Hy-Line®

W-80

COMMERCIAL LAYERS

ALTERNATIVE SYSTEMS

PERFORMANCE STANDARDS GUIDE

Hy-Line®

Use of the Performance Guide

The genetic potential of Hy-Line W-80 Commercial can only be realized if good poultry husbandry practices and management are used. This management guide outlines successful flock management programmes for Hy-Line Variety W-80 Commercial based on field experience compiled by Hy-Line International and using an extensive commercial layer flock database of Hy-Line flocks from all parts of the world. Hy-Line International Management Guides are periodically updated as new performance data and/or nutrition information become available.

The information and suggestions contained in this management guide should be used for guidance and educational purposes only, recognising that local environmental and disease conditions may vary and a guide cannot cover all possible circumstances. While every attempt has been made to ensure that the information presented is accurate and reliable at the time of publication, Hy-Line International cannot accept responsibility for any errors, omissions or inaccuracies in such information or management suggestions. Further, Hy-Line International does not warrant or make any representations or guarantees regarding the use, validity, accuracy, or reliability of, or flock performance or productivity resulting from the use of, or otherwise respecting, such information or management suggestions. In no event shall Hy-Line International be liable for any special, indirect or consequential damages or special damages whatsoever arising out of or in connection with the use of the information or management suggestions contained in this management guide.

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W-80 Alternative Systems
Online Management Guide

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Summary of Performance Standards

REARING PERIOD (TO 17 WEEKS):	
Livability	96.20%
Feed Consumed	5.78–5.99 kg
Body Weight at 17 Weeks	1212–1269 g
LAYING PERIOD (TO 100 WEEKS):	
Percent Peak	93.9–97.7%
Hen-Day Eggs to 60 Weeks Hen-Day Eggs to 100 Weeks	258.1–268.7 494.8–515.0
Hen-Housed Eggs to 60 Weeks Hen-Housed Eggs to 100 Weeks	248.8–258.9 465.3–484.3
Livability to 60 Weeks Livability to 80 Weeks Livability to 100 Weeks	95.08% 92.85% 90.01%
Days to 50% Production (from hatch)	142
Egg Weight at 26 Weeks Egg Weight at 32 Weeks Egg Weight at 70 Weeks Egg Weight at 100 Weeks	54.0–55.7 g 58.5–60.3 g 62.5–64.4 g 62.3–64.2 g
Total Egg Mass per Hen-Housed (19–80 weeks) Total Egg Mass per Hen-Housed (19–100 weeks)	23.2–23.9 kg 29.6–30.5 kg
Body Weight at 26 Weeks Body Weight at 32 Weeks Body Weight at 70 Weeks Body Weight at 100 Weeks	1495–1570 g 1573–1657 g 1641–1756 g 1675–1814 g
Freedom From Egg Inclusions	Excellent
Shell Strength	Excellent
Haugh Units at 38 Weeks Haugh Units at 56 Weeks Haugh Units at 70 Weeks Haugh Units at 100 Weeks	88.1 85.6 83.7 80.0
Average Daily Feed Consumption (19–100 weeks)	109.4–113.3 g/day per bird
Feed Conversion Rate, kg Feed/kg Eggs (20–60 weeks) Feed Conversion Rate, kg Feed/kg Eggs (20–100 weeks)	1.99–2.07 2.10–2.19
Feed Utilization, kg Egg/kg Feed (20–60 weeks) Feed Utilization, kg Egg/kg Feed (20–100 weeks)	0.48–0.50 0.46–0.48
Feed Consumption per Dozen Eggs (20–60 weeks) Feed Consumption per Dozen Eggs (20–100 weeks)	1.46–1.52 kg 1.50–1.56 kg
Condition of Droppings	Dry

Rearing Period Performance Table

AGE (weeks)	MORTALITY Cumulative (%)	BODY WEIGHT (g)		FEED INTAKE (g/bird/day)		WATER INTAKE (ml/bird/day)		CUMULATIVE FEED INTAKE (kg/bird to date)		UNIFORMITY %
		Low	High	Low	High	Low	High	Low	High	
1	1.00	67	75	16	16	24	25	0.11	0.11	
2	1.42	125	137	21	22	31	32	0.26	0.27	>85%
3	1.65	187	206	25	26	38	39	0.43	0.45	
4	1.81	256	280	29	30	44	45	0.64	0.66	
5	**1.95**	**331**	**361**	**35**	**36**	**52**	**54**	**0.88**	**0.91**	>80%
6	2.09	414	450	39	41	59	61	1.15	1.19	
7	2.26	504	546	44	45	65	68	1.46	1.51	
8	2.41	598	645	47	49	71	73	1.79	1.85	
9	2.55	692	744	51	52	76	79	2.14	2.22	
10	**2.68**	**783**	**840**	**54**	**56**	**81**	**84**	**2.52**	**2.61**	
11	2.80	867	927	57	59	85	88	2.92	3.02	>85%
12	2.96	942	1,004	60	62	90	93	3.34	3.46	
13	3.10	1,008	1,070	63	65	95	98	3.78	3.91	
14	3.27	1,066	1,127	66	69	100	103	4.25	4.40	
15	**3.41**	**1,116**	**1,177**	**70**	**72**	**105**	**108**	**4.73**	**4.90**	
16	3.57	1,164	1,223	73	76	110	114	5.25	5.43	
17	3.80	1,212	1,269	77	79	115	119	5.78	5.99	>90%

Rearing Period Space Recommendations

(check local regulations concerning space requirements)

- Useable space is calculated as litter floor and raised slat areas, not including nest space or perch space.
- If the veranda (winter porch) floor space is considered as useable space when calculating stocking density, then the birds must be able to always access this area.
- Rearing density depends on age of transfer to the laying facility. Use the approximation at right.

Week of Transfer	Birds/m² of Useable Space
15	15
16	14
17	13
18	12

	MULTI-TIER	FLOOR
Floor space	< 20 kg live weight per m² of useable space at 16 weeks when transferred to the laying facility. Adjust stocking density if birds are transferred at other ages.	< 20 kg live weight per m² floor space at end of rearing period
Feeder space	2.5 cm/bird with access on both sides; 5 cm/bird with side access; 2.0 cm/bird with circular feeders	2.5 cm/bird with access on both sides; 5 cm/bird with side access; 2.0 cm/bird with circular feeders
Drinking systems, cups or nipples	12.5 birds per nipple drinker; 20 birds per cup	12.5 birds per nipple drinker; 20 birds per cup; 125 birds per bell drinker
Perch space	10–15 cm/bird	10–15 cm/bird

Production Period Performance Table

AGE (weeks)	% HEN-DAY Current		HEN-DAY EGGS Cumulative		HEN-HOUSED EGGS Cumulative		MORT-ALITY Cumulative (%)	BODY WEIGHT (g)		FEED INTAKE (g/bird/day)		WATER INTAKE (ml/bird/day)		HH EGG MASS Cumulative (kg)		AVG. EGG WT. (g/egg)	
	Low	High	Low	High	Low	High		Low	High	Low	High	Low	High	Low	High	Low	High
18	0.1	0.2	0.0	0.0	0.0	0.0	0.04	1257	1316	81	83	121	125	0.00	0.00	39.6	40.8
19	6.2	6.4	0.4	0.5	0.4	0.5	0.25	1299	1360	84	87	126	130	0.02	0.02	42.3	43.5
20	**40.6**	**42.2**	**3.3**	**3.4**	**3.3**	**3.4**	**0.42**	**1336**	**1400**	**88**	**91**	**132**	**136**	**0.15**	**0.15**	**44.8**	**46.2**
21	69.3	72.2	8.1	8.5	8.1	8.4	0.60	1368	1435	91	95	137	142	0.39	0.40	46.7	48.1
22	78.8	82.0	13.6	14.2	13.6	14.1	0.78	1398	1467	94	98	141	146	0.67	0.69	48.4	49.9
23	84.0	87.4	19.5	20.3	19.4	20.2	0.98	1425	1496	97	100	145	150	0.99	1.02	50.0	51.5
24	87.1	90.6	25.6	26.7	25.4	26.4	1.18	1450	1523	99	102	148	153	1.33	1.38	51.5	53.0
25	**89.0**	**92.6**	**31.8**	**33.2**	**31.5**	**32.8**	**1.37**	**1474**	**1548**	**100**	**104**	**150**	**156**	**1.70**	**1.75**	**52.8**	**54.4**
26	90.3	94.0	38.2	39.7	37.8	39.3	1.56	1495	1570	102	105	153	158	2.08	2.15	54.0	55.7
27	91.5	95.3	44.6	46.4	44.1	45.9	1.74	1513	1590	103	107	154	160	2.48	2.55	55.1	56.8
28	92.3	96.1	51.0	53.1	50.4	52.5	1.92	1529	1608	104	108	156	162	2.88	2.97	56.0	57.7
29	92.7	96.5	57.5	59.9	56.8	59.1	2.10	1543	1623	105	109	157	163	3.29	3.39	56.8	58.5
30	**93.2**	**97.0**	**64.1**	**66.7**	**63.1**	**65.7**	**2.28**	**1554**	**1636**	**106**	**110**	**159**	**164**	**3.70**	**3.81**	**57.4**	**59.2**
31	93.6	97.4	70.6	73.5	69.5	72.4	2.46	1565	1647	107	110	160	166	4.12	4.24	58.0	59.8
32	93.7	97.5	77.2	80.3	75.9	79.0	2.63	1573	1657	108	112	162	167	4.53	4.67	58.5	60.3
33	93.8	97.6	83.7	87.2	82.3	85.7	2.80	1581	1665	108	112	163	168	4.95	5.10	58.9	60.7
34	93.8	97.7	90.3	94.0	88.7	92.3	2.97	1586	1672	109	113	164	169	5.37	5.53	59.3	61.1
35	**93.9**	**97.7**	**96.9**	**100.8**	**95.0**	**98.9**	**3.14**	**1591**	**1677**	**110**	**114**	**165**	**171**	**5.78**	**5.96**	**59.6**	**61.5**
36	93.8	97.6	103.4	107.7	101.4	105.5	3.30	1595	1682	110	114	166	171	6.20	6.39	59.9	61.8
37	93.7	97.5	110.0	114.5	107.7	112.1	3.46	1598	1686	111	115	166	172	6.61	6.82	60.2	62.0
38	93.6	97.4	116.5	121.3	114.0	118.7	3.61	1601	1690	111	115	167	173	7.03	7.24	60.4	62.2
39	93.4	97.3	123.1	128.1	120.3	125.2	3.75	1603	1693	111	115	167	173	7.44	7.67	60.6	62.4
40	**93.3**	**97.1**	**129.6**	**134.9**	**126.6**	**131.8**	**3.89**	**1605**	**1696**	**112**	**116**	**167**	**173**	**7.85**	**8.09**	**60.8**	**62.6**
41	93.2	97.0	136.1	141.7	132.9	138.3	4.02	1607	1699	112	116	168	174	8.26	8.51	60.9	62.8
42	93.1	96.8	142.7	148.5	139.1	144.8	4.15	1609	1702	112	116	168	174	8.67	8.94	61.1	63.0
43	92.9	96.7	149.2	155.3	145.3	151.3	4.26	1611	1704	112	116	168	174	9.08	9.36	61.2	63.1
44	92.8	96.5	155.7	162.0	151.5	157.7	4.37	1612	1706	112	116	168	174	9.49	9.78	61.4	63.2
45	**92.6**	**96.4**	**162.1**	**168.8**	**157.7**	**164.2**	**4.47**	**1613**	**1708**	**112**	**116**	**168**	**174**	**9.89**	**10.19**	**61.5**	**63.3**
46	92.5	96.2	168.6	175.5	163.9	170.6	4.60	1614	1710	112	116	168	174	10.30	10.61	61.6	63.5
47	92.3	96.1	175.1	182.2	170.1	177.0	4.68	1615	1712	112	116	168	174	10.70	11.03	61.7	63.6
48	92.2	96.0	181.5	188.9	176.2	183.4	4.76	1616	1714	112	116	168	174	11.10	11.44	61.7	63.6
49	92.1	95.8	188.0	195.6	182.3	189.8	4.84	1618	1716	112	116	168	174	11.50	11.85	61.8	63.7
50	**91.9**	**95.7**	**194.4**	**202.3**	**188.5**	**196.2**	**4.92**	**1619**	**1718**	**112**	**116**	**168**	**174**	**11.90**	**12.26**	**61.9**	**63.8**
51	91.8	95.5	200.8	209.0	194.6	202.5	4.99	1620	1719	112	116	168	174	12.30	12.67	61.9	63.8
52	91.6	95.4	207.2	215.7	200.7	208.9	5.07	1621	1721	112	116	168	174	12.69	13.08	62.0	63.9
53	91.5	95.2	213.6	222.4	206.7	215.2	5.15	1622	1723	112	116	168	174	13.09	13.49	62.0	63.9
54	91.3	95.0	220.0	229.0	212.8	221.5	5.24	1623	1725	112	116	168	174	13.48	13.89	62.1	64.0
55	**91.2**	**94.9**	**226.4**	**235.7**	**218.8**	**227.8**	**5.32**	**1624**	**1727**	**112**	**116**	**168**	**174**	**13.88**	**14.30**	**62.1**	**64.0**
56	91.0	94.7	232.8	242.3	224.9	234.0	5.41	1625	1729	112	116	168	174	14.27	14.70	62.2	64.1
57	90.8	94.5	239.1	248.9	230.9	240.3	5.50	1627	1731	112	116	168	173	14.66	15.11	62.2	64.1
58	90.7	94.4	245.5	255.5	236.9	246.5	5.60	1628	1733	112	116	168	173	15.05	15.51	62.3	64.2

Production Period Performance Table (cont.)

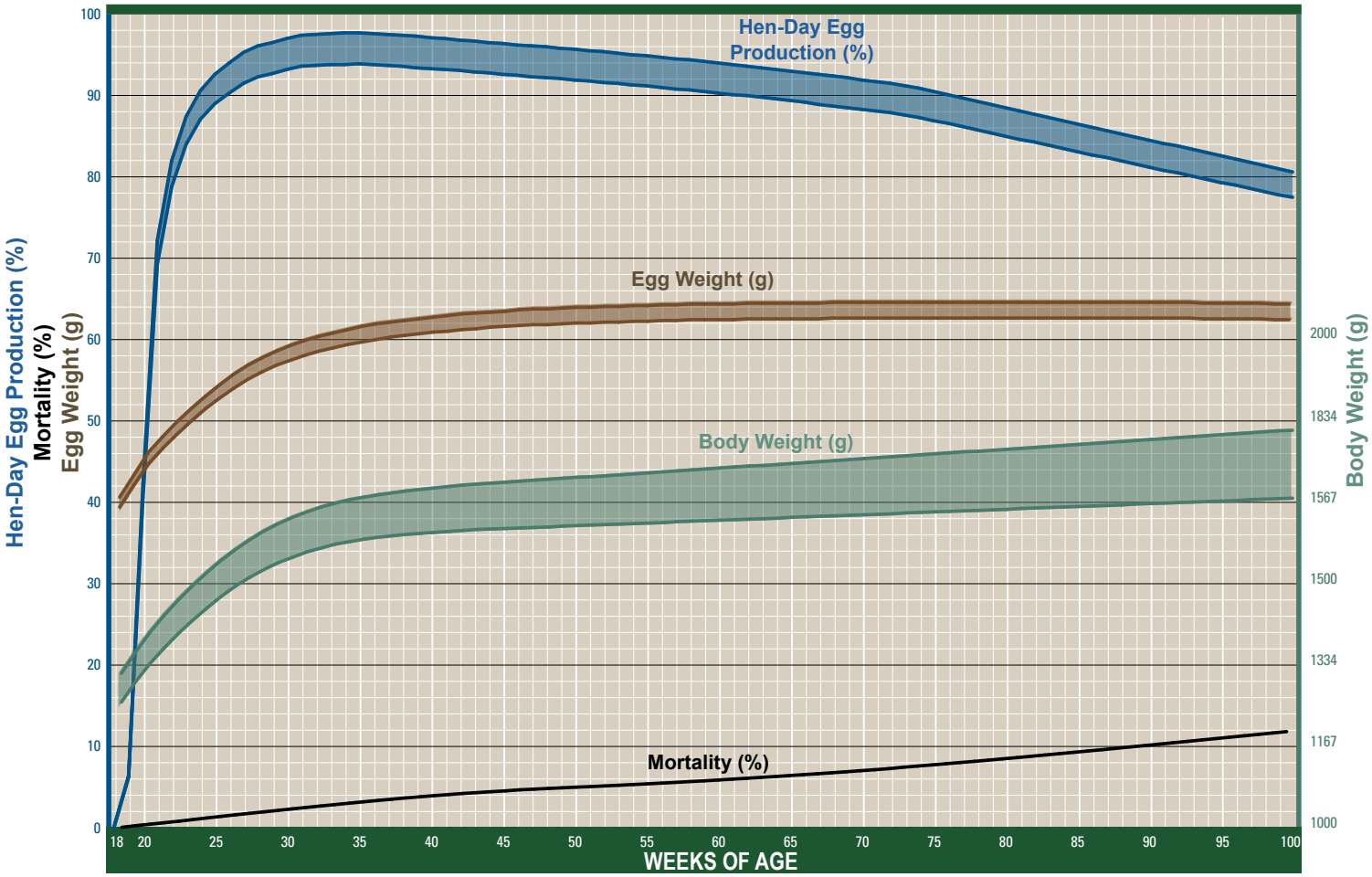
AGE (weeks)	% HEN-DAY Current		HEN-DAY EGGS Cumulative		HEN-HOUSED EGGS Cumulative		MORT-ALITY Cumulative (%)	BODY WEIGHT (g)		FEED INTAKE (g/bird/day)		WATER INTAKE (ml/bird/day)		HH EGG MASS Cumulative (kg)		AVG. EGG WT. (g/egg)	
	Low	High	Low	High	Low	High		Low	High	Low	High	Low	High	Low	High	Low	High
59	90.5	94.2	251.8	262.1	242.8	252.7	5.69	1629	1735	112	116	168	173	15.44	15.91	62.3	64.2
60	**90.3**	**94.0**	**258.1**	**268.7**	**248.8**	**258.9**	**5.79**	**1630**	**1737**	**112**	**116**	**168**	**173**	**15.82**	**16.30**	**62.3**	**64.2**
61	90.1	93.8	264.5	275.3	254.7	265.1	5.90	1631	1739	112	116	168	173	16.21	16.70	62.3	64.2
62	90.0	93.6	270.8	281.8	260.6	271.3	6.00	1632	1741	112	116	168	173	16.59	17.09	62.4	64.3
63	89.8	93.4	277.0	288.4	266.5	277.4	6.11	1633	1742	112	116	168	173	16.97	17.49	62.4	64.3
64	89.6	93.2	283.3	294.9	272.4	283.5	6.21	1634	1744	112	116	168	173	17.35	17.88	62.4	64.3
65	**89.4**	**93.0**	**289.6**	**301.4**	**278.3**	**289.6**	**6.33**	**1636**	**1746**	**112**	**116**	**168**	**173**	**17.73**	**18.27**	**62.4**	**64.3**
66	89.2	92.8	295.8	307.9	284.1	295.7	6.44	1637	1748	112	116	168	173	18.10	18.65	62.4	64.3
67	88.9	92.6	302.0	314.4	289.9	301.8	6.55	1638	1750	112	116	168	173	18.48	19.04	62.4	64.3
68	88.7	92.4	308.2	320.8	295.7	307.8	6.67	1639	1752	112	116	168	173	18.85	19.42	62.5	64.4
69	88.5	92.2	314.4	327.3	301.5	313.8	6.79	1640	1754	112	116	168	173	19.22	19.80	62.5	64.4
70	**88.3**	**91.9**	**320.6**	**333.7**	**307.3**	**319.8**	**6.92**	**1641**	**1756**	**112**	**116**	**168**	**173**	**19.59**	**20.18**	**62.5**	**64.4**
71	88.1	91.7	326.8	340.1	313.0	325.8	7.04	1642	1758	112	116	168	173	19.96	20.56	62.5	64.4
72	87.9	91.5	332.9	346.5	318.7	331.7	7.17	1643	1760	112	116	168	173	20.32	20.94	62.5	64.4
73	87.6	91.2	339.1	352.9	324.4	337.6	7.34	1645	1762	112	116	168	173	20.69	21.32	62.5	64.4
74	87.3	90.9	345.2	359.3	330.1	343.5	7.48	1646	1764	112	116	168	173	21.05	21.69	62.5	64.4
75	**86.9**	**90.5**	**351.3**	**365.6**	**335.7**	**349.4**	**7.62**	**1647**	**1766**	**112**	**116**	**168**	**173**	**21.41**	**22.06**	**62.5**	**64.4**
76	86.6	90.1	357.3	371.9	341.3	355.2	7.76	1648	1768	112	116	168	173	21.76	22.43	62.5	64.4
77	86.2	89.7	363.4	378.2	346.8	361.0	7.91	1649	1770	112	116	168	173	22.12	22.79	62.5	64.4
78	85.8	89.3	369.4	384.5	352.3	366.7	8.05	1650	1771	112	116	168	173	22.47	23.15	62.5	64.4
79	85.4	88.9	375.3	390.7	357.8	372.4	8.20	1651	1773	112	116	168	173	22.82	23.52	62.5	64.4
80	**85.0**	**88.5**	**381.3**	**396.9**	**363.3**	**378.1**	**8.36**	**1652**	**1775**	**112**	**116**	**168**	**173**	**23.17**	**23.87**	**62.5**	**64.4**
81	84.6	88.1	387.2	403.0	368.7	383.8	8.51	1654	1777	112	116	168	173	23.52	24.23	62.5	64.4
82	84.3	87.7	393.1	409.2	374.1	389.4	8.67	1655	1779	112	116	168	173	23.86	24.59	62.5	64.4
83	83.9	87.3	399.0	415.3	379.4	394.9	8.83	1656	1781	112	116	168	173	24.20	24.94	62.5	64.4
84	83.5	86.9	404.8	421.4	384.8	400.5	8.99	1657	1783	112	116	168	173	24.54	25.29	62.5	64.4
85	**83.1**	**86.5**	**410.7**	**427.4**	**390.0**	**406.0**	**9.15**	**1658**	**1785**	**112**	**116**	**167**	**173**	**24.88**	**25.64**	**62.5**	**64.4**
86	82.7	86.1	416.4	433.4	395.3	411.4	9.31	1659	1787	112	116	167	173	25.21	25.98	62.5	64.4
87	82.4	85.7	422.2	439.5	400.5	416.9	9.47	1660	1789	112	116	167	173	25.54	26.32	62.5	64.4
88	82.0	85.3	427.9	445.4	405.7	422.3	9.64	1661	1791	112	116	167	173	25.87	26.66	62.5	64.4
89	81.6	84.9	433.7	451.4	410.9	427.6	9.81	1663	1793	112	116	167	173	26.20	27.00	62.5	64.4
90	**81.2**	**84.5**	**439.3**	**457.3**	**416.0**	**433.0**	**9.97**	**1664**	**1795**	**112**	**116**	**167**	**173**	**26.52**	**27.33**	**62.5**	**64.4**
91	80.8	84.1	445.0	463.2	421.1	438.2	10.14	1665	1797	112	116	167	173	26.84	27.66	62.5	64.4
92	80.5	83.8	450.6	469.0	426.1	443.5	10.31	1666	1799	112	116	167	173	27.16	27.99	62.5	64.4
93	80.1	83.4	456.2	474.9	431.1	448.7	10.48	1667	1801	112	116	167	173	27.48	28.31	62.5	64.4
94	79.7	83.0	461.8	480.7	436.1	453.9	10.65	1668	1803	112	116	167	173	27.79	28.63	62.4	64.3
95	**79.3**	**82.6**	**467.4**	**486.5**	**441.1**	**459.1**	**10.82**	**1669**	**1805**	**112**	**116**	**167**	**173**	**28.10**	**28.95**	**62.4**	**64.3**
96	79.0	82.2	472.9	492.2	446.0	464.2	10.99	1670	1807	112	116	167	173	28.40	29.27	62.4	64.3
97	78.6	81.8	478.4	497.9	450.9	469.3	11.16	1672	1809	112	116	167	173	28.70	29.58	62.4	64.3
98	78.2	81.4	483.9	503.6	455.7	474.3	11.33	1673	1811	112	116	167	173	29.00	29.89	62.4	64.3
99	77.8	81.0	489.3	509.3	460.5	479.4	11.50	1674	1813	112	116	167	173	29.30	30.19	62.3	64.2
100	**77.5**	**80.6**	**494.8**	**515.0**	**465.3**	**484.3**	**11.67**	**1675**	**1814**	**112**	**116**	**167**	**173**	**29.59**	**30.49**	**62.3**	**64.2**

Production Period Space Recommendations

check local regulations concerning space requirements)

Floor	7–9 birds/m^2 of useable space. Higher stocking densities can be used in aviary systems. Consult equipment manufacturers.
Feeders	5cm/bird (with access on both sides); 10 cm/bird (with access on one side); 4 cm/bird with circular feeders
Drinkers	Nipples/cups: 1 per 10 birds; circular drinkers: 1 cm/bird; linear drinker: 2.5 cm per bird
Perches	10–15 cm/bird
Nests	5 birds/nest or 120 birds per m^2 in colony nests

Performance Graph



Egg Quality and Egg Size Distribution

AGE (weeks)	HAUGH UNITS	BREAKING STRENGTH
20	**90.6**	**4490**
22	90.3	4480
24	90.1	4470
26	89.8	4450
28	89.5	4430
30	**89.2**	**4410**
32	89.0	4390
34	88.7	4360
36	88.4	4340
38	88.1	4330
40	**87.8**	**4320**
42	87.6	4310
44	87.3	4300
46	87.0	4290
48	86.7	4280
50	**86.5**	**4270**
52	86.2	4260
54	85.9	4250
56	85.6	4240
58	85.4	4230
60	**85.1**	**4220**
62	84.8	4210
64	84.5	4200
66	84.3	4190
68	84.0	4170
70	**83.7**	**4150**
72	83.4	4130
74	83.2	4110
76	82.9	4090
78	82.6	4070
80	**82.3**	**4050**
82	82.1	4030
84	81.8	4010
86	81.5	4000
88	81.2	3980
90	**81.0**	**3960**
92	80.8	3950
94	80.6	3940
96	80.4	3930
98	80.2	3920
100	**80.0**	**3910**

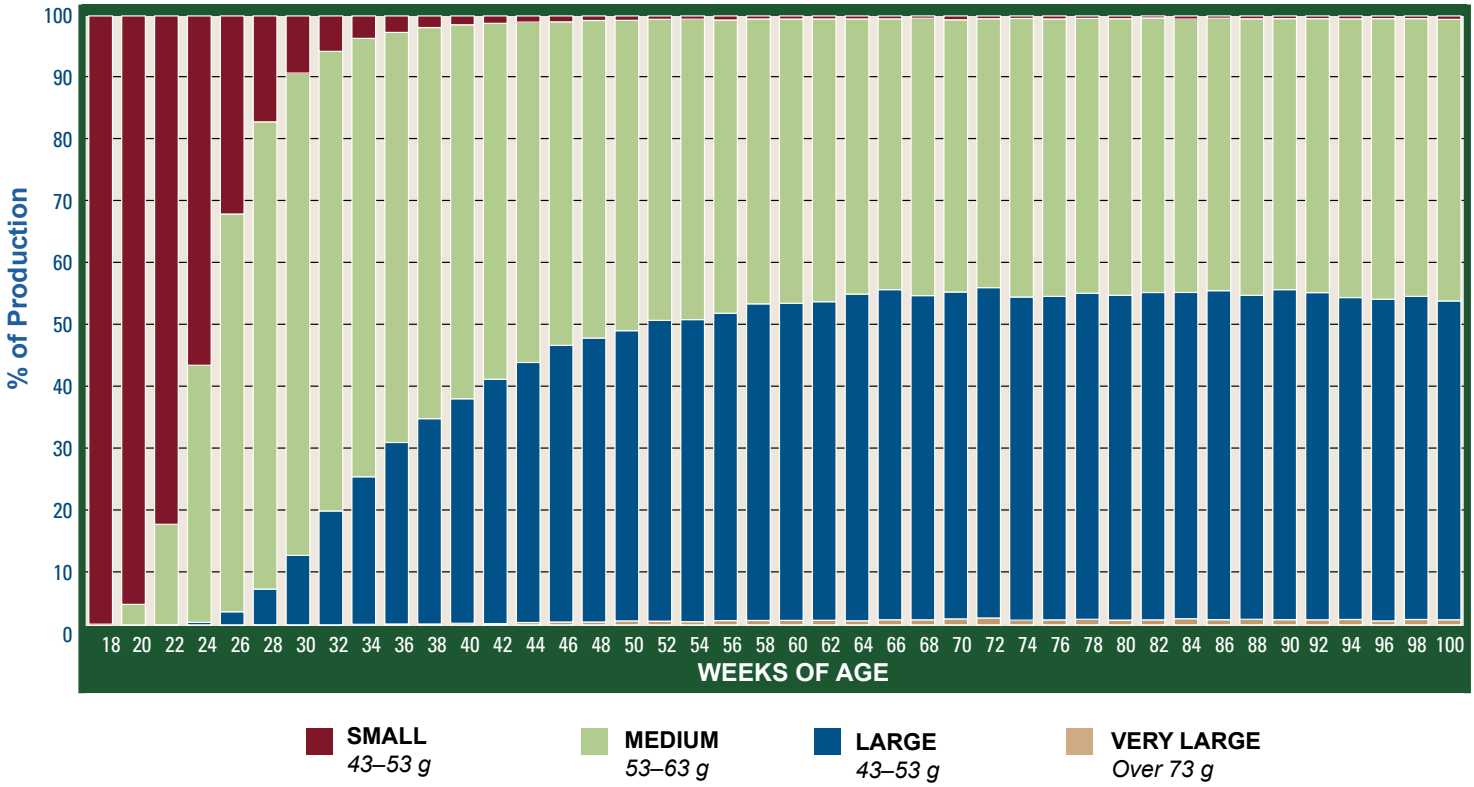
E.U. Standards–Weekly*

AGE (weeks)	AVG. EGG WEIGHT (g)	% SMALL 43–53 g	% MEDIUM 53–63 g	% LARGE 63–73 g	% VERY LARGE Over 73 g
18	40.2	99.89	0.11	0.00	0.00
20	**45.5**	**96.64**	**3.36**	**0.00**	**0.00**
22	49.2	83.49	16.47	0.04	0.00
24	52.3	57.37	42.22	0.41	0.00
26	54.9	32.53	65.32	2.15	0.00
28	56.8	17.39	76.74	5.85	0.02
30	**58.3**	**9.39**	**79.20**	**11.40**	**0.01**
32	59.4	5.82	75.48	18.69	0.01
34	60.2	3.69	71.99	24.23	0.09
36	60.8	2.71	67.34	29.81	0.14
38	61.3	1.91	64.23	33.72	0.14
40	**61.7**	**1.45**	**61.42**	**36.87**	**0.26**
42	62.0	1.22	58.45	40.13	0.20
44	62.3	1.02	55.89	42.71	0.38
46	62.5	0.97	53.13	45.43	0.47
48	62.7	0.75	52.15	46.63	0.47
50	**62.8**	**0.73**	**50.96**	**47.66**	**0.65**
52	62.9	0.56	49.44	49.40	0.60
54	63.0	0.54	49.33	49.61	0.52
56	63.1	0.67	48.16	50.47	0.70
58	63.2	0.50	46.78	52.00	0.72
60	**63.3**	**0.51**	**46.68**	**52.08**	**0.73**
62	63.3	0.50	46.43	52.32	0.75
64	63.4	0.50	45.18	53.65	0.67
66	63.4	0.48	44.47	54.21	0.84
68	63.4	0.38	45.55	53.24	0.83
70	**63.4**	**0.63**	**44.71**	**53.68**	**0.98**
72	63.4	0.46	44.16	54.25	1.13
74	63.4	0.42	45.74	53.07	0.77
76	63.4	0.50	45.56	53.12	0.82
78	63.5	0.41	45.14	53.54	0.91
80	**63.5**	**0.46**	**45.41**	**53.35**	**0.78**
82	63.5	0.33	45.09	53.76	0.82
84	63.5	0.52	44.89	53.58	1.01
86	63.5	0.38	44.74	54.03	0.85
88	63.4	0.47	45.41	53.21	0.91
90	**63.4**	**0.45**	**44.50**	**54.20**	**0.85**
92	63.4	0.45	44.99	53.73	0.83
94	63.4	0.48	45.77	52.87	0.88
96	63.4	0.45	46.07	52.83	0.65
98	63.3	0.45	45.61	53.06	0.88
100	**63.3**	**0.57**	**46.24**	**52.35**	**0.84**

** Distribution of egg sizes based on weekly (not cumulative) average egg weights.*

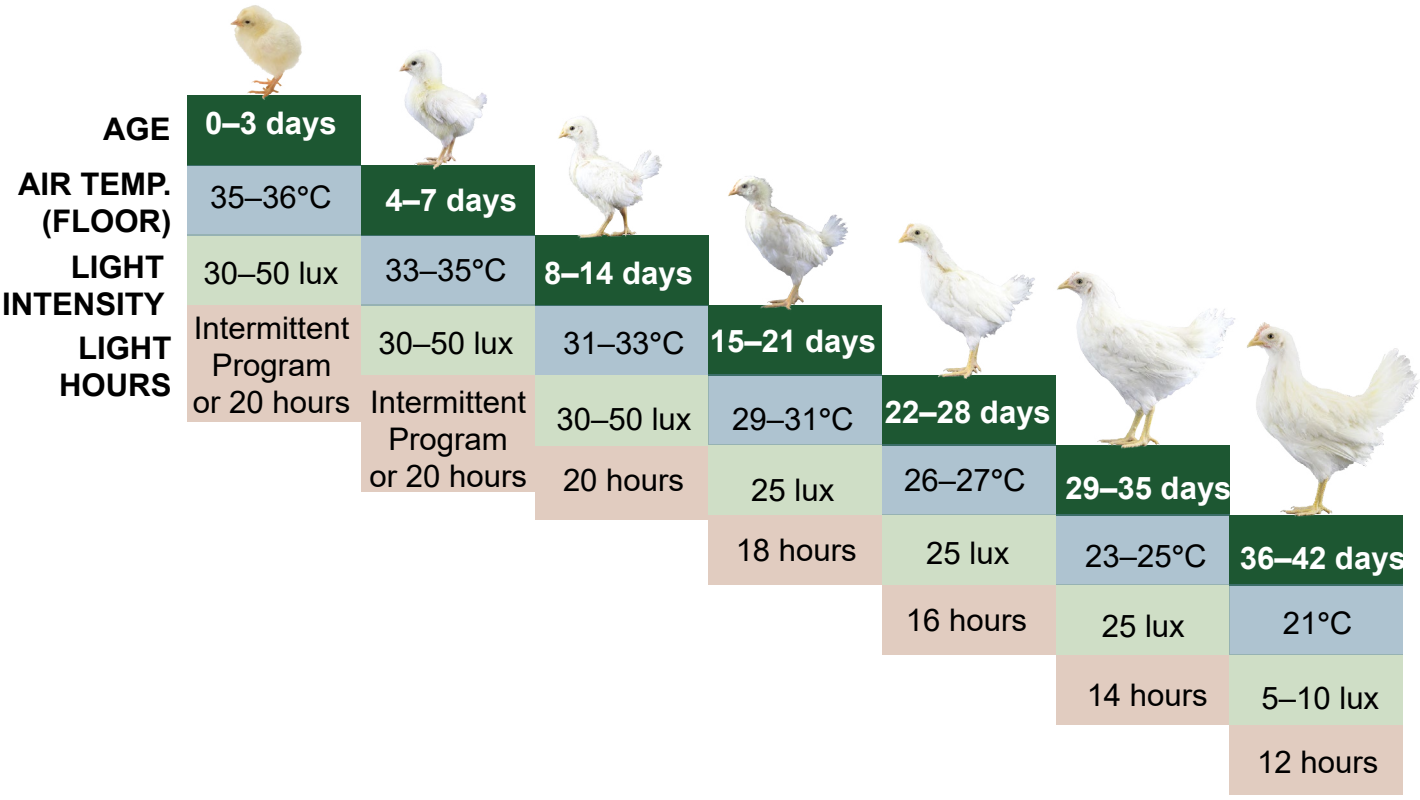
Egg Size Distribution (cont.)

E.U. Standards–Weekly*

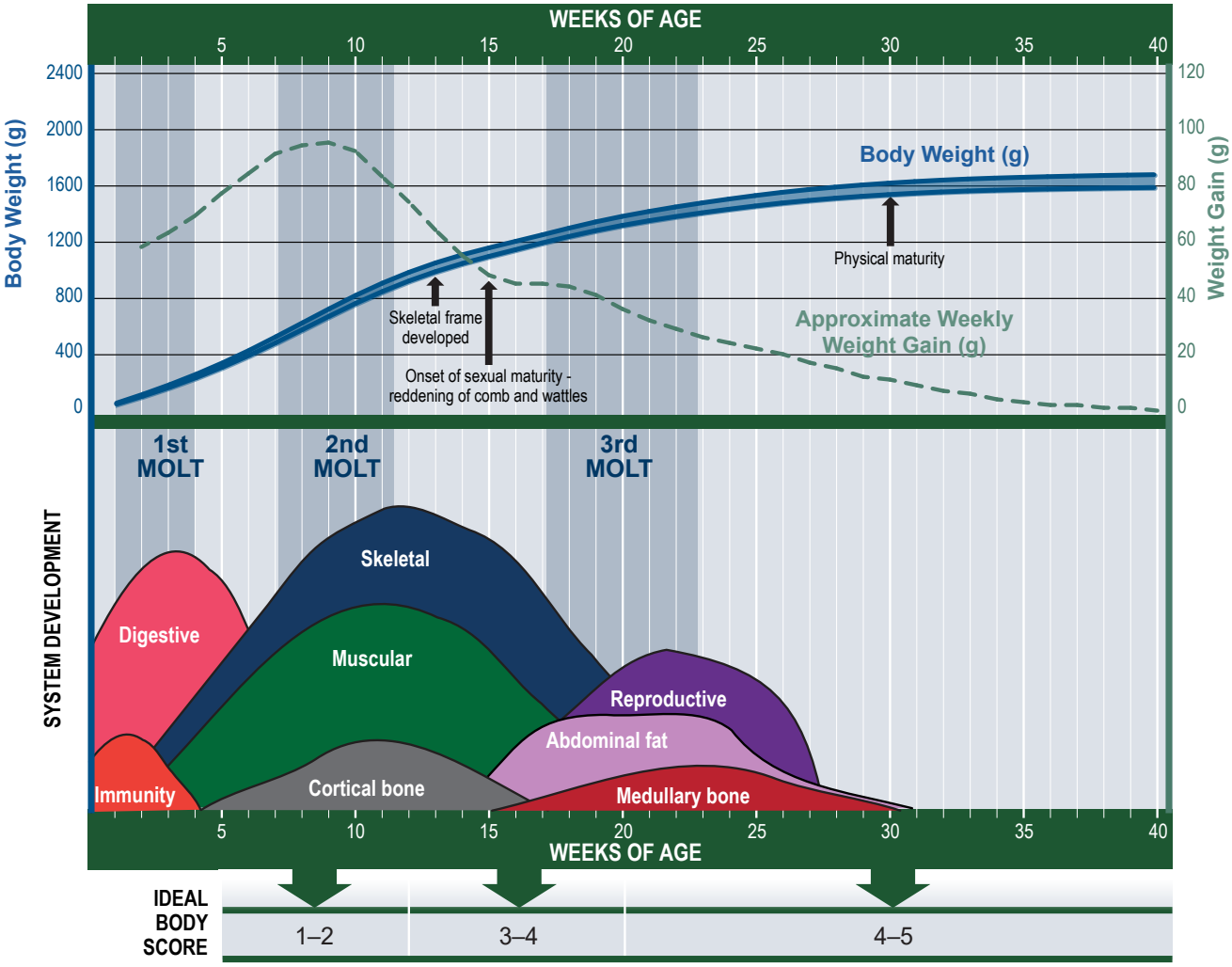


** Distribution of egg sizes based on weekly (not cumulative) average egg weights.*

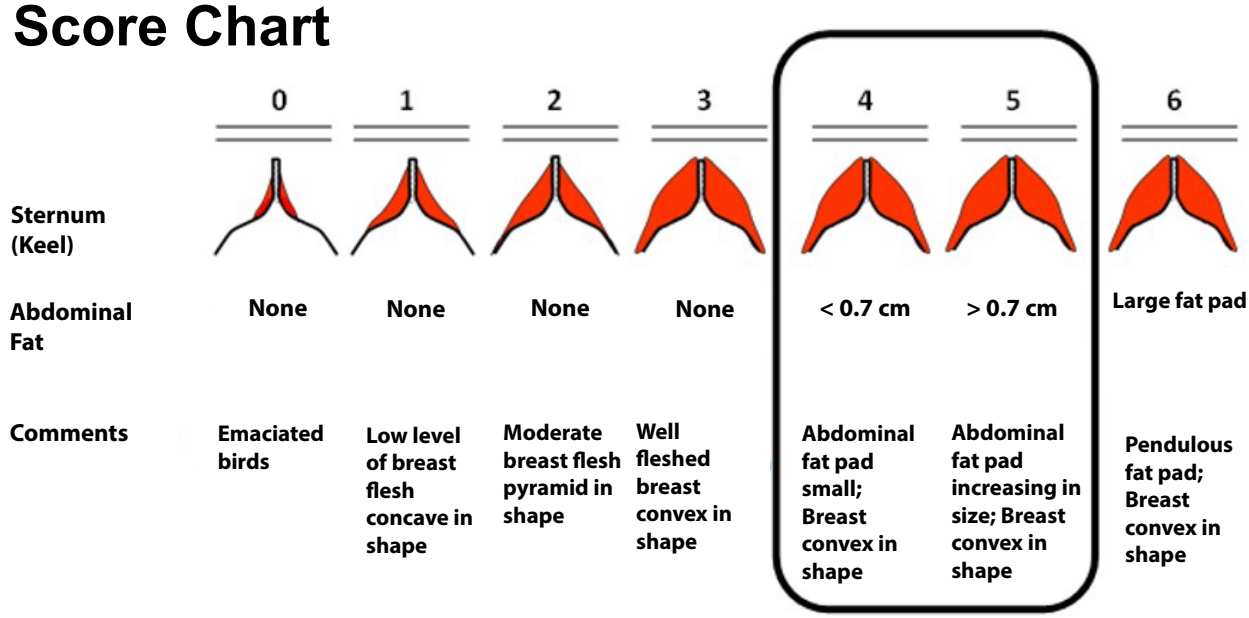
Brooding Temperature and Lighting Recommendations



Development of the Organ Systems in Pullets

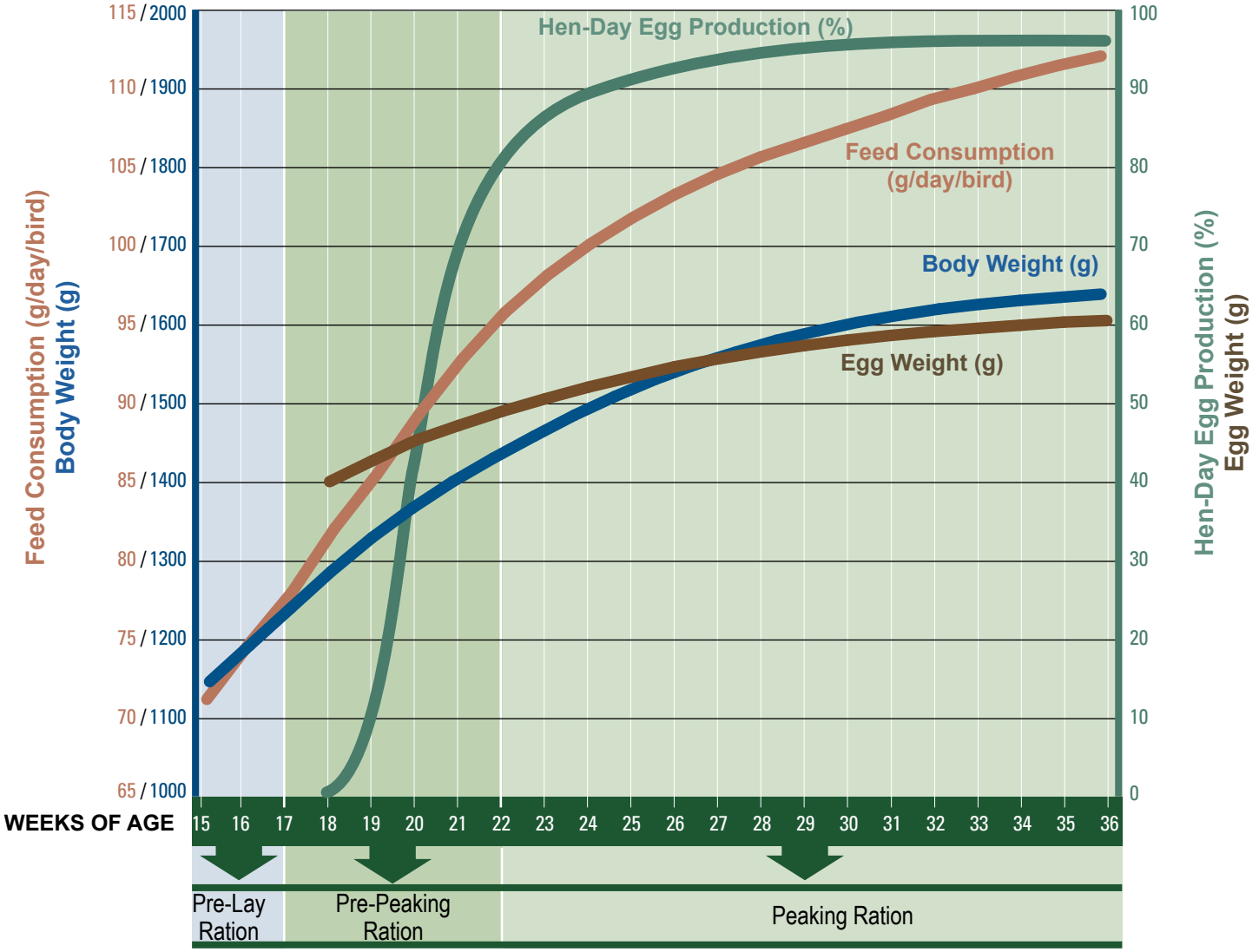


Body Score Chart



Transition Period from Rear to Peak Egg Production

Frequently formulate to changing feed consumption during transition period until feed consumption is consistent.

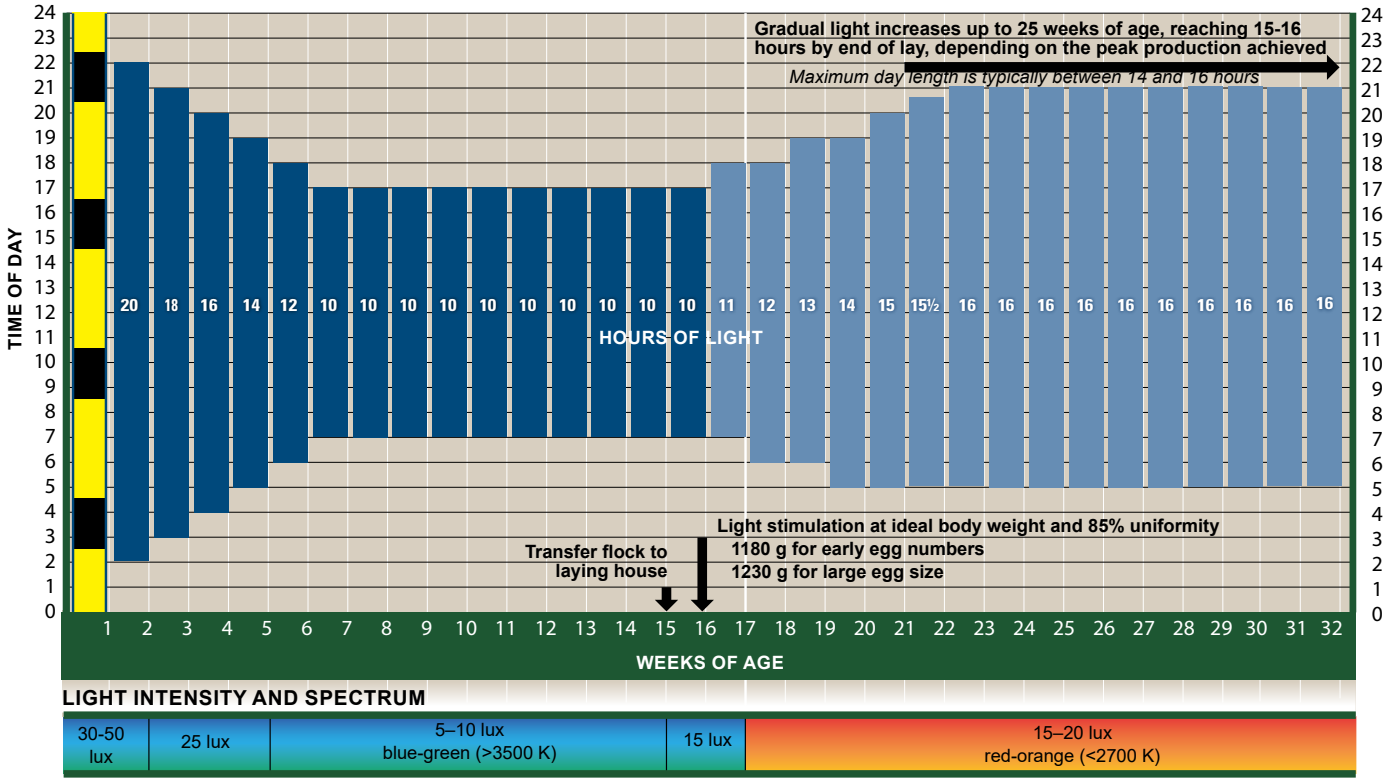


Pre-Peak

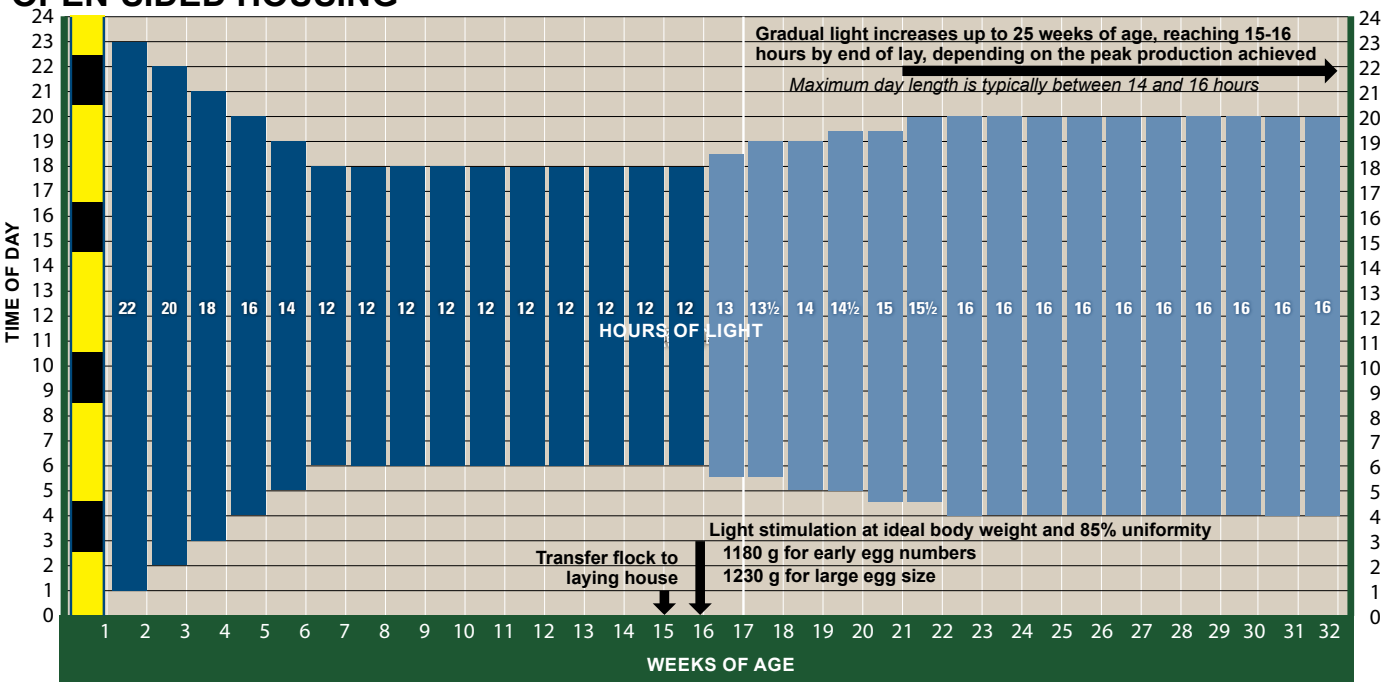
- Pre-Peak diets are intended for flocks with low feed intake and are fed for a limited period from first egg to the beginning of peak production. The nutrient specification of the Pre-Peak diet should be dense enough to allow for lower feed intake and also cater to the increased nutritional needs of the bird entering egg production. Continue to feed the Pre-Peak until feed intake has developed sufficiently to allow transition to the Peak diet.
- If utilised until no more than 50–70% HD, a Pre-Peak diet with reduced energy concentration can be beneficial to stimulate feed intake. Pre-Peaking diets are useful in situations where local conditions may result in reduced feed intake, such as hot climates where feed intake may be depressed.
- Increasing the vitamins and trace mineral inclusion to 30% can be useful to cope with the lower feed intake during the Pre-Peak phase.

Light Programs

LIGHT-CONTROLLED HOUSING

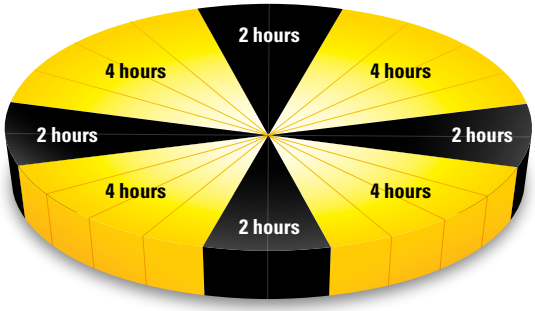


OPEN-SIDED HOUSING

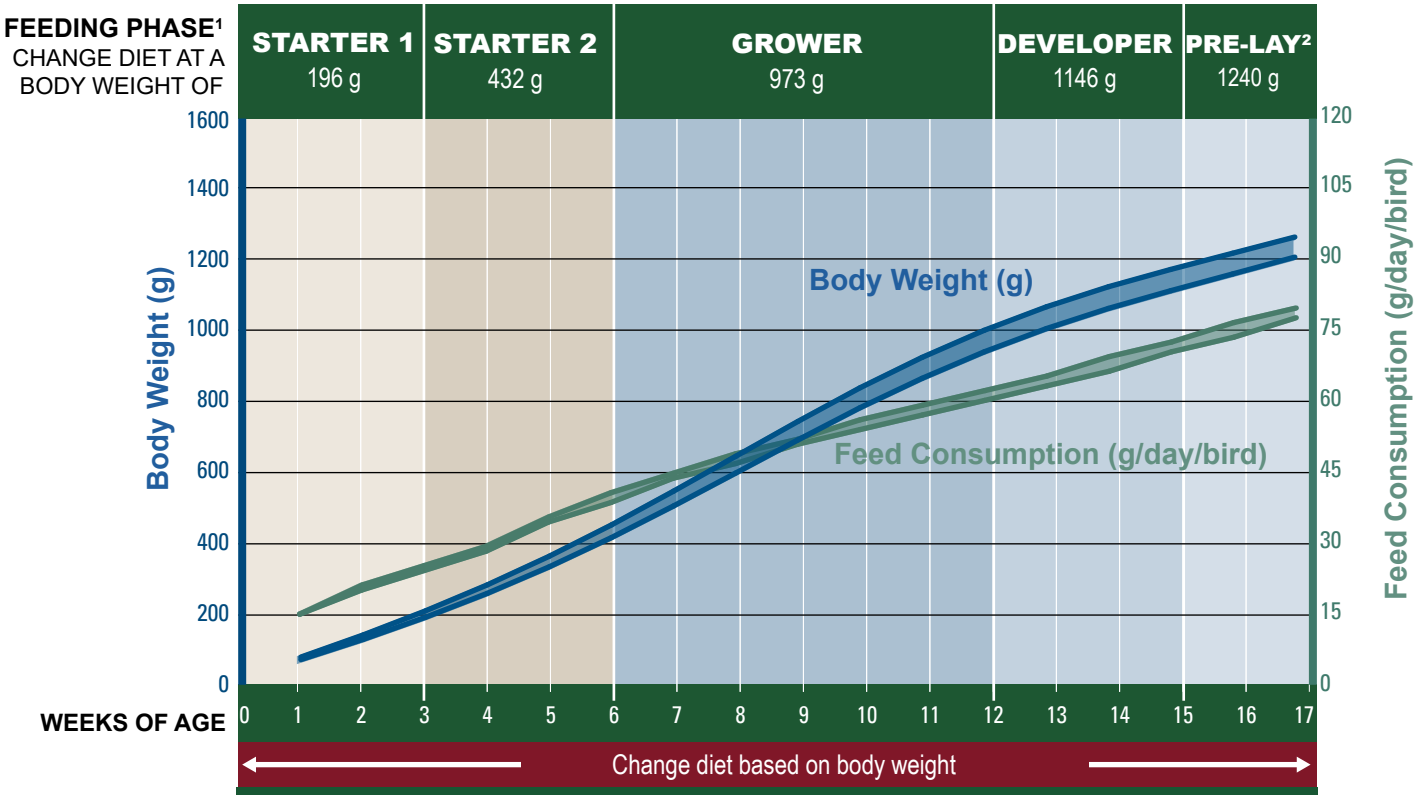


Intermittent Lighting Program for Chicks

- Preferred lighting technique.
- Use from 0–7 days (can be used up to 14 days of age).
- Intermittent dark periods provide rest periods for chicks.
- Synchronises chicks' activities and feedings.
- Establishes more natural behaviour of rest and activity.
- May improve 7-day livability and pullet body weight.
- Some dark periods may be shortened or removed to accommodate work schedules.



Rearing Period Nutritional Recommendations



NUTRITION	RECOMMENDED NUTRIENT CONCENTRATION				
Metabolizable energy[3], kcal/kg	2900 / 3100	2850 / 3050	2700 / 2900	2600 / 2800	2650 / 2850
Metabolizable energy[3], MJ/kg	12.13 / 12.97	11.92 / 12.76	11.30 / 12.13	10.88 / 11.72	11.09 / 11.92
	Standardized Ileal Digestible Amino Acids / Total Amino Acids[4]				
Lysine, %	1.10 / 1.20	0.95 / 1.04	0.83 / 0.91	0.70 / 0.76	0.73 / 0.80
Methionine, %	0.55 / 0.60	0.47 / 0.50	0.40 / 0.44	0.33 / 0.35	0.37 / 0.39
Methionine+Cystine,%	0.99 / 1.11	0.84 / 0.94	0.71 / 0.80	0.59 / 0.67	0.66 / 0.74
Threonine, %	0.78 / 0.93	0.67 / 0.78	0.57 / 0.67	0.47 / 0.56	0.53 / 0.61
Tryptophan, %	0.22 / 0.26	0.19 / 0.22	0.17 / 0.20	0.14 / 0.17	0.16 / 0.20
Arginine, %	1.14 / 1.24	0.99 / 1.06	0.86 / 0.93	0.73 / 0.78	0.76 / 0.82
Isoleucine, %	0.84 / 0.89	0.72 / 0.77	0.62 / 0.67	0.52 / 0.55	0.58 / 0.62
Valine, %	0.96 / 1.05	0.82 / 0.90	0.71 / 0.78	0.59 / 0.65	0.64 / 0.70
Crude protein[5], %	20.37	18.27	16.94	15.00	15.87
Calcium[6], %	1.05	1.00	0.95	0.90	2.50
Phosphorus (available)[7], %	0.48	0.47	0.45	0.40	0.43
Phosphorus (digestible), %	0.44	0.43	0.41	0.35	0.38
Sodium, %	0.20	0.19	0.18	0.17	0.18
Chloride, %	0.20	0.19	0.18	0.17	0.18
Linoleic acid (C18:2 n-6), %	1.20	1.20	1.20	1.20	1.20
Choline, mg/kg	2,000	1,800	1,800	1,500	1,500

[1] Body weights are approximate. Ages shown are a guide only. Please note that at time of transfer, there will be some loss in body weight (normally 10–12%) due to reduced water intake. Ration changes through rear must be based on body weight rather than age.

[2] Do not feed Pre-Lay Diet earlier than 15 weeks of age. Do not feed Pre-Lay later than first egg as it contains insufficient calcium to support egg production. Implementing a pre-lay diet can be challenging in mixed-age flocks. If it's not possible to use the Pre-Lay diet, the calcium content of the last stage rearing diet (developer) must be increased to 1.4%.

[3] Recommended energy range is based on raw material energy values shown in feed ingredient table at back of this guide. It is important that target concentrations of dietary energy are adjusted according to energy system applied to raw material matrix.

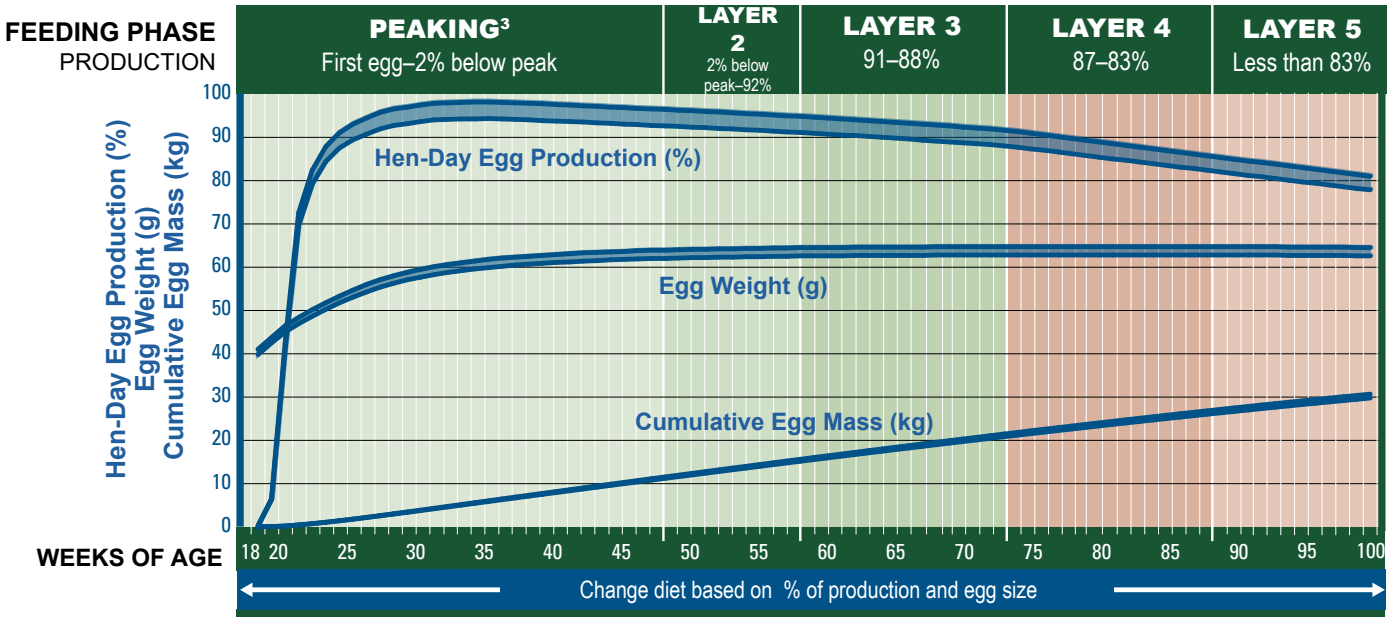
[4] Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilise other ingredients, recommendations for Standardised Ileal Digestible Amino Acids must be followed.

[5] Diets should always be formulated to provide required intake of amino acid. Concentration of crude protein in diet will vary with raw material used. Crude protein value provided is an estimated typical value only.

[6] Calcium should be supplied as fine calcium carbonate (mean particle size less than 2 mm). Coarse limestone (2–4 mm) can be introduced in Pre-Lay Diet at up to 50% of total limestone. Introduction of up to 50% coarse limestone of the pre-lay diet can help familiarize the bird to a coarser form of limestone and help support positive behaviour.

[7] Where other phosphorus systems are used, diets should contain recommended minimum level of available phosphorus.

Production Period Nutritional Recommendations for Egg Numbers[1,2]



NUTRITION	RECOMMENDED DAILY NUTRIENT INTAKE				
Metabolizable energy[4], kcal/bird/day	310 / 325	310 / 325	307 / 322	302 / 317	295 / 310
Metabolizable energy[4], MJ/bird/day	1.30 / 1.36	1.30 / 1.36	1.28 / 1.35	1.26 / 1.33	1.23 / 1.30
	Standardized Ileal Digestible Amino Acids / Total Amino Acids[5]				
Lysine, mg/day	850 / 931	850 / 931	845 / 925	825 / 903	800 / 876
Methionine, mg/day	425 / 457	425 / 457	423 / 454	413 / 444	400 / 430
Methionine+Cystine, mg/day	765 / 863	757 / 853	735 / 829	718 / 809	696 / 785
Threonine, mg/day	621 / 730	621 / 730	617 / 726	602 / 709	584 / 687
Tryptophan, mg/day	187 / 224	187 / 224	186 / 222	182 / 217	176 / 210
Arginine, mg/day	884 / 951	884 / 951	879 / 945	858 / 923	832 / 895
Isoleucine, mg/day	680 / 731	680 / 731	676 / 727	660 / 710	640 / 688
Valine, mg/day	748 / 825	748 / 825	744 / 820	726 / 801	704 / 776
Crude protein[6], g/day	18.00	18.00	17.80	17.50	17.00
Sodium, mg/day	180	170	170	170	170
Chloride, mg/day	180	170	170	170	170
Linoleic acid (C18:2 n-6), g/day	2.00	2.00	1.60	1.50	1.40
Choline, mg/day	180	180	180	180	180

	CALCIUM AND PHOSPHORUS			
	Calcium[7,8] g/day	Phosphorus (available)[7,9] mg/day	Phosphorus (digestible) mg/day	Calcium Particle Size (fine : coarse)
Weeks 18–32	4.00	447	401	40% : 60%
Weeks 33–55	4.15	421	381	35% : 65%
Weeks 56–72	4.30	395	356	30% : 70%
Weeks 73–85	4.45	369	334	25% : 75%
Weeks 86+	4.60	344	309	25% : 75%

	IDEAL PROTEIN REFERENCE				
	PEAKING	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Lysine	100%	100%	100%	100%	100%
Methionine	50%	50%	50%	50%	50%
M+C	90%	89%	87%	87%	87%
Threonine	73%	73%	73%	73%	73%
Tryptophan	22%	22%	22%	22%	22%
Arginine	104%	104%	104%	104%	104%
Isoleucine	80%	80%	80%	80%	80%
Valine	88%	88%	88%	88%	88%

Production Period Dietary Nutrient Concentrations for Egg Numbers[1,2]

FEEDING PHASE / PRODUCTION	PEAKING[3] First egg until production drops 2% below peak					LAYER 2 2% below peak to 92%					LAYER 3 91–88%					LAYER 4 87–83%					LAYER 5 Less than 83%				
NUTRITION	**RECOMMENDED CONCENTRATION**																								
Metabolizable energy[4], kcal/bird/day	310 / 325					310 / 325					307 / 322					302 / 317					295 / 310				
Metabolizable energy[4], MJ/bird/day	1.30 / 1.36					1.30 / 1.36					1.28 / 1.35					1.26 / 1.33					1.23 / 1.30				
	FEED CONSUMPTION (*Typical Feed Consumption)																								
g/day per bird	85	90	**95**	100	105	90	95	**100**	105	110	100	106	**112**	118	124	100	106	**112**	118	124	100	106	**112**	118	124
	Standardized Ileal Digestible Amino Acids																								
Lysine, %	1.00	0.94	**0.89**	0.85	0.81	0.94	0.89	**0.85**	0.81	0.77	0.85	0.80	**0.75**	0.72	0.68	0.83	0.78	**0.74**	0.70	0.67	0.80	0.75	**0.71**	0.68	0.65
Methionine, %	0.50	0.47	**0.45**	0.43	0.40	0.47	0.45	**0.43**	0.40	0.39	0.42	0.40	**0.38**	0.36	0.34	0.41	0.39	**0.37**	0.35	0.33	0.40	0.38	**0.36**	0.34	0.32
Methionine+Cystine,%	0.90	0.85	**0.81**	0.77	0.73	0.84	0.80	**0.76**	0.72	0.69	0.74	0.69	**0.66**	0.62	0.59	0.72	0.68	**0.64**	0.61	0.58	0.70	0.66	**0.62**	0.59	0.56
Threonine, %	0.73	0.69	**0.65**	0.62	0.59	0.69	0.65	**0.62**	0.59	0.56	0.62	0.58	**0.55**	0.52	0.50	0.60	0.57	**0.54**	0.51	0.49	0.58	0.55	**0.52**	0.49	0.47
Tryptophan, %	0.22	0.21	**0.20**	0.19	0.18	0.21	0.20	**0.19**	0.18	0.17	0.19	0.18	**0.17**	0.16	0.15	0.18	0.17	**0.16**	0.15	0.15	0.18	0.17	**0.16**	0.15	0.14
Arginine, %	1.04	0.98	**0.93**	0.88	0.84	0.98	0.93	**0.88**	0.84	0.80	0.88	0.83	**0.78**	0.74	0.71	0.86	0.81	**0.77**	0.73	0.69	0.83	0.78	**0.74**	0.71	0.67
Isoleucine, %	0.80	0.76	**0.72**	0.68	0.65	0.76	0.72	**0.68**	0.65	0.62	0.68	0.64	**0.60**	0.57	0.55	0.66	0.62	**0.59**	0.56	0.53	0.64	0.60	**0.57**	0.54	0.52
Valine, %	0.88	0.83	**0.79**	0.75	0.71	0.83	0.79	**0.75**	0.71	0.68	0.74	0.70	**0.66**	0.63	0.60	0.73	0.68	**0.65**	0.62	0.59	0.70	0.66	**0.63**	0.60	0.57
	Total Amino Acids[5]																								
Lysine, %	1.10	1.03	**0.98**	0.93	0.89	1.03	0.98	**0.93**	0.89	0.85	0.93	0.87	**0.83**	0.78	0.75	0.90	0.85	**0.81**	0.77	0.73	0.88	0.83	**0.78**	0.74	0.71
Methionine, %	0.54	0.51	**0.48**	0.46	0.44	0.51	0.48	**0.46**	0.44	0.42	0.45	0.43	**0.41**	0.38	0.37	0.44	0.42	**0.40**	0.38	0.36	0.43	0.41	**0.38**	0.36	0.35
Methionine+Cystine,%	1.02	0.96	**0.91**	0.86	0.82	0.95	0.90	**0.85**	0.81	0.78	0.83	0.78	**0.74**	0.70	0.67	0.81	0.76	**0.72**	0.69	0.65	0.79	0.74	**0.70**	0.67	0.63
Threonine, %	0.86	0.81	**0.77**	0.73	0.70	0.81	0.77	**0.73**	0.70	0.66	0.73	0.68	**0.65**	0.62	0.59	0.71	0.67	**0.63**	0.60	0.57	0.69	0.65	**0.61**	0.58	0.55
Tryptophan, %	0.26	0.25	**0.24**	0.22	0.21	0.25	0.24	**0.22**	0.21	0.20	0.22	0.21	**0.20**	0.19	0.18	0.22	0.20	**0.19**	0.18	0.18	0.21	0.20	**0.19**	0.18	0.17
Arginine, %	1.12	1.06	**1.00**	0.95	0.91	1.06	1.00	**0.95**	0.91	0.86	0.95	0.89	**0.84**	0.80	0.76	0.92	0.87	**0.82**	0.78	0.74	0.90	0.84	**0.80**	0.76	0.72
Isoleucine, %	0.86	0.81	**0.77**	0.73	0.70	0.81	0.77	**0.73**	0.70	0.66	0.73	0.69	**0.65**	0.62	0.59	0.71	0.67	**0.63**	0.60	0.57	0.69	0.65	**0.61**	0.58	0.55
Valine, %	0.97	0.92	**0.87**	0.83	0.79	0.92	0.87	**0.83**	0.79	0.75	0.82	0.77	**0.73**	0.69	0.66	0.80	0.76	**0.72**	0.68	0.65	0.78	0.73	**0.69**	0.66	0.63
Crude protein[6], %	21.18	20.00	**18.95**	18.00	17.14	20.00	18.95	**18.00**	17.14	16.36	17.80	16.79	**15.89**	15.08	14.35	17.50	16.51	**15.63**	14.83	14.11	17.00	16.04	**15.18**	14.41	13.71
Sodium, %	0.21	0.20	**0.19**	0.18	0.17	0.19	0.18	**0.17**	0.16	0.15	0.17	0.16	**0.15**	0.14	0.14	0.17	0.16	**0.15**	0.14	0.14	0.17	0.16	**0.15**	0.14	0.14
Chloride, %	0.21	0.20	**0.19**	0.18	0.17	0.19	0.18	**0.17**	0.16	0.15	0.17	0.16	**0.15**	0.14	0.14	0.17	0.16	**0.15**	0.14	0.14	0.17	0.16	**0.15**	0.14	0.14
Linoleic acid (C18:2 n-6), %	2.35	2.22	**2.11**	2.00	1.90	2.22	2.11	**2.00**	1.90	1.82	1.60	1.51	**1.43**	1.36	1.29	1.50	1.42	**1.34**	1.27	1.21	1.40	1.32	**1.25**	1.19	1.13
Choline, mg/kg	2118	2000	**1895**	1800	1714	2000	1895	**1800**	1714	1636	1800	1698	**1607**	1525	1452	1800	1698	**1607**	1525	1452	1800	1698	**1607**	1525	1452

CALCIUM AND PHOSPHORUS CHANGES BASED ON FEED INTAKE	Weeks 18–32						Weeks 33–55					Weeks 56–72					Weeks 73–85					Weeks 86+				
Feed Consumption, g/day per bird	85	90	95	**100**	106	112	100	106	**112**	118	124	100	106	**112**	118	124	100	106	**112**	118	124	100	106	**112**	118	124
Calcium[7,8], %	4.71	4.44	4.21	**4.00**	3.77	3.57	4.15	3.92	**3.71**	3.52	3.35	4.30	4.06	**3.84**	3.64	3.47	4.45	4.20	**3.97**	3.77	3.59	4.60	4.34	**4.11**	3.90	3.71
Phosphorus (available)[7,9], %	0.53	0.50	0.47	**0.45**	0.42	0.40	0.42	0.40	**0.38**	0.36	0.34	0.39	0.37	**0.35**	0.33	0.32	0.37	0.35	**0.33**	0.31	0.30	0.34	0.32	**0.31**	0.29	0.28
Phosphorus (digestible), %	0.47	0.45	0.42	**0.40**	0.38	0.36	0.38	0.36	**0.34**	0.32	0.31	0.36	0.34	**0.32**	0.30	0.29	0.33	0.31	**0.30**	0.28	0.27	0.31	0.29	**0.28**	0.26	0.25

[1] All nutrient requirements are based on the Feed Ingredient Tables at hyline.com.

[2] Crude protein, methionine+cystine, fat, linoleic acid, and / or energy may be changed to optimise egg size.

[3] Peaking nutrient levels are calculated for birds at peak egg production. Prior to achieving peak egg production, the nutrient requirements will be lower.

[4] A good approximation of the influence of temperature on energy needs is that for each 0.5°C change higher or lower than 22°C, subtract or add about 1.8 kcal /bird /day, respectively.

[5] Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilise other ingredients, recommendations for Standardised Ileal Digestible Amino Acids must be followed.

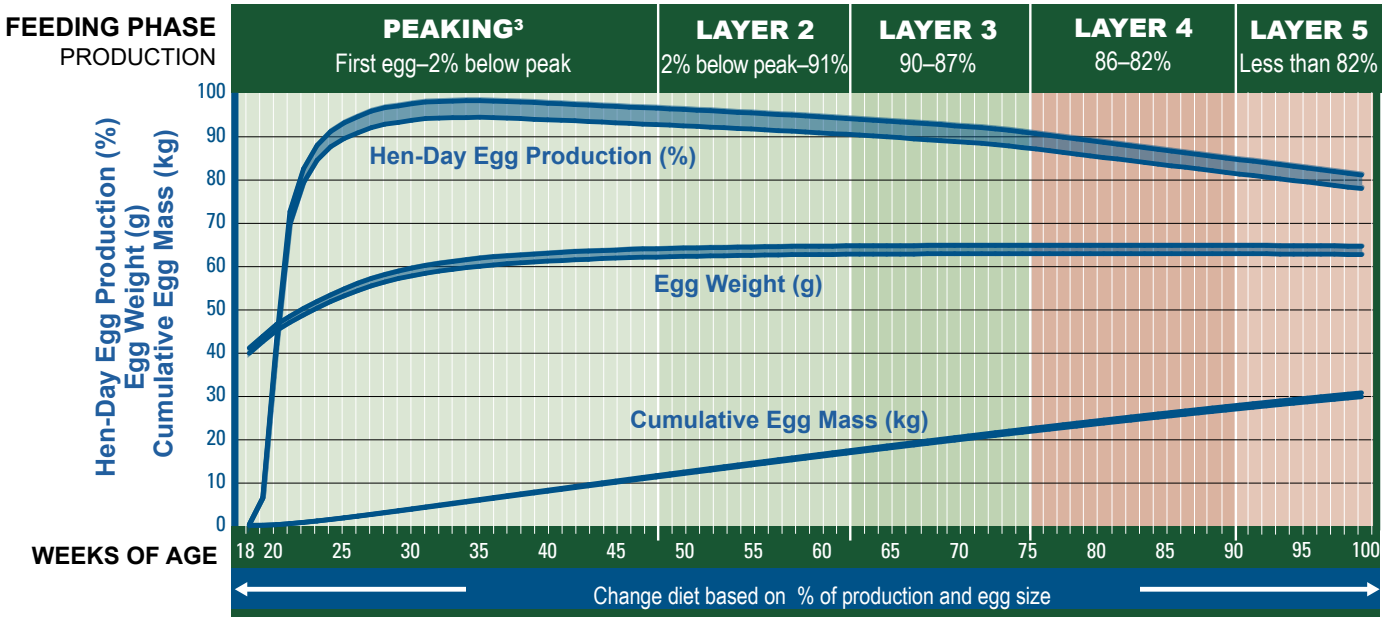
[6] Diets should always be formulated to provide required intake of amino acid. Concentration of crude protein in diet will vary with raw material used. Crude protein value provided is an estimated typical value only.

[7] Calcium and available phosphorus requirements are determined by flock age. When production remains higher and diets are fed for longer than ages shown, it is recommended to increase to calcium and phosphorus concentrations of next feeding phase.

[8] Calcium carbonate particle size recommendation varies throughout lay. Refer to Calcium Particle Size at hyline.com. Dietary calcium levels and fine to coarse ratio may need to be adjusted based on limestone solubility.

[9] Where other phosphorus systems are used, diets should contain recommended minimum level of available phosphorus.

Production Period Nutritional Recommendations for Egg Weight[1,2]



NUTRITION	RECOMMENDED DAILY NUTRIENT INTAKE				
Metabolizable energy[4], kcal/bird/day	320 / 335	320 / 335	315 / 330	310 / 325	300 / 315
Metabolizable energy[4], MJ/bird/day	1.34 / 1.40	1.34 / 1.40	1.32 / 1.38	1.30 / 1.36	1.26 / 1.32
	Standardized Ileal Digestible Amino Acids / Total Amino Acids[5]				
Lysine, mg/day	870 / 953	870 / 953	865 / 947	845 / 925	810 / 887
Methionine, mg/day	435 / 468	435 / 468	433 / 465	423 / 454	405 / 435
Methionine+Cystine, mg/day	800 / 903	792 / 893	779 / 878	761 / 858	729 / 822
Threonine, mg/day	609 / 716	609 / 716	606 / 712	592 / 696	567 / 667
Tryptophan, mg/day	191 / 229	191 / 229	190 / 227	186 / 222	178 / 213
Arginine, mg/day	905 / 973	905 / 973	899 / 967	879 / 945	842 / 906
Isoleucine, mg/day	713 / 767	705 / 758	692 / 744	676 / 727	648 / 697
Valine, mg/day	783 / 864	774 / 854	761 / 840	744 / 820	713 / 786
Crude protein[6], g/day	18.50	18.50	18.40	18.00	17.20
Sodium, mg/day	190	180	180	180	180
Chloride, mg/day	190	180	180	180	180
Linoleic acid (C18:2 n-6), g/day	2.00	2.00	1.60	1.50	1.40
Choline, mg/day	160	180	180	180	180

	CALCIUM AND PHOSPHORUS			
	Calcium[7,8] g/day	Phosphorus (available)[7,9] mg/day	Phosphorus (digestible) mg/day	Calcium Particle Size (fine : coarse)
Weeks 18–32	4.00	447	401	40% : 60%
Weeks 33–55	4.15	421	381	35% : 65%
Weeks 56–72	4.30	395	356	30% : 70%
Weeks 73–85	4.45	369	334	25% : 75%
Weeks 86+	4.60	344	309	25% : 75%

	IDEAL PROTEIN REFERENCE				
	PEAKING	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Lysine	100%	100%	100%	100%	100%
Methionine	50%	50%	50%	50%	50%
M+C	92%	91%	90%	90%	90%
Threonine	70%	70%	70%	70%	70%
Tryptophan	22%	22%	22%	22%	22%
Arginine	104%	104%	104%	104%	104%
Isoleucine	82%	81%	80%	80%	80%
Valine	90%	89%	88%	88%	88%

Production Period Dietary Nutrient Concentrations for Egg Weight[1,2]

FEEDING PHASE / PRODUCTION	PEAKING[3] First egg until production drops 2% below peak					LAYER 2 2% below peak to 91%					LAYER 3 90–87%					LAYER 4 86–82%					LAYER 5 Less than 82%				
NUTRITION	**RECOMMENDED CONCENTRATION**																								
Metabolizable energy[4], kcal/bird/day	320 / 335					320 / 335					315 / 330					310 / 325					300 / 315				
Metabolizable energy[4], MJ/bird/day	1.34 / 1.40					1.34 / 1.40					1.32 / 1.38					1.30 / 1.36					1.26 / 1.32				
FEED CONSUMPTION (*Typical Feed Consumption)																									
g/day per bird	85	90	**95**	100	105	90	95	**100**	105	110	100	106	**112**	118	124	100	106	**112**	118	124	100	106	**112**	118	124
Standardized Ileal Digestible Amino Acids																									
Lysine, %	1.02	0.97	**0.92**	0.87	0.83	0.97	0.92	**0.87**	0.83	0.79	0.87	0.82	**0.77**	0.73	0.70	0.85	0.80	**0.75**	0.72	0.68	0.81	0.76	**0.72**	0.69	0.65
Methionine, %	0.51	0.48	**0.46**	0.44	0.41	0.48	0.46	**0.44**	0.41	0.40	0.43	0.41	**0.39**	0.37	0.35	0.42	0.40	**0.38**	0.36	0.34	0.41	0.38	**0.36**	0.34	0.33
Methionine+Cystine,%	0.94	0.89	**0.84**	0.80	0.76	0.88	0.83	**0.79**	0.75	0.72	0.78	0.73	**0.70**	0.66	0.63	0.76	0.72	**0.68**	0.64	0.61	0.73	0.69	**0.65**	0.62	0.59
Threonine, %	0.72	0.68	**0.64**	0.61	0.58	0.68	0.64	**0.61**	0.58	0.55	0.61	0.57	**0.54**	0.51	0.49	0.59	0.56	**0.53**	0.50	0.48	0.57	0.53	**0.51**	0.48	0.46
Tryptophan, %	0.22	0.21	**0.20**	0.19	0.18	0.21	0.20	**0.19**	0.18	0.17	0.19	0.18	**0.17**	0.16	0.15	0.19	0.18	**0.17**	0.16	0.15	0.18	0.17	**0.16**	0.15	0.14
Arginine, %	1.06	1.01	**0.95**	0.91	0.86	1.01	0.95	**0.91**	0.86	0.82	0.90	0.85	**0.80**	0.76	0.73	0.88	0.83	**0.78**	0.74	0.71	0.84	0.79	**0.75**	0.71	0.68
Isoleucine, %	0.84	0.79	**0.75**	0.71	0.68	0.78	0.74	**0.71**	0.67	0.64	0.69	0.65	**0.62**	0.59	0.56	0.68	0.64	**0.60**	0.57	0.55	0.65	0.61	**0.58**	0.55	0.52
Valine, %	0.92	0.87	**0.82**	0.78	0.75	0.86	0.81	**0.77**	0.74	0.70	0.76	0.72	**0.68**	0.64	0.61	0.74	0.70	**0.66**	0.63	0.60	0.71	0.67	**0.64**	0.60	0.58
Total Amino Acids[5]																									
Lysine, %	1.12	1.06	**1.00**	0.95	0.91	1.06	1.00	**0.95**	0.91	0.87	0.95	0.89	**0.85**	0.80	0.76	0.93	0.87	**0.83**	0.78	0.75	0.89	0.84	**0.79**	0.75	0.72
Methionine, %	0.55	0.52	**0.49**	0.47	0.45	0.52	0.49	**0.47**	0.45	0.43	0.47	0.44	**0.42**	0.39	0.38	0.45	0.43	**0.41**	0.38	0.37	0.44	0.41	**0.39**	0.37	0.35
Methionine+Cystine,%	1.06	1.00	**0.95**	0.90	0.86	0.99	0.94	**0.89**	0.85	0.81	0.88	0.83	**0.78**	0.74	0.71	0.86	0.81	**0.77**	0.73	0.69	0.82	0.78	**0.73**	0.70	0.66
Threonine, %	0.84	0.80	**0.75**	0.72	0.68	0.80	0.75	**0.72**	0.68	0.65	0.71	0.67	**0.64**	0.60	0.57	0.70	0.66	**0.62**	0.59	0.56	0.67	0.63	**0.60**	0.57	0.54
Tryptophan, %	0.27	0.25	**0.24**	0.23	0.22	0.25	0.24	**0.23**	0.22	0.21	0.23	0.21	**0.20**	0.19	0.18	0.22	0.21	**0.20**	0.19	0.18	0.21	0.20	**0.19**	0.18	0.17
Arginine, %	1.14	1.08	**1.02**	0.97	0.93	1.08	1.02	**0.97**	0.93	0.88	0.97	0.91	**0.86**	0.82	0.78	0.95	0.89	**0.84**	0.80	0.76	0.91	0.85	**0.81**	0.77	0.73
Isoleucine, %	0.90	0.85	**0.81**	0.77	0.73	0.84	0.80	**0.76**	0.72	0.69	0.74	0.70	**0.66**	0.63	0.60	0.73	0.69	**0.65**	0.62	0.59	0.70	0.66	**0.62**	0.59	0.56
Valine, %	1.02	0.96	**0.91**	0.86	0.82	0.95	0.90	**0.85**	0.81	0.78	0.84	0.79	**0.75**	0.71	0.68	0.82	0.77	**0.73**	0.69	0.66	0.79	0.74	**0.70**	0.67	0.63
Crude protein[6], %	21.76	20.56	**19.47**	18.50	17.62	20.56	19.47	**18.50**	17.62	16.82	18.40	17.36	**16.43**	15.59	14.84	18.00	16.98	**16.07**	15.25	14.52	17.20	16.23	**15.36**	14.58	13.87
Sodium, %	0.22	0.21	**0.20**	0.19	0.18	0.20	0.19	**0.18**	0.17	0.16	0.18	0.17	**0.16**	0.15	0.15	0.18	0.17	**0.16**	0.15	0.15	0.18	0.17	**0.16**	0.15	0.15
Chloride, %	0.22	0.21	**0.20**	0.19	0.18	0.20	0.19	**0.18**	0.17	0.16	0.18	0.17	**0.16**	0.15	0.15	0.18	0.17	**0.16**	0.15	0.15	0.18	0.17	**0.16**	0.15	0.15
Linoleic acid (C18:2 n-6), %	2.35	2.22	**2.11**	2.00	1.90	2.22	2.11	**2.00**	1.90	1.82	1.60	1.51	**1.43**	1.36	1.29	1.50	1.42	**1.34**	1.27	1.21	1.40	1.32	**1.25**	1.19	1.13
Choline, mg/kg	1882	1778	**1684**	1600	1524	2000	1895	**1800**	1714	1636	1800	1698	**1607**	1525	1452	1800	1698	**1607**	1525	1452	1800	1698	**1607**	1525	1452

CALCIUM AND PHOSPHORUS CHANGES BASED ON FEED INTAKE	Weeks 18–32						Weeks 33–55					Weeks 56–72					Weeks 73–85					Weeks 86+				
Feed Consumption, g/day per bird	85	90	95	**100**	106	112	100	106	**112**	118	124	100	106	**112**	118	124	100	106	**112**	118	124	100	106	**112**	118	124
Calcium[7,8], %	4.71	4.44	4.21	**4.00**	3.77	3.57	4.15	3.92	**3.71**	3.52	3.35	4.30	4.06	**3.84**	3.64	3.47	4.45	4.20	**3.97**	3.77	3.59	4.60	4.34	**4.11**	3.90	3.71
Phosphorus (available)[7,9], %	0.53	0.50	0.47	**0.45**	0.42	0.40	0.42	0.40	**0.38**	0.36	0.34	0.39	0.37	**0.35**	0.33	0.32	0.37	0.35	**0.33**	0.31	0.30	0.34	0.32	**0.31**	0.29	0.28
Phosphorus (digestible), %	0.47	0.45	0.42	**0.40**	0.38	0.36	0.38	0.36	**0.34**	0.32	0.31	0.36	0.34	**0.32**	0.30	0.29	0.33	0.31	**0.30**	0.28	0.27	0.31	0.29	**0.28**	0.26	0.25

[1] All nutrient requirements are based on the Feed Ingredient Tables at hyline.com.

[2] Crude protein, methionine+cystine, fat, linoleic acid, and / or energy may be changed to optimise egg size.

[3] Peaking nutrient levels are calculated for birds at peak egg production. Prior to achieving peak egg production, the nutrient requirements will be lower.

[4] A good approximation of the influence of temperature on energy needs is that for each 0.5°C change higher or lower than 22°C, subtract or add about 1.8 kcal /bird /day, respectively.

[5] Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilise other ingredients, recommendations for Standardised Ileal Digestible Amino Acids must be followed.

[6] Diets should always be formulated to provide required intake of amino acid. Concentration of crude protein in diet will vary with raw material used. Crude protein value provided is an estimated typical value only.

[7] Calcium and available phosphorus requirements are determined by flock age. When production remains higher and diets are fed for longer than ages shown, it is recommended to increase to calcium and phosphorus concentrations of next feeding phase.

[8] Calcium carbonate particle size recommendation varies throughout lay. Refer to Calcium Particle Size at hyline.com. Dietary calcium levels and fine to coarse ratio may need to be adjusted based on limestone solubility.

[9] Where other phosphorus systems are used, diets should contain recommended minimum level of available phosphorus.

Vitamins and Trace Minerals

ITEM [1,2,3,4]	IN 1000 KG COMPLETE DIET	
	Rearing Period	Production Period
Vitamin A, IU	10,000,000	8,000,000
Vitamin D_3[5], IU	3,300,000	3,300,000
Vitamin E, g	30.00	25.00
Vitamin K (menadione), g	3.50	3.00
Thiamin (B_1), g	2.20	2.50
Riboflavin (B_2), g	6.60	5.50
Niacin (B_3)[6], g	40.00	30.00
Pantothenic acid (B_5), g	10.00	10.00
Pyridoxine (B_6), g	4.50	5.00
Biotin (B_7), mg	100.00	75.00
Folic acid (B_9), g	1.00	0.90
Cobalamine (B_{12}), mg	23.00	23.00
Manganese[7], g	100.00	100.00
Zinc[7], g	85.00	80.00
Iron[7], g	30.00	40.00
Copper[7], g	15.00	8.00
Magnesium[7], g	600.00	500.00
Iodine, g	1.50	1.20
Selenium[7], g	0.25	0.25

[1] Minimum recommendations for rearing and laying periods. Local regulations may limit dietary content of individual vitamins or minerals. Levels of 150-200mg/kg of Vitamin C can be beneficial during periods of stress.

[2] Store premixes according to supplier's recommendations and observe 'use by' dates to ensure vitamin activity is maintained. Inclusion of antioxidant may improve premix stability.

[3] Vitamin and mineral recommendations vary according to activity.

[4] Where heat treatment is applied to diet, higher levels of vitamins may be required. Consult with vitamin supplier regarding stability through individual production processes.

[5] A proportion of Vitamin D_3 can be supplemented as 25-hydroxy D_3 according to supplier's recommendations and applicable limits.

[6] Higher levels of Niacin are recommended in non-cage systems.

[7] Greater bioavailability and productivity may be possible with use of chelated mineral sources.

Drinking Water Quality for Poultry

ITEM	MAXIMUM CONCENTRATION (ppm or mg/L)*	
Nitrate NO_3^- [1]	25	Older birds will tolerate higher levels up to 20 ppm. Stressed or disease challenged birds may be more sensitive to effects of Nitrate.
Nitrate Nitrogen (NO_3-N) [1]	6	
Nitrite NO_2^- [1]	4	Nitrite is considerably more toxic than Nitrate, especially for young birds, where 1 ppm Nitrite may be considered toxic.
Nitrite Nitrogen (NO_2-N) [1]	1	
Total dissolved solids [2]	1000	Levels up to 3000 ppm may not affect performance but could increase manure moisture.
Chloride (Cl^-) [1]	250	Levels as low as 14 mg may be problematic if sodium is higher than 50 ppm.
Sulphate (SO_4^-) [1]	250	Higher levels may be laxative.
Iron (Fe) [1]	<0.3	Higher levels result in bad odour and taste.
Magnesium (Mg) [1]	125	Higher levels may be laxative. Levels above 50 ppm may be problematic if sulphate levels are high.
Potassium (K) [2]	20	Higher levels may be acceptable depending on sodium level, alkalinity, and pH.
Sodium (Na) [1,2]	50	Higher concentration is acceptable but concentrations above 50 ppm should be avoided if high levels of chloride, sulphate, or potassium exist.
Manganese (Mn) [3]	0.05	Higher levels may be laxative.
Arsenic (As) [2]	0.5	
Fluoride (F^-) [2]	2	
Aluminium (Al) [2]	5	
Boron (B) [2]	5	
Cadmium (Cd) [2]	0.02	
Cobalt (Co) [2]	1	
Copper (Cu) [1]	0.6	Higher levels result in bitter taste.
Lead (Pb) [1]	0.02	Higher levels are toxic.
Mercury (Hg) [2]	0.003	Higher levels are toxic.
Zinc (Zn) [1]	1.5	Higher levels are toxic.
pH [1]	5–7	Birds may adapt to lower pH. Below pH 5 may reduce water intake and corrode metal fittings. Above pH 8 may reduce intake and reduce effectiveness of water sanitation.
Total bacteria counts [3]	1000 CFU/ml	This is likely to indicate dirty water.
Total Coliform bacteria [3]	50 CFU/ml	
Faecal Coliform bacteria [3]	0 CFU/ml	
Oxygen Reduction Potential (ORP) [3]	650–750 mEq	The ORP range at which 2–4 ppm of free chlorine will effectively sanitise water at a favourable pH range of 5–7.

* Limits may be lower as interactions exist between magnesium and sulphate; and between sodium, potassium, chloride, and sulphate.

[1] Carter & Sneed, 1996. Drinking Water Quality for Poultry, Poultry Science and Technology Guide, North Carolina State University Poultry Extension Service. Guide no. 42

[2] Marx and Jaikaran, 2007. Water Analysis Interpretation. Agri-Facts, Alberta Ag-Info Centre. Refer to http://www.agric.gov.ab.ca/app84/rwqit for online Water Analysis Tool

[3] Watkins, 2008. Water: Identifying and Correcting Challenges. Avian Advice 10(3): 10–15 University of Arkansas Cooperative Extension Service, Fayetteville

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