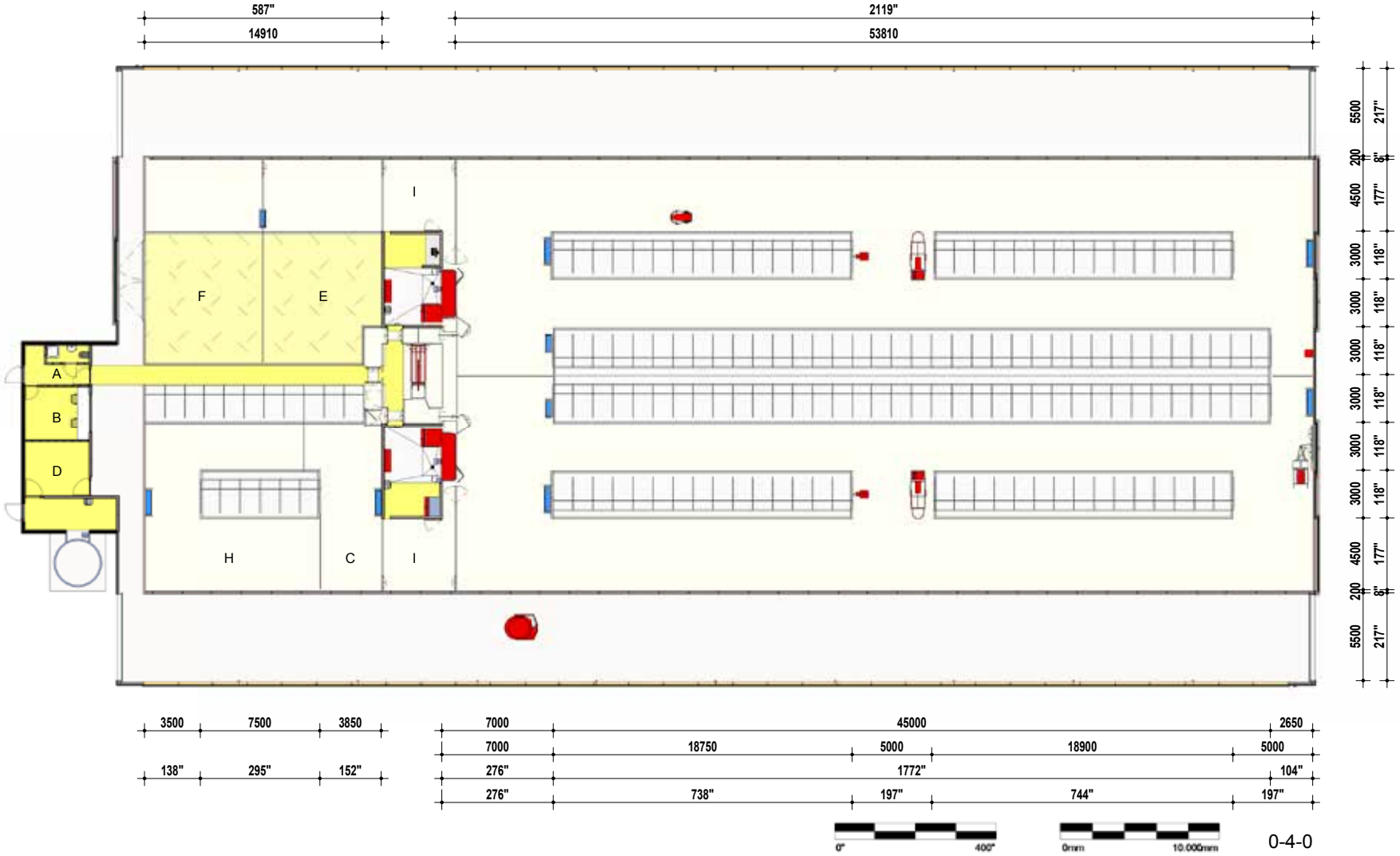
For the animals that – for one reason or another – do not visit the robot on their own accord, a holding area can be created.

- **Flexible**
  This could be a holding area made up of a number of fences to create a temporary holding area. When all the animals that have been fetched have visited the robot, the fences can be removed and the robot becomes accessible again. There is also an automatic fence that opens at a signal from the robot.
- **Fixed**
  Besides the robot a fixed holding area can be created in combination with split entry (see picture 2). Both the to be fetched cows and the rest of the herd can enter the robot unrestricted.

Picture 2. Holding area in combination with split entry (source: Vetvice).

Lely Vector automatic feeding system

By using the Lely Vector cows can be fed automatically 24/7. A feed kitchen with storage for at least three days is required.



Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Cosmix concentrate feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Grazeway selection box
- Lely Luna cow brush
- Lely Treatment box
- Lely Vector automatic feeding system (feed kitchen, mixing and feeding robot)

A • Office
B • Hygiene area
C • Separation area
D • Machine area
E • Freshly calved (section of transition area)
F • Calving area (section of transition area)
H • Dry cows
I • Waiting area

Clean access • yellow marked area from outside the barn to the control room of the robot.

3+3 V1: Ideal for robotic milking and seasonal grazing

About the barn

- Lely Grazeway selection boxes on the outside of the barn.
- The close-up and calving group are kept in a separate barn.
- Concept of enlargement from a 3+0 to a 3+3 barn.

About products and areas

Lely Luna cow brush

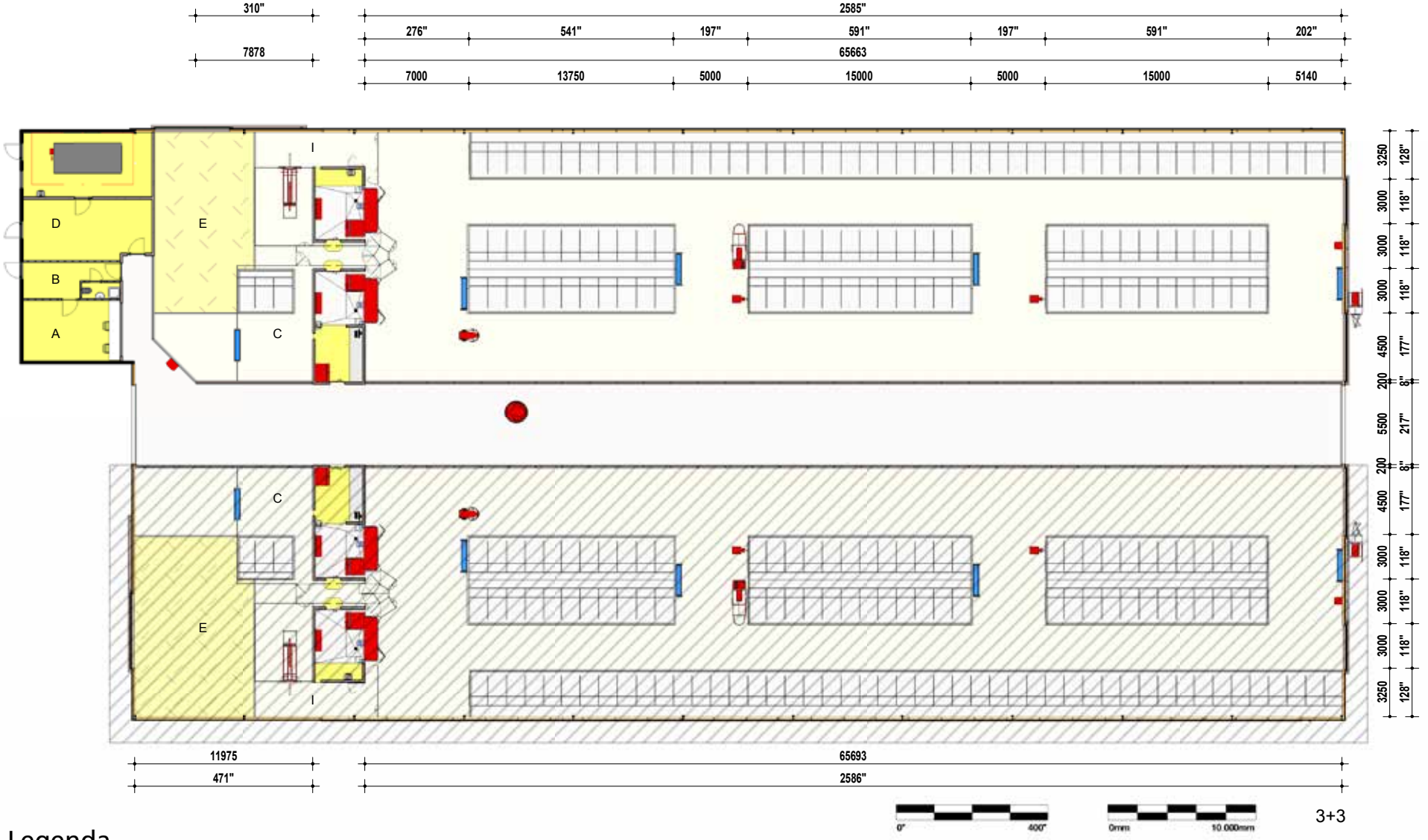
The Luna can be situated on every wall and post where it does not disturb the cow traffic. The preferred height of installation depends on the breed of the cows.

Lely Discovery mobile barn cleaner

The Discovery can reach all places in the barn, including corners and passageways. It is advised to install the charging station on a spot where the least movement of cows can be expected (so e.g. not in front of the milking robot).

Lely Cosmix concentrate feeder

For animals requiring more than 8 kg (17.6 lb) of concentrate, one or more concentrate feeding stations can be placed in the barn. Do not place extra stations in the direct vicinity of the robot in order to avoid too much cow traffic in front of and near the robot. Installing a Cosmix in a cubicle is not preferred since the cubicle most often is too short plus there is a height difference with the (slatted) floor.



Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Cosmix concentrate feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Grazeway selection box
- Lely Juno feed pusher
- Lely Juno loader
- Lely Luna cow brush
- Lely Nautilus milk cooling tank
- Lely Treatment box

A • Office
B • Hygiene area
C • Separation area
D • Machine area
E • Freshly calved (section of transition area)
I • Waiting area

Clean access • yellow marked area from outside the barn to the control room of the robot.

3+3 V2: Easy to make lactation groups

About the barn

- Barn split up in four groups (one robot per group).
- Groups based on lactation stage:
  - Cows calve in other/ separate barn.
  - Top left (including straw pen with selection by Lely Grazeway): freshly calved.
  - Cow follows route counterclockwise.
  - Top right: cow goes dry, gets treated in treatment box and leaves barn.
  - No cubicles in separation area; no risk of cows lying down and not visiting the robot.

About products and areas

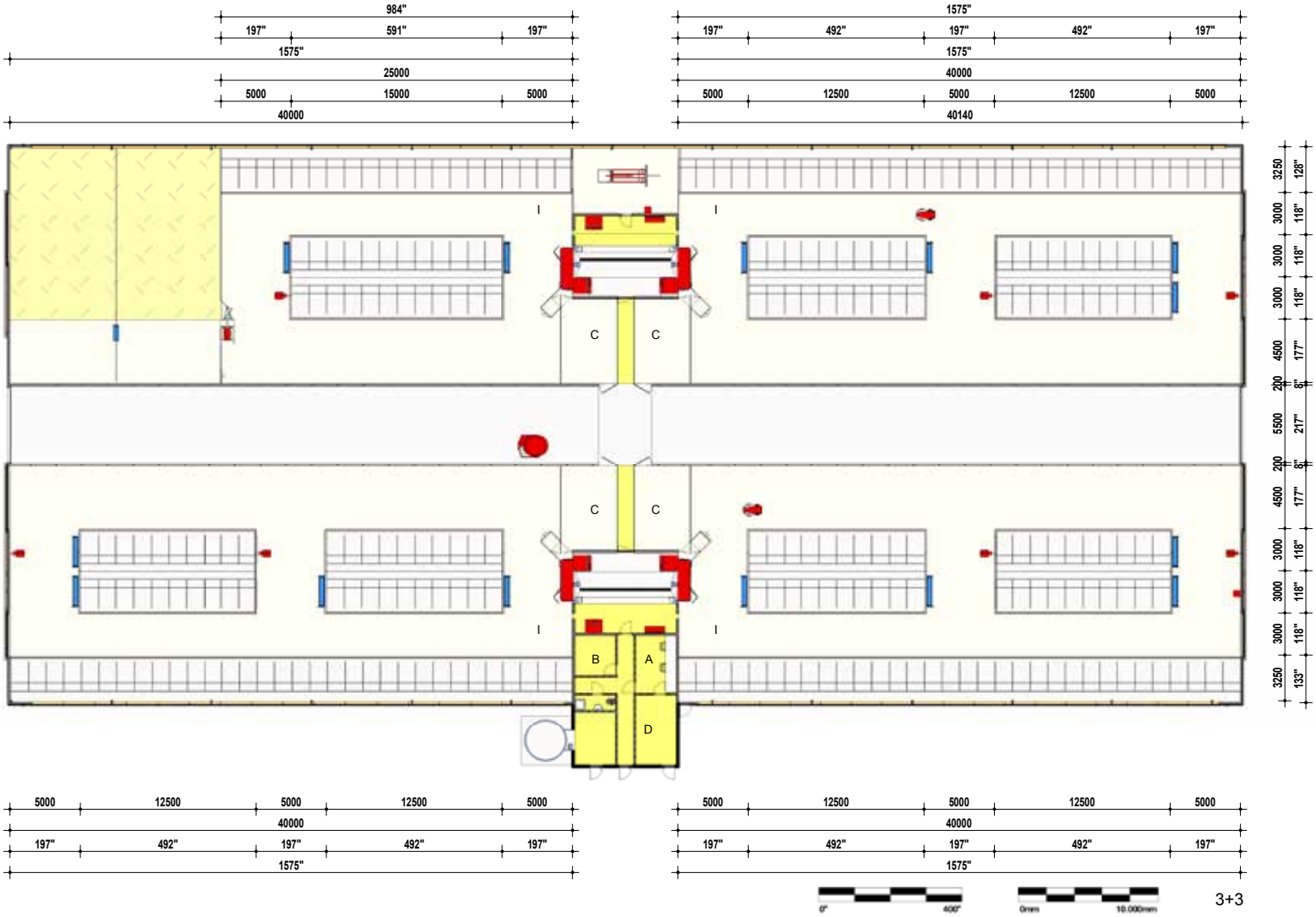
Office

It is strongly advised to have an office in the barn to make it easier to carry out the necessary administration and to increase efficiency.

Lely Treatment box

A good treatment box is indispensable in achieving labour efficiency and convenience on the farm. The basic principle should be that an animal can be treated easily, quickly and safely by one person. This can be accomplished through centrally positioning the treatment box – in or near the separation area – and through the clever use of flexible fencing. In this way, animals from different groups can be treated and eventually rehoused.

A permanent treatment area also means that all medication and materials required for the treatment are at hand, as well as the entrance to the T4C management system where the correct registration of every treatment takes place. A second PC accessible while wearing work boots, is certainly a plus.



Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Calm automatic calf feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Grazeway selection box
- Lely Luna cow brush
- Lely Treatment box
- Lely Vector automatic feeding system (feed kitchen, mixing and feeding robot)

A • Office
B • Hygiene area
C • Separation area
D • Machine area
I • Waiting area

Clean access • yellow marked area from outside the barn to the control room of the robot.

3+3 V3: Easily separate a cow within the group

About the barn

- Barn split up in four groups (one robot per group).
- The close-up and calving group are kept in a separate barn.
- Two treatment boxes for easy treatment of all groups.
- Clean access easily arranged.
- Loader of the Juno outside the barn.

About products and areas

Robot area

The robot should be in an enclosed area, not open to the cattle, with an easy to clean floor, ceiling and walls. This area should have running water, good lighting but also ventilation to keep the control room fly-free in the summer; this can be achieved through a wall or ceiling ventilator. Insulated walls and ceilings will keep the robot control room frost-free in the winter. The entrance to the control room should be clean and dry. A small passageway alongside the Astronaut milking robot – too small for cattle but wide enough for the farmer – enabling easy access from the control room to the cattle area, is very convenient for the farmer (maximum 40 cm (15.7 in)).

Lely Astronaut milking robot

- The robot unit must be installed on a solid, and correctly constructed foundation.
- The cows must have easy access to the robot unit.
- The cows must not be able to lie down in the entrance and exit route of the robot unit.
- It is recommended that drinking troughs are installed before and after the robot unit.

Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Cosmix concentrate feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Juno feed pusher
- Lely Juno loader
- Lely Luna cow brush
- Lely Treatment box

A • Office
B • Hygiene area
C • Separation area
D • Machine area
E • Freshly calved (section of transition area)

I • Waiting area
Clean access • yellow marked area from outside the barn to the control room of the robot.

0-6-0: Ideal for larger groups

About the barn

- Feed alley on the outside of the barn which makes it manageable for only one person.
- Concept for enlargement from a two- to four-robot barn.
- Possibility for multiple groups.

About products and areas

Transition area

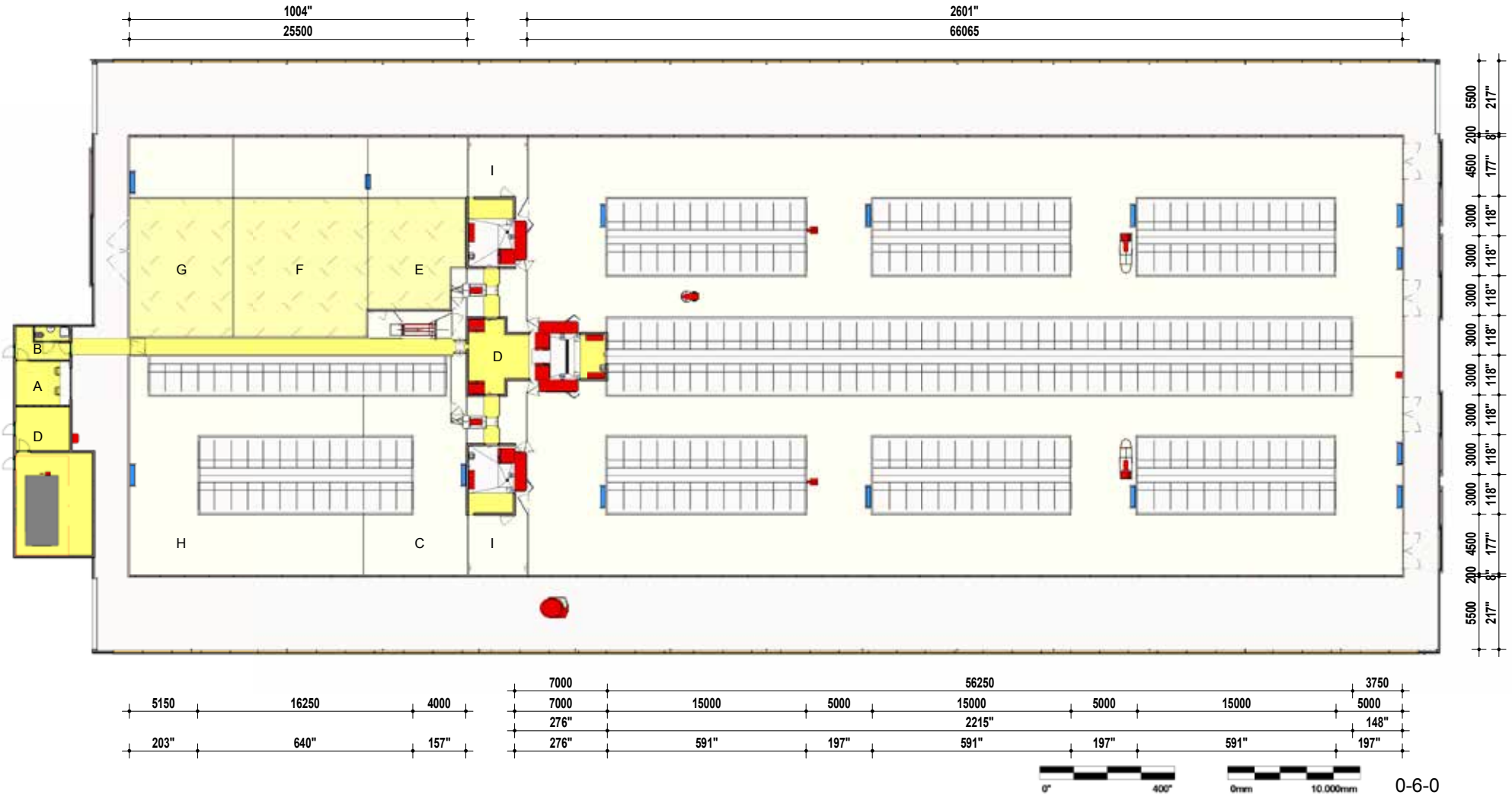
This area should be comfortable (for example a bedded pen) and easy to muck out. Adequate space, fresh feed and drinking water should be freely available to the animals. Ideally the transition area is split up in three sections:

- Freshly calved (closest to the robot)
  The location of the freshly calved section is the first priority; the best place is immediately next to the close up and calving group. Cows that calve can then easily and quickly be moved.
- Calving area (next to freshly calved section)
- Close up (next to calving area)
  14 days before calving

A transition area designed as a bedded pen will ideally provide 5% of the herd with an area of 15 m^2 (17.9) $yard^2$) per animal.

Lely Calm automatic calf feeder

House calves in a separate barn with a good dry climate to improve the health and development of the animals, lower infection pressure. A frost free installation is required.



Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Cosmix concentrate feeder
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Luna cow brush
- Lely Nautilus milk cooling tank
- Lely Treatment box
- Lely Vector automatic feeding system (feed kitchen, mixing and feeding robot)

A • Office
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D • Machine area
E • Freshly calved (section of transition area)
F • Calving area (section of transition area)
G • Close-up (section of transition area)
H • Dry cows
I • Waiting area

Clean access • yellow marked area from outside the barn to the control room of the robot.

0+0: Best practice of loose housing

About the barn

- Cutting lines in the straw pack because of the size of the barn (exceeds the page).
- Freshly calved cows are part of the herd.
- Treatment box reachable via separation area.

About products and areas

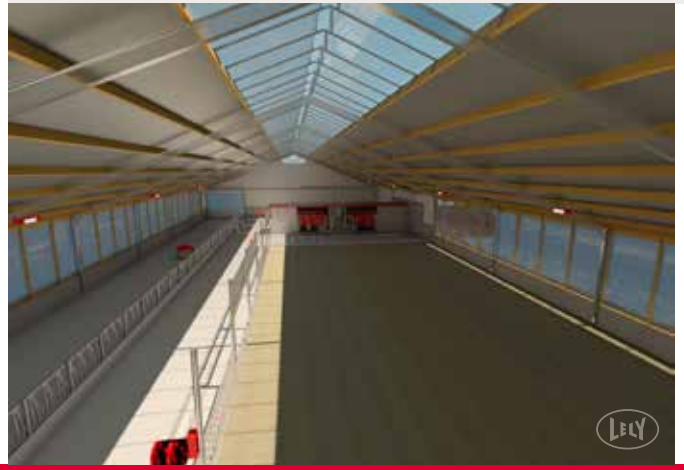
Tank room

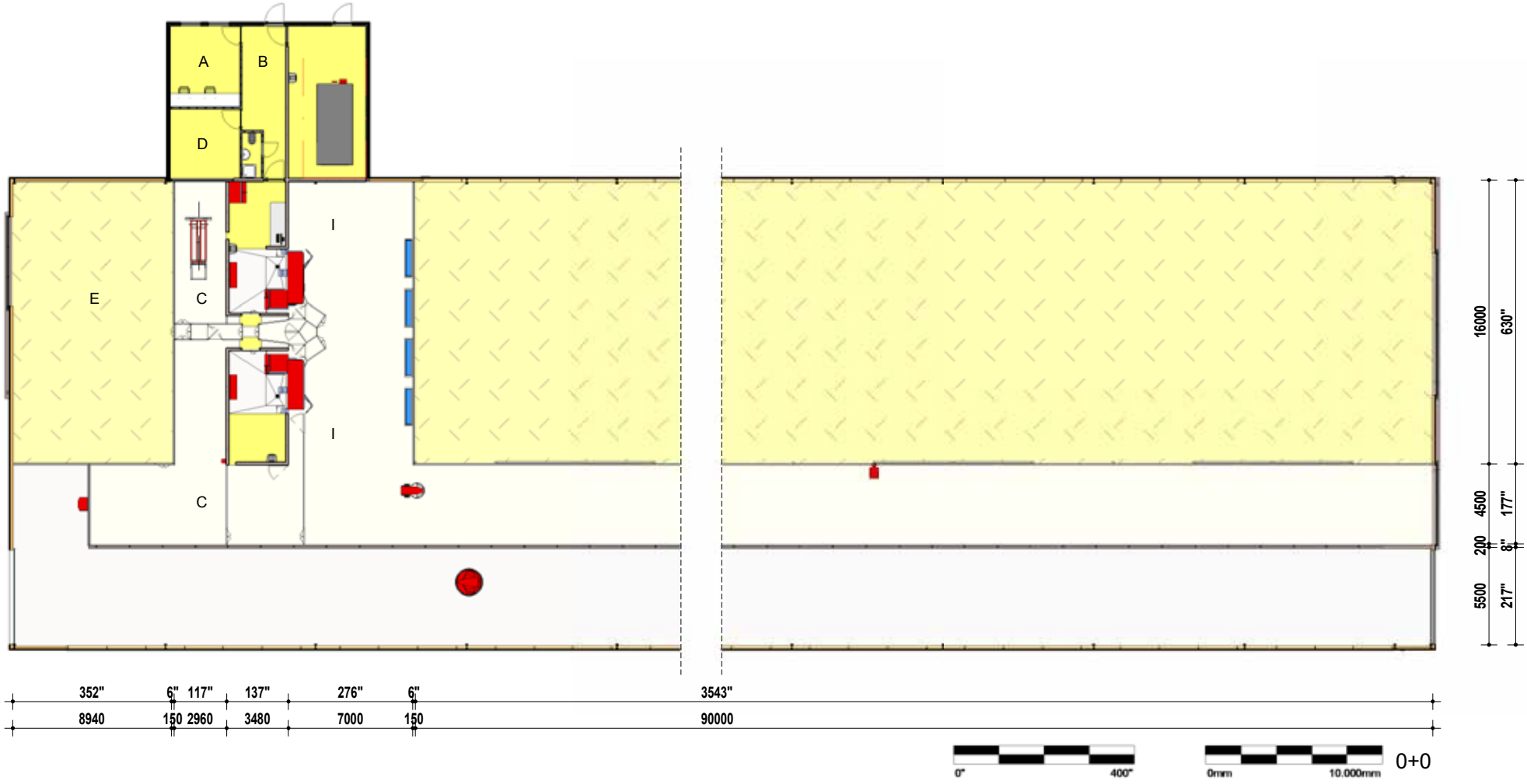
There are one or more refrigerated milk tanks in the tank area. These tanks should be cleaned every time they are emptied. To prevent the Lely Astronaut milking robot from standing idle during the emptying and cleaning of the milk tanks, a Lely buffering tank system is usually installed to collect the milk. This system automatically restarts the cooling process when the cleaning is finished.

The requirements for the tank rooms are different in each country.

Lely Nautilus milk cooling tank

The tank and condensing unit should be located in a well-ventilated and frost free area.





Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Discovery mobile barn cleaner
- Lely Discovery loader
- Lely Juno feed pusher
- Lely Juno loader
- Lely Luna cow brush
- Lely Nautilus milk cooling tank
- Lely Treatment box

A • Office
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E • Freshly calved (section of transition area)

I • Waiting area
Clean access • yellow marked area from outside the barn to the control room of the robot.

1234: Robotic milking and 24/7 grazing

About the barn

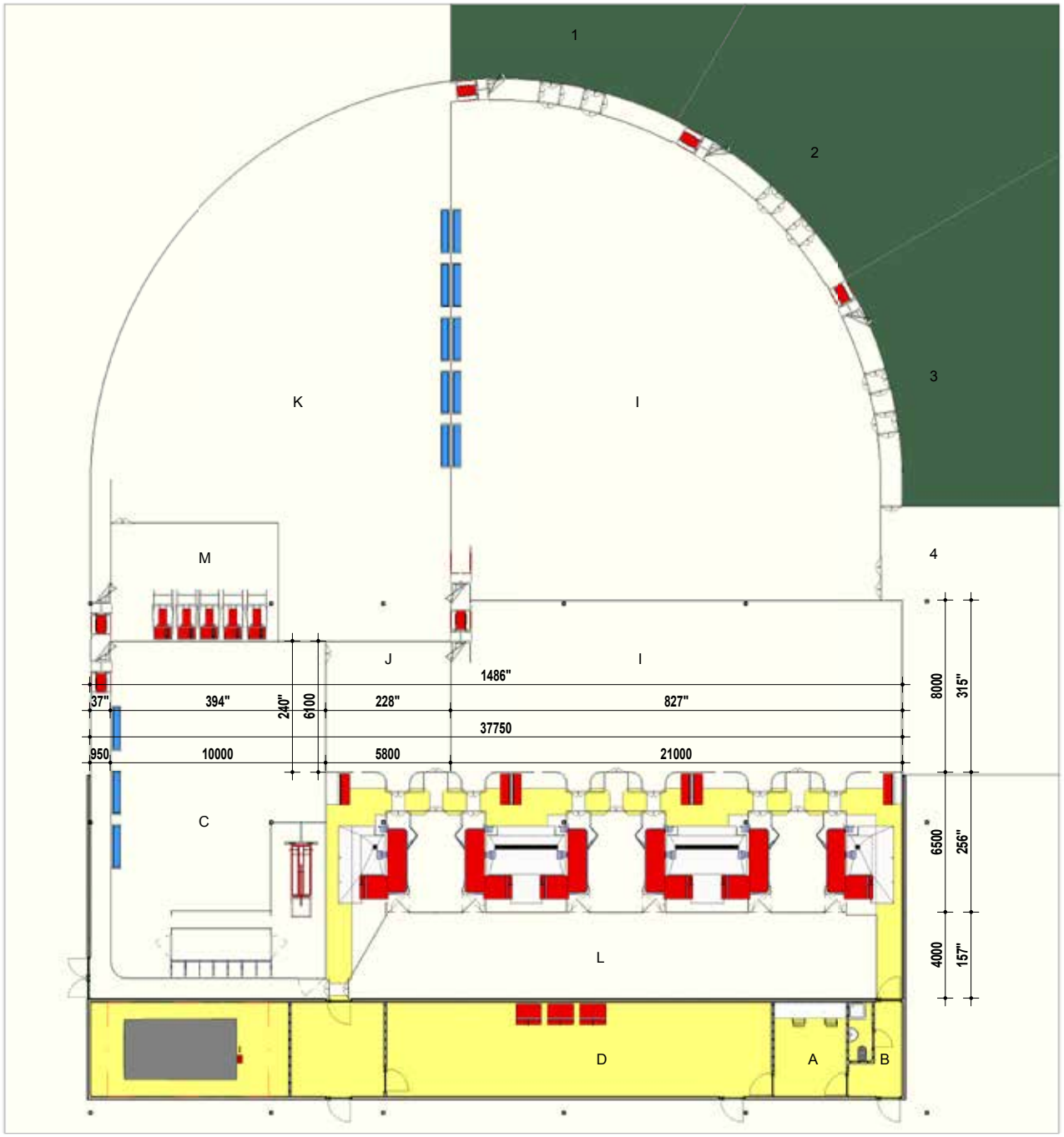
- Usage of several Lely Grazeway selection boxes.
- Dry cows are kept in a separate meadow (not visible on this layout).
- Cows enter the waiting area (I) via meadow 1, 2, 3 or (winter barn) 4. From this waiting area they are sent to:
  - The training area (J) for heifers.
  - The general waiting area to enter the milking robots (I).
  - The non-milking area (K). In this area cows are sent which don't need to be milked (at that specific time). They can eat additional roughage. From this area they will go to the meadows via a Grazeway.
- After the robot visit, the cows enter the post-milk area (L). From the post-milk area they enter:
  - The non-milking area (K). They can eat additional roughage. From this area they will go to the meadow via a Grazeway.
  - The separation area (C) including treatment box. From this area they will go to the meadow via the non-milking area.
  - The concentrate area (M) for concentrate supply by Lely Cosmix concentrate feeders. From this area they will leave to the meadow via the non-milking area.

About products and areas

Lely Grazeway selection box

Grazing and automatic milking go well together. When combining automatic milking with grazing it is strongly recommended to make use of one or more Grazeway selection boxes. The selection box is placed at the exit of the barn and will only allow the animals outside if they have recently been milked; animals that are due to be milked remain inside. This system gives the animals an extra incentive to visit the robot because they quickly learn that they are allowed outside after a visit to the robot.

The selection box can be placed either inside or outside. Placing the selection box inside has the advantage that it will remain cleaner and also that the animals not yet allowed outside are more easily sent back into the barn. When building a new barn it is advisable to leave space for the installation of a grazing box. Make sure that the (mobile) manure scraper is not hampered by the selection box. If the grazing box is to be placed outside, a roof and a shallow pit for the manure disposal could be the solution to a clean environment.



Legenda

- Lely Astronaut milking robot (Robot Unit, Central Unit, M4Use)
- Lely Cosmix concentrate feeder
- Lely Grazeway selection box
- Lely Nautilus milk cooling tank
- Lely Treatment box

A • Office
B • Hygiene area
C • Separation area
D • Machine area
I • Waiting area
Clean access • yellow marked area
from outside the barn to
the control room of the robot.

For grazing system only:
J • Training area
K • Non-milking area
L • Post-milk area
M • Concentrate area

Passionate about farming

Lely has a long and deep history of recognizing the needs of modern farmers. Our products are developed with the cow as starting point. We strive to let her excel and as such, we supply products to farmers and contractors ranging from forage harvesting, to feeding, housing, caring, milking and energy sourcing. In addition we boast specific knowledge and experience in facilitating farmers to get the best out of their equipment. As such our in-depth knowledge of the complete farm cycle – from grass to glass – is unrivalled in the agricultural business.

We are committed to a sustainable, profitable and enjoyable future in farming.

Commissioned by Lely International N.V.