The PigSAFE pens have been developed as a system for farrowing and lactation with unconfined sows to optimise welfare and economic performance. They have been designed to meet biological needs of sows and piglets, as well as requirements for stockperson safety and management ease (Figure 1). This involves a basic nest area, with solid flooring to allow provision of nesting material and sloping walls against which the sow can slide more slowly to ground level for suckling, to lower the risk of piglets being trapped and killed. A heated corner creep area has easy access from the nest. A separate slatted dunging area is bounded by walls with barred panels to adjacent pens to discourage farrowing outside the nest. A feeding crate for the sow (only wide enough for feeding not for farrowing) is included at one side of the pen, where the sow can be locked in to allow safe inspection or treatment of the piglets. **Whilst information on this design is given in good faith, we cannot accept any responsibility for the consequences of its adoption by others.** We consider that the detail of the design is very important in its performance and therefore any deviation from the details given in this document is done at the producer’s own risk. For further information on the project in which this design was developed and tested, please refer to *The PigSAFE Project – Final summary report 2012.*

**Figure 1:** Recommended PigSAFE pen design.

**NB:** These recommendations are based on our experience designing and working with PigSAFE pens. This information is given in good faith, but we can accept no responsibility for its adoption, especially if design criteria are modified when building the pens. Anyone thinking of constructing such pens is recommended to contact us for more detailed discussion of the key features, and visits to view the prototypes are welcome by prior arrangement.

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Details of the design

The details of the design are considered crucial to the performance of the system. Many features are designed to encourage the sows to perform positive maternal behaviours as well as aid with husbandry procedures.

**Voluntary feeding stall:** sows can only be locked in for husbandry procedures – aids operator safety.

**Corner creep:** heated at 30°C. The corner design allows easy access from the udder and contributes to oval nest shape. Outside edge shorter for easy staff access.

**Nest area:** Solid, dark and high-sided with piglet protection and straw for nesting. Designed to attract the sow to farrow in ideal location, with head facing the dunging passage.

**Chat-holes and dunging area:** open slatted area with sow and piglet drinkers. Sows can make nose contact and this area is not private or enclosed so encourages farrowing in the nest.

**Pop-hole:** Wall either swings back after 7 days or a pop-hole is opened to improve hygiene.

**Sloped walls:** aids sow posture changes by slowing down descent and preventing rolling. Provides escape route for piglets.
Creep area = 1m² recommended area to allow creep feeding and older piglets to all fit (Figure 2b and c) (1m² would fit 14, 4 week old weaners). Corner creep is crucial (not front) as this helps with nest shape and piglets learning creep location; if the sow farrows in ideal position (Figure 2a) piglets often walk through the creep to access the udder.

- The front of the creep has two protruding, but graduated bars that prevent the sow lying flush against the creep face and “locking” the piglets in (Figure 3a). The protruding bars are graduated so that at sow’s shoulder height she is unlikely to bump into them. There is a gap at the bottom (200mm from the floor) to allow the sow’s udder to be unobstructed during suckling but means she cannot get her shoulders under there when lying. The gap between the protrusions and the rest of the creep face is 180mm. We recommend the undersides of these bars are rounded off to prevent injury.

- Gaps/voids between creep bars measure 180mm to allow weaners to exit the creep without damaging their shoulders.

- A better “close-in” of piglets in the creep is recommended and photographed (Figure 3b). This ratchet mechanism allows you to shut the piglets in without opening the lid and allows control of the micro-climate by adjusting the height of the boarding on the front of the creep. [Stockperson TIP: remember the default is to keep fronts open and click ratchet in place firmly after handling piglets in the creep. Handles should be visible (i.e. creep fronts open) when scanning the farrowing room. Painting ratchet handle tops red helps distinguish them from the general room background].

- On the outside edge (passageway for staff), the creep wall is only 600mm tall to allow easy access to the piglets. The inside edge is 1200mm high with vertical bars to prevent sow climbing and jumping.

- [Building TIP: Make sure creep front has no solid sided structures or deviations in angle (Figure 4a). Piglets can use solid, more private areas as toilets rather than go out of the creep (Figure 4b)]

![Figure 2: a) Newborns suckling with easy creep access; b) and c) older piglets lying in the creep.](image)

![Figure 3: Two front creep options. a) protruding bars would benefit from being rounded back to protect the sow’s udder. b) ratchet system for closing the creep without opening the lid.](image)

![Figure 4: Importance of creep front details: a) good design (✓) no solid front areas and b) problematic design (✗) with solid partition causing hygiene issues.](image)
**Sloped walls:** These are here to assist with careful lying down of the sow and protect the piglets because the sow cannot lie flush against the nest walls and therefore crush against them. Sloped walls are around the whole nest, including the access door. Sows prefer sloped walls to farrowing rails. Research shows that sows will lie unassisted rather than use a farrowing rail. The sloped wall also allows piglets to walk around the sow during farrowing, so that they can seek the udder and teats unobstructed. They also provide escape areas if crushed (Figure 5).

![Figure 5: Sow using sloped wall to lie down and piglet escaping crush incident using sloped wall.](image)

- The bottom part of the slope is at a distance from the wall of **180mm** (basically shoulder width of big 4-week weaners) and at the top the distance is **25mm**. The height from the ground is **200mm** (allows little piglets to escape and the sow cannot get her shoulders under).

**Nest area:**
The nest area has high-sided, dark walls (1200mm high) and a solid floor (see flooring for details). The nest is designed to feel enclosed with only one main viewpoint for the sow out into the dunging passage and her neighbouring sow. Pens are always mirror-images so that the sow has a neighbour (Figure 6a). The corner creep, dividing wall and kick-board form an oval shaped nest (Figure 6b and c) which is the shape a sow would make when naturally nest-building. Substrate is provided in the nest area to allow this nest-building behaviour to be performed (*2kg long-stemmed straw recommended*). When the sow’s hormones signal that she is due to give birth and start nest-building the substrate and enclosed design of the nest-area stimulates her to withdraw into this area (Figure 6c), nest-build, orientate herself with her head facing the dunging area and give birth to her piglets in the safest place for them (closest to the creep, furthest from the dunging area Figure 6d).

- The **kick-boards/steps** between the nest and the dunging passage retain both piglets and straw and help give the nest its oval shape. [*Building TIP: it needs to be properly fixed in its slot (i.e. bolt through at the top) as the sows will take it out and try and nest-build with it - Figure 7*]. It can come out properly between days 2-7 post-farrowing (when the piglets are using the creep properly and the straw has been cleaned out). This step has a recommended height of **150mm**.

![Figure 6: Pens are mirror images (a) and nests are enclosed (b). Substrate is provided for nest-building (c). Sow giving birth in ideal position (d).](image)

![Figure 7: Sow nesting with step](image)
Dividing wall/pop-hole:

- The **wall dividing the dunging passage from the nest** can be on hinges and moved back after 7 days post-farrowing with a bolt mechanism that fixes it in place to the slats or the wall. If you can incorporate this flexible feature it helps to improve nest hygiene. **[Building TIP: make sure the swinging wall is as close to the main wall as possible; because of the hinge you need to have a certain amount of clearance to open up, but try not to have a big gap as this creates a draught].** If this feature cannot be properly incorporated (difficult in conversion systems), a pop-hole should be put into the dividing wall (between nest and dunging areas) and lifted up after ~7 days (Figure 8). This pop-hole feature is also beneficial if there is any (rare) occasion that a sow gives birth to any piglets in the dunging area. In excessively hot climates there is a risk of sows wanting to cool down in the dunging passage before returning to the nest to farrow; sometimes they can give birth to one or two out in the dunging passage. By opening the pop-hole, any stranded piglets can get back to the nest.

![Figure 8: Pop-hole to improve hygiene. a) before opened and b) after opened](image)

Flooring:

**Slats** = we recommend that the slats are either Triband stainless steel with a 9mm void or plastic (not concrete). The void should not be greater than 10mm because piglet foot injuries are more likely with larger voids. The legal maximum void width for concrete slats for piglets is 11mm and any flooring must adhere to the requirements detailed in the Defra Code of Recommendations for the Welfare of Pigs ([http://www.defra.gov.uk/foodfarm/farmanimal/welfare/onfarm/documents/pigcode.pdf](http://www.defra.gov.uk/foodfarm/farmanimal/welfare/onfarm/documents/pigcode.pdf)).

- It is recommended that all areas other than the nest and creep should be slatted (NB: if you are selling under a particular assurance scheme check with that scheme that this proportion of slats:solid is acceptable under their audit).
- The solid area in the nest can be concrete or solid plastic tiles with occasional small perforations to help with drainage. This latter option is recommended, but careful slat choice is required to ensure they are adequate for the weight of heavy sows and have sufficient profile to minimise slipping. In addition producers should seek advice from slat suppliers on likely wear rate of slats over time to make an informed choice. Nest hygiene is critical – if a solid, undrained floor is adopted, this should have a drainage slope of 2% towards the dunging area and additional bedding supplied at the time of farrowing to absorb birth fluids.
- **[Building NECESSITY: A good support structure underneath the pen is essential as the sows will be walking around more and therefore there are greater levels of stress to the floor in “busy” areas (i.e. over the step). If sows slip or feel too much give in the floor they lose confidence and are less likely to get up].**
**Dunging passage:**
This area is designed to be very open and non-private and has a natural temperature differential to the nest area. This encourages dunging and urinating in the correct area and makes the nest more attractive for farrowing.

- **Sow and piglet combined drinker** = the sow drinker height is 700mm from the floor and the piglet drinker height is 200mm from the floor (Figure 9). Both are positioned at almost a 90° angle. [Building TIP: make sure the drinker angle is not too acute otherwise the sows cannot angle their heads properly to bite down and drink]. These are placed in the dunging area, and an anti-flood bar is recommended around the base as sows like to cool-down using the piglet drinker and can sit on the piglet drinker if it is not protected. Position the drinker so that the sow is going to walk fully out of the nest to drink. If a drinker is also put in the feeder, a slatted floor is recommended underneath.

**Chat holes between pens:**
These are an important feature of the pen (Figure 10). Having these contact areas is helpful for gilts that tend to react when first separated from the group. They allow contact throughout lactation and may help reduce weaning stress and post-weaning fighting.

- Because these areas let a lot of light into the pen they give the nest-space more of a sense of enclosure and attract the sow away from open areas and into the nest area to farrow – which is the safest area for the piglets.
- It is also important to use the metal bars rather than slotted plastic. The slotted plastic does not allow full nose to nose contact and can be very dark. These barred areas have a 65mm void between bars and are positioned 400mm from the ground to minimise risk of faecal transfer.
- Bars should be positioned mainly in the dunging area with visibility from the nest area into the corresponding pen. Chat holes are also on the other side of the dunging area to maximise contact areas outside of the nest-site and to discourage animals from farrowing in the dunging area. [NB: if there were no barred areas behind the dividing wall it becomes an enclosed area and therefore may be attractive to the sow for farrowing].

**Access gates** are recommended in the dunging area and therefore the barred areas need to be incorporated into these access gates. It is recommended that the access gates are on hinges that allow them to be swung both ways. This allows ease of movement between pens when moving sows in, but it also gives the option of shutting the sows in their nest areas for access along the dunging area. [Building TIP: as with any features that incorporate hinges it is important to minimise the gap between walls and doors and therefore minimise the risk of draughts or faecal transfer].
**Voluntary feeding stall:**
The feeding area for the sow is designed to be wide enough for a sow to fit in and feed, but not so wide that she could lie laterally and farrow in there. This feeder is **not** a farrowing crate and therefore adheres to assurance schemes.

- **Width and height:** It has a lock-in feature (similar to the individual feeders in a dry sow house) so that piglets can be handled safely while the sow is feeding. However, it is only wide enough for her to stand in or lie ventrally (500m), so not wide enough for farrowing or long term confinement (Figure 11). Make sure the feeders are tall enough for the largest sows to get in without scraping their backs. We would recommend a height of no less than **1100mm**, especially at the point of entry (the gates that lift over the back, when open, hang lower than the overall height of the feeding stall, so make sure this is taken into account).

- **Feeder bowl:** The feeder bowls should be flush to the floor (no gap). We would recommend a feeder bowl that is smooth (no edges where old feed can collect) and preferably plastic, as galvanised steel can be sharp. In addition, we recommend that they are either able to be removed for cleaning or a hinge mechanism put in place to empty any old feed. Another possibility is putting a gromit in the bottom (inaccessible to the sow) to allow drainage of water after pressure washing.

- **Building TIP:** Sows nudging feeder shut: Some sows nose the bars of the lock-in feeder and, once loosened, can shut themselves in. We have put a clasp on the feeders to prevent this (Figure 12).

**Figure 11:** Voluntary feeding stalls. Sows can be locked in for husbandry but only wide enough for standing or ventral lying.

**Figure 12:** Safety catch on feeder to prevent self-lock in by sow

- **Stockperson TIP:** The default position is open, if sows are accidentally left locked in this would be a welfare compromise and potentially fatal for the piglets. A good tip is to attach/weld a red metal rod or flag onto the top of the shut-in part of the feeder (Figure 12*) which would stand upright if left shut and would be easily spotted in the farrowing room when scanning the pens.
[Building and stockperson TIP: We recommend the feeder has hinged front to act as an access gate and for ease of cleaning feeders (Figure 13). This is helpful for weaning sows easily].

Figure 13: Access gate on sow feeder