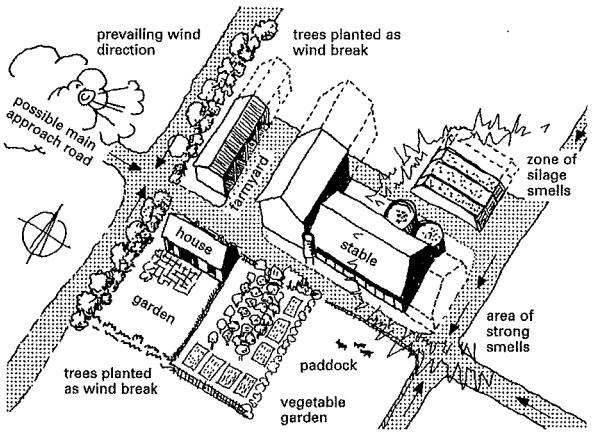
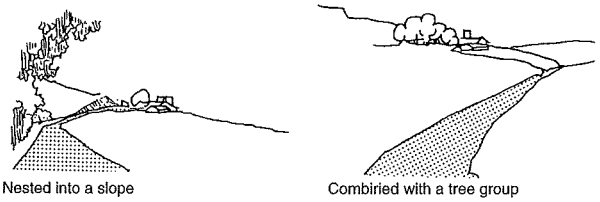


1 Schematic layout of the elements of a farmyard (farmhouse, working areas, traffic areas)



2 Integration of the farmyard into the landscape

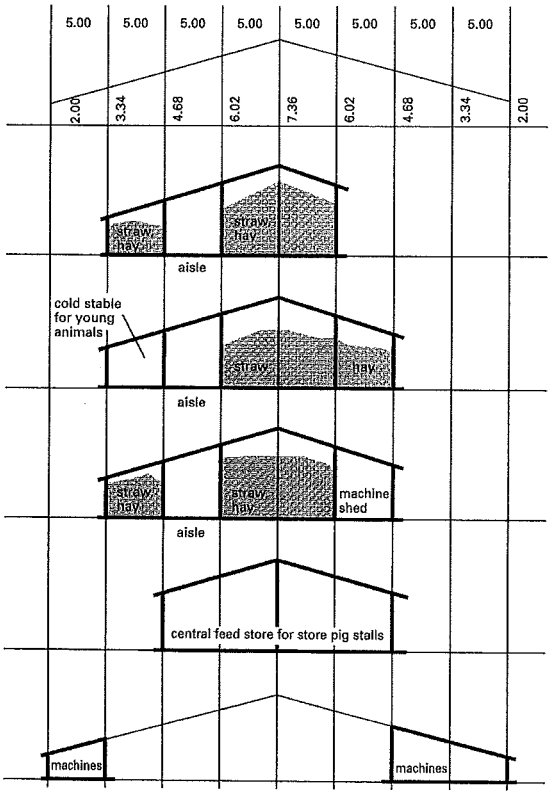
The selection of location for a farm has to balance topographical and climatic conditions with business considerations. This should take priority over factors resulting from ownership. Buildings for livestock have almost the same climatic requirements as houses for people. Extremely frosty, misty or very windy regions and particularly exposed locations should be avoided. The relationship of the buildings to each other, the arrangement of the functional areas in relation to nearby residential areas and the prevailing wind direction should all be taken into account. The prevailing wind direction is more important in summer than in winter.

The choice of location should differentiate between the transport connections internally and externally. The quality of external transport connections is determined by the connection of the farm to public roads, leading to customers and marketing organisations (farm shop, dairy etc.). For the quality of internal connections, a good link to the main farm road network in the vicinity is more important than the farm itself being near the fields.

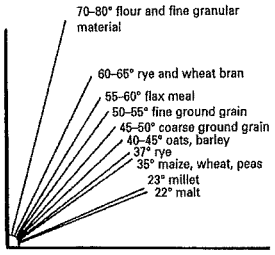
The arrangement of the buildings should observe the following distances: min. 10 m between all buildings, from the farmhouse to the buildings for livestock at least 15 m; from the farmhouse southwards to the plot boundary at least 10 m and west or east min. 6 m → 1.

Animal husbandry operations with technical facilities normally require areas of 4000–5000 m², with plot widths of 35–45 m, and approx. 1000 m² for the residential area including garden. (UK farms tend to be larger than those in other European countries, which may be in part the result of differing inheritance practices.) Working and transport routes within and outside the buildings should not exceed the following gradients: for hand trucks = 5%, motor vehicles = 10%, short hills max. 20%.

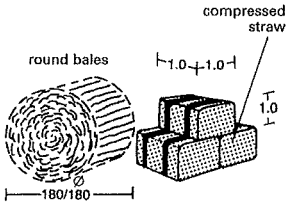
The residential garden serves as an extension of the house. The location should if possible be to the south or west of the house, min. 100 m² lawn, paved and secluded sitting area, borders for flowers, bushes, children's play area and washing line, altogether needing approx. 400–500 m². Personal consumption requires a vegetable garden with 50–60 m² per person and an orchard approx. 100 m² per person.



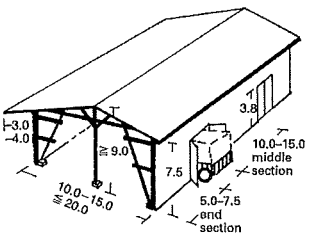
3 Planning system for a flexible barn area



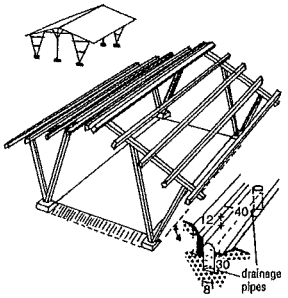
4 Angles of repose for agricultural crops



5 Straw



6 Barn with transverse gangway



7 Field barn

The following tables show the plot size required according to production capacity and type of operation, based on investigations by Herms and Hillendahl. Various plot areas can be reduced, e.g. through the installation of a tower silo instead of a silage heap, upstairs instead of downstairs feed rooms, slurry storage under the slatted floor instead of in outdoor containers, building up to boundaries etc.
The tables of plot size → ❶ – ❼ do not take into account all the space required for housing machines and workshops or for the residential area, as these do not have to be in the farmyard.

Space required (m^2)	No. pigs 500	1000	1500	2000
pig shed	850	1700	2500	3400
slurry pit	250	400	600	800
transport area	240	400	440	400
yard area	1300	2300	2700	3000
total area required (m^2)	2640	4800	6290	7600
plot width required (m)	35	35	55	55

❶ Pig fattening: space required

Space required (m^2)	No. sows				No. sows: S No. piglets: P		
	80	100	120	150	46 S 400 P	88 S 800 P	142 S 1200 P
pig shed	720	850	1020	1200	880	1760	2640
slurry pit	90	100	110	120	240	400	600
transport area	230	250	270	300	240	400	480
yard area (incl. run-out)	1600	1850	2100	2400	1480	2640	3120
total area required (m^2)	2640	3050	3500	4020	2840	5200	6830
plot width required (m)	45	45	45	50	45	45	50

❷ Pig breeding (with fattening): space required

Space required (m^2)	Calf fattening in single pens No. calves				Bullock fattening, loose, fully slatted floor No. bullocks			
	100	200	300	400	100	200	300	400
cowshed	340	640	930	1200	400	940	1410	1880
green fodder	—	—	—	—	50	100	150	200
silage heap	—	—	—	—	560	1000	1250	1500
slurry pit	50	100	150	200	120	200	300	400
transport area	200	200	200	200	650	560	750	850
yard area	1110	1600	2200	2640	1210	2100	3140	2170
total area required (m^2)	1700	2540	3480	4240	2990	4900	7000	7000
plot width required (m)	45	45	45	45	35	35	50	50

❸ Finishing beef cattle: space required

Space required (m^2)	Stanchions/feeding/ cubicles No. cows			Loose pens No. cows			
	40	60	80	50	80	120	200
cowshed	250	380	500	400	640	960	1600
milk area	10	20	30	50	80	120	200
silage heap	200	300	400	250	400	600	1000
green fodder	80	120	160	100	160	240	400
slurry pit	160	240	320	200	320	480	800
transport area	400	600	720	500	720	960	1400
yard area	800	1050	1200	1250	1760	2400	3000
total area required (m^2)	1900	2710	3330	2750	4080	5760	8400
plot width required (m)	33	33	33	45	45	45	45

❹ Milk cows without calves: space required

Space required (m^2)	Stanchions/feeding/ cubicles No. cows			Loose pens No.cows			
	40	60	80	50	80	120	200
cowshed	320	470	630	440	700	1050	1750
milk area	20	20	30	60	80	80	80
silage heap	250	380	500	310	500	750	1250
green fodder	100	150	200	130	200	300	500
slurry pit	200	300	400	260	400	600	1000
transport area	500	750	900	620	900	1200	1750
yard area	1000	1270	1500	1560	2200	3000	3750
total area required (m^2)	2390	3340	4160	3380	4980	6980	10080
plot width required (m)	33	33	43	45	45	45	45

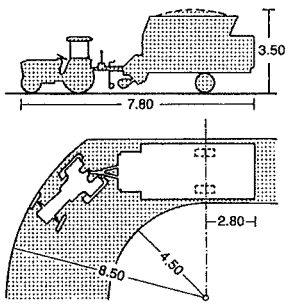
❺ Milk cows with calves: space required

Space required (m^2)	Laying hens, 3 per cage No. hens			Fattening chickens, battery No. hens		
	10000	50000	100000	10000	50000	100000
hen house	630	3000	6000	400	2000	4000
egg sorting room	—	400	800	—	—	—
dung	110	550	1100	50	250	500
transport area	200	1200	1800	100	500	1000
yard area	1260	5050	8000	1000	4000	7000
total area required (m^2)	2200	10200	17700	1550	6750	12500
plot width required (m)	35	100	100	35	80	80

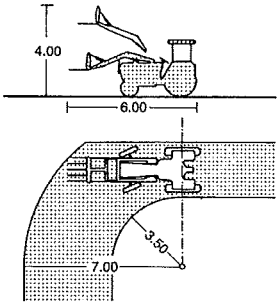
❻ Chickens: space required

Space required (m^2)	Roots/corn production No. ha			Corn/feed production No. ha		
	60	80	100	80	100	120
machine shed	250	290	320	230	270	300
grain and storage	250	250	250	250	250	250
traffic and machine parking	180	200	220	180	200	220
additional yard area	200	230	250	200	230	250
total area required (m^2)	880	970	1040	860	950	1020
plot width required (m)	33	33	40	33	33	40

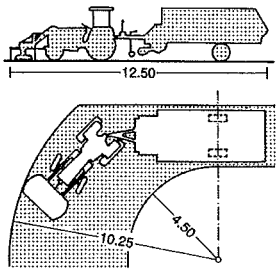
❼ Arable farming: space required



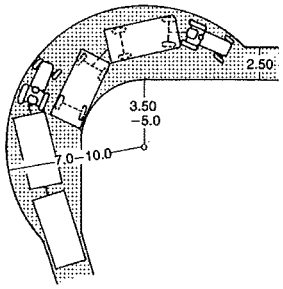
1 Tractor with trailer



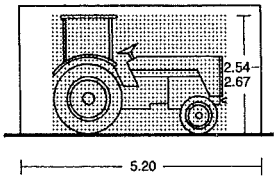
2 Tractor with front loader

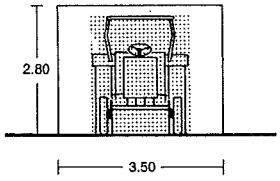


3 Tractor with front mower and trailer

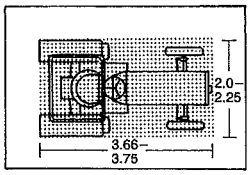


4 Space required for vehicles turning

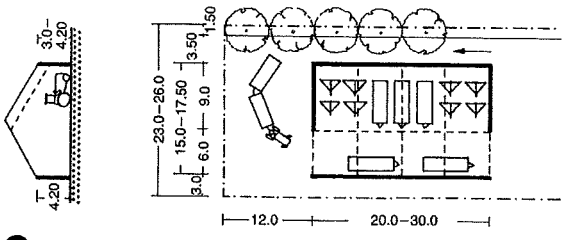




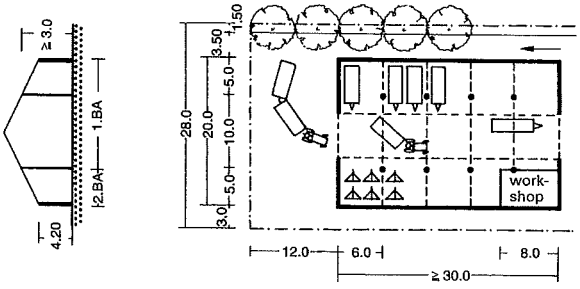
	m²	Length	Width	Height
green fodder	12	6.95	2.35	2.26
dry fodder	19			2.94
green fodder	11	7.80	2.46	2.45
dry fodder	17			3.10
green fodder	12	7.25	2.25	2.30
dry fodder	18			3.25
green fodder	14	8.00	2.35	2.25
dry fodder	20			2.90
guideline for trailer	13–20	7.70	2.40	310
guideline for shed		8.70	3.40	3.40



5 Space required for a single tractor (rough dimensions of shed)



6 Small tractor shed with side gangway



7 Large tractor shed with central gangway; supported structure

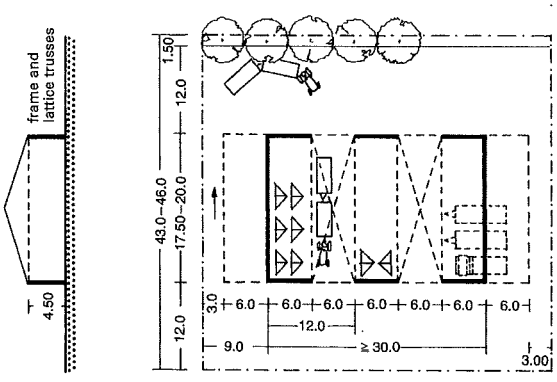
Type of building/farm	Reference dimension	Farm size			
		10 ha	15 ha	20 ha	30 ha
Garage for tractors and motor mowers	Floor area	26.0 m²	43.0 m²	44 m²	62 m²
	Depth	5.0 m	5.2 m	5.2 m	5.4 m
	Height	2.7 m	2.8 m	2.8 m	2.9 m
Garage for mountain farm transporter with loader, motor mower and self-propelled belt reaper	Floor area	46.0 m²			
	Depth	7.3 m			
	Height				
	Transporter	2.9 m			
	Motor mower	2.2 m			
Workshop	Floor area	12.0 m²	12.0 m²	14.0 m²	16.0 m²
Shed for fodder-producing farm without own arable	Floor area	160.0 m²	230.0 m²	260.0 m²	350.0 m²
	Depth	7.6 m	8.7 m	8.7 m	9.5 m
	Height	3.3 m	3.4 m	3.4 m	3.5 m
Shed for mixed fodder/ arable farm	Floor area	180.0 m²	310.0 m²	370.0 m²	520.0 m²
	Depth	7.6 m	8.7 m	8.7 m	9.5 m
	Height	3.3 m	3.5 m	3.5 m	3.6 m
Shed for arable farm with no animals	Floor area		240.0 m²	340.0 m²	450.0 m²
	Depth		8.0 m	8.0 m	9.7 m
	Height		3.5 m	3.5 m	5.8 m
Shed for mountain farm	Floor area		120.0 m²		
	Depth		8.3 m		
	Height		3.2 m		

8 Space required for garages/sheds

Machine	Features	L (m)	W (m)	H (m)
Tractors (with safety harness)				
standard tractor	up to 60 hp	3.30–3.70	1.50–2.00	2.00–2.60
4 × 4 tractor	60–120 hp	4.00–5.00	1.80–1.40	2.50–2.80
(incl. load-carrying tractor)	120–200 hp	5.50–6.00	2.40–2.50	2.50–2.90
equipment carrier with load platform	up to 45 hp	4.50	1.70	2.50
Transporters (with tow bar), twin-axle trailers				
flat-bed trailer	up to 3 t	approx. 6.00	1.80–1.90	approx. 1.50
flat-bed trailer	3–5 t	approx. 6.50	1.90–2.10	approx. 1.60
and tipper	5–8 t	approx. 7.00	2.10–2.20	approx. 1.80
single-axle trailer	up to 3 t	approx. 5.00[1)]	1.90–2.10	approx. 1.60
with scraper floor	3–5 t	5.00–5.50[1)]	2.10	approx. 1.60
or tipper	5–8 t	5.50–6.00	2.20–2.25	approx. 2.00
slurry tank trailer	3–6 m³	5.50–6.50	1.80–2.00	1.80–2.20
Earth-tilling equipment (in transport mode)				
plough (attachment)	2-share	approx. 2.00	approx. 1.20	approx. 1.20
	3-share	2.70–3.30	1.30–1.50	approx. 1.20
	5-share	4.50–5.50	2.00–2.50	approx. 1.20
reversible plough (attachment)	2-share	approx. 2.30	approx. 1.10	1.30–1.70
	3-share	2.90–3.30	1.40–1.60	1.30–1.70
	5-share	4.50–5.50	2.00–2.50	1.30–1.70
grubber		1.50–3.00	2.30–3.00	0.60–1.10
disc harrow		3.20–3.50	1.70–3.50	0.70–1.10
attachment combination		2.70–3.00	1.10–1.30	
rotary hoe		1.10–1.40	2.00–3.00	1.10–1.20
vibrating harrow		0.80	up to 3 m	1.00
rotary harrow		2.00–3.00	up to 3 m	1.00
rollers	3-part	2.50	up to 3 m	0.80
Mineral fertiliser spreaders				
box spreader		0.70–1.20	2.70–3.00	0.70–1.20
centrifugal spreader	attachment	1.00–1.50	1.40–1.50	0.90–1.40
large-capacity spreader	trailer	4.30–5.50	1.80–2.80	1.70–2.00

[1)] muck spreader approx. 0.5 m longer

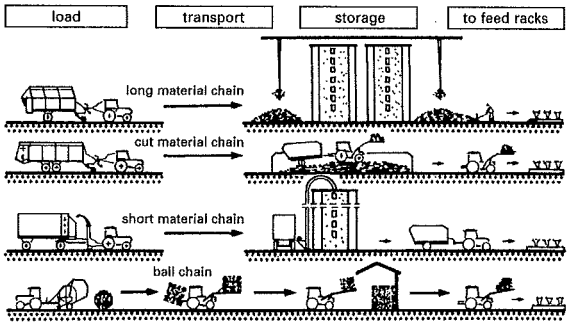
9 Dimensions of agricultural machinery



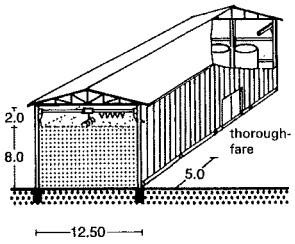
10 Large machinery and equipment shed with transverse gangway

form of fodder	dimensions (cm)	fresh	wilted (35%)	hay	straw	handling method
long	ca. 25	1.7	1.2–1.5	0.5	0.3	in portions (grab)
cut	4–8	2.0	1.5–1.8	0.8	0.4	bulk material (dosing rollers)
short	4	3.5	2.5–3.0	0.6–1.0	0.5–0.8	bulk material (blower, cutter)
small bales	35 × 50 × 80	–	2.5–3.0	1.0–1.5	0.8–1.3	bulk material (manual)
large bales	Ø 180–150	–	3.0	0.8–1.8	0.6–1.3	bulk material (front loader)
	150 × 150 × 240 (160 × 120 × 70)	–		0.6–0.9	0.7–1.3	

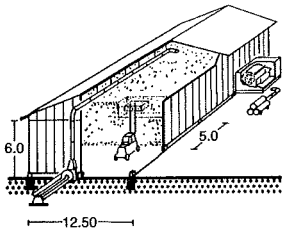
1 Comparison of the various fodder products



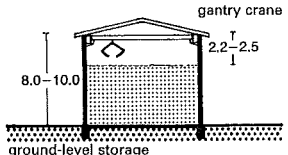
2 Fodder storage and preparation

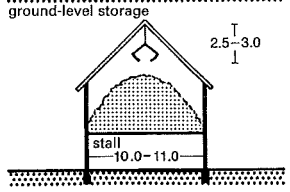


3 Hay storage barn, with grab

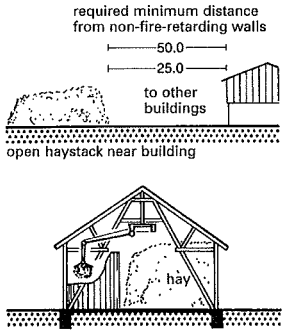


4 Hay storage barn

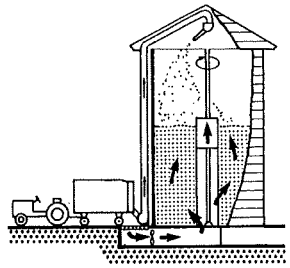




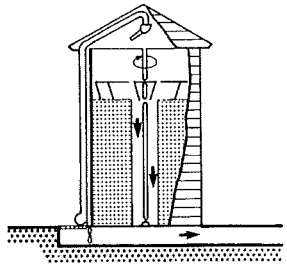
5 Overhead hay store



6 Hay storage barn



7 Hay tower: filling and ventilation

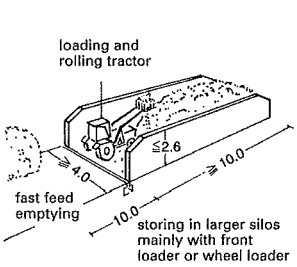


8 Hay tower: emptying

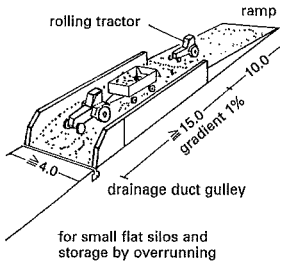
Fodder		Density in dt (100 kg)/m³	Space req.(filling, before settlement) m³/dt (100 kg)
Hay:	long hay (quality good to very good, stack height 2–6 m)	0.7–1.2	1.7–1.0
	chaff 5 cm (quality good to very good, stack height 2–6 m)	0.9–1.2	1.30–1.00
	dense (HD) bales, unlayered	1.3–1.7	0.90–0.70
	dense (HD) bales, layered	1.6–2.0	0.80–0.60
	aerated hay	1.2–1.7	1.00–0.70
	hay tower	1.5–1.8	0.80–0.70
	dry grass – cobs	5.0–6.0	0.20–0.17
Silage:	wilted silage (35–25% MC)	5.5–7.0	0.20–0.16
	maize silage (28–20% MC)	6.0–7.5	0.18–0.15
	turnip leaves	8.5–9.5	0.13–0.12
Other:	fodder turnips	6.3–7.0	0.16–0.14
	concentrate, pellets	5.5–6.5	0.22–0.19
	dry fodder	3.2–3.5	0.38–0.34

MC: moisture content. The listed storage space does not include room for loading and unloading technology (e.g. sheds, gangways, space for crane etc.), but does incorporate a filling supplement of 20% for hay and concentrate, and 10% for silage.

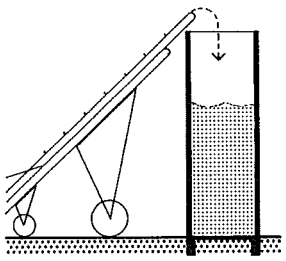
9 Storage of fodder



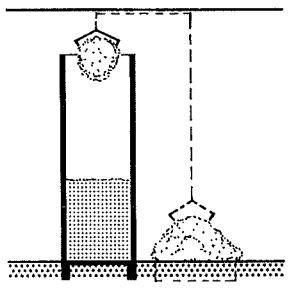
10 Flat silo



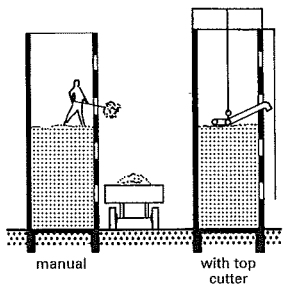
11 Flat silo with ramp



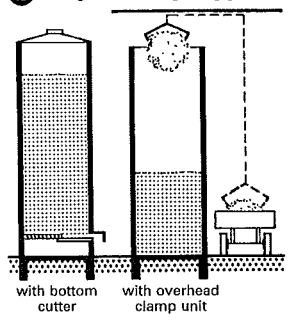
12 Tower silo: filling using conveyor



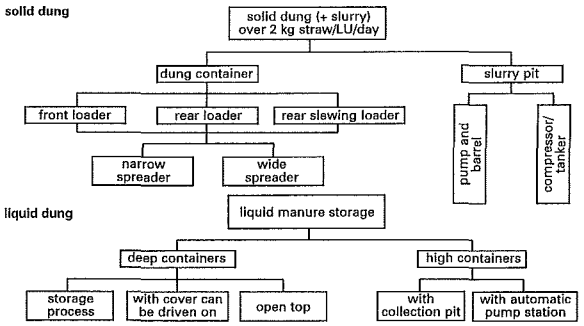
13 Silage tower, filling using grab



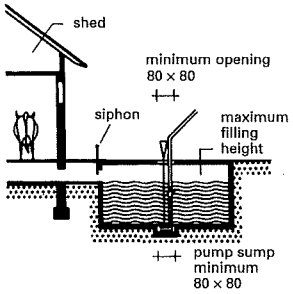
14 Silage tower, removal



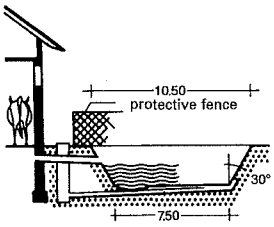
15 Silage tower, removal



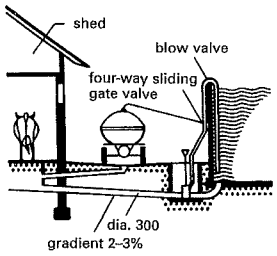
1 Overview of solid dung and liquid dung (slurry) storage and removal



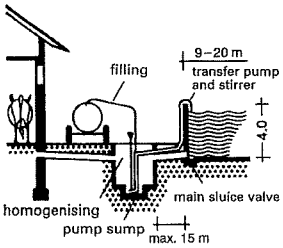
2 Underground tank (solid)



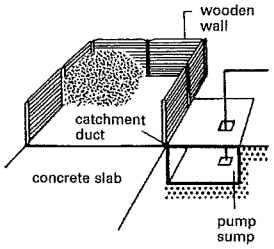
3 Earth tank with plastic sealing layers



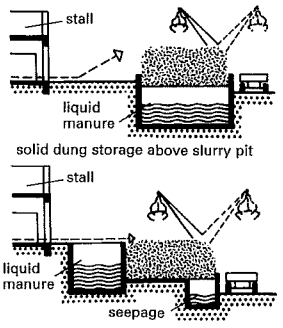
4 Overground tank with pumping station



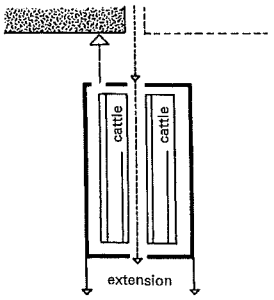
5 Overground tank with slurry pit



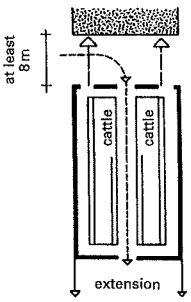
6 Pit for solid dung including slurry pit



7 Solid dung store: low-level with slurry pit at side



8 Solid dung store to front, with split dung holders



9 Solid dung store to front, with barn entrance at side

The amount of dung and urine produced by farm animals depends on the type of animal, its live weight (expressed in large animal units, 1 LU = 500 kg live weight) and the type and composition of the fodder and drink. Exact determination of contents is not possible because the composition of fodder normally varies over the farm year, so only average values can be given → ⑩ – ⑪.

Solid dung: The normal litter quantity of 1.5–2 kg of straw per LU/day results in a stacking height of solid dung of 2.0–2.5 m, equivalent to a dung slab of 0.5 m^2/LU × month. The slurry pit collects, in addition to urine, cleaning water and a large part of the rain falling through and being polluted by the dung heap. If evaporation of ⅓ of the rain and 3 m^2 dung per LU is assumed (corresponds to 6 months' storage), this gives slurry production of 0.64 m^3/LU × month.

Liquid dung (slurry): Dung, urine and cleaning water are collected. When slurry is stored in closed pits, then no rainwater gets in; for open slurry tanks a free space of 20–30 cm above the highest slurry level should be sufficient to take the rain. Evaporation of the water and part of the slurry liquid makes the free space larger again. Milk cows produce about 1.4 m^3/LU × month of slurry. Intensive fattening of bullocks with maize silage fodder can reduce slurry production to about 1.0 m^3/LU × month.

Regulations: Among the most frequent causes of pollution from farms are structural failure of slurry and effluent stores, mismanagement and lack of maintenance of slurry handling systems and problems with dirty water disposal. National regulations have been tightened in response. In England and Wales the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 set legal minimum standards for installations, including that they may not be located within 10 m of watercourses that might become polluted.

Animal	Solid dung		Slurry	Nutrients contained in dung (kg/LU/month)				
	dt/LU/ month	m^3/LU/ month	m^3/LU/ month	N	P_2O_5	K_2O	CaO	MgO
horse	7.5	1.0	0.1	4.5	2.1	4.0	1.8	1.05
cow, tethering stall	9.0	1.2	0.6	4.5	2.3	5.9	1.8	1.8
bullock, tethering stall	9.0	1.2	0.6					
bullock, deep straw	15.0	2.0	[1]					
sheep	6.5	0.9	[1]	5.2	1.5	4.4	2.1	1.2
pig	5.0	0.6	0.6	2.8	3.8	2.5	2.0	1.0
pig, deep litter	10.0	1.2	[1]					
laying hen (dry droppings 80% MC)	4.6	0.4		16.3	21.4	11.2	55.8	
laying hen (ground kept droppings 78% MC)	5.5	0.7		14.3	18.7	10.5		
fattening chicken (ground kept droppings)	5.9	0.8						
rabbit (dry droppings)	3.3	0.4		1.7	1.5	4.0	2.1	

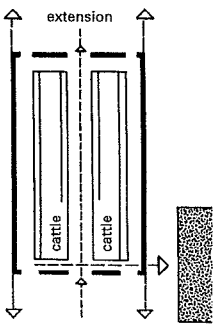
[1] mixed with litter; MC: moisture content.

⑩ Solid dung production and composition

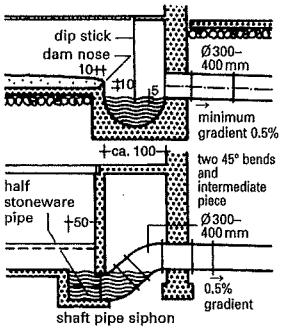
Animal	Slurry m^3/LU/ month	MC %	Nutrients N	P_2O_5	K_2O	CaO	MgO	N	P_2O_5	K_2O	CaO	MgO
			kg/m^3					kg/LU/month				
cow	1.4	10	4	2	6	2	1	5.6	2.8	8.4	2.8	1.5
pig	1.4	7	6	4	3	3	1	8.4	5.6	4.2	4.2	1.4
laying hen	1.9	15	8	8	5	15	2	15.2	15.2	9.5	28.5	3.8

MC: moisture content

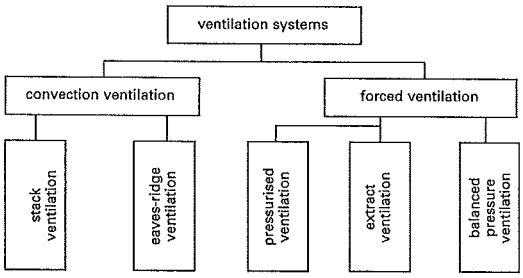
⑪ Slurry production and composition



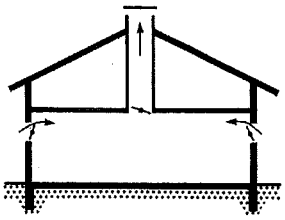
⑫ Solid dung store to side



⑬ Gas traps for slurry pits and flowing slurry channels

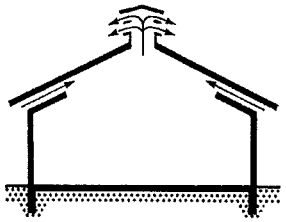


❶ Categorisation of ventilation systems



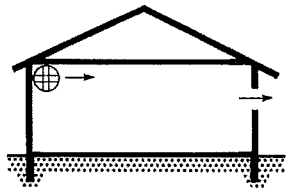
at least 5 m stack height required; works only with low outside temperatures; no energy costs

❷ Shaft ventilation



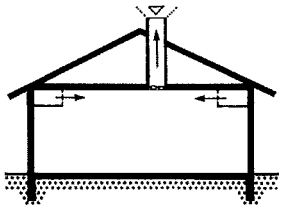
precondition: roof = ceiling; difficulties with inverted weather conditions; the supply air must be regulatable

❸ Eaves-ridge ventilation



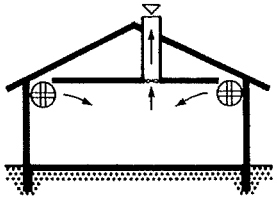
problems with wind direction; no specific outgoing air; good when used in connection with heating; energy requirement: 105–125 kWh/LU/year

❹ Pressurised ventilation



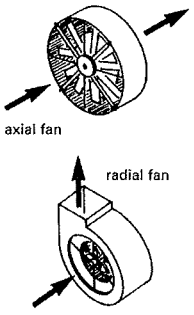
simple system; specific outgoing air (environmental protection); difficult to combine with heating; energy requirements: 98–105 kWh/LU/year

❺ Extract ventilation

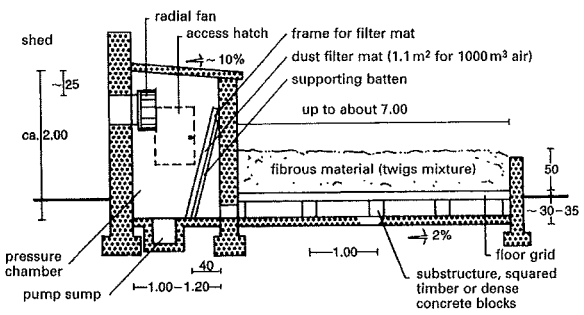


expensive system; safe air distribution; functions independently of weather; simple to combine with heating; high capital cost (1.5 to 2 times that of extract ventilation); energy requirement: 205 kWh/LU/year

❻ Balanced pressure ventilation



❼ Fan types



❽ Earth filter system (design by Zeisig)

FARMYARDS

Climate in Animal Housing

In addition to their own characteristics, fodder and behaviour, the climate in their housing has the most decisive influence on the performance and health of the animals. 'Climate' includes the factors temperature, humidity, air movement, air composition, light, ventilation, window area, building volume, orientation of building and its thermal insulation. The air intake speed should be between 2.0 and 5.0 m/s according to the width of the building. Ventilation systems are divided into convection ventilation and forced ventilation → ❷ – ❼.

Air temperature (°C)		Recommended air speed (m/s)
under	18	0.15
	20	0.20
over	22	0.24
	24	0.35
	26	0.50

❾ Recommended air speed according to temperature

	For animals (l/m³)	Max. workplace conc.
carbon dioxide	3.50	5.00
ammonia	0.05	0.05
hydrogen sulphide	0.01	0.01

❿ Permissible gas concentration in animal housing

The design should, as with mechanical ventilation, be based on a calculated determination of the size of air inlet and outlet openings. These should be designed according to the summer airflows and in the case of complete wind still according to the following formula:

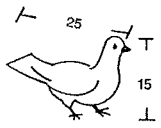
$$w = \frac{g \cdot H \cdot \Delta t/T_1}{1 + F_1/F_2}\ (m/s) \qquad F_2 = \frac{Vi}{3600 \cdot w}\ (m^2)$$

w = speed of the outlet air in the ridge opening (m/s)
g = acceleration due to gravity (9.81 m/s^{-2})
H = height from floor to ridge (m)
T_1 = outside temperature in K (subtract 273 for temperature in °C)
Δt = temperature difference between indoor and outdoor air (K)
Vi = summer air renewal rate (m^3/h)
F_1 = inlet air area (m^2)
F_2 = outlet air area (m^2)
(for simplicity, $\frac{F_1}{F_2} = 1$ can be assumed)

Housing for:	Optimal range for animals		Recommended calculated values in winter	
	Air temp. (°C)	Rel. humidity (%)	Air temp. (°C)	Rel. humidity (%)
milk cows, suckling calves, bullocks, young breeding cattle and calving	0–20	60–80	10	80
young fattening cattle, bullocks	20–18*	60–80	16	80
fattening calves	20–16*	60–80	18	70
gilts, dry and carrying sows, boars	5–15	60–80	12	80
fattening pigs	20–19*	60–80	17	80
sows and piglets:				
sows	12–16	60–80		
piglets at birth (using zone heating)	30–32	40–60		
piglets to 6 weeks	20–22	60–70		
growing piglets to 30 kg	22–18*	60–80	20	60
cage-reared hens from approx. 5 kg to approx. 20 kg (2–8 weeks)	26–22*	40–60	26	60
hen chicks with zone heating, temperature in chick zone, each week of life 3°C lower	32–18*	60–70	26	60
young and laying hens	15–22	60–80	18	70
turkey chicks with zone heating, temperature in chick zone, each week of life 3°C lower	36–18*	60–80	22	60
fattening turkeys from 7th week	19–10*	60–80	16	80
ducks	30–10*	60–80	20	60
workhorses	10–15	60–80	12	80
riding, racing horses	15–17	60–80	16	80
breeding sheep	6–14	60–80	10	80
fattening sheep	16–14*	60–80	16	80

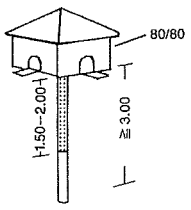
* with increasing age of animal, air temperature should gradually decrease from higher to lower value

⓫ Air temperature and relative humidity in keeping various animals



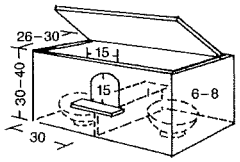
Loft area per pair . . . . . 0.15–0.20 m²
(pedigree pigeons correspondingly more)
1 pair of carrier pigeons . . . . 0.5 m³ air space
1 pair of pedigree pigeons . . . 1.0 m³ air space
15–20 pairs of pedigree pigeons in a loft
20–25 pairs of pigeons in a loft

❶ Pigeons



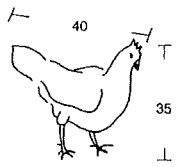
On a 3–4 m high pole, protected from birds of prey with metal sheet, or as dovecote on the east or south side of a house

❷ Dovecote



2 nests for each pair of pigeons on the floor of the box or on special frames.
Feeding through wooden box with small openings.
Drinking container with similar openings

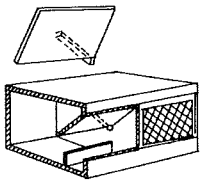
❸ Nesting box (Fulton)



Scratching room for 5 hens	≧3 m²
Scratching room for 10 hens	≧5 m²
Scratching room for 20 hens	≧10 m²

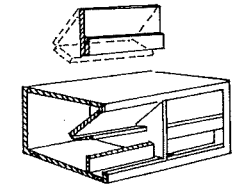
Sleeping room for 5–6 hens or 4–5 heavy hens
= 1 running m of perch = 10–12 hens per m²

❹ Hen (Orpington)



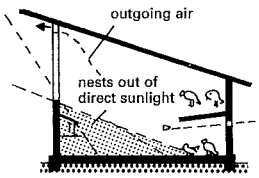
In breeding boxes, the laying nests are built as trap nests, with a trapdoor, which either hangs loose on a hook → ❿ or consists of two linked flaps → ⓫. When the hen goes into the nest, the flap is lifted and falls in.

❺ Laying nest, open



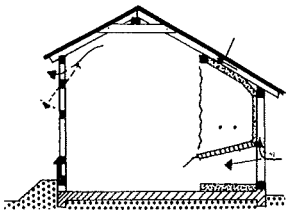
Nests can be on the floor or stacked 3 high, with the upper face sloping.
Nest size 35 × 35 to 40 × 40 cm.
Floor area and 35 cm height, 1 open nest for 5 hens, 1 trap nest for 3–4 hens.

❻ Laying nest with flap



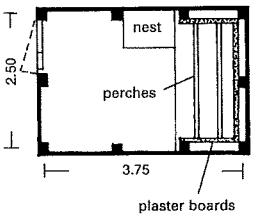
Ventilation without draughts. Laying nests away from window.
Ventilation flaps capable of being closed, if sunny.
Scratching room should adapt to outside heat, but the sleeping room must be warm.
Therefore, sleeping room is often separated with a curtain and built with thermal insulation

❼ Chicken coop (Peseda)



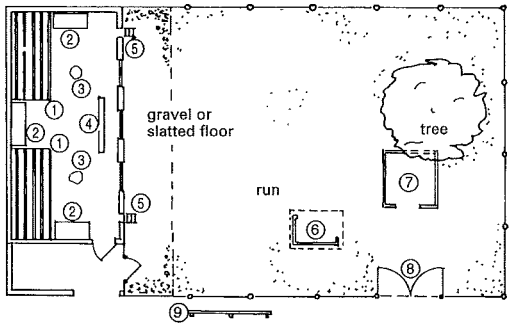
Coop for 20 chickens with separate thermally insulated sleeping niche, with sloping plate for droppings and wall ventilation.
Hatching opening 18 x 20 x 30 cm, protected against draughts with side boards and can be closed with a slider.

❽ Section → ❾



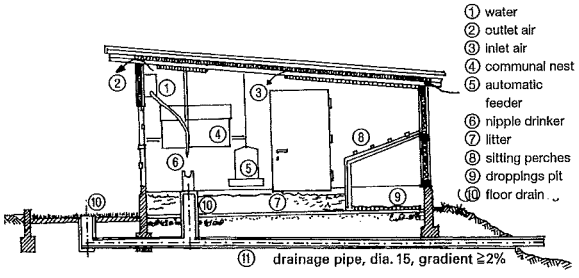
Perches according to the size of the hens 4–7 cm wide, 5–6 cm high, 3.5 m free-spanning, easily removed, 5–6 hens on 1 m perch.
Arch.: W Cords

❾ Plan → ❽

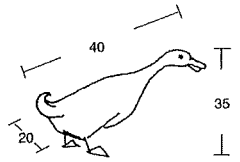


① perch with pit for droppings beneath
② communal nests
③ feed container
④ nipple drinker
⑤ flap to run out
⑥ sand bath
⑦ compost heap
⑧ door to fill up compost heap
⑨ wind protection

❿ Chicken coop and run → ⓫

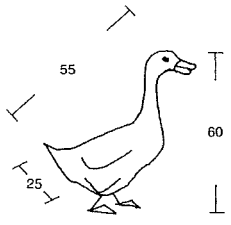


⓫ Section of coop → ❿



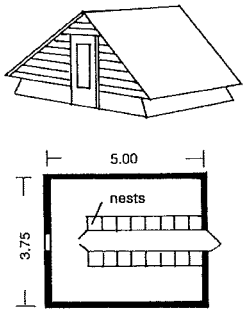
House area (4–5 ducks) 1 m²
House height 1.7–2.0 m
Highest no. for house = 1 drake and 20 ducks.
The floor should be solid, rat-safe, dry and airy.
Run to water, if possible marshy land

⓬ Duck (Peking)

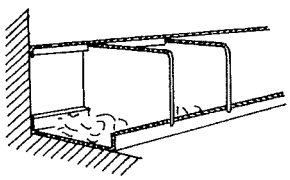


The same applies here as for ducks. For fattening, the birds are kept in small, just sufficient rooms or individual cells, 40 cm long, 30 cm wide, with chute for droppings and feeding tray in front of cell

⓭ Goose (Pomeranian)



⓮ Duck house

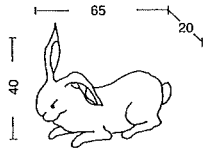


Nest size 40 × 40 cm
Trap nests in breeding house as for hens.
Per duck = 1 nest → ⓮

⓯ Laying nest for 4–5 ducks

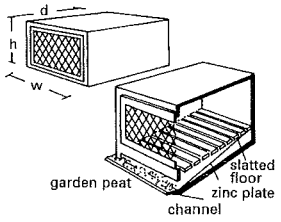
Housing Poultry

(See also Laying Hens → p. 455.)
Housing for poultry requires careful design and construction in order to keep them successfully. Coops should be clean, airy, free of draughts, dry, thermally insulated and weatherproof. Provision should be made for cleaning out. The window area should be max. 1/10 of the floor area. Timber construction with a thermal insulation layer is best. Adjacent rooms should be provided for feed preparation and storage. The form of the house should be suitable for the direction of the sun, the window side south and the door east. Laying nests will be at the darkest location. A chicken coop is divided into a scratching room with litter and pit for droppings with the perch above → ❾.
The run is ideally of unlimited size and the area should be grassed with a tree for shade → ❿, a compost heap and a sand bath. The number of hens depends on the size of the run and the free floor area of the empty coop. If the run is of unlimited size, 5 hens per m² coop floor area. If the run is smaller than 4 times the coop floor area, then 2 hens can be kept per m² coop floor area. There should be room for perches, feed bowls etc. in the area.



hutch area per animal 0.65–1.0 m²; should be well ventilated, dry and protected from sun and predators (rats); hutches usually made of wood with drainage → ❷, 5% gradient

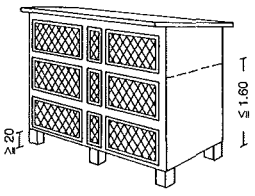
❶ Rabbit (Belgian giant)



	w	d	h
small purebreds	80	80	55
medium purebreds	100	80	65
large purebreds	120	80	75

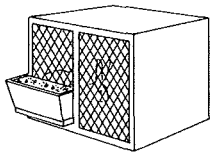
(depth is the same to ease subdivision)

❷ Size of rabbit hutches (cm)



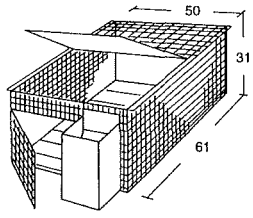
for small purebreds three tiers, for large purebreds two tiers within above limits (length unlimited); slatted floor → ❷ with drainage facilities and common urine collection channel below

❸ Stacked rabbit hutches



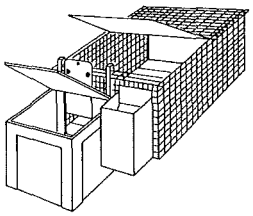
opening front or front section between two hutches → ❸; front wall of galvanised wire netting; hutches for female hares with dark netting and 10 cm high bed

❹ Feed rack in hutch



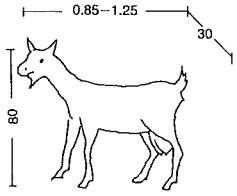
cage is made entirely from galvanised wire netting, mesh size 25 × 25 or 12 × 70 mm

❺ Wire cage with automatic feeder



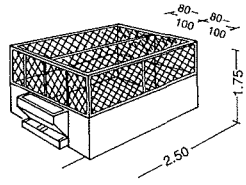
wooden or polyurethane nesting boxes for young animals: floor of nesting boxes at least 70 mm below base of cage

❻ Breeding cage with nesting box and automatic feeder



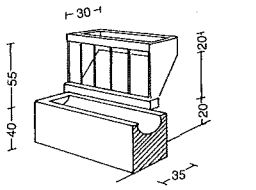
stall area per animal	1.5–2.0 m²
stall width per animal	0.75–1.00 m
stall depth, tethered	1.8 m
stall depth, free	2.5–2.8 m
stall height	1.7–2.5 m
stall temperature	10–20 °C

❼ Goat (German Saanenziege)



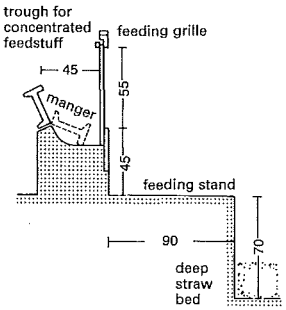
wire mesh above the rack level; tiled flooring at a gradient, with a channel for urine; feed rack and water trough serve both stalls

❽ Modern goat housing with feed rack and trough between two pens

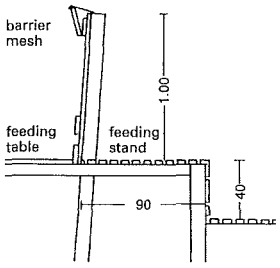


standard dimensions of a feeding rack and drinking trough in the feeding aisle (transverse aisle); daily requirements per goat: 1.2 kg hay, 2.3 kg of root crop, 2–3 l of water

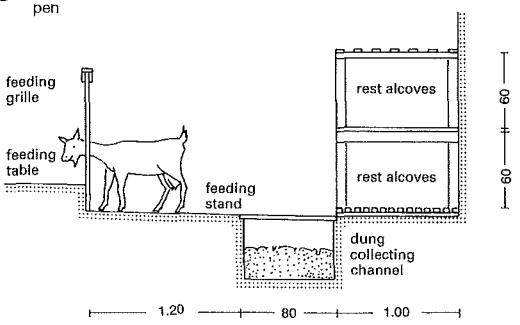
❾ Feed rack and trough for goat pen



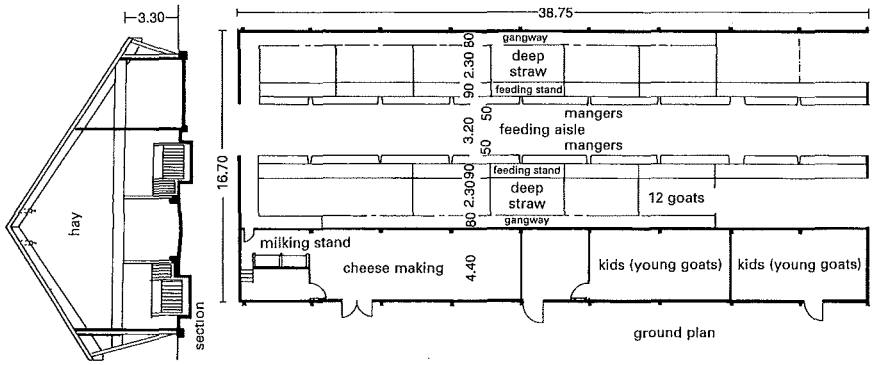
❿ Two-room goat housing with deep litter bed



⓫ Loose box with fully slatted floor



⓬ Multi-space loose housing with wall-mounted bed niches



⓭ Two-room housing with deep litter bed

Summer 5 kg grass/day and 0.5 kg hay
6 kg red clover
Winter 1 kg hay/day,
water 2–3 litre/animal/day

Space required	Loose housing	Length of feeding rack	Tethered stall		
			Standing	Width	Length
	m²	cm			
kid	0.7	20	—		
young animal	1.2	30–40	50	50	40
goat	1.5	40–50	80	50–70	40
buck	2.2–4.0	80	80	60	50

windows 1/15 –1/20 of the building height
ceiling > 2.50 m
trough: 1 basin for 30 animals; 0.4 kg straw/day, 1.5 dt/year/animal, dung production 7–15 dt/goat

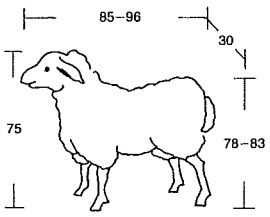
⓮ Goat keeping

Rabbit hutches

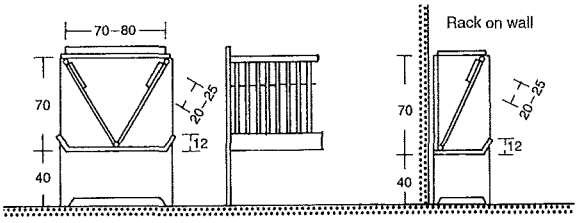
These → ❷ – ❹ are often free-standing at wind-protected rear sides of barns and houses. Hutches can be stacked 3 × vertically → ❸. They should be protected against rats and mice, and be easy to clean and with urine drains → ❷. For the breeding of fattening and meat rabbits → ❺ – ❻ in close rooms, there are stringent requirements for the construction of the hutch and the climate. Rabbits react to poor climate much more sensitively than piglets or chicks. Thermally insulated buildings with forced ventilation are required for breeding and fattening. The hutch volume should be 4.5–5.5 m³ per doe including offspring. The temperature in the breeding hutch should be 10–28 °C, optimally 18 °C, in the fattening hutch 20 °C.

Goat sheds

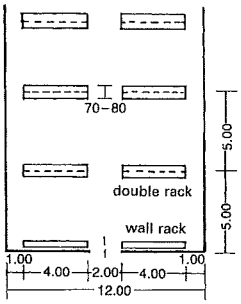
If possible these should face to the east or south. Dry with good ventilation and lighting, window area = 1/5–1/20 of the floor area. Where goats are tied up in numbers, the standing width should be 75–80 cm, depth 1.50–2.00 m, without including the passages necessary in front and behind the pens. A paddock next door to the south is ideal.



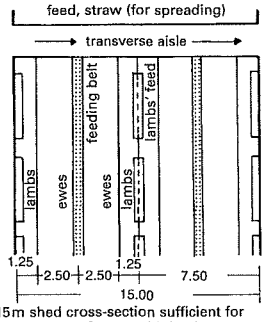
1 Sheep



2 Ladder feed rack with trough

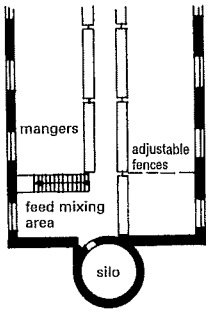


3 Shed without gangway for feeding

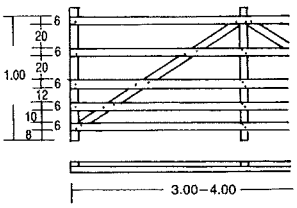


15m shed cross-section sufficient for four groups of ewes with lambs

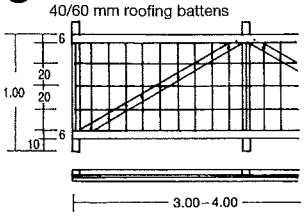
4 Shed with transverse gangway, 15 m cross-section, adequate for four groups of ewes with lambs



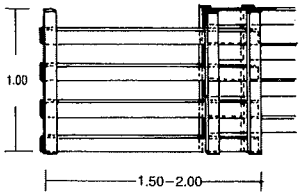
5 Good arrangement of silo and feed mixing place in sheep shed



6 Fence for dividing shed made of 40/60 mm roofing battens



7 Fence for dividing shed made of roofing battens and wire mesh



8 Extendable fence made of battens

Loose, lying and feeding room for sheep

Animal	Loose and lying area (m^2/animal)	Necessary feeding width (m^2/animal)
mother ewe to 70 kg	0.85	0.4
mother ewe over 70 kg	1.0	0.45
mother ewe with lambs	1.2–1.6	0.6
lambs to 8 weeks	0.3–0.4	0.15
fattening lamb	0.4–0.5	0.2
yearling	0.7–0.8	0.3
breeding ram in single bay	3.0–4.0	0.5
breeding ram in communal bay	1.5–2.0	0.5

Size and weight of the two most important sheep breeds

Merino sheep and black-headed meat sheep	Weight	Wither height	Rump length
ram	120–130 kg	0.83 m	0.96 m
ewe	70–80 kg 65–75 kg	0.78 m	0.85 m

Net space requirement for sheep kept in a herd on fully perforated floor

Animal	m^2/animal
ewe	0.8
ewe with lambs	1.2
fattening lamb	0.5
yearling	0.6
ram	1.5

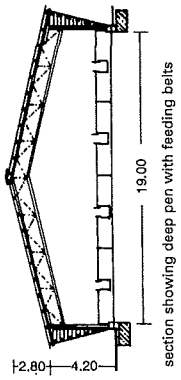
Optimal shed climate values (Burgkart)

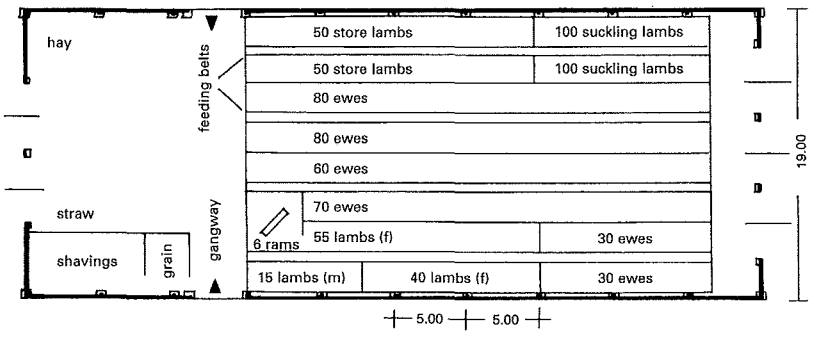
Housing for...	Temperature (°C)	Relative humidity (%)
... mothers	8–10	60–75
... lambs and fattening	10–14	60–75
... breeding	14–16	60–70

Fodder storage per ewe (including lambs) in winter indoor period

Stored goods	Space requirement
hay (feeding only hay)	3.3 m^3
hay (feeding hay and silage)	1.0 m^3
silage	1.0 m^3

9 Sheep sheds





10 Sheep shed for 350 ewes, 110 young sheep, 200 suckling lambs, 100 fattening lambs

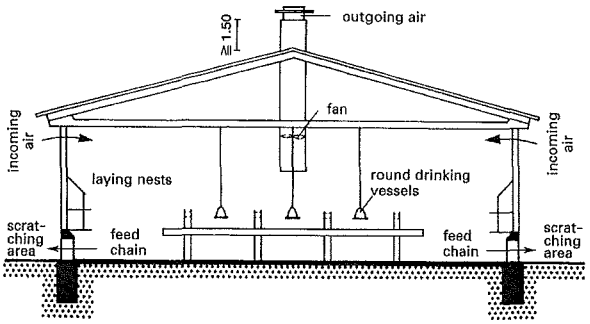
Sheep housing should face to the east or west; single housing is much like goat housing → p. 453. Intensive sheep farming requires large, free-standing sheds with flexible housing according to time of year (winter, early year, lambing time, after lambing), separated by fences according to age and sex.

Floor 50–60 cm below ground level. Door threshold 20 cm above ground level. The height difference of 60–80 cm is filled with dung, which remains for 3–4 months.

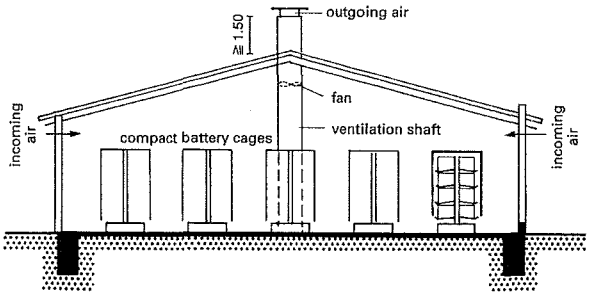
Feeding racks should therefore be adjustable, ideally with a manger, either round (diameter 2.20 m) or elongated mangers – 3.40 m is sufficient for 25–30 sheep. Spacing between feed containers 2.30 m, from the wall 1.80 m. Doors to the south, divided at half height. Door width ≧2.50 m, door height ≧2.80 m, to remove the dung.

Building height 3.30–3.50 m, window area 1/20–1/25 of the building floor area, high-level tilting window. All building components, timber on plinth 15–20 cm above highest dung level, should be protected against dung salts.

Feed mixing place 1/10–1/15 of the pen area. For small herds ≧m^2 turnip store should be provided. Storage for hay and straw per sheep 3.00 m^3.



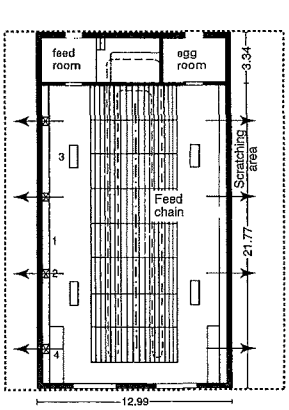
❶ Keeping laying hens on floor: on two levels with open area



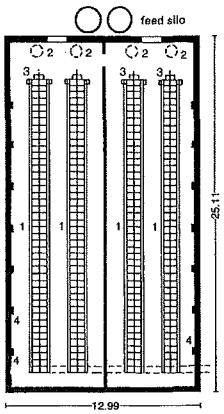
❷ Keeping laying hens in small groups

Minimum area	2.5 m²
Area/bird	min. 800 cm²/bird; for birds weighing more than 2 kg, 900 cm²
Height of the coop	min. 60 cm (trough side), nowhere less than 50 cm
Arrangement of the coops	min. 90 cm gangway width between the rows, floor spacing min. 35 cm
Nest area	min. 900 cm² for groups of up to 10 birds; for groups of 30 birds, the nest is to be enlarged by 90 cm² for every further bird
Feeding trough	min. 12 cm/bird; or 14.5 cm for birds weighing more than 2.5 kg
Roosting perch	min. 15 cm/ bird; min. 2 perches at different heights per holding unit
Light	newbuild: natural lighting min. 3% floor area

❸ Requirements for keeping hens in small groups (Animal Welfare, Animal Husbandry Regulations → refs)



❹ Floor housing for laying hens with open area for 1600 birds



❺ Small group housing with three storeys for approx. 4800 birds

(See also Housing poultry → p. 452.)

The legal requirements for the keeping of laying hens are laid down in the **Animal Welfare Law** and in the **Animal Welfare, Animal Husbandry Regulations.** The regulations contain general provisions about the keeping, feeding and care of farm animals and these apply for all husbandry, with special regulations for the commercial keeping of laying hens:

The keeping of hens is allowed **on the floor** → ❶ on one or more levels with or without free range and in small groups → ❷ in fitted out accommodation with scratching area, nest and perching bars.

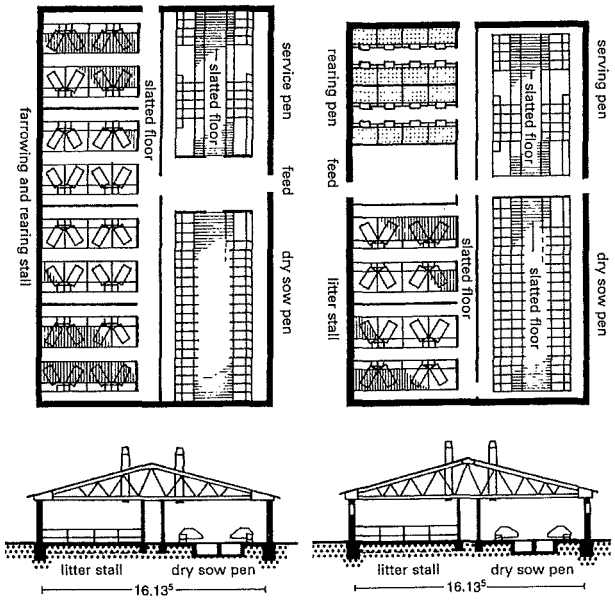
A particular requirement for free-range management is the provision of a **cold scratching place** (outside, separated and roofed scratching area with paved surfacing) between the barn and the run.

Occupation density	max. 9 hens/m² usable area, for multi-storey floor keeping, max. 18 birds/m² floor area
Levels	max. 4 levels vertically, with barn floor first level
Group size	without partitions, max. 6000 birds
Feeding	long trough: max. 10 cm edge length/bird round trough: max. 4 cm edge length/bird
Drinking trough	gutter/round trough: 2.5 cm/min. 1 cm edge length/bird nipple/beaker drinker: min. 2 places for up to 10 birds and 1 for every further 10 birds
Nests	group nest: min. 1 m² for max. 120 birds single nest: max. 7 birds/nest (135 × 25 cm)
Perches	min. 15 cm/bird, horizontal spacing of the perches 30 cm, to wall 20 cm
Litter area	at least a third of barn floor area and min. 250 cm²/bird
Cold scratching room	for all poultry farms with access to an open-air run (unless construction or other legal reasons prevent it)
Opening to cold scratching room	min. 35 cm high/40 cm wide, min. 1 m/500 birds, distributed evenly along external wall
Light	newbuild: natural lighting min 3% floor area

❻ Requirements for keeping hens on the floor (Animal Welfare, Animal Husbandry Regulations → refs)

All types of facility must provide a **minimum area of 2.5 m²** and be equipped so that the hens can move to a reasonable extent according to their personal needs: i.e. can move to **feed, drink and rest.** The lighting is to be sufficient for the birds to recognise each other and for the people responsible for care to be able to see them properly. The floor must provide hard standing for the birds and have access to adequately dimensioned and distributed feeding and drinking facilities. The facility should also provide a freely accessible nest during the laying phase with a floor constructed so that the birds do not come into contact with wire mesh. A litter area should also be provided to enable the laying hens to peck, scratch and dust-bath as is their nature. The laying hens in a group must be able to enjoy simultaneous and undisturbed rest on a perch.

Tables and text from: DLG → refs.



❶ Sheds for breeding pigs, with and without feeding gangway (theoretical diagram)

	Shed area m² (net)	External area m² (net) open area apart from grazing areas
sows with **piglets** up to 40 days old	7.5	2.5
fattening pigs	0.8 (up to 50 kg live weight) 1.1 (up to 85 kg live weight) 1.3 (up to 110 kg live weight)	0.6 (up to 50 kg live weight) 0.8 (up to 85 kg live weight) 1.0 (up to 110 kg live weight)
piglets over 40 days old and up to 30 kg	0.6	0.4
breeding pigs	2.5 breeding sow 6.0 breeding boar	1.9 breeding sow 8.0 breeding boar

❷ Requirements for pig keeping (EU Eco Directive 2092/91, annex VIII → refs)

	Usable floor area m² (net)
young sows	1.85 (group size up to 5 animals) 1.65 (group size 6–39 animals) 1.50 (group size > 40 animals)
sows	2.50 (group size up to 5 animals) 2.25 (group size 6–39 animals) 2.05 (group size > 40 animals)
young breeding pigs and fattening pigs	0.50 (30–50 kg live weight) 0.75 (50–110 kg live weight) 1.00 (> 110 kg live weight)
fattening piglets	0.15 (>5–10 kg average weight) 0.20 (>10–20 kg average weight) 0.35 (>20 kg average weight)

❸ Requirements for pig keeping (Animal Welfare, Animal Husbandry Regulations → refs)

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The animal welfare requirements for the commercial keeping of pigs are laid down in the Animal Welfare Law and in the Animal Welfare, Animal Husbandry Regulations. The regulations contain general provisions for pig-keeping facilities and for the keeping of pigs:

Pig sheds (except for birthing pens) must be constructed so that the pigs have eye contact with the other pigs kept there. The pigs must be able **easily to lie, stand up, lie down and adopt a natural posture**. The pigs must have a dry lying area available. They must not unavoidably come into contact with urine and dung.

There must be adequate equipment for the reduction of heat stress at high shed temperatures. The **floor** of the pig shed must be **slip-resistant** and provide a **firm footing** over the entire area where the pigs live and in the driving gangways. The construction must be appropriate for the size and weight of the pigs and no holes, gaps or cavities are allowed which might lead to risk of injury.

If a **slatted floor** is used, the maximum width of the gaps is 11 cm for suckling piglets, 14 mm for fattening piglets, 18 mm for young pigs for breeding and 20 mm for young sows, sows and boars. The width of the tread surface in areas where the pigs live must correspond to the slatted floor and, if slatted concrete flooring is used, it must be at least 5 cm for suckling and fattening piglets and 8 cm for all other pigs. If **metal grating flooring** is made of wire mesh, the wires must be plastic coated and the external diameter of the coated wire must be at least 9 mm.

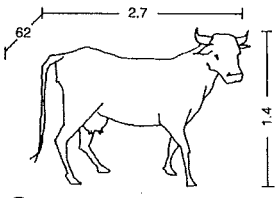
In the area where the pigs lie, the floor must be constructed so that the health of the pigs cannot be harmed and heat transmission is not too high or too low. The degree of perforation of the floor may not be more than 15% (except for fattening piglets).

The **lighting** of the sheds must (applies to new building from 04/08/2006) be natural daylight. The window areas must have a total area of at least 3% of the shed floor area and be arranged so that the lighting is as uniform as possible. The window area can be reduced to 1.5% of the shed floor area on account of technology, construction or building regulations as long as artificial lighting as comparable as possible to natural lighting is also provided.

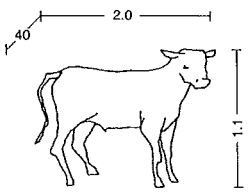
It should be ensured that each pig has access at all times to **activity material** without health risks, which serves their natural inquisitiveness and can be investigated, moved and altered by the pig. Each pig must have constant access to **water** in sufficient quantity and quality, and if the pigs are kept in groups additional drinking troughs are to be provided in sufficient quantity separate from the feeding trough.

In addition to the general requirements, the Animal Welfare, Animal Husbandry Regulations contain further provisions for the keeping of **sucking piglets, young sows, sows and boars** → ❸.

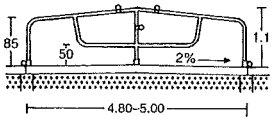
If the farm intends to market products as **organic**, the provisions of the EU Eco Directive will also have to be complied with → ❷.

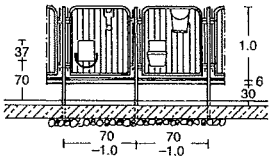


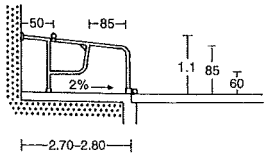
1 Cow

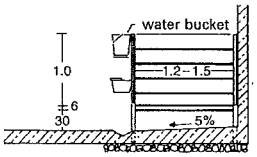


2 Young animal in stall



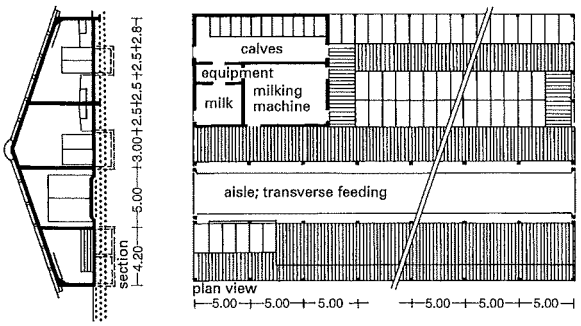




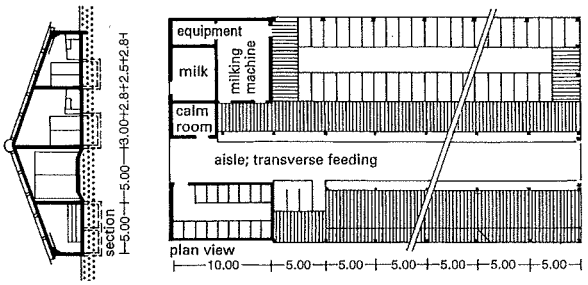


3 Lying boxes for cows (AFP)

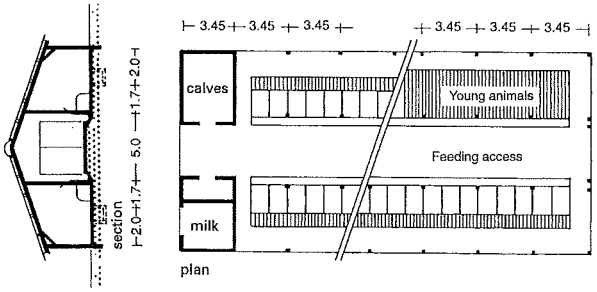
4 Single stalls for young cattle (14 days to 10 weeks)



5 Box pens, 3 rows, for dairy cows with young cattle



6 Box pens, 2 rows, for dairy cows with young cattle



7 Conventional stalls with stanchions, 2 rows, for dairy cows with young cattle

The requirements for cow sheds, according to the **Agricultural Investment Support Programme (AFP)**, annex 1, 'Special requirements for particularly welfare-oriented husbandry', represent the current standard for keeping cows in terms of animal welfare and can be considered as minimum requirements (which can be deviated from in exceptional cases according to the farm's situation). The provisions of the EU Eco Directive and Recommendations for horned cows also contain ideas of future developments in conventional livestock farming.

Lying box dimensions and design

The dimensions of the lying boxes have to be based on the average bodily dimensions of the 25% largest animals in a herd. The values below therefore represent lower limits. The dimensions for individual cows can be worked out as follows:
Lying length: (0.92 × diagonal rump length) + 21 cm
Lying box length: lying length + 21 cm + (wither height × 0.56)
Lying box width: wither height × 0.86

Tables and text from Aulendorf → refs.

Criterion	AFP (esp. animal welfare-oriented	EU Eco Directive	Recommendations for horned cows
space available (m^2) stall yard	5.0 per LU[1]	6.0 per animal 4.5 per animal	9.0 per LU[1] 12 per animal
lying box width (cm)	120–130		120
lying box length (cm)	240–250/ 270–280[2]		270–300[2]
separating bar distance from floor (cm)	60		
feeding place width (cm)	75		80–90
feeding gangway width (cm)	>350		450
gangway width (cm)	>250		400
animal/feeding place ratio	1:1 (1:2:1)[3]		1:1.1 to 1:1.2
animal/lying box ratio	1:1		1:1.1 to 1:1.2
lighting area: % of cowshed floor area	5		
lying area in deep stall/cow	4.5		8[5]
lying area in deep stall (m)			max. 6
max. gap width (cm)			3
other	gangway between 12–15 cubicles	– max. 50% of the usable cowshed area slatted floor – yard or pasture – straw litter	

[1] lying box, stall and feeding place area
[2] opposite/wall mounted, deep box recommended
[3] when stock of feed, i.e. guideline, mixed fodder in swathes
[4] movement area from age of 1 year (area which is always accessible, 50% lying box area)
[5] of which 3 m^2 can be reckoned as movement area

8 Requirements for the keeping of dairy cows (Aulendorf → refs)

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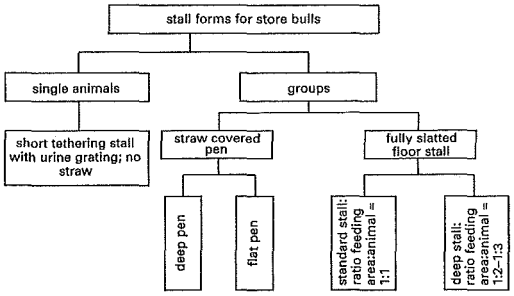
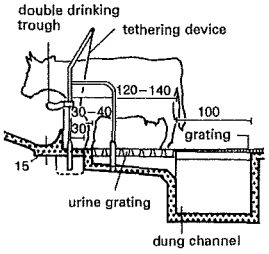
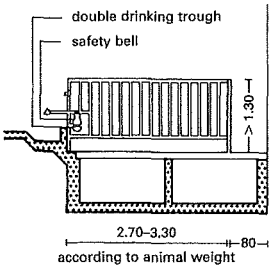


1 Methods of finishing beef cattle

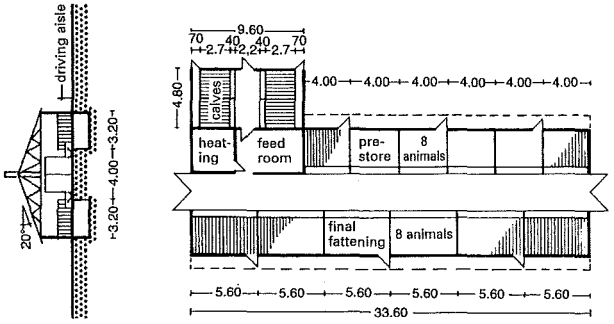


animal weight	length	width
up to 300 kg	120 cm	70–80 cm
up to 600 kg	140 cm	90–100 cm

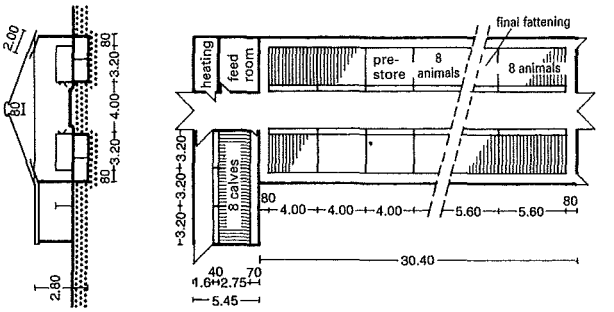
2 Short stall for finishing beef cattle without straw



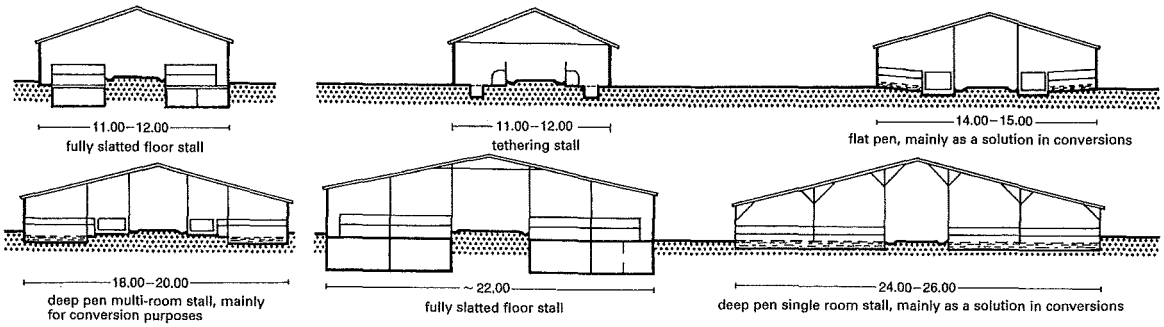
3 Fully slatted stall for finishing beef cattle with driving gangway



4 Fully slatted shed for 96 finishing beef cattle with stall changing, external driving gangway



5 Fully slatted shed for 96 finishing beef cattle with stall changing, driving gangway behind the stalls



6 Shed sections for various forms of finishing beef cattle stall

The methods used to finish beef cattle are divided into single and group management → 1. Keeping animals singly requires constant adaptation of the stall on account of the fast growth of a bull. Different stalls are therefore required for different ages. Pay attention to good drainage of urine from the lying area.

The advantage of keeping cattle singly is that herd behaviour is excluded. Group management (6–15 animals of the same age and similar weights is usual) requires that the animals have already got used to each other as calves.

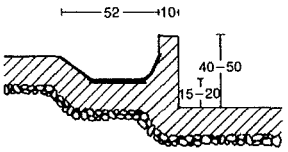
According to the bedding quantity and the system of dung removal, either the animal can walk and lie in the entire area of the pen, which is completely straw-bedded, or the lying and feeding areas are separated. Animals kept singly are tied and short stalls are recommended → 2. The design of a shed for finishing beef cattle must create the possibility of bringing single animals or groups in or out of the stalls without danger. The best ventilation is provided by convectors or extractor systems. These work reliably with roof pitches of about 20°. Beef cattle are normally fed maize silage.

	Maize silage		Storage space req./year	Hay		Storage space req./year
	(kg/day)	(kg/year)	(m^3)	(kg/day)	(kg/year)	(m^3)
1st fattening phase 125–350 kg	12	4380	6.15	0.5	180 (HD – dense bales)	1.2
Final finishing 350–550 kg	22	80.30	11.15			

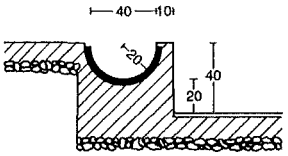
7 Fodder required per animal place in finishing beef cattle stall

Weight range	Floor area per animal	Feeding width per animal	Recommended slatted floor dimensions	
(kg)	(m^2)	(cm)	Width (mm)	Gap width (mm)
125–150	1.20	40		
150–220	1.40	45		
220–300	1.50	50	1.20	
300–400	1.80	57	to	35
400–500	2.00	63	1.60	
> 500	2.20	70		

8 Space required and slatted floor size for finishing beef cattle stalls



9 Manger fitting

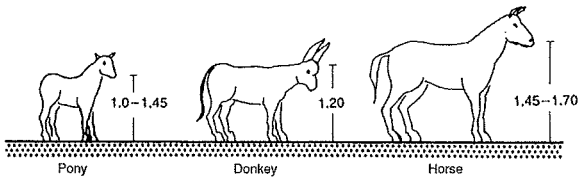


10 Manger fitting

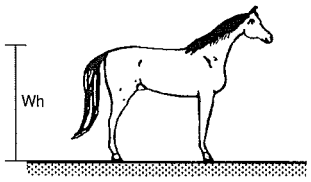
The correct care according to the needs of the species is a precondition for the health, performance and long life of the horse, and also for its willingness and mental stability. Today, after 5000 years of domestication, the needs of horses are still similar to those of wild animals on the steppes. Horses are herd animals and social contact is essential. Whether kept in groups or singly, attention should be paid to the social relationships and compatibility of horses. When horses are kept separately, ensure at least sight, sound and smell contact between the animals. Foals and young horses must grow up in groups.

Keeping in groups: This can be in single boxes or group boxes with adjacent paddock.

Single boxes: Tie stalls are not to be recommended in the long term. When horses are kept singly, a movement area at least as large as a single box is better than none at all. Stables for heavy horses should be planned with a ceiling height of at least 1.5 × withers height, i.e. approx. ≧2.70 m.

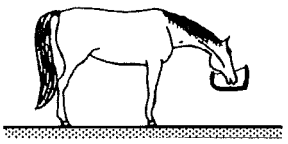


All dimensions are based on withers height (Wh)
= very large horse = 1.80 m
= average large horse = 1.67 m
= pony = 1.45 m



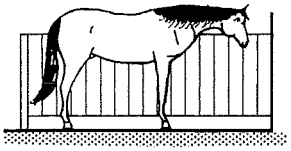
❶ Withers height

approx. 1/3 × Wh
= very large horse = approx. 60 cm
= average large horse = approx. 55 cm
= pony = approx. 50 cm
= small pony = approx. 30–40 cm



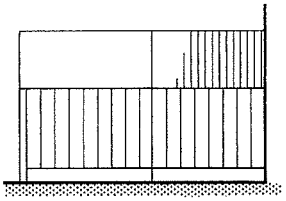
❷ Height of the manger floor (feeding height)

approx. 0.60 × Wh
= very large horse = approx. 1.45 m
= average large horse = approx. 1.35 m
= pony = approx. 1.20 m



❸ Height of the box partition (breast height)

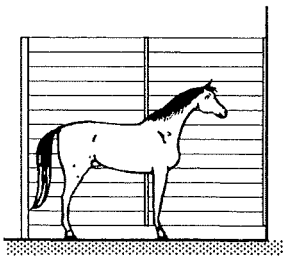
approx. 1.30 × Wh
= very large horse = approx. 2.35 m
= average large horse = approx. 2.45 m
= pony = approx. 1.95 m



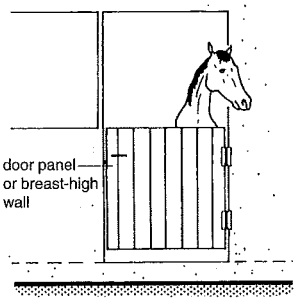
❹ Height of the box partition (upper part lattice, visual contact)

min. 1.45 × Wh
= very large horse = approx. 2.60 m
= average large horse = approx. 2.40 m
= pony = approx. 2.20 m

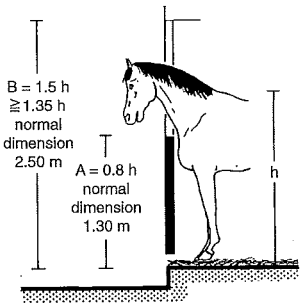
Separate stallions and mares; do not accommodate in adjacent boxes



❺ Height of the box partition (upper part provides no visual contact; only recommended in exceptional cases)



❻ Stable half-door → ❼

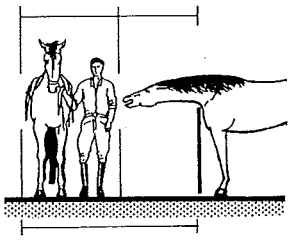


❼ → ❻ Section and dimensions

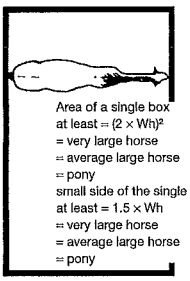
Width of access passages
= large horse = approx. 1.20 m
= pony = approx. 1.00 m

Width of stable passages should be 3 m if possible; min. 2 × access passage width is necessary to turn horses round.

= average large horse = approx. 2.40 m
= pony = approx. 2.00 m



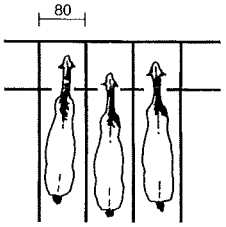
❽ Width of through and box passages



Area of a single box
at least = (2 × Wh)²
= very large horse = approx. 13.0 m²
= average large horse = approx. 11.2 m²
= pony = approx. 8.5 m²
small side of the single loose box
at least = 1.5 × Wh
= very large horse = approx. 2.70 m²
= average large horse = approx. 2.50 m²
= pony = approx. 2.20 m²

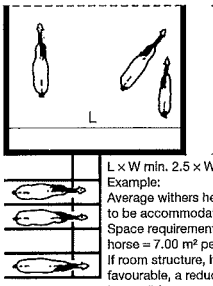
❾ Keeping a horse singly

narrower for ponies



Length including manger
= very large horse = 3.25 m
= average large horse = 3.00 m
= pony = 2.60 m

❿ Feeding stalls



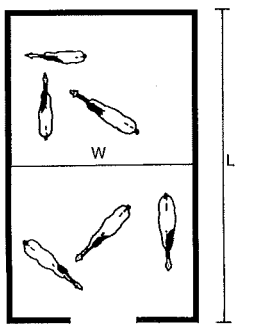
L × W =
→ ⓭ **Single box open stable without permanent access to paddock** at least **(2 × Wh)²** per horse (as for single boxes)
Example:
Average withers height for horse to be accommodated = 1.67 m
Space requirement = (2 × 1.67)² per horse = 11.2 m² per horse

L × W min. 2.5 × Wh² per horse
Example:
Average withers height for horse to be accommodated = 1.67 m
Space requirement = 2.5 × 1.67² per horse = 7.00 m² per horse
If room structure, horses and carers favourable, a reduction of up to 20% is possible

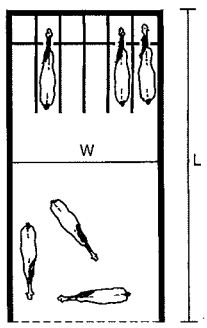
⓫ Open stable for a group with separate feeding stands and constant access to the paddock

L × W =
→ ⓮ **Group open stable with integrated mangers and constant access to paddock** at least **3 × Wh²** per horse (without space for feeding stands)
Example:
Average withers height for horse to be accommodated = 1.67 m
Space requirement = (3 × 1.67²) per horse = 8.4 m² per horse

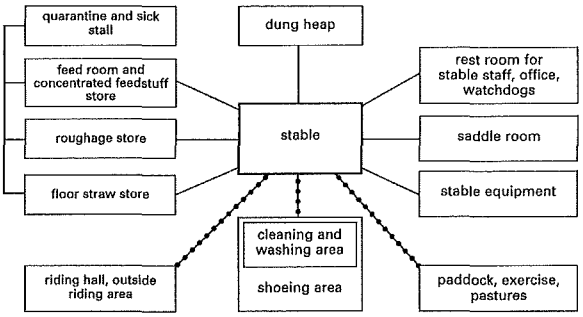
⓬ Space requirement per horse with two different keeping arrangements



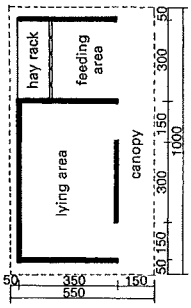
⓭ Single box, open stable → ⓬



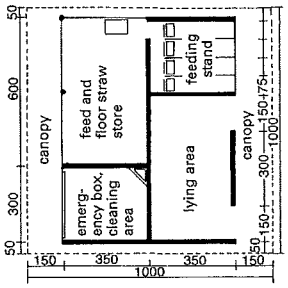
⓮ Open stable for a group → ⓬



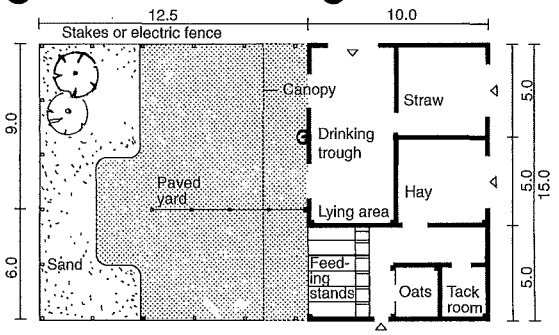
1 Relationships of ancillary rooms to the stable



2 Small shelter



3 Large shelter



4 Multi-room open stable for 5–6 horses with feeding stands

Although the horse is insensitive to wind (and has a physiological need of air movement), draughts should be prevented. This is done with artificial ventilation systems providing constant airflow. There is little point in attempting an 'ideal' stable temperature. With sufficient preparation and appropriate management, any horse can tolerate winter temperatures in the stable, even a few degrees of frost → 8.

Preparation, storage, density (kg/m³)	Required storage room (m³) with 20–30% empty space	
	200 stable days[1]	365 stable days[2]
long hay (75)	17–20	30–36
HD (dense) bales, non-stacked (150)	9–11	15–18
HD (dense) bales, stacked (180)	7–9	12–14

[1] corresponds to 1000–1200 kg [2] corresponds to 1800–2200 kg

6 Space required for hay storage for 5–6 kg/horse/day

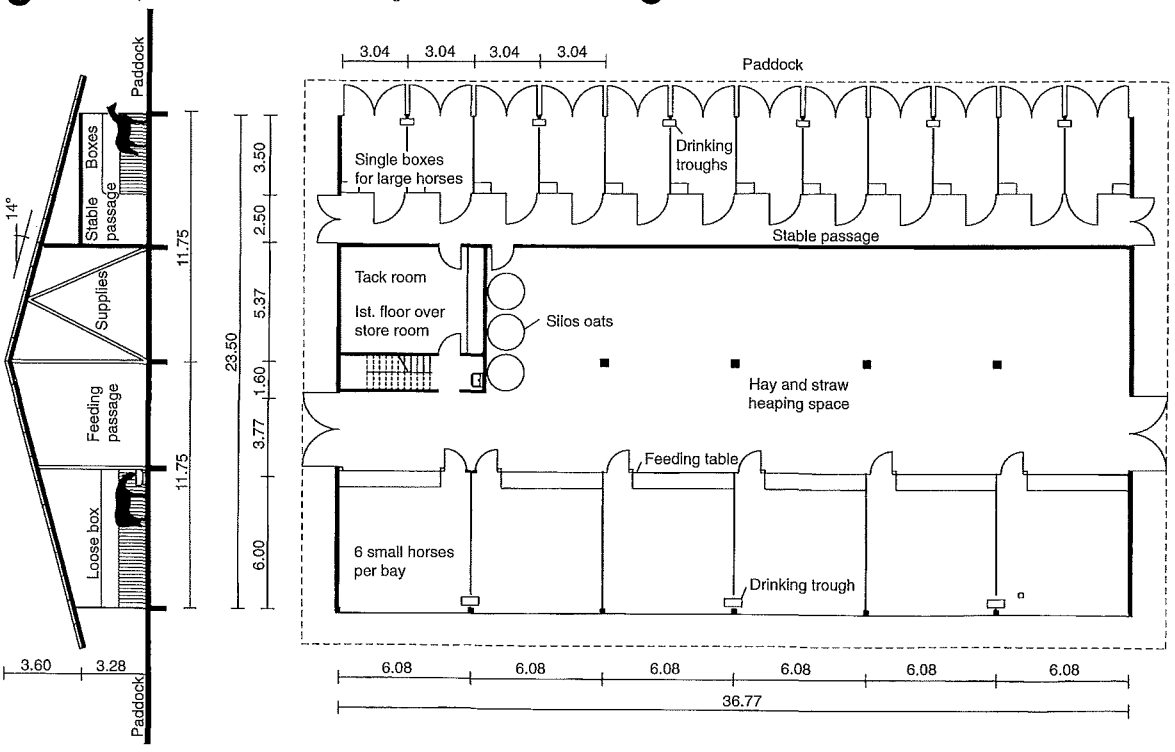
Preparation, storage, density (kg/m³)	Required storage room (m³) for three months[1] with 20–30% empty space
long straw (50)	22
HD (dense) bales, non-stacked (70)	15
HD (dense) bales, stacked (100)	11

[1] corresponds to 900 kg

7 Space required for straw storage for 10 kg/horse/day

Air temperature	Stable temperature should roughly follow outside temperature even in winter
humidity	60–80%
airflow speed in animal area	min. 0.1 m/s
CO_2 content in air as harmful gas indicator	< 0.10 vol. %
ammonia content in air	< 10 ppm
hydrogen sulphide	0 ppm

8 Climatic requirements in stables



5 Group open stable Cross-section → 5