

BAT Conclusions for Intensive Rearing of Poultry or Pigs (Feb 2017)

The full and complete final BAT Conclusions Document for Intensive Rearing of Poultry or Pigs (Feb 2017) is available at the EIPPC Bureau website:

<http://eippcb.jrc.ec.europa.eu/reference/>

The following guidance in tabular form, must be read in conjunction with the above referenced document.

SCOPE

Identify here the particular processes and activities at the installation that come within the scope of the BAT conclusions for the Intensive Rearing of Poultry or Pigs CID document.

Application of organic fertiliser to land outside the installation boundary will not be controlled by conditions of an IED licence, however the CID document for Intensive Rearing of Poultry or Pigs (2017) includes BAT conclusions on techniques for landspreading of manure.

BAT Conclusions <i>Important:</i> <i>(CID should be read (full text) in conjunction with this table)</i>	Applicability Assessment ((1)describe whether or not it applies, stating clearly the precise reasons and (2) how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
<p><i>Note: This single document addresses both pig installations and poultry installations.</i></p> <p><i>BAT 1-29 below apply to both pig and poultry sites (blank font below)</i></p> <p><i>BAT 30 applies to ammonia emissions from an animal house for <u>pigs</u> (olive green font/shading below)</i></p> <p><i>BAT 31-34 applies to ammonia emissions from <u>poultry</u> houses (red font/shading below)</i></p>		

Section 1 General BAT Conclusions <i>(BAT 1-29 below apply to both pig and poultry sites)</i>	Applicability Assessment ((1)describe whether or not it applies, stating clearly the precise reasons and (2) how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
BAT 1. BAT is to implement and adhere to an environmental management system (EMS) that incorporates <u>all</u> of the features as detailed in (Section 1.1 Environmental Management System -EMS)	Applicable <i>For inspection purposes only. Consent of copyright owner required for any other use.</i>	<p>Eoin O Brien is an existing pig producer with many years experience. He has been awarded the teagasc certificate in pig production.</p> <p>The extended facility will continue to function both as a Bord Bia Quality Assurance Scheme unit and as a supplier of pigs under the British Red Tractor Farm Assurance Pig Standard.</p> <p>Expert consultants are being utilised for the development of this facility.</p> <p>Specialist services are utilised by management on-site in specific areas of responsibility, in order to ensure the efficient and proper running of the facility.</p>

		<p>An EMS is implemented within the site. This includes the identification and monitoring of various environmental aspects on site.</p> <p>The applicant implements and maintains a comprehensive monitoring, maintenance and training programme on site to provide maximum protection for the environment, animals and staff alike.</p>
<p>BAT 2. In order to prevent or reduce the environmental impact and improve overall performance, BAT is to use <u>all</u> the techniques provided. (Section 1.2 Good housekeeping)</p>	<p>Applicable</p>	<p>The building and its layout is state of the art for the industry. A thorough review was undertaken of the best available techniques to minimise emissions from the unit and to maximise welfare conditions for animals and staff alike on-site during the initial planning stages.</p> <p>A secure fence around the site and effective landscaping, natural colonisation of earth embankments where necessary.</p> <p>Stormwater from the site will</p>

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		<p>be directed to the existing soak ways. A storm water monitoring point with inspection chamber, labelled SW1 (Grid Ref: E197421, N76518) will be provided as shown on the storm drainage layout plan drawing No 214037-02 attached. Storm water will consist of rain water from roofs and storm water will be directed to the designated soak ways. The storm water drainage system and monitoring points will be inspected weekly and analysed quarterly for chemical oxygen demand (C.O.D). Details of the weekly inspections and quarterly laboratory analysis will be recorded on file and the C.O.D analysis results will be submitted to the Agency on the Annual Environment Reports. There has been no incidence of high C.O.D on storm water analysis from the existing installation.</p> <p>Provision of drains to properly collect any manure and divert it to the nearest manure tank.</p>
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		<p>The collection and the removal from the site of all pig manure to be used by local farmers as fertilisers on land in accordance with Good Agricultural Practices for the Protection of Waters S.I. 31 of 2014.</p> <p>The collection and the removal from the site of hazardous waste materials-spent fluorescent lighting tubes, veterinary waste, generated on the site. Such wastes removed from the site are to removed only by permitted/licensed contractors.</p> <p>The collection and the removal from the site of all dead animals and all animal tissues. Collections are currently undertaken by a licensed contractor, and transported for disposal or recovery at an authorised rendering plant.</p> <p>Record and maintain required records of all consignments of waste despatched from the site.</p>
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		<p>The applicant implements and maintains a comprehensive monitoring, maintenance and training programme on site to provide maximum protection for the environment, animals and staff alike.</p> <p>An Emergency Response Procedure has been put in place for this facility.</p>
<p>BAT 3. In order to reduce total nitrogen excreted and consequently ammonia emissions while meeting the nutritional needs of the animals, BAT is to use a diet formulation and nutritional strategy which includes <u>one or a combination of the techniques given (Section 1.3 Nutritional Management).</u></p>	<p>BAT 3A+B. BAT C+D Applicable economically viable</p>	<p>Diets will be formulated by professional animal nutritionists with a view to achieving the most efficient use of feed inputs to deliver optimum pig performance and to minimise the excretion of nitrogen. N excretion will be kept to a minimum by using low protein diets.</p>

	Technique (1)	Applicability		
a	Reduce the crude protein content by using an N-balanced diet based on the energy needs and digestible amino acids.	Generally applicable.		
b	Multiphase feeding with a diet formulation adapted to the specific requirements of the production period.	Generally applicable.		
c	Addition of controlled amounts of essential amino acids to a low crude protein diet.	Applicability may be restricted when low-protein feedstuffs are not economically available. Synthetic amino acids are not applicable to organic livestock production.		
d	Use of authorised feed additives which reduce the total nitrogen excreted.	Generally applicable.		
(1) A description of the techniques is given in Section 4.10.1. Information on the effectiveness of the techniques for ammonia emission reduction can be taken from recognised European or international guidance e.g. UNECE guidance document on 'Options for ammonia mitigation'.				

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Table 1.1

BAT-associated total nitrogen excreted

Parameter	Animal category	BAT-associated total nitrogen excreted ⁽¹⁾ ⁽²⁾ (kg N excreted/animal place/year)
Total nitrogen excreted, expressed as N.	Weaners	1,5-4,0
	Fattening pigs	7,0-13,0
	Sows (including piglets)	17,0-30,0
	Laying hens	0,4-0,8
	Broilers	0,2-0,6
	Ducks	0,4-0,8
	Turkeys	1,0-2,3 ⁽³⁾

⁽¹⁾ The lower end of the range can be achieved by using a combination of techniques.

⁽²⁾ The BAT-associated total nitrogen excreted is not applicable to pullets or breeders, for all poultry species.

⁽³⁾ The upper end of the range is associated with the rearing of male turkeys.

The associated monitoring is in BAT 24. The BAT-associated total nitrogen excreted levels may not be applicable to organic livestock production and to the rearing of poultry species not indicated above.

BAT 4.

In order to reduce the total phosphorus excreted, while meeting the nutritional needs of the animals, BAT is to use a diet formulation and a nutritional strategy which includes one or a combination of the techniques given (**Section 1.3 Nutritional Management**)

BAT 4A+B.
BAT 4C
Applicable when economically viable and available

Diets will be formulated by professional animal nutritionists with a view to achieving the most efficient use of feed inputs to deliver optimum pig performance and to minimise the excretion of phosphorous excretion will be

	Technique (*)	Applicability		kept to a minimum by using low protein diets.
a	Multiphase feeding with a diet formulation adapted to the specific requirements of the production period.	Generally applicable.		
b	Use of authorised feed additives which reduce the total phosphorus excreted (e.g. phytase).	Phytase may not be applicable in case of organic livestock production.		
c	Use of highly digestible inorganic phosphates for the partial replacement of conventional sources of phosphorus in the feed.	Generally applicable within the constraints associated with the availability of highly digestible inorganic phosphates.		
(*) A description of the techniques is given in Section 4.10.2.				

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Table 1.2

BAT-associated total phosphorus excreted

Parameter	Animal category	BAT-associated total phosphorus excreted ⁽¹⁾ ⁽²⁾ (kg P ₂ O ₅ excreted/animal place/year)
Total phosphorus excreted, expressed as P ₂ O ₅ .	Weaners	1,2-2,2
	Fattening pigs	3,5-5,4
	Sows (including piglets)	9,0-15,0
	Laying hens	0,10-0,45
	Broilers	0,05-0,25
	Turkeys	0,15-1,0

⁽¹⁾ The lower end of the range can be achieved by using a combination of techniques.

⁽²⁾ The BAT-associated total phosphorus excreted is not applicable to pullets or breeders, for all poultry species.

The associated monitoring is in BAT 24. The BAT-associated total phosphorus excreted levels may not be applicable to organic livestock production and to the rearing of poultry species not indicated above.

BAT 5.

In order to use water efficiently, BAT is to use a combination of the techniques given (**Section 1.4 Efficient Use of Water**),

- A. Applicable
- B. Applicable
- C. Applicable
- D. Applicable

- A. Records are kept of water usage.
- B. The applicant implements and maintains a comprehensive monitoring and maintenance

	Technique	Applicability		
a	Keep a record of water use.	Generally applicable.	<p>E. Applicable</p> <p>F. Not Applicable</p>	<p>programme on site to provide maximum protection for the environment, animals and staff alike.</p> <p>C. Power-washers in place and in use.</p> <p>D. Water troughs are in place. Monitoring is in place to ensure there is sufficient water available. All animal drink appliances are regularly maintained to ensure that there is no leakage to the waste storage structures.</p> <p>E. The applicant implements and maintains a comprehensive monitoring and maintenance programme on site to provide maximum protection for the environment, animals and staff alike.</p>
b	Detect and repair water leakages.	Generally applicable.		
c	Use high-pressure cleaners for cleaning animal housing and equipment.	Not applicable to poultry plants using dry cleaning systems.		
d	Select and use suitable equipment (e.g. nipple drinkers, round drinkers, water troughs) for the specific animal category while ensuring water availability (<i>ad libitum</i>).	Generally applicable.		
e	Verify and (if necessary) adjust on a regular basis the calibration of the drinking water equipment.	Generally applicable.		
f	Reuse uncontaminated rainwater as cleaning water.	May not be applicable to existing farms due to high costs. Applicability may be restricted by biosecurity risks.		

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	Technique	Applicability		
a	Keep a record of water use.	Generally applicable.		
b	Detect and repair water leakages.	Generally applicable.		
c	Use high-pressure cleaners for cleaning animal housing and equipment.	Not applicable to poultry plants using dry cleaning systems.		
d	Select and use suitable equipment (e.g. nipple drinkers, round drinkers, water troughs) for the specific animal category while ensuring water availability (<i>ad libitum</i>).	Generally applicable.		
e	Verify and (if necessary) adjust on a regular basis the calibration of the drinking water equipment.	Generally applicable.		
f	Reuse uncontaminated rainwater as cleaning water.	May not be applicable to existing farms, due to high costs. Applicability may be restricted by biosecurity risks.		
BAT 6. In order to reduce the generation of waste water, BAT is to use a combination of the techniques given (Section 1.5 Emissions from Wastewater).			Applicable	<ol style="list-style-type: none"> All foul areas are covered to minimise rainwater ingress. Water troughs will be appropriately calibrated for the stock using them and will be routinely checked and repaired or replaced where necessary. Staff will check water troughs for leakages
	Technique (1)	Applicability		
a	Keep the fouled yard areas as small as possible.	Generally applicable.		
b	<u>Minimise</u> use of water.	Generally applicable.		
c	Segregate uncontaminated rainwater from waste water streams that require treatment.	May not be applicable to existing farms.		
(1) A description of the technique is given in Section 4.1.				

			on a daily basis when entering pens to carry out daily animal checks											
<p>BAT 7. In order to reduce emissions to water from waste water, BAT is to use <u>one or a combination</u> of the techniques given (Section 1.5 Emissions from Wastewater).</p> <table border="1"> <thead> <tr> <th></th> <th>Technique (*)</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>Drain waste water to a dedicated container or to a slurry store.</td> <td>Generally applicable.</td> </tr> <tr> <td>b</td> <td>Treat waste water.</td> <td>Generally applicable.</td> </tr> <tr> <td>c</td> <td>Landspreading of waste water e.g. by using an irrigation system such as sprinkler, travelling irrigator, tanker, umbilical injector.</td> <td>Applicability may be restricted due to the limited availability of suitable land adjacent to the farm. Applicable only for waste water with a proven low level of contamination.</td> </tr> </tbody> </table>		Technique (*)	Applicability	a	Drain waste water to a dedicated container or to a slurry store.	Generally applicable.	b	Treat waste water.	Generally applicable.	c	Landspreading of waste water e.g. by using an irrigation system such as sprinkler, travelling irrigator, tanker, umbilical injector.	Applicability may be restricted due to the limited availability of suitable land adjacent to the farm. Applicable only for waste water with a proven low level of contamination.	<p>A. Applicable</p> <p>B. Not Applicable</p> <p>C. Applicable</p>	<p>a. Manure/slurry from houses and passageways which are used to move animals is diverted to underground storage.</p> <p>c. The pig slurry produced at this farm is used by customer farms in the general area as a valuable fertilizer source.</p>
	Technique (*)	Applicability												
a	Drain waste water to a dedicated container or to a slurry store.	Generally applicable.												
b	Treat waste water.	Generally applicable.												
c	Landspreading of waste water e.g. by using an irrigation system such as sprinkler, travelling irrigator, tanker, umbilical injector.	Applicability may be restricted due to the limited availability of suitable land adjacent to the farm. Applicable only for waste water with a proven low level of contamination.												
<p>BAT 8. In order to use energy efficiently in a farm, BAT is to use <u>a combination</u> of the techniques given. (Section 1.6 Efficient use of Energy).</p>	<p>A. Applicable</p> <p>B. Applicable</p> <p>C. Applicable</p> <p>D. Applicable</p> <p>E. Not Applicable</p> <p>F. Not Applicable</p> <p>G. Not Applicable</p>	<p>a. The applicant implements and maintains a comprehensive monitoring and maintenance programme on site to provide maximum protection for the environment, animals and staff alike.</p> <p>b. The applicant implements and</p>												

	Technique (!)	Applicability	H. Applicable	
a	High efficiency heating/cooling and ventilation systems.	May not be applicable to existing plants.	H. Applicable	<p>maintains a comprehensive monitoring and maintenance programme on site to provide maximum protection for the environment, animals and staff alike.</p> <p>c. The farm buildings are built taking heed of Best Available Techniques which involve the inclusion of a high standard of insulation which reduces the requirements for heating and fossil fuel consumption.</p> <p>d. All artificial lighting will be used in the accommodation houses, offices and outside yards and will be low energy lighting. Location of lighting will be strategically planned.</p>
b	Optimisation of heating/cooling and ventilation systems and management, especially where air cleaning systems are used.	Generally applicable.		
c	Insulation of the walls, floors and/or ceilings of animal housing.	May not be applicable to plants using natural ventilation. Insulation may not be applicable to existing plants due to structural restrictions.		
d	Use of energy-efficient lighting.	Generally applicable.		

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e	<p>Use of heat exchangers. One of the following systems may be used:</p> <ol style="list-style-type: none"> 1. air-air; 2. air-water; 3. air-ground. 	<p>Air-ground heat exchangers are only applicable when there is available space due to the need for a large soil surface.</p>		<p>h. New housing will entail natural ventilation where possible however buildings will also require mechanical ventilation systems.</p>
f	<p>Use of heat pumps for heat recovery.</p>	<p>The applicability of heat pumps based on geothermal heat recovery is limited when using horizontal pipes due to the need for space availability.</p>		
g	<p>Heat recovery with heated and cooled littered floor (combedeck system).</p>	<p>Not applicable to pig plants. Applicability depends on the possibility to install closed underground storage for the circulating water.</p>		
h	<p>Apply natural ventilation.</p>	<p>Not applicable to plants with a centralised ventilation system. In pig plants, this may not be applicable to:</p> <ul style="list-style-type: none"> — housing systems with littered floors in warm climates; — housing systems without littered floors or without covered, insulated boxes (e.g. kennels) in cold climates. <p>In poultry plants, this may not be applicable:</p> <ul style="list-style-type: none"> — during the initial stage of rearing, apart from duck production; — due to extreme climate conditions. 		
<p>BAT 9. In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to set up and implement a noise management plan, as part of the environmental management system (see BAT 1), that includes specified elements (Section 1.7 Noise emissions). Note: BAT 9 is only applicable to cases where a noise nuisance at sensitive receptors is expected and/or has been substantiated.</p>			<p>Not Applicable</p>	

<p>BAT 10. In order to prevent, or where that is not practicable, to reduce noise emissions, BAT is to use <u>one or a combination</u> of the techniques given. (Section 1.7 Noise emissions).</p>	<p>Applicable</p>	<ol style="list-style-type: none"> 1. The main source of noise on the unit will be from the animals during feeding time. 2. The buildings within the facility will be well insulated and because of this the noise from the animals at feeding time will not be audible beyond the site by a landscape earthen berm providing a topographical obstruction to sound waves.
<p>BAT 11. In order to reduce dust emissions from each animal house, BAT is to use <u>one or a combination</u> of the techniques given (Section 1.8 Dust emissions).</p>	<p>Applicable</p>	<ol style="list-style-type: none"> 1. All animal feed will be delivered to site by lorry in covered containers. 2. The feed will then be transferred from the lorry to sealed feed bins on site by means of a pipeline; the system prevents dust from escaping. 3. An automated wet

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	Technique (*)	Applicability		
a	Reduce dust generation inside livestock buildings. For this purpose, a combination of the following techniques may be used:			
1.	1. Use coarser litter material (e.g. long straw or wood shavings rather than chopped straw);	Long straw is not applicable to slurry-based systems.	Consent of copyright owner required for any other use.	feed system will be in operation; the animal feed will be mixed with water in an enclosed wet feed mixing unit located in the feed and pump house and will then be transported by pipeline around the unit to feed troughs in the pig pens.
	2. Apply fresh litter using a low-dust littering technique (e.g. by hand);	Generally applicable.		
	3. Apply <i>ad libitum</i> feeding;	Generally applicable.		
	4. Use moist feed, pelleted feed or add oily raw materials or binders in dry feed systems;	Generally applicable.		
	5. Equip dry feed stores which are filled pneumatically with dust separators;	Generally applicable.		
	6. Design and operate the ventilation system with low air speed within the house.	Applicability may be limited by animal welfare considerations.		
b	Reduce dust concentration inside housing by applying one of the following techniques:			
	1. Water fogging;	Applicability may be restricted by the animal sensation of thermal decrease during fogging, in particular at sensitive stages of the animal's life, and/or for cold and humid climates. Applicability may be also restricted for solid manure systems at the end of the rearing period due to high ammonia emissions.		4. The automated feed system will be fitted with an alarm in order to alert staff in the event of a malfunction.

	2. Oil spraying;	Only applicable to poultry plants with birds older than around 21 days. The applicability to plants for laying hens may be limited due to the risk of contamination of the equipment present in the shed.		
	3. Ionisation.	May not be applicable to pig plants or to existing poultry plants due to technical and/or economic reasons.		
c	Treatment of exhaust air by an air cleaning system, such as:			
	1. Water trap;	Only applicable to plants with a tunnel ventilation system.		
	2. Dry filter;	Only applicable to poultry plants with a tunnel ventilation system.		
	3. Water scrubber;	This technique may not be generally applicable due to the high implementation cost.		
	4. Wet acid scrubber;	Applicable to existing plants only where a centralised ventilation system is used.		
	5. Bioscrubber (or biotrickling filter);			
	6. Two-stage or three-stage air cleaning system;			
	7. Biofilter.	Only applicable to slurry-based plants. A sufficient area outside the animal house is needed to accommodate the filter packages. This technique may not be generally applicable due to the high implementation cost. Applicable to existing plants only where a centralised ventilation system is used.		
BAT 12. In order to prevent, or where that is not practicable, to reduce odour emissions				An odour assessment has been completed.

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<p>from a farm, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes specified elements (Section 1.9 Odour emissions).</p> <p>Note: BAT 12 is only applicable to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.</p>												
<p>BAT 13. In order to prevent or, where that is not practicable, to reduce odour emissions and/or odour impact from a farm, BAT is to <u>use a combination of</u> the techniques given (Section 1.9 Odour emissions).</p> <table border="1"> <thead> <tr> <th></th> <th>Technique (*)</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>Ensure adequate distances between the farm/plant and the sensitive receptors.</td> <td>May not be generally applicable to existing farms/plants.</td> </tr> <tr> <td>b</td> <td> <p>Use a housing system which implements one or a combination of the following principles:</p> <ul style="list-style-type: none"> — keeping the animals and the surfaces dry and clean (e.g. avoid feed spillages, avoid dung in lying areas of partly slatted floors); — reducing the emitting surface of manure (e.g. use metal or plastic slats, channels with a reduced exposed manure surface); — removing manure frequently to an external (covered) manure store; — reducing the temperature of the manure (e.g. by slurry cooling) and of the indoor environment; — decreasing the air flow and velocity over the manure surface; — keeping the litter dry and under aerobic conditions in litter-based systems. </td> <td> <p>Decreasing the temperature of the indoor environment, the air flow and the velocity may not be applicable due to animal welfare considerations.</p> <p>Slurry removal by flushing is not applicable to pig farms located close to sensitive receptors due to odour peaks.</p> <p>See applicability for animal housing in BAT 30, BAT 31, BAT 32, BAT 33 and BAT 34.</p> </td> </tr> </tbody> </table>			Technique (*)	Applicability	a	Ensure adequate distances between the farm/plant and the sensitive receptors.	May not be generally applicable to existing farms/plants.	b	<p>Use a housing system which implements one or a combination of the following principles:</p> <ul style="list-style-type: none"> — keeping the animals and the surfaces dry and clean (e.g. avoid feed spillages, avoid dung in lying areas of partly slatted floors); — reducing the emitting surface of manure (e.g. use metal or plastic slats, channels with a reduced exposed manure surface); — removing manure frequently to an external (covered) manure store; — reducing the temperature of the manure (e.g. by slurry cooling) and of the indoor environment; — decreasing the air flow and velocity over the manure surface; — keeping the litter dry and under aerobic conditions in litter-based systems. 	<p>Decreasing the temperature of the indoor environment, the air flow and the velocity may not be applicable due to animal welfare considerations.</p> <p>Slurry removal by flushing is not applicable to pig farms located close to sensitive receptors due to odour peaks.</p> <p>See applicability for animal housing in BAT 30, BAT 31, BAT 32, BAT 33 and BAT 34.</p>	Applicable	1. The animals are housed in dry housing which keeps the animal's clean avoiding odour.
	Technique (*)	Applicability										
a	Ensure adequate distances between the farm/plant and the sensitive receptors.	May not be generally applicable to existing farms/plants.										
b	<p>Use a housing system which implements one or a combination of the following principles:</p> <ul style="list-style-type: none"> — keeping the animals and the surfaces dry and clean (e.g. avoid feed spillages, avoid dung in lying areas of partly slatted floors); — reducing the emitting surface of manure (e.g. use metal or plastic slats, channels with a reduced exposed manure surface); — removing manure frequently to an external (covered) manure store; — reducing the temperature of the manure (e.g. by slurry cooling) and of the indoor environment; — decreasing the air flow and velocity over the manure surface; — keeping the litter dry and under aerobic conditions in litter-based systems. 	<p>Decreasing the temperature of the indoor environment, the air flow and the velocity may not be applicable due to animal welfare considerations.</p> <p>Slurry removal by flushing is not applicable to pig farms located close to sensitive receptors due to odour peaks.</p> <p>See applicability for animal housing in BAT 30, BAT 31, BAT 32, BAT 33 and BAT 34.</p>										

c	<p>Optimise the discharge conditions of exhaust air from the animal house by using one or a combination of the following techniques:</p> <ul style="list-style-type: none"> — increasing the outlet height (e.g. exhaust air above roof level, stacks, divert air exhaust through the ridge instead of through the low part of the walls); — increasing the vertical outlet ventilation velocity; — effective placement of external barriers to create turbulence in the outgoing air flow (e.g. vegetation); — adding deflector covers in exhaust apertures located in low parts of walls in order to divert exhaust air towards the ground; — dispersing the exhaust air at the housing side which faces away from the sensitive receptor; — aligning the ridge axis of a naturally ventilated building transversally to the prevailing wind direction. 	Alignment of the ridge axis is not applicable to existing plants.		
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d	Use an air cleaning system, such as: 1. Bioscrubber (or biotrickling filter); 2. Biofilter; 3. Two-stage or three-stage air cleaning system.	This technique may not be generally applicable due to the high implementation cost. Applicable to existing plants only where a centralised ventilation system is used. A biofilter is only applicable to slurry-based plants. For a biofilter, a sufficient area outside the animal house is needed to accommodate the filter packages.		
e	Use one or a combination of the following techniques for storage of manure:			
	1. Cover slurry or solid manure during storage;	See applicability of BAT 16.b for slurry. See applicability of BAT 14.b for solid manure.		
	2. Locate the store taking into account the general wind direction and/or adopt measures to reduce wind speed around and above the store (e.g. trees, natural barriers);	Generally applicable.		
	3. Minimise stirring of slurry.	Generally applicable.		

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f	Process manure with one of the following techniques in order to minimise odour emissions during (or prior to) landspreading:			
	1. Aerobic digestion (aeration) of slurry;	See applicability of BAT 19.d.		
	2. Compost solid manure;	See applicability of BAT 19.f.		
	3. Anaerobic digestion.	See applicability of BAT 19.b.		
g	Use one or a combination of the following techniques for manure landspreading:			
	1. Band spreader, shallow injector or deep injector for slurry landspreading;	See applicability of BAT 21.b, BAT 21.c or BAT 21.d.		
	2. Incorporate manure as soon as possible.	See applicability of BAT 22.		

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<p>BAT 14 In order to reduce ammonia emissions to air from the storage of solid manure, BAT is to use <u>one or a combination</u> of the techniques given (Section 1.10 Emissions from solid manure storage).</p> <table border="1" data-bbox="190 343 1227 718"> <thead> <tr> <th data-bbox="190 343 250 395"></th> <th data-bbox="250 343 739 395">Technique (!)</th> <th data-bbox="739 343 1227 395">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="190 395 250 486">a</td> <td data-bbox="250 395 739 486">Reduce the ratio between the emitting surface area and the volume of the solid manure heap.</td> <td data-bbox="739 395 1227 486">Generally applicable.</td> </tr> <tr> <td data-bbox="190 486 250 638">b</td> <td data-bbox="250 486 739 638">Cover solid manure heaps.</td> <td data-bbox="739 486 1227 638">Generally applicable when solid manure is dried or pre-dried in animal housing. May not be applicable to not dried solid manure in case of frequent addition to the heap.</td> </tr> <tr> <td data-bbox="190 638 250 718">c</td> <td data-bbox="250 638 739 718">Store dried solid manure in a barn.</td> <td data-bbox="739 638 1227 718">Generally applicable.</td> </tr> </tbody> </table>		Technique (!)	Applicability	a	Reduce the ratio between the emitting surface area and the volume of the solid manure heap.	Generally applicable.	b	Cover solid manure heaps.	Generally applicable when solid manure is dried or pre-dried in animal housing. May not be applicable to not dried solid manure in case of frequent addition to the heap.	c	Store dried solid manure in a barn.	Generally applicable.	Not Applicable	No solid manure stored on site
	Technique (!)	Applicability												
a	Reduce the ratio between the emitting surface area and the volume of the solid manure heap.	Generally applicable.												
b	Cover solid manure heaps.	Generally applicable when solid manure is dried or pre-dried in animal housing. May not be applicable to not dried solid manure in case of frequent addition to the heap.												
c	Store dried solid manure in a barn.	Generally applicable.												
<p>BAT 15 In order to prevent, or where that is not practicable, to reduce emissions to soil and water from the storage of solid manure, BAT is to use <u>a combination</u> of the techniques given (Section 1.10 Emissions from solid manure storage).</p>	Not Applicable	No solid manure stored on site												

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	Technique (!)	Applicability		
a	Store dried solid manure in a barn.	Generally applicable		
b	Use a concrete silo for storage of solid manure.	Generally applicable.		
c	Store solid manure on solid impermeable floor equipped with a drainage system and a collection tank for the run-off.	Generally applicable.		
d	Select a storage facility with a sufficient capacity to hold the solid manure during periods in which landspreading is not possible.	Generally applicable.		
e	Store solid manure in field heaps placed away from surface and/or underground watercourses which liquid run-off might enter.	Only applicable to temporary field heaps which change location each year.		
BAT 16. In order to reduce ammonia emissions to air from a slurry store, BAT is to use a <u>combination</u> of the techniques given. (Section 1.11 Emissions from slurry storage).			Applicable	<ol style="list-style-type: none"> All proposed manure storage tanks will be covered and manure will be removed by vacuum tanker to minimise odour. Houses will contain modern ventilation systems to circulate fresh air through the
	Technique (!)	Applicability		
a	Appropriate design and management of the slurry store by using a combination of the following techniques:			

	1. Reduce the ratio between the emitting surface area and the volume of the slurry store;	May not be generally applicable to existing stores. Excessively high slurry stores may not be applicable due to increased costs and safety risks.		animal houses thus minimising odour. 3. Surfaces will be smooth and easy to clean.
	2. Reduce wind velocity and air exchange on the slurry surface by operating the store at a lower level of fill;	May not be generally applicable to existing stores.		
	3. Minimise stirring of slurry.	Generally applicable.		
b	Cover the slurry store. For this purpose, one of the following techniques may be used:			
	1. Rigid cover;	May not be applicable to existing plants due to economic considerations and structural limitations to withstand the extra load.		
	2. Flexible covers;	Flexible covers are not applicable to areas where prevailing weather conditions can compromise their structure.		

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	<p>3. Floating covers such as:</p> <ul style="list-style-type: none"> — plastic pellets; — light bulk materials; — floating flexible covers; — geometrical plastic tiles; — air-inflated cover; — natural crust; — straw. 	<p>The use of plastic pellets, light bulk materials and geometrical plastic tiles is not applicable to naturally crusting slurries.</p> <p>Agitation of the slurry during stirring, filling and emptying may preclude the use of some floating materials which may cause sedimentation or blockages in the pumps.</p> <p>Natural crust formation may not be applicable to cold climates and/or to slurry with low dry matter content.</p> <p>Natural crust is not applicable to stores where stirring, filling and/or discharging of slurry renders the natural crust unstable.</p>		
c	Slurry acidification.	Generally applicable.		
<p>BAT 17. In order to reduce ammonia emissions to air from an earth-banked slurry store (lagoon), BAT is to use a combination of the techniques given (Section 1.11 Emissions from slurry storage).</p>			Applicable	The slurry lagoon will be decommissioned as part of the proposed development.

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	Technique (*)	Applicability		
a	<u>Minimise</u> stirring of the slurry.	Generally applicable.		
b	Cover the earth-banked slurry store (lagoon) with a flexible and/or floating cover such as: <ul style="list-style-type: none"> — flexible plastic sheets; — light bulk materials; — natural crust; — <u>straw</u>. 	<p>Plastic sheets may not be applicable to large existing lagoons due to structural reasons.</p> <p>Straw and light bulk materials may not be applicable to large lagoons where wind drift does not permit the lagoon surface to be kept fully covered.</p> <p>The use of light bulk materials is not applicable to naturally crusting slurries.</p> <p>Agitation of the slurry during stirring, filling and emptying may preclude the use of some floating materials which may cause sedimentation or blockages in the pumps.</p> <p>Natural crust formation may not be applicable to cold climates and/or to slurry with low dry matter content.</p> <p>Natural crust is not applicable to lagoons where stirring, filling and/or discharging of slurry renders the natural crust unstable.</p>		
<p>BAT 18. In order to prevent emissions to soil and water from slurry collection, piping, and from a store and/or an earth-banked storage (lagoon), BAT is to use a combination of the techniques given (Section 1.11 Emissions from slurry storage).</p>			Applicable	All pig manure will be stored prior to land application in reinforced concrete tanks with leak detection systems that will conform to the Department of Agriculture, Food and the Marine specifications (S108, S144).

	Technique (1)	Applicability		
a	Use stores that are able to withstand mechanical, chemical and thermal influences.	Generally applicable.	<i>For inspection purposes only. Consent of copyright owner required for any other use.</i>	
b	Select a storage facility with a sufficient capacity to hold the slurry during periods in which land-spreading is not possible.	Generally applicable.		
c	Construct leak-proof facilities and equipment for collection and transfer of slurry (e.g. pits, channels, drains, pump stations).	Generally applicable.		
d	Store slurry in earth-banked stores (lagoons) with an impermeable base and walls e.g. with clay or plastic lining (or double-lined).	Generally applicable to lagoons.		
e	Install a leakage detection system, e.g. consisting of a geomembrane, a drainage layer and a drainage pipe system.	Only applicable to new plants.		
f	Check structural integrity of stores at least once every year.	Generally applicable.		
BAT 19. If on-farm processing of manure is used, in order to reduce emissions of nitrogen, phosphorus, odour and microbial pathogens to air and water and facilitate manure			Not Applicable	

storage and/or landspreading, BAT is to process the manure by applying <u>one</u> or a <u>combination</u> of the techniques (Section 1.12 On Farm processing of manure)				
	Technique (!)	Applicability		
a	Mechanical separation of slurry. This includes e.g.: Screw press separator; — Decanter-centrifuge separator; — Coagulation-Flocculation; — Separation by sieves; — Filter pressing.	Only applicable when: — a reduction of nitrogen and phosphorus content is needed due to limited available land for manure application; — manure cannot be transported for landspreading at a reasonable cost. The use of polyacrylamide as a flocculant may not be applicable due to the risk of acrylamide formation.		
b	Anaerobic digestion of manure in a biogas installation.	This technique may not be generally applicable due to the high implementation cost.		
c	Use of an external tunnel for manure drying.	Only applicable to manure from plants for laying hens. Not applicable to existing plants without manure belts.		
d	Aerobic digestion (aeration) of slurry.	Only applicable when pathogen and odour reduction is important prior to landspreading. In cold climates, it may be difficult to maintain the required level of aeration during winter.		
e	Nitrification-denitrification of slurry.	Not applicable to new plants/farms. Only applicable to existing plants/farms when the removal of nitrogen is necessary due to limited available land for manure application.		
f	Composting of solid manure.	Only applicable when: — manure cannot be transported for landspreading at a reasonable cost; — pathogen and odour reduction is important prior to landspreading; — there is enough space in the farm for windrows to be established.		
BAT 20. In order to prevent or, where that is not practicable, to reduce emissions of			Not Applicable	No manure spread on site

nitrogen, phosphorus and microbial pathogens to soil and water from manure landspreading, BAT is to use all the techniques given (**Section 1.13 Manure landspreading**).

	Technique
a	<p>Assess the manure receiving land to identify risks of run-off, taking into account:</p> <ul style="list-style-type: none"> — soil type, conditions and slope of the field; — climatic conditions; — field drainage and irrigation; — crop rotations; — water resources and water protected zones.
b	<p>Keep sufficient distance between manure spreading fields (leaving an untreated strip of land) and:</p> <ol style="list-style-type: none"> 1. areas where there is a risk of run-off to water such as watercourses, springs, boreholes, etc.; 2. neighbouring properties (including hedges).
c	<p>Avoid manure spreading when the risk of run-off can be significant. In particular, manure is not applied when:</p> <ol style="list-style-type: none"> 1. the field is flooded, frozen or snow-covered; 2. soil conditions (e.g. water saturation or compaction) in combination with the slope of the field and/or field drainage are such that the risk of run-off or drainage is high; 3. run-off can be anticipated according to expected rainfall events.
d	<p>Adapt the manure landspreading rate taking into account the nitrogen and phosphorus content of the manure and taking into account the characteristics of the soil (e.g. nutrient content), the seasonal crop requirements and weather or field conditions that could cause run-off.</p>
e	<p>Synchronize manure landspreading with the nutrient demand of crops.</p>

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f	Check the spreading fields at regular intervals to identify any sign of run-off and properly respond when necessary.			
g	Ensure adequate access to the manure store and that loading of manure can be done effectively without spillage.			
h	Check that machinery for manure landspreading is in good working order and set at the proper application rate.			
BAT 21. In order to reduce ammonia emissions to air from slurry landspreading, BAT is to use <u>one or a combination of</u> the techniques given (Section 1.13 Manure landspreading).		Not Applicable	No manure spread on site	
	Technique (!)			Applicability
a	Slurry dilution, followed by techniques such as low-pressure water irrigation system.			Not applicable to crops grown to be eaten raw due to the risk of contamination. Not applicable when the soil type does not allow rapid infiltration of dilute slurry into the soil. Not applicable when crops do not require irrigation. Applicable to fields easily connected to the farm by pipework.
b	Band spreader, by applying one of the following techniques: 1. Trailing hose; 2. Trailing shoe.	Applicability may be limited when the straw content of the slurry is too high or when the dry matter content of the slurry is higher than 10 %. Trailing shoe is not applicable to growing solid-seeded arable crops.		

c	Shallow injector (open slot).	Not applicable on stony, shallow or compacted soil where it is difficult to achieve a uniform penetration. Applicability may be limited where crops may be damaged by machinery.						
d	Deep injector (closed slot).	Not applicable on stony, shallow or compacted soil where it is difficult to achieve a uniform penetration and an effective slit closure. Not applicable during the vegetation of the crops. Not applicable on grassland, unless changing to arable land or when reseeded.						
e	Slurry acidification.	Generally applicable.						
<p>BAT 22. In order to reduce ammonia emissions to air from manure landspreading, BAT is to incorporate the manure into the soil as soon as possible (Section 1.13 Manure landspreading).</p> <p>See also Table 1.3 of CID</p> <p style="text-align: center;"><i>Table 1.3</i></p> <p style="text-align: center;">BAT-associated time delay between manure landspreading and incorporation into the soil</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Parameter</th> <th style="width: 50%;">BAT-associated time delay between manure landspreading and incorporation into the soil (hours)</th> </tr> </thead> <tbody> <tr> <td>Time</td> <td style="text-align: center;">0 ⁽¹⁾-4 ⁽²⁾</td> </tr> </tbody> </table> <p><small>(1) The lower end of the range corresponds to immediate incorporation. (2) The upper end of the range can be up to 12 hours when conditions are not favourable for a faster incorporation, e.g. when human and machinery resources are not economically available.</small></p> <p>Note Applicability factors.</p>			Parameter	BAT-associated time delay between manure landspreading and incorporation into the soil (hours)	Time	0 ⁽¹⁾ -4 ⁽²⁾	Not Applicable	No mature spread on site
Parameter	BAT-associated time delay between manure landspreading and incorporation into the soil (hours)							
Time	0 ⁽¹⁾ -4 ⁽²⁾							
<p>BAT 23. In order to reduce ammonia emissions from the whole production process for the rearing of pigs (including sows) or poultry, BAT is to estimate or calculate the</p>			Applicable	The site operates a balance feed system with different mixes for each stage of growth				

<p>reduction of ammonia emissions from the whole production process using the BAT implemented on the farm (Section 1.14 Emissions from the whole production process).</p>		<p>this minimises ammonia emissions.</p>										
<p>BAT 24. BAT is to monitor the total nitrogen and total phosphorus excreted in manure using <u>one</u> of the specified techniques with at least the frequency given (Section 1.15 Monitoring of emissions and process parameters).</p> <table border="1" data-bbox="192 456 1232 839"> <thead> <tr> <th data-bbox="192 456 255 504"></th> <th data-bbox="255 456 600 504">Technique (!)</th> <th data-bbox="600 456 940 504">Frequency</th> <th data-bbox="940 456 1232 504">Applicability</th> </tr> </thead> <tbody> <tr> <td data-bbox="192 504 255 708">a</td> <td data-bbox="255 504 600 708">Calculation by using a mass balance of nitrogen and phosphorus based on the feed intake, crude protein content of the diet, total phosphorus and animal performance.</td> <td data-bbox="600 504 940 708" rowspan="2">Once every year for each animal category.</td> <td data-bbox="940 504 1232 708" rowspan="2">Generally applicable.</td> </tr> <tr> <td data-bbox="192 708 255 839">b</td> <td data-bbox="255 708 600 839">Estimation by using manure analysis for total nitrogen and total phosphorus content.</td> </tr> </tbody> </table> <p>See also Tables 1.1 & 1.2 of CID</p>		Technique (!)	Frequency	Applicability	a	Calculation by using a mass balance of nitrogen and phosphorus based on the feed intake, crude protein content of the diet, total phosphorus and animal performance.	Once every year for each animal category.	Generally applicable.	b	Estimation by using manure analysis for total nitrogen and total phosphorus content.	<p>Applicable</p>	<p>Low protein diets are being utilised on site.</p>
	Technique (!)	Frequency	Applicability									
a	Calculation by using a mass balance of nitrogen and phosphorus based on the feed intake, crude protein content of the diet, total phosphorus and animal performance.	Once every year for each animal category.	Generally applicable.									
b	Estimation by using manure analysis for total nitrogen and total phosphorus content.											
<p>BAT 25 BAT is to monitor ammonia emissions to air using <u>one</u> of the specified techniques with at least the frequency given (Section 1.15 Monitoring of emissions and process parameters).</p>	<p>Applicable</p>	<p>Is completed as part of PRTR returns</p>										

	Technique (*)	Frequency	Applicability		
a	Estimation by using a mass balance based on the excretion and the total (or total ammoniacal) nitrogen present at each manure management stage.	Once every year for each animal category.	Generally applicable.		
b	Calculation by measuring the ammonia concentration and the ventilation rate using ISO, national or international standard methods or other methods ensuring data of an equivalent scientific quality.	Every time there are significant changes to at least one of the following parameters: (a) the type of livestock reared at the farm; (b) the housing system.	Only applicable to emissions from each animal house. Not applicable to plants with an air cleaning system installed. In this case, BAT 28 applies. Due to the cost of measurements, this technique may not be generally applicable.		
c	Estimation by using emission factors.	Once every year for each animal category.	Generally applicable.		

See also Table 2.1 of CID

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Table 2.1

BAT-AEL for ammonia emissions to air from each pig house

Parameter	Animal category	BAT-AEL ⁽¹⁾ (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	Mating and gestating sows	0,2-2,7 ⁽²⁾ ⁽³⁾
	Farrowing sows (including piglets) in crates	0,4-5,6 ⁽⁴⁾
	Weaners	0,03-0,53 ⁽⁵⁾ ⁽⁶⁾
	Fattening pigs	0,1-2,6 ⁽⁷⁾ ⁽⁸⁾

- ⁽¹⁾ The lower end of the range is associated with the use of an air cleaning system.
⁽²⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 4,0 kg NH₃/animal place/year.
⁽³⁾ For plants using BAT 30.a6, 30.a7 or 30.a11, the upper end of the BAT-AEL is 5,2 kg NH₃/animal place/year.
⁽⁴⁾ For existing plants using BAT 30.a0 in combination with nutritional management techniques, the upper end of the BAT-AEL is 7,5 kg NH₃/animal place/year.
⁽⁵⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 0,7 kg NH₃/animal place/year.
⁽⁶⁾ For plants using BAT 30.a6, 30.a7 or 30.a8, the upper end of the BAT-AEL is 0,7 kg NH₃/animal place/year.
⁽⁷⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 3,6 kg NH₃/animal place/year.
⁽⁸⁾ For plants using BAT 30.a6, 30.a7, 30.a8 or 30.a16, the upper end of the BAT-AEL is 3,65 kg NH₃/animal place/year.

The BAT-AELs may not be applicable to organic livestock production. The associated monitoring is in BAT 25.

BAT 26.

BAT is to periodically monitor odour emissions to air (**Section 1.15 Monitoring of emissions and process parameters**).

Not Applicable

Odour nuisance at sensitive locations not anticipated.

<p>Odour emissions can be monitored by using:</p> <ul style="list-style-type: none"> — EN standards (e.g. by using dynamic olfactometry according to EN 13725 in order to determine odour concentration). — When applying alternative methods for which no EN standards are available (e.g. measurement/estimation of odour exposure, estimation of odour impact), ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality can be used. <p>Note: BAT 26 is only applicable to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.</p>														
<p>BAT 27. BAT is to monitor dust emissions from each animal house using <u>one</u> of the specified techniques with at least the frequency given (Section 1.15 Monitoring of emissions and process parameters).</p> <table border="1" data-bbox="190 635 1227 1066"> <thead> <tr> <th></th> <th>Technique (!)</th> <th>Frequency</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>Calculation by measuring the dust concentration and the ventilation rate using EN standard methods or other methods (ISO, national or international) ensuring data of an equivalent scientific quality.</td> <td>Once every year.</td> <td>Only applicable to dust emissions from each animal house. Not applicable to plants with an air cleaning system installed. In this case, BAT 28 applies. Due to the cost of measurements, this technique may not be generally applicable.</td> </tr> <tr> <td>b</td> <td>Estimation by using emission factors.</td> <td>Once every year.</td> <td>Due to the cost of establishing emissions factors, this technique may not be generally applicable.</td> </tr> </tbody> </table>		Technique (!)	Frequency	Applicability	a	Calculation by measuring the dust concentration and the ventilation rate using EN standard methods or other methods (ISO, national or international) ensuring data of an equivalent scientific quality.	Once every year.	Only applicable to dust emissions from each animal house. Not applicable to plants with an air cleaning system installed. In this case, BAT 28 applies. Due to the cost of measurements, this technique may not be generally applicable.	b	Estimation by using emission factors.	Once every year.	Due to the cost of establishing emissions factors, this technique may not be generally applicable.	Not Applicable	Cost prohibitive
	Technique (!)	Frequency	Applicability											
a	Calculation by measuring the dust concentration and the ventilation rate using EN standard methods or other methods (ISO, national or international) ensuring data of an equivalent scientific quality.	Once every year.	Only applicable to dust emissions from each animal house. Not applicable to plants with an air cleaning system installed. In this case, BAT 28 applies. Due to the cost of measurements, this technique may not be generally applicable.											
b	Estimation by using emission factors.	Once every year.	Due to the cost of establishing emissions factors, this technique may not be generally applicable.											
<p>BAT 28. BAT 28 is to monitor ammonia, dust and/or odour emissions from each animal house equipped with an air cleaning system by using <u>all of</u> the specified techniques with at least the frequency given. (Section 1.15 Monitoring of emissions and process parameters).</p>	Not Applicable	No air cleaning system												

	Technique (1)	Frequency	Applicability		
a	Verification of the air cleaning system performance by measuring ammonia, odour and/or dust under practical farm conditions and according to a prescribed measurement protocol and using EN standard methods or other methods (ISO, national or international) ensuring data of an equivalent scientific quality.	Once	Not applicable if the air cleaning system has been verified in combination with a similar housing system and operating conditions.		
b	Control of the effective function of the air cleaning system (e.g. by continuously recording operational parameters or using alarm systems).	Daily	Generally applicable.		
BAT 29. BAT is to monitor the specified process parameters at least once every year. (Section 1.15 Monitoring of emissions and process parameters).				Applicable	BAT 29A to F are monitored once a year.
	Parameter	Description	Applicability		
a	Water consumption.	Recording using e.g. suitable meters or invoices. The main water-consuming processes in animal houses (cleaning, feeding, etc.) can be monitored separately.	Monitoring the main water-consuming processes separately may not be applicable to existing farms, depending on the configuration of the water supply network.		

b	Electric energy consumption.	Recording using e.g. suitable meters or invoices. Electricity consumption of animal houses is monitored separately from other plants in the farm. The main energy-consuming processes in animal houses (heating, ventilation, lighting, etc.) can be monitored separately.	Monitoring the main energy-consuming processes separately may not be applicable to existing farms, depending on the configuration of the energy supply network.		
c	Fuel consumption.	Recording using e.g. suitable meters or invoices.	Generally applicable.		
d	Number of incoming and outgoing animals, including births and deaths when relevant.	Recording using e.g. existing registers.			
e	Feed consumption.	Recording using e.g. invoices or existing registers.			
f	Manure generation.	Recording using e.g. existing registers.			

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Section 2. BAT Conclusions for Intensive Rearing of Pigs

(BAT 30 below applies to pig sites only)

BAT 30.

In order to reduce ammonia emissions to air from each pig house, BAT is to use one or a combination of the techniques given. (Section 2.1 Ammonia emissions from pig houses).

	Technique (!)	Animal category	Applicability
a	<p>One of the following techniques, which apply one or a combination of the following principles:</p> <ul style="list-style-type: none"> (i) reduce the ammonia emitting surface; (ii) increase the frequency of slurry (manure) removal to external storage; (iii) separate urine from faeces; (iv) keep litter clean and dry.. 		
	<p>0. A deep pit (in case of a fully or partly slatted floor) only if used in combination with an additional mitigation measure, e.g.:</p> <ul style="list-style-type: none"> — a combination of nutritional management techniques; — air cleaning system; — pH reduction of the slurry; — slurry cooling. 	All pigs	Not applicable to new plants, unless a deep pit is combined with an air cleaning system, slurry cooling and/or pH reduction of the slurry.

Part Applicable

The building and its layout is state of the art for the industry. A thorough review was undertaken of the best available techniques to minimise emissions from the unit and to maximise welfare conditions for animals and staff alike on-site during the initial planning stages.

All accommodation houses are power washed and disinfected as the pigs are moved in an 'all out/all in' system through their growth cycle. All wash water is directed to underground tanks through slats and drains.

Technique (!)	Animal category	Applicability		
1. A vacuum system for frequent slurry removal (in case of a fully or partly slatted floor).	All pigs	May not be generally applicable to existing plants due to technical and/or economic considerations.		
2. Slanted walls in the manure channel (in case of a fully or partly slatted floor).	All pigs			
3. A scraper for frequent slurry removal (in case of a fully or partly slatted floor).	All pigs			
4. Frequent slurry removal by flushing (in case of a fully or partly slatted floor).	All pigs	<p>May not be generally applicable to existing plants due to technical and/or economic considerations.</p> <p>When the liquid fraction of the slurry is used for flushing, this technique may not be applicable to farms located close to sensitive receptors due to odour peaks during flushing.</p>		
5. Reduced manure pit (in case of a partly slatted floor).	Mating and gestating sows	May not be generally applicable to existing plants due to technical and/or economic considerations.		
	Fattening pigs			

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6. Full litter system (in case of a solid concrete floor).	Mating and gestating sows	Solid manure systems are not applicable to new plants unless it can be justified for animal welfare reasons. May not be applicable to naturally ventilated plants located in warm climates and to existing plants with forced ventilation for weaners and fattening pigs. BAT 30.a7 may require large space availability.								
	Weaners									
	Fattening pigs									
7. Kennel/hut housing (in case of a partly slatted floor).	Mating and gestating sows	Solid manure systems are not applicable to new plants unless it can be justified for animal welfare reasons. May not be applicable to naturally ventilated plants located in warm climates and to existing plants with forced ventilation for weaners and fattening pigs. BAT 30.a7 may require large space availability.								
	Weaners									
	Fattening pigs									
8. Straw flow system (in case of a solid concrete floor).	Weaners						Solid manure systems are not applicable to new plants unless it can be justified for animal welfare reasons. May not be applicable to naturally ventilated plants located in warm climates and to existing plants with forced ventilation for weaners and fattening pigs. BAT 30.a7 may require large space availability.			
	Fattening pigs									
9. Convex floor and separated manure and water channels (in case of partly slatted pens).	Weaners									May not be generally applicable to existing plants due to technical and/or economic considerations.
	Fattening pigs									

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Technique (!)	Animal category	Applicability
10. Littered pens with combined manure generation (slurry and solid manure).	Farrowing sows	
11. Feeding/lying boxes on solid floor (in case of litter-based pens).	Mating and gestating sows	Not applicable to existing plants without solid concrete floors.
12. Manure pan (in case of a fully or partly slatted floor).	Farrowing sows	Generally applicable.
13. Manure collection in water.	Weaners	May not be generally applicable to existing plants due to technical and/or economic considerations.
	Fattening pigs	
14. V-shaped manure belts (in case of partly slatted floor).	Fattening pigs	
15. A combination of water and manure channels (in case of a fully slatted floor).	Farrowing sows	

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	16. Littered external alley (in case of a solid concrete floor).	Fattening pigs	Not applicable to cold climates. May not be generally applicable to existing plants due to technical and/or economic considerations.		
b	Slurry cooling.	All pigs	Not applicable when: — heat reuse is not possible; — litter is used.		
c	Use of an air cleaning system, such as: 1. Wet acid scrubber; 2. Two-stage or three-stage air cleaning system; 3. Bioscrubber (or biotrickling filter).	All pigs	May not be generally applicable due to the high implementation cost. Applicable to existing plants only where a centralised ventilation system is used.		
d	Slurry acidification.	All pigs	Generally applicable.		
e	Use of floating balls in the manure channel.	Fattening pigs	Not applicable to plants equipped with pits that have slanted walls and to plants that apply slurry removal by flushing.		
<p>(¹) A description of the techniques is given in Sections 4.11 and 4.12.</p>					
<p>See also Table 2.1 of CID</p>					

Table 2.1

BAT-AEL for ammonia emissions to air from each pig house

Parameter	Animal category	BAT-AEL ⁽¹⁾ (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	Mating and gestating sows	0,2-2,7 ⁽²⁾ ⁽³⁾
	Farrowing sows (including piglets) in crates	0,4-5,6 ⁽⁴⁾
	Weaners	0,03-0,53 ⁽⁵⁾ ⁽⁶⁾
	Fattening pigs	0,1-2,6 ⁽⁷⁾ ⁽⁸⁾

- ⁽¹⁾ The lower end of the range is associated with the use of an air cleaning system.
- ⁽²⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 4,0 kg NH₃/animal place/year.
- ⁽³⁾ For plants using BAT 30.a6, 30.a7 or 30.a11, the upper end of the BAT-AEL is 5,2 kg NH₃/animal place/year.
- ⁽⁴⁾ For existing plants using BAT 30.a0 in combination with nutritional management techniques, the upper end of the BAT-AEL is 7,5 kg NH₃/animal place/year.
- ⁽⁵⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 0,7 kg NH₃/animal place/year.
- ⁽⁶⁾ For plants using BAT 30.a6, 30.a7 or 30.a8, the upper end of the BAT-AEL is 0,7 kg NH₃/animal place/year.
- ⁽⁷⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 3,6 kg NH₃/animal place/year.
- ⁽⁸⁾ For plants using BAT 30.a6, 30.a7, 30.a8 or 30.a16, the upper end of the BAT-AEL is 3,65 kg NH₃/animal place/year.

The BAT-AELs may not be applicable to organic livestock production. The associated monitoring is in BAT 25.

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Section 3. BAT Conclusions for Intensive Rearing of Poultry

BAT 31-34 applies to ammonia emissions from poultry houses

(Section 3.1 Ammonia emissions from poultry houses).

BAT 31.

In order to reduce ammonia emissions to air from each house for laying hens, broiler breeders or pullets, BAT is to use one or a combination of the techniques given (Section 3.1.1 Ammonia emissions from houses for laying hens, broiler breeders or pullets).

	Technique (!)	Applicability
a	Manure removal by belts (in case of enriched or unenriched cage systems) with at least: <ul style="list-style-type: none"> — one removal per week with air drying; or — two removals per week without air drying. 	Enriched cage systems are not applicable to pullets and broiler breeders. Unenriched cage systems are not applicable to laying hens.
b	In case of non-cage systems:	
	0. Forced ventilation system and infrequent manure removal (in case of deep litter with a manure pit) only if used in combination with an additional mitigation measure, e.g.: <ul style="list-style-type: none"> — achieving a high dry matter content of the manure; — an air cleaning system. 	Not applicable to new plants, unless combined with an air cleaning system.

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	Technique (!)	Applicability		
	1. Manure belt or scraper (in case of deep litter with a manure pit).	Applicability to existing plants may be limited by the requirement for a complete revision of the housing system.		
	2. Forced air drying of manure via tubes (in case of deep litter with a manure pit)	The technique can be applied only to plants with sufficient space underneath the slats.		
	3. Forced air drying of manure using perforated floor (in case of deep litter with a manure pit).	Due to high implementation costs, applicability to existing plants may be limited.		
	4. Manure belts (in case of aviary).	Applicability to existing plants depends on the width of the shed.		
	5. Forced drying of litter using indoor air (in case of solid floor with deep litter).	Generally applicable.		
c	Use of an air cleaning system, such as: 1. Wet acid scrubber; 2. Two-stage or three-stage air cleaning system; 3. Bioscrubber (or biotrickling filter).	May not be generally applicable due to the high implementation cost. Applicable to existing plants only where a centralised ventilation system is used.		

See also Table 3.1 of CID

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Table 3.1

BAT-AELs for ammonia emissions to air from each house for laying hens

Parameter	Type of housing	BAT-AEL (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	Cage system	0,02-0,08
	Non-cage system	0,02-0,13 ⁽¹⁾

⁽¹⁾ For existing plants using a forced ventilation system and an infrequent manure removal (in case of deep litter with a manure pit), in combination with a measure achieving a high dry matter content of the manure, the upper end of the BAT-AEL is 0,25 kg NH₃/animal place/year.

The associated monitoring is in BAT 25. The BAT-AEL may not be applicable to organic livestock production.

BAT 32.

In order to reduce ammonia emissions to air from each house for broilers, BAT is to use one or a combination of the techniques given (**Section 3.1.2 Ammonia emissions from houses for broilers**).

	Technique ⁽¹⁾	Applicability
a	Forced ventilation and a non-leaking drinking system (in case of solid floor with deep litter).	Generally applicable.

b	Forced drying system of litter using indoor air (in case of solid floor with deep litter).	For existing plants, the applicability of forced air drying systems depends on the height of the ceiling. Forced air drying systems may not be applicable to warm climates, depending on the indoor temperature.		
c	Natural ventilation, equipped with a non-leaking drinking system (in case of solid floor with deep litter).	Natural ventilation is not applicable to plants with a centralised ventilation system. Natural ventilation may not be applicable during the initial stage of rearing of broilers and due to extreme climate conditions.		
d	Litter on manure belt and forced air drying (in case of tiered floor systems).	For existing plants, the applicability depends on the height of the side walls.		
e	Heated and cooled littered floor (in case of combi-deck systems).	For existing plants, the applicability depends on the possibility to install closed underground storage for the circulating water.		
f	Use of an air cleaning system, such as: 1. Wet acid scrubber; 2. Two-stage or three-stage air cleaning system; 3. Bioscrubber (or biotrickling filter).	May not be generally applicable due to the high implementation cost. Applicable to existing plants only where a centralised ventilation system is used.		
See also Table 3.2 of CID				

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Table 3.2

BAT-AEL for ammonia emissions to air from each house for broilers with a final weight of up to 2,5 kg

Parameter	BAT-AEL ⁽¹⁾ ⁽²⁾ (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	0,01-0,08

- ⁽¹⁾ The BAT-AEL may not be applicable to the following types of farming: extensive indoor, free-range, traditional free-range and free-range — total freedom, as defined in Commission Regulation (EC) No 543/2008 of 16 June 2008 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 as regards the marketing standards for poultrymeat (OJ L 157, 17.6.2008, p. 46).
- ⁽²⁾ The lower end of the range is associated with the use of an air cleaning system.

The associated monitoring is in BAT 25. The BAT-AEL may not be applicable to organic livestock production.

BAT 33.

In order to reduce ammonia emissions to air from each animal house for ducks, BAT is to use one or a combination of the techniques given (**Section 3.1.3 Ammonia emissions from houses for ducks**).

BAT 34.

In order to reduce ammonia emissions to air from each animal house for turkeys, BAT is to use one or a combination of the techniques given (**Section 3.1.4 Ammonia emissions from houses for turkeys**).

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Section 4. Description of Techniques (refer to CID for full text)		
4.1 Techniques for reducing emissions from wastewater		
4.2. Techniques for efficient use of energy		
4.3. Techniques for reducing dust emissions		
4.4. Techniques for reducing odour emissions		
4.5. Techniques for reducing emissions from the storage of solid manure		
4.6. Techniques for reducing emissions from slurry storage		
4.7. Techniques for on farm manure processing		
4.8. Techniques for manure landspreading		
4.9. Techniques for monitoring		
4.10. Nutritional management		
4.11. Techniques to treat emissions to air from animal housing		
4.12. Techniques for pig houses		
4.13. Techniques for poultry housing		
4.13.1. Techniques for reducing ammonia emissions from houses for laying hens, broiler breeders or pullets		
4.13.2. Techniques for reducing ammonia emissions from broiler houses		

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