Foreword

This Philippine National Standard (PNS) on Animal Feed Ingredients aims to provide guidelines for the quality and safety of feed ingredients used in animal feeds intended for domesticated livestock and poultry animals.

The formulation of this Philippine National Standards (PNS) on Animal Feed Ingredients was drafted and reviewed by the BAFS Technical Working Group prior to its presentation for public consultations in Quezon City, Cebu, Davao, and Cagayan de Oro with the major stakeholders of animal feed industry. Comments from the stakeholders were carefully evaluated and inputted accordingly in this standard.

The Technical Working Group created by BAFS for this purpose (as per Special Order No. 274), is composed of experts from the Animal Feeds Standardization Division of the Bureau of Animal Industry, Philippine Society of Animal Nutritionists, Philippine Association of Feed Millers, Inc, and Animal and Dairy Sciences Cluster of the University of the Philippines, Los Baños.
1 **Scope**
This standard applies to quality and safety parameters of feed ingredients, including their classification, descriptions and purchase specifications, being used in animal feeds intended for domesticated livestock and poultry animals.

2 **References**
The title of the standard publications and other references of this Code are listed on the back.

3 **Definition of Terms**

3.1 **Feed** is any single or multiple materials, whether processed, semi-processed or raw, which is intended to be fed directly to domesticated animals to meet the nutrient requirements in order to maintain life, promote growth, production and reproduction without any additional substance except water.

3.2 **Feed Additive** refers to an ingredient or combination of ingredients which is added to the basic mixed feed to fulfill a specific need which include, but not limited to, acidifiers, antioxidants, aromatics, deodorizing agents, flavor enhancers, mold inhibitors, pellet binders, preservatives, sweeteners, toxin binders, etc. It is usually used in micro quantities and requires careful handling and mixing. A feed additive may have no nutritive value but is added to the feed to improve its quality and efficacy.

3.3 **Feed Ingredient** is a component part or constituent of any combination or mixture making up a feed, whether or not it has a nutritional value in the animal's diet, including feed supplements and additives. Ingredients are of plant, animal or aquatic origin, or other organic or inorganic substances.

3.4 **Feed Supplement** refers to a feed ingredient or mixture of feed ingredients intended to supply the deficiencies in a ration or improve the nutritive balance or performance of the total mixture. For purposes of this standard, the following, such as but not limited to amino acids, fatty acids, vitamins and minerals are considered as feed supplements.

4 **Classification of Feed Ingredients**

4.1 **Energy Sources**

4.2 **Protein Sources**
4.2.1 Animal and Marine Protein
4.2.2 Plant Protein

4.3 **Non-Protein Nitrogen Sources**
4.4 Milling and Factory By-products

4.5 Dairy Products

4.6 Fats and Oils

4.7 Feed Supplements
4.7.1 Mineral Supplements
4.7.1.1 Macro Mineral Supplements
4.7.1.2 Trace Mineral Supplements

4.7.2 Vitamin Supplements
4.7.2.1 Fat Soluble Vitamins
4.7.2.2 Water Soluble Vitamins

4.7.3 Amino Acid Supplements

4.8 Feed Additives

5 Minimum Requirements of Commercial Feed Ingredients

5.1 Energy Sources
Below are the commonly used feed ingredients under this classification:

5.1.1 Banana (*Musa sapientum*) Meal, Peeled
It is the product obtained by chopping, drying, and grinding of peeled banana fruit. This should have dusty texture, pasty and sticky when wet, off-white to light brown color and fresh odor. The specifications should include:

- Moisture .........................  Max 13.0%
- Ash ...............................  Max 2.0 %
- Crude Fiber .........................  Max 5.0%
- Starch ..............................  Min 50.0%
5.1.2 Banana (*Musa sapientum*) Meal, Unpeeled

It is the product obtained by chopping, drying, and grinding of unpeeled banana fruit. This should have dusty texture, pasty and sticky when wet, light brown to tan color with brown specks and fresh odor. The specifications should include:

- Moisture ....................... Max 12.0%
- Ash ............................. Max 6.0%
- Crude Fiber ..................... Max 10.0%
- Starch ........................... Min 40.0%

5.1.3 Barley (*Hordeum vulgare*), Hulled

It is a whole grain that is spindle-shaped in five angles and possessed a broad shallow groove on the ventral side. This should be light gray to tannish gray in color and should be fresh and free from mustiness. The specifications should include:

- Moisture ....................... Max 12.0%
- Empty grains ..................... Max 2.0%
- Impurities ........................ Max 3.0%
- Starch ........................... Min 45.0%

5.1.4 Cassava (*Manihot esculenta*) Meal/Chips, Peeled

It is the product obtained by peeling, chopping, drying, and grinding of cassava tubers that is dusty when dry and sticky when wet. This should be white to off-white in color and should be sweet and free from mustiness in odor. The specifications should include:

- Moisture ....................... Max 13.0%
- Ash ............................. Max 3.0%
- Crude Fiber ..................... Max 3.0%
- Impurities ........................ Max 2.0%
- HCN* ............................ Max 15.0 mg/kg
5.1.5 Cassava (*Manihot esculenta*) Meal/Chips, Unpeeled

It is the product obtained by chopping, drying, and grinding of whole cassava tubers that is dusty when dry and sticky when wet. This should be brownish white in color and have fresh odor. The specifications should include:

- **Moisture** ………………….... Max 13.0%
- **Ash** ………………………….. Max 7.0%
- **Crude Fiber** ………………….. Max 6.0%
- **Impurities** …………………..… Max 2.0%
- **HCN*** ………………………….. Max 30.0 mg/kg
- **Starch** ………………………….. Min 50.0%

*Hydrocyanic Acid

5.1.6 Corn (*Zea maize*)

A tooth-shaped kernel composed of bran, coat, endosperm and embryo of germ. The color should be white, yellow or in variety and should have a sweet odor free from mustiness. This should be free from infestation. The specifications should include:

- **Moisture** …………………….. Max 13.0%
- **Spoiled and damaged grains** .. Max 3.0%
- **Broken grains** ………………….. Max 2.0%
- **Impurities** …………………….. Max 2.0%
- **Starch** ………………………….. Min 60.0%

5.1.7 Wheat Flour, Feed Grade
Animal Feed Ingredients

It is a product resulting from downgrading food grade flour. It is off-white to cream in color, with characteristic smell of freshly milled flour with traces of wheat hulls. This should be free from infestation. The specifications should include:

- Moisture ......................... Max 12.0%
- Ash ............................... Max 1.0%
- Crude protein .................... Min 10.0%
- Starch ............................. Min 84.0%

5.1.8 Oats (Avena sativa)
These are seeds that are usually rolled or flaked to enhance digestibility. They should smell fresh and free from mustiness. This should be free from infestation. The specifications should include:

- Moisture ......................... Max 13.0%
- Spoiled and Damaged grains ... Max 3.0%
- Impurities .......................... Max 2.0%
- Crude fiber ........................ Max 12.0%
- Starch ............................. Min 35.0%

5.1.9 Rice (Oryza sativa) Middlings
Rice middlings/broken rice are small fragments of rice kernels with traces of awn (“mata-mata”) that have been separated from larger kernels during rice milling. Whole rice kernel may be included. They should be white or brown in color and smell fresh, free from mustiness. This should be free from infestation. The specifications should include:

- Moisture ......................... Max 12.0%
- Starch ............................. Min 55.0%

5.1.10 Rice (Oryza sativa), Paddy or Palay
It is composed of lemma and palea, which have crosshatched markings on the surface and are spinescently hairy. The non-flowering glumes are attached at the base of the paddy and some
varieties are awned or awnless at the apex. This should be slightly yellow to brown in color, where
dark color may indicate off-quality. This should smell fresh and free from mustiness. The
specifications should include:

- Moisture …………………….. Max 12.0%
- Ash……………………… Max 15.0%
- Crude Fiber………………….. Max 10.0%
- Empty grains ………………… Max 2.0%
- Starch………………………... Max 45.0%

5.1.11 Sorghum (Sorghum bicolor)
It is more or less rounded and bluntly pointed, with a black scar marking the point of its attachment to
a stalk at one end and shriveled remains of the two styles at the other end. Color should vary from
white, light brown to dark or reddish brown with fresh smell and free from mustiness. The
specification should include:

- Moisture …………………….. Max 12.0%
- Empty grains ………………… Max 3.0%
- Impurities …………………….. Max 2.0%
- Tannin ……………………….... Max 1.0%
- Starch ……………………….... Min 60.0%

5.1.12 Cane Sugar, Brown (Sucrose)
This is unrefined cane sugar that should be brown to golden brown in color and should have fresh
and sweet smell, not musty or sour. The specifications should include:

- Moisture ……………………… Max 5.0%

5.1.13 Wheat (Triticum sativa)
Whole grain of wheat is oval, and blunt at the tip with tuft hairs. Soft wheat should have a tan to light
brown color while hard wheat should have brown to reddish brown color. Odor should be fresh and
free from mustiness. Quality varies depending on the country of origin. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>Soft</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
<td>Max 12.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 9.0%</td>
<td>Min 12.0%</td>
</tr>
<tr>
<td>Starch</td>
<td>Min 65.0%</td>
<td>Min 62.0%</td>
</tr>
<tr>
<td>Impurities</td>
<td>Max 2.0%</td>
<td>Max 2.0%</td>
</tr>
</tbody>
</table>

5.2 Protein Sources

5.2.1 Animal and Marine Protein Sources

5.2.1.1 Blood Meal/Hemoglobin Powder
It is the coagulated blood which has been dried and ground into a meal that should be reddish black in color and has a characteristic bloody odor. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>Max 12.0%</th>
<th>Min 88.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
<td>Min 88.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 88.0%</td>
<td>Min 88.0%</td>
</tr>
<tr>
<td>Pepsin Digestibility*</td>
<td>Min 70.0%</td>
<td>Min 70.0%</td>
</tr>
<tr>
<td>Salmonella(at 25 grams).....</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>

* AOAC, Official Method of Analysis

5.2.1.2 Egg Powder, Whole, Spray dried
These are pasteurized, spray dried whole egg solids that should be cream to light brown in color and with characteristic egg odor. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>High protein</th>
<th>Low Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 10.0 %</td>
<td>Max 10.0%</td>
</tr>
</tbody>
</table>
5.2.1.3 Fish Meal, imported

These are clean, dried, ground tissues of undecomposed fish or fish cuttings, with or without the oil extracted that should be light tan or light brown to reddish brown in color depending on the species of fish with characteristic odor of cooked/dried fish but should not be rancid. The specifications should include:

<table>
<thead>
<tr>
<th>Component</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 10.0%</td>
<td></td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 60.0%</td>
<td>Min 45.0%</td>
</tr>
<tr>
<td>Pepsin Digestibility*</td>
<td>Min 70.0%</td>
<td></td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Max 12.0%</td>
<td></td>
</tr>
<tr>
<td>Salt (NaCl)</td>
<td>Max 4.0%</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>Max 0.25%</td>
<td>Max 0.25%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Max 0.75%</td>
<td>Max 0.75%</td>
</tr>
<tr>
<td>Salmonella (at 25 grams)</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Histamine</td>
<td>Max 500 ppm</td>
<td></td>
</tr>
</tbody>
</table>

*AOAC, Official Method of Analysis

5.2.1.4 Fish Meal, Local

Local fish meals are dried, ground tissues of undecomposed fish or fish cuttings, with or without the oil extracted. This should be light tan or light brown to reddish brown in color and with characteristic odor of cooked/dried fish but should not be rancid. The specifications should include:

<table>
<thead>
<tr>
<th>Component</th>
<th>Min %</th>
<th>Max %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>Min 60.0%</td>
<td></td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Max 15.0%</td>
<td>Min 28.0%</td>
</tr>
<tr>
<td>Calcium</td>
<td>Max 0.25%</td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Max 0.75%</td>
<td></td>
</tr>
<tr>
<td>Salmonella (at 25 grams)</td>
<td>Negative</td>
<td></td>
</tr>
</tbody>
</table>
5.2.1.5 Fish Meal Analogue

It is a blend of animal by-products containing feather meal, blood meal, meat and bone meal, poultry by product with or without fishmeal or fish soluble that is brown to dark brown in color and with fresh and meaty but not burnt odor. The specifications should include:

- Moisture ....................... Max 12.0%
- Crude Protein .................... Min 50.0%
- Pepsin Digestibility* ............ Min 35.0%
- Salt (NaCl) ....................... Max 3.0%
- Calcium .......................... Max 5.0%
- Phosphorus ....................... Min 3.0%
- Salmonella (at 25 grams) ........ Negative
- Histamine ....................... 500ppm

*AOAC, Official Method of Analysis
5.2.1.6 Meat and Bone Meal

These are finely ground, dry rendered tissues and bones, exclusive of hair, hoof and hide trimmings, blood and contents of digestive tract. Color may vary but should be usually grayish brown with fresh and meaty but not burnt smell. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>Min 45% CP</th>
<th>Min 50% CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
<td>Max 12.0%</td>
</tr>
<tr>
<td>Ash</td>
<td>Max 35.0%</td>
<td>Max 27.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 45.0%</td>
<td>Min 50.0%</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Max 10.0%</td>
<td>Max 10.0%</td>
</tr>
<tr>
<td>Pepsin Digestibility*</td>
<td>Min 60.0%</td>
<td>Min 60.0%</td>
</tr>
<tr>
<td>Salt (NaCl)</td>
<td>Max 3.0%</td>
<td>Max 3.0%</td>
</tr>
<tr>
<td>Calcium</td>
<td>Max 10.0*</td>
<td>Max 8.0%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Max 7.0%</td>
<td>Max 5.0%</td>
</tr>
<tr>
<td>Salmonella (at 25 grams)</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>

* AOAC, Official Method of Analysis

5.2.1.7 Plasma

Protein

This is a product separated from blood cells and obtained by the addition of anticoagulant to whole fresh animal blood to prevent clotting. It is dried and ground. Color should be off-white to beige and should be odorless. The specifications should include:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 70.0%</td>
</tr>
<tr>
<td>Pepsin Digestibility*</td>
<td>Min 85.0%</td>
</tr>
<tr>
<td>Salmonella (at 25 grams)</td>
<td>Negative</td>
</tr>
</tbody>
</table>

* AOAC, Official Method of Analysis
5.2.1.8 Pork/Porcine Meal

It is made from pork/porcine by-products which have been cleaned, ground and rendered. This should be light brown in color with fresh fried meat smell. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>Min 45% CP</th>
<th>Min 50% CP</th>
<th>Min 60% CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 6.0 %</td>
<td>Max 6.0 %</td>
<td>Max 6.0 %</td>
</tr>
<tr>
<td>Ash</td>
<td>Max 35.0 %</td>
<td>Max 33.0 %</td>
<td>Max 23.0 %</td>
</tr>
<tr>
<td>Pepsin Digestibility*</td>
<td>Min 60.0 %</td>
<td>Min 60.0%</td>
<td>Min 65.0%</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Max 6.0%</td>
<td>Max 6.0%</td>
<td>Max 8.0%</td>
</tr>
<tr>
<td>Calcium</td>
<td>Max 15.0 %</td>
<td>Max 12.0 %</td>
<td>Max 10.0 %</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Min 7.0 %</td>
<td>Min 6.0 %</td>
<td>Min 4.0 %</td>
</tr>
<tr>
<td>Salmonella (at 25 grams)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>NPN**</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>
5.2.1.9  Poultry By-product Meal

These are dried, ground tissues of undecomposed necks, heads, fats, carcass, and traces of feathers of poultry with or without the oil extracted. This should be tan or light brown to reddish brown in color with fresh and meaty but not burnt smell. This should be free from any evidence of scorching and over heating or presence of foul odor. The specifications should include:

- Moisture ......................... Max 12.0%
- Crude Protein .................... Min 50.0%
- Pepsin Digestibility* ............ Min 40.0%
- Crude Fat ........................... Max 17.0%
- Calcium ............................ Max 5.0%
- Phosphorus ....................... Min 2.0%
- *AOAC, Official Method of Analysis
- Salmonella (at 25 grams)...... Negative

5.2.1.10  Hydrolyzed Feather meal

This is the product resulting from the treatment under pressure of clean, undecomposed feathers from slaughtered poultry and free of additives. The specifications should include:

- Moisture .......................... Max 12.0%
- Crude Protein ..................... Min 70.0 %
- Pepsin Digestibility* ............ Min 30.0%

*AOAC, Official Method of Analysis

** Non Protein Nitrogen
Animal Feed Ingredients

Salmonella (at 25 grams) ....... Negative

* AOAC, Official Method of Analysis

5.2.1.11 Poultry Meal
These are ground, rendered and dried tissues of undecomposed meat and bone of poultry. The color may vary but should be usually grayish brown with fresh and meaty but not burnt odor. This should be free from any evidence of scorching and over heating or presence of foul odor, as well as free of feathers. The specifications should include:

Moisture ......................... Max 12.0%
Crude Protein .................... Min 50.0%
Pepsin Digestibility* ............ Min 50.0%
Crude Fat ......................... Max 15.0%
Calcium ........................... Max 5.0%
Phosphorus ....................... Min 3.0%
Salmonella (at 25 grams) ....... Negative

* AOAC, Official Method of Analysis

5.2.1.12 Shrimp Meal
This is by-product of shrimp processing and contains either the exoskeleton or whole shrimp that should be pink or orange in color and with characteristic smell of cooked/dried shrimp. The specifications should include:

Moisture ......................... Max 12.0%
Crude Protein .................... Min 30.0%
Animal Feed Ingredients

Pepsin Digestibility* …………. Min 63.0%
Salt (NaCl) ....................... Max 3.0%
Calcium ........................ Max 6.0%
Phosphorus ..................... Min 2.0%
Salmonella(at 25 grams) .... Negative
Histamine ....................... 500.0 mg/kg

*AOAC, Official Method of Analysis

5.2.1.13 Squid Meal
This is undecomposed whole, dried and ground squid that should be light brown to black color and has a characteristic smell of cooked/dried squid. The specifications should include:

Moisture ....................... Max 12.0%
Crude Protein .................. Min 40.0%
Crude Fat ....................... Min 15.0%
Salt (NaCl) ..................... Max 3.0%
Salmonella(at 25 grams) ...... Negative
NPN* .............................. Negative

*Non Protein Nitrogen

5.2.2 Plant Protein Sources

5.2.2.1 Black Bean (Phaseolus vulgaris)
A small black variety of the common bean that should be black in color with fresh and nutty smell. This should be free from infestations. The specification should include:

- Moisture ......................... Max 12.0%
- Crude Protein ..................... Min 20.0%
- Crude Fiber ....................... Max 6.0%

5.2.2.2 Canola (Brassica spp.) Meal
A by-product after extraction of oil from canola seeds that should be yellow gold in color and have fresh and nutty smell. This should be free from infestations. The specification should include:

- Moisture ......................... Max 12.0%
- Crude Protein ..................... Min 37.0%
- Crude Fiber ....................... Max 12.0%

5.2.2.3 Leucaena /Ipil-ipil (Leucaena spp.) Leaf meal
Dried ground Leucaena leaves with minimum amount of stems. This should be greenish brown in color with fresh and free from musty odor. This should be free from infestations. The specifications should include:

- Moisture ......................... Max 12.0%
- Crude Protein ..................... Min 20.0%
- Crude Fiber ....................... Max 14.0%
- Mimosine ......................... Max 2 ppm

5.2.2.4 Rapeseed (Brassica napus) Meal
Animal Feed Ingredients

A by-product after extraction of oil from rapeseed that should be greenish brown to brown in color and have fresh and nutty smell. This should be free from infestations. The specifications should include:

- Moisture ......................... Max 12.0%
- Crude Protein ..................... Min 32.0%
- Crude Fiber  ...................... Max 12.0%

5.2.2.5 Soybean (Glycine Max) Oil Meal, Soya or Soybean Meal

These are by-products after extraction of oil from soybean seeds that should be bright yellow to yellowish brown in color and have fresh, sweet and nutty odor. This should be free from infestations. The specifications should include:

<table>
<thead>
<tr>
<th>Low Protein</th>
<th>High Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 43.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 7.0%</td>
</tr>
</tbody>
</table>

- Protein Solubility in 0.2% KOH.... 73.0 – 88
- Urease activity as change in pH .. 0.02 -0.30
- Ash ............................... Max 7.0%
- Anti-caking agent................. Max 1.0%

5.2.2.6 Soybean (Glycine Max), Full Fat

These are processed (extrusion, toasting, expansion, microwaving, etc.) soybean seeds with the purpose of removing much of the anti-nutritional factors. It should be light yellow in color and with fresh and nutty smell. This should be free from infestations. The specifications should include:
Moisture ......................... Max 12.0%
Crude Protein ..................... Min 35.0%
Crude Fat  ......................... Min 16.0%
Crude Fiber  ................. Max 8.0%
Protein Solubility in 0.20% KOH. 60.0 – 75.0%
Urease activity as change in pH. 0.02 – 0.30

5.2.2.7  **Cowpea (Vigna sinensis)**
It is a product obtained from drying cowpea seeds that should be brown in color and should be odorless. This is locally called “paayap” or “kibal”. This should be free from infestations. The specifications should include:

Moisture ......................... Max 13.0%
Crude Protein ..................... Min 20.0%
Crude Fiber  ......................... Max 4.0%

5.2.2.8  **Dunn Peas (Pisum sativum)**
This has greenish brown, wrinkled outer covering with yellow cotyledons where color should vary from light green to greenish brown and has no odor. This should be free from infestations. The specifications should include:

Moisture ......................... Max 10.0 %
Crude Protein ..................... Min 18.0%
Crude Fiber  ......................... Max 6.0%
5.2.2.9 Feed Peas (*Pisum sativum*)
Dried peas intended for animal feed that should be grayish green in color and should be odorless. This should be free from infestations. The specifications should include:

- Moisture …………………… Max 10.0%
- Crude Protein ……………… Min 22.0%
- Crude Fiber ………………… Max 6.0%

5.2.2.10 Green Peas (*Pisum sativum*)
Dried peas intended for animal feed that should be green in color and should be odorless. This should be free from infestations. The specifications should include:

- Moisture …………………… Max 10.0%
- Crude Protein ……………… Min 23.0%
- Crude Fiber ………………… Max 6.0%

5.2.2.11 Lupins (*Lupinus spp.*)
Dried lupin seeds that should be cream/gray, speckled in color and have fresh and not musty odor. This should be free from infestations. The specifications should include:

- Moisture …………………… Max 10.0%
- Crude Protein ……………… Min 27.0%
- Crude Fiber ………………… Max 12.0%

5.2.2.12 Maple peas (*Lathyrus niger*)
Animal Feed Ingredients

It is also called black peas or parched peas. Round shaped seeds, either brown or mottled varieties with yellow cotyledons. The color should be brown, black or speckled and should be odorless. This should be free from infestations. The specifications should include:

- **Moisture** ............................... Max 13.0%
- **Crude Protein** ......................... Min 23.0%
- **Crude Fiber** ............................. Max 6.0%

5.2.2.13 Mungbean(*Phaseolus vulgaris*)

This is dried mungbean seed that should be green or yellow in color and should be odorless. This should be free from infestations. The specification should include:

- **Moisture** ............................... Max 13.0%
- **Crude Protein** ......................... Min 20.0%
- **Crude Fiber** ............................. Max 6.0%

5.2.2.14 Pigeon Pea/Kadyos (*Cajanus cajan*)

This is dried whole pigeon pea seed that should be cream in color and should be odorless. This should be free from infestations. The specifications should include:

- **Moisture** ............................... Max 13.0%
- **Crude Protein** ......................... Min 20.0%
- **Crude Fiber** ............................. Max 10.0%

5.2.2.15 Rice Bean/Tapilan (*Phaseolous calcaratus*)

This is dried whole or ground rice bean that should be cream/light brown in color and should be odorless. This should be free from infestations. The specifications should include:
5.2.2.16  Safflower (*Carthamus tinctorius*) Seed
This is dried safflower seed that should be off-white in color and have fresh and nutty odor. This should be free from infestations. The specifications should include:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 13.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 18.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 8.0%</td>
</tr>
</tbody>
</table>

5.2.2.17  Sunflower (*Helianthus annuus*) Seeds
This is dried sunflower seed that commonly should be black with white stripes or plain black. This should be free from infestations. This should be odorless and include the following specifications:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 10.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 13.0%</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Min 25.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 30.0%</td>
</tr>
</tbody>
</table>

5.2.2.18  Vetch (*Vicia sativa*) Seeds/Common vetch
This is pillow shaped seed with a mottled brown seed coat that when split, seed color varies from white/beige to orange, depending on the variety. This should be odorless and should be free from infestations. The specifications should include:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 10.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 16.0%</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Min 30.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 25.0%</td>
</tr>
</tbody>
</table>
Animal Feed Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 10.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 25.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 5.0%</td>
</tr>
</tbody>
</table>

5.2.2.19 White Peas/Yellow Peas (*Pisum sativum*)
Dried garden peas with wrinkled seed coat at maturity that should be white to yellow in color and should be odorless. This should be free from infestations. The specifications should include:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 20.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 10.0%</td>
</tr>
</tbody>
</table>

5.2.2.20 Guar Meal
A co-product generated from the production of guar gum, an industrially important commodity being widely used in industries such as food, textile, pharmaceuticals, personal care, health care, nutrition, explosives, mining, and oil drilling. After the extraction of the endosperm, the gum part, the remaining germ & husk form part of guar meal. It should be cream to light brown in color and should be free from burnt odor. This should be free from infestations. The specifications should include:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 7.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 49.0%</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>Max 4.0%</td>
</tr>
<tr>
<td>Ash</td>
<td>Max 6.0%</td>
</tr>
</tbody>
</table>

5.3 Non-protein nitrogen source

5.3.1 Urea
This is opaque, round or crystal granules containing high amount of nitrogen. This should be white in color and have no characteristic odor. This should be for ruminant use only. The specifications should include:
5.4 Milling and Factory By-products

5.4.1 Bakery By-Products
These are bakery products and by products blended, dried and ground into a meal that should vary from white to dark brown in color and have fresh and not musty or rancid odor. They should not be burnt, moldy or insect-damaged. The specifications should include:

- Moisture ……………………….. Max 10.0%
- Salt (NaCl)…………………….. Max 5.0%
- Crude Fat …………………….. Max 10.0%
- Starch………………………… Min 35.0%

5.4.2 Cassava Residue Meal/Pellet
This is a by-product of starch production.

- Moisture …………………….. Max 12.0%
- Ash…………………………….. Max 7.0%
- Crude Protein…………………. Min 7.0%
- Fiber…………………………….. Max 13.0%
- Impurities …………………….. Max 2.0%
- HCN…………………………….. Max 50.0 mg/kg
- Starch ……………………….. Min 40.0%
5.4.3 Dried Spent Brewer’s Grain
This is a by-product from the brewing process of barley and other grains that should be light to dark brown in color with dried fermented grain smell. The specifications should include:

- Moisture ........................ Max 10.0%
- Crude Protein ...................... Min 23.0%
- Crude Fiber ......................... Max 17.0%

5.4.4 Dried Brewer’s Yeast
This is dried by-product obtained from fermentation of grains that should be pale brown in color and has fermented grain smell. The specifications should include:

- Moisture ........................ Max 10.0%
- Crude Protein ...................... Min 30.0%
- Crude Fiber ......................... Max 16.0%

5.4.5 Copra Cake/Meal
A by-product after extraction of oil from copra that should be light brown to brown in color and have nut-like and pleasant smell, one that resembles roasted coconut not musty, burnt nor rancid odor. This is unpalatable at high inclusion rates and has imbalanced amino acid profile. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>Expeller</th>
<th>Solvent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 8.0%</td>
<td>Max 10.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 18.0%</td>
<td>Min 20.0%</td>
</tr>
</tbody>
</table>
5.4.6 Corn Bran

The outer covering of the corn kernel with some starch that should be off-white to light yellow in color and have fresh and free from musty odor. This should be free from infestation and should include the following specifications:

- Moisture ....................... Max 12.0%
- Crude Protein .................. Min 8.0%
- Crude Fiber ..................... Max 10.0%

5.4.7 Corn Germ Meal

It is a by-product after oil extraction from corn germ by expeller or solvent processes that should be golden yellow to brown in color and with fresh and nutty smell and not musty or sour. This should be free from infestation. The specifications should include:

<table>
<thead>
<tr>
<th></th>
<th>Expeller</th>
<th>Solvent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 12.0%</td>
<td>Max 12.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 13.0%</td>
<td>Min 20.0%</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Min 6.0%</td>
<td>Min 1.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 10.0%</td>
<td>Max 9.0%</td>
</tr>
</tbody>
</table>
5.4.8 **Corn Gluten Feed**

It is a by-product in the manufacture of starch from corn by wet-milling process. May consist of corn gluten meal and corn bran with or without corn solubles and corn oil. This should be tan to yellowish brown in color and smell fresh similar to that of toasted cereals blended with a slight trace of dried fermented corn. This should be free from infestations. The specifications should include:

- **Moisture** .........................  Max 12.0%
- **Crude Protein** .....................  Min 16.0%
- **Crude Fiber** ........................ Max 12.0%

5.4.9 **Corn Gluten Meal**

Dried corn residue after a large part of the starch, germ and bran have been removed that should be golden yellow or brownish-yellow in color and with nutty and not rancid smell. This should be free from infestations. The specifications should include:

- **Moisture** .........................  Max 10.0%
- **Crude Protein** .....................  Min 60.0%
- **Crude Fiber** ........................ Max 3.0%

5.4.10 **Dried Distillers Grains with Solubles (DDGS)**

A co-product of fermentation of cereals and grains, mostly corn, for the production of alcohol. It should be bright yellow to light brown in color and should be free of burnt or smoky odor. The specifications should include:

- **Moisture** .........................  Max 12.0%
- **Crude protein** .....................  Min 25.0%
- **Crude fiber** ......................... Max 8.0%
- **Crude fat** .......................... Max 10.0%
5.4.11 Sugarcane (*Saccharum officinarum*) Molasses

It is a by-product in the manufacture of cane sugar that should be brown to dark brown in color and should have typical sugar aroma. The specifications should include:

- Moisture …………………… Max 25.0%
- Brix …………………… Min 78.0 degrees

5.4.12 Palm Kernel Meal

A by-product after extraction of oil from palm kernel that should be light to dark brown in color with fresh and nutty but not musty, burnt nor rancid odor. This should include the following specifications:

- Moisture …………………… Max 8.0%
- Ash…………………………. Max 5.0%
- Crude Protein ………………… Min 18.0%
- Crude Fiber………………….. Max 12.0%
- Crude Fat …………………… Min 14.0%

5.4.13 Rice Bran, D₁ or Cono

This consists primarily of pericarp or bran layer and germ of rice, with minimal quantity of hulls that should be off-white to light brown in color and with fresh and not rancid or musty odor. This should be free from insect infestations and foreign materials. The specifications should include:

- Moisture …………………… Max 10.0%
- Ash…………………………. Max 8.0%
- Crude Protein ………………… Min 11.0%
- Crude Fiber………………….. Max 7.0%


Animal Feed Ingredients

Crude Fat …………………. Min 12.0%

5.4.14 Rice Bran D₂ or Kiskis
This is also the pericarp or bran layer and germ of rice, but with higher quantity of hulls than Rice Bran D₁ that should be light brown in color with fresh and not rancid or musty odor. This should be free from insect infestations and foreign materials. The specifications should include:

- Moisture …………………. Max 12.0%
- Ash .......................... Max 8.0%
- Crude Protein .............. Min 9.0%
- Crude Fiber ................. Max 12.0%
- Crude Fat ................... Min 9.0%

5.4.15 Scrap Noodles
These are pasta or rice noodles rejected for human consumption that should be odorless. The specifications should include:

<table>
<thead>
<tr>
<th>Pasta</th>
<th>Rice noodles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture ................</td>
<td>Max 5.0%</td>
</tr>
<tr>
<td>Crude Protein ..........</td>
<td>Min 10.0%</td>
</tr>
<tr>
<td>Starch ..................</td>
<td>Min 70.0%</td>
</tr>
</tbody>
</table>

5.4.16 Soya Hulls
These are by-products after dehulling soybeans that should be light yellow in color with fresh and not musty odor. The specifications should include:

- Moisture .................. Max 12.0%
Animal Feed Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>Min 10.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 38.0%</td>
</tr>
</tbody>
</table>

5.4.17 Wheat Gluten
This is by-product in the manufacture of starch from wheat that should be beige in color and no characteristic odor.
The specifications should include:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>12.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>75.0%</td>
</tr>
</tbody>
</table>

5.4.18 Wheat Pollard
This is by-product of wheat milling. It is the portion of wheat between the skin or the bran and endosperm. It may either be soft or hard depending on the variety of wheat. The soft pollard should be light brown in color while hard pollard should be light reddish brown color. Both should smell fresh and not musty. This should be free from insect infestations and should have the following specifications:

<table>
<thead>
<tr>
<th></th>
<th>Soft</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Max 13.0%</td>
<td>Max 13.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 14.0%</td>
<td>Min 16.0%</td>
</tr>
<tr>
<td>Crude Fiber</td>
<td>Max 10.0%</td>
<td>Max 11.0%</td>
</tr>
</tbody>
</table>

5.5 Dairy Products

5.5.1 Buttermilk Powder
It is by-product in the production of butter that should be yellowish white to cream in color with a characteristic odor of sour milk. This should not contain burnt particles. The specifications should include:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>10.0%</td>
</tr>
</tbody>
</table>
Animal Feed Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>Max 11.0%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>Min 30.0%</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>Min 5.0%</td>
</tr>
<tr>
<td><em>Salmonella</em> (at 25 grams)</td>
<td>Negative</td>
</tr>
</tbody>
</table>

5.5.2 Lactose Powder

This is milk sugar where its sweetness is only about 1/5 of the sweetness of ordinary sugar. This should be off-white in color with fresh and milky smell. The specifications should include:

- Moisture ....................... Max 1.0%
- Lactose ......................... Min 98.0%
- *Salmonella* (at 25 grams) .......... Negative

5.5.3 Skimmed Milk Powder

It is a product resulting from the removal of water and fats from clean milk. This should be white or cream in color with fresh and milky smell. The specifications should include:

- Moisture ....................... Max 6.0%
- Protein ......................... Min 33.0%
- Calcium ......................... Max 1.5%
- Phosphorous ..................... Min 0.8%
- Lactose ......................... Min 40.0%
- *Salmonella* (at 25 grams) .......... Negative

5.5.4 Skimmed Milk Replacer


It is a replacer for a regular skimmed milk that contains vegetable protein and lactose. The specifications should include:

- **Moisture** .................. Max 6.0%
- **Protein** .................... Min 25.0%
- **Calcium** ................... Max 1.5%
- **Phosphorous** ............. Min 0.8%
- **Lactose** ................... Min 20.0%
- **Salmonella** (at 25 grams) .. Negative

5.5.5 Whey Powder, Sweet

It is the portion of milk which remains after most of the casein and fat have been removed for the manufacture of cheese. This should be white or cream in color with fresh and milky smell. The specifications should include:

- **Moisture** .................. Max 6.0%
- **Ash** ......................... Max 8.5%
- **Crude Protein** ............. Min 11.0%
- **Salt** ........................ Max 3.5%
- **Lactose** ................... Min 65.0%
- **Salmonella** (at 25 grams) .. Negative

5.5.6 Whey powder, deproteinized

It is the product which results from the removal of protein from whey. The color should be off-white to cream. The specifications should include the following:
Animal Feed Ingredients

- Moisture ......................... Max 6.0%
- Ash ............................... Max 11.0%
- Crude Protein ..................... Min 2.0%
- Salt ............................... Max 3.5%
- Lactose ............................ Min 80.0%
- *Salmonella* (at 25 grams) ...... Negative

5.5.7 Whole Milk Powder
It is a product obtained by drying milk that should be white in color, have fresh and milky odor. The specifications should include:

- Moisture .......................... Max 7.0%
- Crude Protein ..................... Min 20.0%
- Crude Fat ........................... Min 20.0%
- Calcium ........................... Max 1.0%
- Phosphorous ...................... Min 1.0%
- Lactose ............................ Min 45.0%
- *Salmonella* (at 25 grams) ...... Negative

5.6 Fats and Oils

5.6.1 Acidulated Oil or Acid Oil
It is acid-treated by-product in the refining of crude coco oil that should be dark brown in color and have acidic but not rancid odor. This should be free from foreign materials. The specifications should include:

- Moisture .......................... Max 5.0%
Animal Feed Ingredients

Total free fatty acid

as Lauric ............. Max 60.0%
as Oleic ............... Max 65.0%

Peroxide value............. Max 10 meq/kg

5.6.2 Coconut Oil

It is crude or refined oil extracted from coconut meat using solvent or expeller process that should be clear liquid, dark yellow to golden yellow in color, has fresh and not rancid odor. The specifications should include:

Moisture ....................... Max 2.0%

Total free fatty acid

as Lauric ............. Max 5.0%
as Oleic ............... Max 7.0%

Peroxide Value ............ Max 5.0 meq/kg

Iodine Value ................. Max 10.0g iodine per100 g oil

5.6.3 Fish Oil

It is oil obtained from fish cannery that should be pale yellow in color and have fishy odor but not rancid. The specifications should include:

Moisture ....................... Max 2.0%

Total free fatty acid

as Lauric ............. Max 5.0%
as Oleic ............... Max 7.0%

Peroxide Value ............ Max 7.0 meq/kg

Iodine Value ................. 110-120 g iodine per 100 g oil
PHILIPPINE NATIONAL STANDARD

Animal Feed Ingredients

Salmonella (at 25 grams)…….. Negative

5.6.4 Palm Kernel Oil, crude

It is crude oil extracted from palm nuts using solvent or expeller process. This should be reddish brown in color and have fresh but not rancid or musty odor. The specifications should include:

- Moisture .......................... Max 2.0%
- Total free fatty acid, as Palmitic… Max 5.0%
- Peroxide Value ...................... Max 7.0 meq/kg
- Iodine Value ......................... Max 23.0 g iodine per 100 g oil

5.6.5 Palm Oil, crude

It is crude oil extracted from palm fruit using solvent or expeller process. This is dark orange in color and has fresh but not rancid or musty odor. The specifications should include:

- Moisture .......................... Max 2.0%
- Total free fatty acid, as Palmitic… Max 6.0%
- Peroxide value ..................... Max 10.0meq/kg
- Iodine Value ......................... Max 55.0 g iodine per 100 g oil

5.6.6 Palm Olein

It is fractionated palm oil. This is light orange in color and has fresh but not rancid or musty odor. The specifications should include:

- Moisture .......................... Max 2.0%
- Total free fatty acid, as Palmitic… Max 6.0%
5.6.7 Soybean Oil
It is crude or refined oil extracted from soybean seeds using solvent or expeller process. This should have brownish yellow color and fresh and not rancid or musty odor. The specifications should include:

- Moisture: Max 2.0%
- Total free fatty acid, as Oleic: Max 6.0%
- Peroxide Value: Max 7.0 meq/kg
- Iodine Value (number): Max 141.0 g iodine per 100 g oil

5.6.8 Tallow
It is by-product of the rendering process of fat from cattle, carabao and sheep that should be white to off-white in color and have fresh and not rancid or musty odor. This requires heating before mixing to the feeds and is solid at room temperature. The specifications should include:

- Moisture: Max 2.0%
- Total free fatty acid, as Butyric: Max 5.0%
- Peroxide Value: Max 7.0 meq/kg
- Iodine Value (number): Min 38.0 g iodine per 100 g oil

5.6.9 Cooking Oil, Used
This is residual oil after frying food products that should be yellow to brown in color and have burnt oil smell. The specifications should include:
Animal Feed Ingredients

Moisture ...............................  Max 2.0%

Total free fatty acid
  as Lauric .......................  Max 20.0%
  as Oleic .......................  Max 25.0%

Peroxide Value .......................  Max 7.0 meq/kg

5.7 Feed Supplements and Additives

5.7.1 Mineral Supplements

5.7.1.1 Macro Mineral Supplements

5.7.1.1.1 Calcium and Phosphorous Sources

5.7.1.1.1.1 Bone Meal, Steamed
It is by-product of meat processing composed of bones sterilized by cooking with steam under pressure, dried and ground. This should be light tan to gray in color and have cooked meat and bone odor. The specifications should include:

Moisture .........................  Max 10.0%
Calcium .........................  Max 30.0%
Phosphorus .................  Min  12.0%
Salmonella(at 25 grams)...........  Negative

5.7.1.1.1.2 Dicalcium Phosphate, or Dicaphos
Dicalcium phosphate is a calcium salt of phosphoric acid. This should be beige to light gray in color and have no characteristic odor. The specifications should include:
Animal Feed Ingredients

Calcium ………………… Max 24.0%
Phosphorus ………………… Min 18.0%
Fluorine ………………… Max 0.2%

5.7.1.1.1.3 Monodicalcium Phosphate, or Monodical [Ca \((\text{H}_2\text{PO}_4)_2\cdot\text{H}_2\text{O}\)]
Monodical is a blend of dicalcium phosphate and monocalciumphosphate that should be beige to light gray in color and should have no characteristic odor. The specifications should include:

Calcium ………………… Max 20.0%
Phosphorus ………………… Min 21.0%
Fluorine ………………… Max 0.2%

5.7.1.1.1.4 Monocalcium Phosphate Ca\(\text{H}_4\text{O}_8\text{P}_2\)
Monocalciumphosphate is a calcium salt of phosphoric acid. This should be beige to light gray in color and have no characteristic odor. The specifications should include:

Calcium ………………… Max 16.0%
Phosphorus ………………… Min 22.0%
Fluorine ………………… Max 0.2%

5.7.1.1.1.5 Tricalcium Phosphate or Tricaphos (Ca\(_3\)O\(_8\)P\(_2\))
This is the product obtained by heating rock phosphate deposits where color should vary from grayish tan to brownish red and should have no characteristic odor. This should be free from foreign materials. The specifications should include:

Calcium ………………… Max 24.0%
5.7.1.1.2 Calcium Sources

5.7.1.1.2.1 Limestone
This is also known as calcium carbonate (CaCO$_3$) and is available in fine powder or coarse grits. This should be grayish white to off-white in color and should have no characteristic odor. This should be free from foreign materials. The specifications should include:

- Calcium ....................... Min 36.0%
- pH .............................. Max 9.0%
- Magnesium ................. Max 2.5%

5.7.1.1.2.2 Oyster Shell
This is obtained by drying and grinding oyster shells that should be off-white to grayish black in color and should have fishy odor. The specifications should include:

- Moisture ....................... Max 5.0%
- Calcium ....................... Min 30.0%
- Salmonella (at 25 grams)....... Negative

5.7.1.1.3 Sodium and Chlorine Sources

5.7.1.1.3.1 Salt (NaCl)
These are granular crystals or fine powder commonly known as “table salt”. This should be white to off-white in color and should have no characteristic odor. This should be free from lumps and/or foreign materials. The specifications should include:
Moisture ......................... Max 5.0%
Sodium ............................. Min 37.0%
Chlorine ............................. Min 58.0%

5.7.1.1.3.2 Iodized Salt
These are granular crystals or fine powder with iodine that should be white in color and should have no characteristic odor. This should be free from lumps and/or foreign materials. The specifications should include:

Moisture ......................... Max 3.0%
Sodium ............................. Min 37.0%
Chlorine ............................. Min 58.0%
Iodine ............................. Min 0.007%

5.7.1.1.3.3 Sodium bicarbonate
These are white crystal or granules prepared from sodium carbonate, water and carbon dioxide. This should be free from foreign materials and specifications should include:

Moisture......................... Max 2.0%
Sodium............................. Min 26.0%

Oven drying at 105ºC for all moisture value of feed ingredients

5.7.2 Amino Acids Supplements

5.7.2.1 DL-Methionine
It is a synthetic form of methionine that should have a typical odor, somewhat like organic sulphur compounds. The forms, colors and specifications should be the following:
DL methionine - white to slightly yellowish/crystal powder

Purity as DL-Methionine………………. Min 98.0%

5.7.2.2 Methionine hydroxyl analogue (MHA)
It is a hydroxyl acid with four carbons and methyl-thio radical with pKa of 3.6. It can be either liquid or powder.

Purity as MHA liquid/powder …………. Min 85.0%.

5.7.2.3 L-lysine HCl
It is a synthetic form of lysine that should be odorless and should include the following forms, color and specifications:

L-lysine hydrochloride- dirty white or cream

Purity as L- lysine hydrochloride …… Min 98.0%

5.7.2.4 Lysine sulfate
It is a light brown synthetic form of lysine and composed of pure lysine and other amino acid.

Purity as L-lysine sulfate ……………… Min 87.0%

5.7.2.5 L-threonine
This is synthetic amino acid produced by fermentation that should be off-white in color and odorless. The specification should include:

Purity as L- threonine…………………. Min 98.0%

5.7.2.6 L-tryptophan
L-tryptophan is also a synthetic amino acid produced by fermentation that should be off-white in color and odorless. The specification should include:

Purity as L-tryptophan..................... Min 99.0%

5.7.2.7 L-Valine
L-valine is also a synthetic amino acid produced by fermentation that should be off-white in color and odorless. The specification should include:

Purity as L-valine......................... Min 95.0%

5.8 Feed Additives

5.8.1 Acidifying Agents (Acidifiers)
Chemical products added to the feed to decrease the pH in the stomach, improving digestion and modulating the microflora in the gastrointestinal (GI) tract.

5.8.2 Anti-Caking Agents
Chemical products used to prevent formation of lumps.

5.8.3 Antimolds (Mold Inhibitors)
Chemical preservatives added to the feeds and raw materials to prevent mold development.

5.8.4 Antioxidants
Chemical products used to prevent rancidity in feeds and raw materials; protect the polyunsaturated fatty acids and the fat-soluble vitamins from destruction by peroxidation.

5.8.5 Dextrose Anhydrous
The anhydrous form of D-Glucose which is a natural monosaccharide and carbohydrate. Dextrose serves to replace lost nutrients and electrolytes. It is also used as a sweetener.
Animal Feed Ingredients

5.8.6 Enzymes
   Chemical products which are added to the feed to improve nutrient digestibility.

5.8.7 Flavorings/Sweeteners
   Agents added to improve palatability of the feed.

5.8.8 Hormones
   Substances used to alter metabolism in the body.

5.8.9 Immuno Enhancers
   Natural compounds that activate or prime the innate immune system (beta glucans, etc.).

5.8.10 Nutritional Metabolites
   Molecules that are intermediate products of metabolism which are involved in normal growth, development and reproduction.

5.8.11 Pellet Binders
   Used to improve pellet durability.

5.8.12 Pigmenters
   Used to enhance yolk color and skin pigmentation in poultry.

5.8.13 Prebiotics
   Non-digestible substances used to improve the gut environment for beneficial bacteria.

5.8.14 Probiotics
   Live microbial feed additives that beneficially affect the host animal by improving its intestinal microbial balance.
5.8.15 **Surfactants**
Chemical agents that facilitate uniform dispersion of molecules in viscous liquid raw materials.

5.8.16 **Mycotoxin Binders**
Chemical compounds which can bind or adsorb mycotoxins in feeds.

6 **Hazards in Feeds (guidelines)**

6.1 **Biological Hazards**
Bacteria, parasites, and prions.

6.2 **Chemical Hazards**

6.3 **Heavy Metals**
Commercial feed ingredients should comply with those relevant maximum residue levels for heavy metals established by the *Codex Alimentarius* Commission and/or competent authority for this commodity.

6.4 **Radionuclides**

6.5 **Toxins (Mycotoxins, Plant toxins, Marine Toxins)**

**Mycotoxins**
Mycotoxins, such as but not limited to aflatoxin, T2, zearalenone, Deoxynevalinol(DON) or vomitoxin and ochratoxin should comply with the tolerable levels set by international standardizing body or competent authority.

6.6 **Pesticide Residues**
Animal Feed Ingredients

Commercial feed ingredients should comply with those relevant maximum residue limits established by the Codex Committee on Pesticide Residues and/or competent authority for this commodity.

6.7 Veterinary Drugs

7 Hygiene

It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with appropriate sections of Recommended Code of Practice – Good Animal Feeding (CAC/RCP 54-2004).
The following data are provided as additional information:

**Table 1. Sources of Trace Minerals**

<table>
<thead>
<tr>
<th>Trace Minerals</th>
<th>Sources</th>
<th>Purity</th>
<th>Content of pure element (%)</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cobalt (Co)</td>
<td>Cobalt carbonate (CoCO₃)</td>
<td>49.6</td>
<td></td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Cobalt sulfate, hydrated (CoSO₄·H₂O)</td>
<td>98-99</td>
<td>34.1</td>
<td>Strong pink</td>
</tr>
<tr>
<td></td>
<td>Cobalt sulfate, hydrated (CoSO₄·7H₂O)</td>
<td>98-99</td>
<td>21.0</td>
<td>Orange</td>
</tr>
<tr>
<td>2. Copper (Cu)</td>
<td>Copper carbonate (CuCO₃)</td>
<td>51.4</td>
<td></td>
<td>Green to blue</td>
</tr>
<tr>
<td></td>
<td>Copper chloride (CuCl₂·2H₂O)</td>
<td></td>
<td>37.3</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>Copper hydroxide (Cu[OH]₂)</td>
<td></td>
<td>65.1</td>
<td>Light blue</td>
</tr>
<tr>
<td>purity-not available in the Philippines</td>
<td>Cupric oxide (CuO)</td>
<td>78-79</td>
<td>79.9</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Copper Sulfate, hydrated (CuSO₄·5H₂O)</td>
<td>98-100</td>
<td>25.4</td>
<td>Dark blue</td>
</tr>
<tr>
<td></td>
<td>Copper Sulfate, hydrated (CuSO₄·7H₂O)</td>
<td>98-100</td>
<td>22.2</td>
<td>Sky blue</td>
</tr>
</tbody>
</table>
### Animal Feed Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>Formula</th>
<th>Purity</th>
<th>Mineral (as %)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tribasic copper chloride (TBCC)</td>
<td></td>
<td>98</td>
<td>58</td>
<td>Green powder</td>
</tr>
<tr>
<td><strong>3. Iodine (I)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium iodate (Ca[IO₃]₂)</td>
<td></td>
<td>99</td>
<td>65.1</td>
<td>White crystalline powder</td>
</tr>
<tr>
<td>Potassium iodide (KI)</td>
<td></td>
<td>99-100</td>
<td>76.4</td>
<td>White crystals</td>
</tr>
<tr>
<td>Cuprous iodide (CuI)</td>
<td></td>
<td>-</td>
<td>66.6</td>
<td>-?</td>
</tr>
<tr>
<td>Pentacalciumorthoperiodate (Ca₅[IO₆]₂)</td>
<td></td>
<td>-</td>
<td>39.3</td>
<td>-</td>
</tr>
<tr>
<td><strong>4. Iron (Fe)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrous carbonate (FeCO₃)</td>
<td></td>
<td>-</td>
<td>48.2</td>
<td>Greenish gray</td>
</tr>
<tr>
<td>Ferrous Oxide (FeO)</td>
<td></td>
<td>-</td>
<td>77.7</td>
<td>Jet-black</td>
</tr>
<tr>
<td>Ferrous sulfate (FeSO₄)</td>
<td></td>
<td>98</td>
<td>36.7</td>
<td>White to yellow</td>
</tr>
<tr>
<td>Ferrous sulfate, hydrate (FeSO₄.H₂O)</td>
<td></td>
<td>95-98</td>
<td>32.9</td>
<td>White to yellow</td>
</tr>
<tr>
<td>Ferrous sulfate, hydrate (FeSO₄.7H₂O)</td>
<td></td>
<td>92-97</td>
<td>20.1</td>
<td>Light green</td>
</tr>
<tr>
<td><strong>5. Manganese (Mn)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manganese carbonate (MnCO₃)</td>
<td></td>
<td>-</td>
<td>47.8</td>
<td>Pink</td>
</tr>
<tr>
<td>Manganese chloride (MnCl₂.H₂O)</td>
<td></td>
<td>-</td>
<td>38.2</td>
<td>Reddish</td>
</tr>
<tr>
<td>Manganous oxide (MnO)</td>
<td></td>
<td>81</td>
<td>77.4</td>
<td>Brownish–black</td>
</tr>
<tr>
<td>Manganese sulfate, hydrated (MnSO₄.5H₂O)</td>
<td></td>
<td>95-98</td>
<td>22.8</td>
<td>Light pink</td>
</tr>
<tr>
<td>Manganous sulfate,</td>
<td></td>
<td>99</td>
<td>32.5</td>
<td>Light pink</td>
</tr>
</tbody>
</table>
Animal Feed Ingredients

<table>
<thead>
<tr>
<th>6. Selenium (Se)</th>
<th>7. Zinc (Zn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hydrated (MnSO$_4$•H$_2$O)</td>
<td>Sodium selenite (Na$_2$SeO$_3$)</td>
</tr>
<tr>
<td>Sodium selenite (Na$_2$SeO$_3$)</td>
<td>99-100</td>
</tr>
<tr>
<td>Sodium selenite (Na$_2$SeO$_3$)</td>
<td>-</td>
</tr>
<tr>
<td>Zinc carbonate (ZnCO$_3$)</td>
<td>-</td>
</tr>
<tr>
<td>Zinc chloride (ZnCl$_2$)</td>
<td>-</td>
</tr>
<tr>
<td>Zinc oxide (ZnO)</td>
<td>88-99</td>
</tr>
<tr>
<td>Zinc sulfate, hydrated (ZnSO$_4$•7H$_2$O)</td>
<td>90-95</td>
</tr>
<tr>
<td>Zinc sulfate, hydrated (ZnSO$_4$•H$_2$O)</td>
<td>95-98</td>
</tr>
</tbody>
</table>
### ANNEX 2

**Table 2. Description and Activity of Commercial Vitamins**

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Source</th>
<th>Description*</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Vitamin A 1000</td>
<td>Orange brown to gray free-flowing coated beadlets</td>
<td>1,000,000 I.U./gram</td>
</tr>
<tr>
<td></td>
<td>Vitamin A 500</td>
<td>Pale yellow to brownish free-flowing spray-dried powder; dispersible in water</td>
<td>500,000 I.U./gram</td>
</tr>
<tr>
<td>Vitamin D$_3$</td>
<td>Vitamin D3 500</td>
<td>Cream to brownish, fine spray-dried powder</td>
<td>500,000 I.U./gram</td>
</tr>
</tbody>
</table>
| Vitamin AD$_3$ | Vitamin AD3 1000/200 | Orange brown to gray free-flowing coated beadlets; contains both vitamin A and D$_3$ | Vitamin A = 1,000,000 I.U./gram  
Vitamin D$_3$ = 200,000 I.U./gram |
<p>| Vitamin K$_3$ | Menadionesodium bisulfite | White to brownish, slightly hygroscopic powder; soluble in water | 51.5 % menadione (as is) |
|         | Menadionenicotinamide bisulfite | White to brownish powder; sparingly soluble in water | 43% menadione and 31% nicotinamide |</p>
<table>
<thead>
<tr>
<th>Vitamin B&lt;sub&gt;1&lt;/sub&gt;</th>
<th>Thiamine mononitrate</th>
<th>White to yellowish fine granular powder; sparingly soluble in water</th>
<th>92% thiamine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thiamine hydrochloride</td>
<td>White fine powder; soluble in water</td>
<td>89% thiamine</td>
</tr>
<tr>
<td>Vitamin B&lt;sub&gt;6&lt;/sub&gt;</td>
<td>Pyridoxine hydrochloride</td>
<td>White to yellowish fine, free-flowing powder</td>
<td>82% pyridoxine</td>
</tr>
<tr>
<td>Vitamin B&lt;sub&gt;12&lt;/sub&gt;</td>
<td>Vitamin B&lt;sub&gt;12&lt;/sub&gt; 1%</td>
<td>Fine, reddish-brown powder</td>
<td>9 to 11 mg B&lt;sub&gt;12&lt;/sub&gt; per gram</td>
</tr>
<tr>
<td>Niacin</td>
<td>Niacin</td>
<td>Crystalline, free-flowing white to slightly yellowish powder</td>
<td>99.5%</td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>Calcium D-pantothenate</td>
<td>White to off-white, free flowing crystalline or spray-dried powder</td>
<td>90%</td>
</tr>
<tr>
<td>Biotin</td>
<td>Biotin 2%</td>
<td>White to cream white, very fine, free flowing powder</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Biotin 10%</td>
<td>Off-white to slightly yellowish, free-flowing spray-dried powder</td>
<td>10%</td>
</tr>
<tr>
<td>Folic acid</td>
<td>Folic acid 95%</td>
<td>Yellow to yellow-orange powder</td>
<td>95%</td>
</tr>
<tr>
<td>Animal Feed Ingredients</td>
<td>Description</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------------------------------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Folic acid 80% spray-dried</td>
<td>Yellowish to brownish free-flowing spray-dried power</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Coated vitamin C</td>
<td>97.5%</td>
<td></td>
</tr>
<tr>
<td>White to slightly yellowish powder coated with ethylcellulose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choline chloride</td>
<td>Phosphorylated vitamin C</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Beige, spray-dried powder</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES:

Ad Hoc Codex Intergovernmental Task Force on Animal Feeding

Department of Agriculture – Administrative Order 1 Series of 2008 – Revised Nutrient Standards for Animal Feeds

Department of Agriculture – Administrative Order 12 Series of 2007 – Revised Implementing Rules and Regulations on the Registration of Feed Establishments and Feed Products


Animal Feed Ingredients

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Bureau of Agriculture and Fisheries Standards  
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