

POST-WAR BUILDING STUDIES

NO. 22

FARM BUILDINGS FOR SCOTLAND

BY

A COMMITTEE APPOINTED BY THE
SECRETARY OF STATE FOR SCOTLAND



LONDON: 1946

PUBLISHED FOR THE MINISTRY OF

BY HIS MAJESTY'S STATIONER

THREE SHILLINGS NET

MINISTRY OF WORKS

POST-WAR BUILDING STUDIES

The series of Reports being published under the title of Post-War Building Studies owes its origin to a desire expressed by professional and other institutions connected with the building and civil engineering industries to assist and support the Ministry of Works in regard to post-war plans. During the latter part of 1941 the then Minister, in order to take advantage of these offers of assistance which he was receiving from all quarters, encouraged the establishment of a series of Committees to investigate and report on the major problems which were likely to affect peacetime building. He also offered, on behalf of the Ministry, to provide the necessary staff and organization to co-ordinate the various inquiries, in such a way as to avoid duplication of effort and to secure so far as possible uniform direction and policy.

A list of the Reports in this series is given on the back page of the cover.

The Committees were either appointed by a Government Department or convened by a professional institution, a research association or a trade federation, whichever seemed most appropriate in each case; they were so constituted as to ensure that the Reports contain the considered views of experts and others closely connected with the subject. The Minister gratefully acknowledges the work of the Committees and the valuable assistance given both by the various convening bodies and by the individual members. The Reports are not official publications and it is not intended to give the impression that the Government as such is responsible for or necessarily accepts the views expressed, but their contents are authoritative and cannot but be of interest to all concerned with building.

COMMITTEE ON FARM BUILDINGS FOR SCOTLAND

TO THE RIGHT HONOURABLE JOSEPH WESTWOOD, M.P.,
SECRETARY OF STATE FOR SCOTLAND

SIR, We were appointed by your predecessor, the Rt. Hon. Thomas Johnston, M.P., on 4th August 1943, under the scheme of Post-War Building Studies promoted by the Ministry of Works, as a Committee "to consider and make recommendations regarding the layout, design, and construction of farm buildings after the war."

In interpreting our remit we have assumed it to cover the buildings required for general farming operations. Dwelling-houses have been excluded from the review as well as buildings for poultry, market gardening, and other specialized enterprises undertaken on farms.

We have held thirty-two meetings of the full Committee, and a number of additional meetings have been held by the Technical and Drafting Sub-Committees appointed in the course of our work. Our first step was to ask for the views of the leading organizations concerned with farming, and we subsequently consulted individuals and business firms on specific problems. In order to review the present stage of development of farming and farm buildings, we visited numbers of representative farms in various parts of the country, as well as farms with features of special interest. We were shown the buildings of the three Agricultural Colleges, and of the Hannah Dairy Research Institute. We give a list of the organizations consulted, and of the farms visited by the whole Committee or by groups of members, in Appendix I.

In Appendix VI a section on farm buildings extracted from the Report of the Electrical Installations Committee is reproduced. The report of the Electrical Installations Committee is published as No. 11 of this series.

In view of the conditions imposed by war, we have been unable to undertake a full review of the considerable literature on farm buildings published in technical journals, etc., in the Dominions and America. References are, however, given in footnotes to a number of useful publications relating to the subject of this Report.

Valuable assistance has been rendered by the Hannah Dairy Research Institute, which has undertaken special inquiries on ventilation at our request, and we take this opportunity of expressing our thanks to them. We also tender our thanks to the various organizations, firms, and individuals who supplied us with information and otherwise assisted us in our investigations.

We desire to place on record our warm appreciation of the great assistance which we have received from the Assessors to the Committee, Mr. C. H. Chalmers, Mr. A. G. Ingham, and Mr. John Wilson and for their valuable advice on many aspects of our investigations and in the drafting of the Report.

A Technical Sub-Committee under the Chairmanship of Mr. Ingham was appointed to prepare the plans accompanying the Report. This work made heavy demands upon Mr. Ingham and his staff, and we would like to express our appreciation of the valuable help rendered by them and particularly by Mr. D. P. Bee.

We also desire to record our thanks to Mr. W. M. Calder, who acted as Secretary of the Committee until he received an appointment on 24th May 1945, with the Allied Control Commission in Germany. The efficiency with which he summarized the voluminous evidence received by us greatly lightened our work. We also record our thanks to Mr. G. M. Simpson who has acted as Secretary to the Committee since Mr. Calder's resignation.

MEMBERS OF COMMITTEE

- William C. Davidson, O.B.E., J.P., F.S.I., Deputy Chairman, Scottish Special Housing Association Limited; formerly Secretary and Factor, Barnton, Sauchie and Bannockburn Estates; and Factor to the Commissioners of Crown Lands in Stirlingshire, *Chairman*.
- Charles Jamieson, Organiser, Scottish Farm Servants' Section of Transport and General Workers' Union; Member of Scottish Agricultural Wages Board; Member of Scottish Housing Advisory Committee.
- Alexander Kirkpatrick, Farmer; Member of the Scottish Milk Marketing Board; Member of the Agricultural Executive Committee for Dumfriesshire; Past President of the Ayrshire Cattle Herd Book Society.
- J. R. Lockie, O.B.E., B.L. (N.Z.),¹ County Clerk, Ayr County.
- Major J. G. McGregor, T.D., M.R.C.V.S., Superintending Inspector, Animal Health Division of the Ministry of Agriculture and Fisheries; Member of the Board of Management of the Royal Dick Veterinary College, Edinburgh.
- John Mackie, Farmer; Member of the Board of Governors of the North of Scotland College of Agriculture; Member of the Scottish Agricultural Advisory Council; Member of the Agricultural Executive Committee for Kincardineshire.
- The Rt. Hon. The Earl of Mansfield, B.A. (Oxon), F.Z.S., Landowner; Member of the Agricultural Executive Committee for East Perthshire; Member of Perth County Council; formerly Member of the Board of Governors of the Edinburgh and East of Scotland College of Agriculture.
- William Salmond, F.R.I.B.A., F.S.I.,⁴ Partner of the firm of Messrs. Maclaren, Soutar and Salmond, Chartered Architects and Surveyors, Dundee.
- C. H. Chalmers, B.Sc. (Edin.), N.D.A.,² Chief Milk Inspector, Department of Health for Scotland; formerly Lecturer, University of Leeds.
- A. G. Ingham, A.M.Inst.C.E., F.S.I.,^{3,4} Registered Architect, M.R.San.I., Chief Engineer and Surveyor, Department of Agriculture for Scotland; Assessor, Building Research Board.
- John Wilson, O.B.E., F.R.I.B.A., F.R.S.E.,^{2,4} Ministry of Works; formerly Chief Architect, Department of Health for Scotland.
- W. M. Calder, M.A. (Oxon),² Department of Agriculture for Scotland, *Secretary*.
- G. M. Simpson, Department of Agriculture for Scotland, *Secretary*.

¹ Resigned 30th January 1945, on appointment to U.N.R.R.A.

² Assessor to the Committee.

³ Resigned 24th May 1945, on appointment to the Allied Control Commission in Germany, from which date Mr. G. M. Simpson acted as Secretary.

⁴ Member of Technical Sub-Committee.

TERMS OF REFERENCE

To consider and make recommendations regarding the layout, design, and construction of farm buildings after the war.

CONTENTS

	PARAGRAPH
INTRODUCTION	1-6
SECTION I. FARM BUILDINGS IN RELATION TO ANIMAL WELFARE	
BASIC ASSUMPTIONS	8
CATTLE	
Warmth	9
Ventilation	10
HORSES	
Warmth and Ventilation	11
PIGS	
Warmth	12
Ventilation and Humidity	13
RESEARCH	
The Need for Research	14
Practical Experiments	15
SECTION II. MECHANIZATION, LABOUR, AND THE SIZE OF FARMS	
MECHANIZATION	16-17
ECONOMIC OPERATION	18
SIZE OF FARMS	19-21
ASSUMPTIONS IN PLANS AND RECOMMENDATIONS	22-24
SECTION III. PLANNING THE STEADING	
TOWN AND COUNTRY PLANNING	25
SITE	26-28
SAVING OF LABOUR	29-30
ADAPTATIONS AND EXTENSIONS	31
MECHANICAL CONVEYORS AND TROLLIES	32
COMPACTNESS AND SPACING	33
PREVENTION OF INFECTION	34-35
PROTECTION AGAINST VERMIN	36-37
FIRE PREVENTION	38-42
SANITARY ACCOMMODATION	43
SHELTER	44
SUNLIGHT	45
DWELLING-HOUSES	46
THE STEADING LAYOUT PLANS—(16 designs). See List of Plans, page 8	47-66
THE AMERICAN "BARN"	67

FARM BUILDINGS FOR SCOTLAND

SECTION IV. BUILDINGS FOR DAIRY, LIVESTOCK, AND ARABLE FARMING

NOTE	PARAGRAPH
	68
THE DAIRY BYRE	69
Early Byres	70
First Modern Byre	71
Modern Developments	72-73
Present Practice	74
Feeding Passages	75
Multiple Byre	76
Disadvantages of the Byre	77
DESIGNS FOR BYRES	78
DESIGN FOR DOUBLE DAIRY-COW BYRE	
Floor	79-80
Size of Standings	81-82
Grip and Gangway	83-85
Ventilation Inlets	86-87
Ventilation Outlets	88
Lighting	89-90
Stall Divisions	91-93
Tyings	94-95
Troughs	96
Drinking Bowls	97
Other Structural Features	98-100
Water	101
DESIGN FOR SINGLE DAIRY-COW BYRE	102-103
DRY COW, CALVING, AND ISOLATION BYRES	104
FEEDING AND YOUNG STOCK BYRES	105
CATTLE COURTS	106-107
Position	108
Construction	109
Feeding	110
Watering	111
Drainage and Flooring	112
Courts for Dairy Herds	113-118
Feeding Courts	119
Breeding and Rearing Courts	120
MILKING PARLOURS AND BAILS	
Bail System in Scotland	121
Design of Milking Parlours	122
Structural Features	123-125
Heating	126-127
	128

CONTENTS

	PARAGRAPH
DAIRY PREMISES	129
Structural Features	130-136
COMMUNICATION BETWEEN DAIRY BUILDINGS	137
BULL PENS	138-141
ROOT AND FEED STORAGE	142-145
STABLES	146
Structural Features	147-152
Troughs, Hecks, and Bowls	153-155
Loose Boxes	156
Young Horses	157
PIGGERIES	158-161
PIGGERY PLANS	162-167
STRUCTURAL FEATURES OF PIGGERIES	
Walls	168
Roofs	169
Floors	170-172
Size of Pens	173
Pen Divisions	174-176
Farrowing Crate	177
Feeding Methods	178-180
Ventilation	181
Lighting	182
Water	183
Dung and Sewage Disposal	184
DUNGSTEADS	
Dungsteads	185-189
Carting System	190

SECTION V. BUILDINGS FOR ARABLE, SHEEP FARMING, AND CROFTS

MACHINERY AND IMPLEMENTS	191-193
BARNs, SHEDs, AND GRANARIES	194-195
SILOS	196-198
POTATO SHEDS	199-200
GRAIN-DRYING RACKS	201-202
STACKYARDS	203
BUILDINGS FOR SHEEP FARMING	204
Tanks and Dippers	205-207
Covered Pens	208
HIGHLAND CROFT BUILDINGS	209-210

FARM BUILDINGS FOR SCOTLAND

SECTION VI. MATERIALS AND CONSTRUCTIONAL METHODS

	PARAGRAPH
BUILDING STANDARDS	211
MATERIALS	212-213
ROOFS	214-218
FLOORS	219-221
PREFABRICATION	222-223
HANGARS AND CORRUGATED STEEL HUTS	224

SECTION VII. SERVICES

WATER	225-232
ELECTRICITY	233-234
GAS	235
DRAINAGE	236-237
Intercepting Chamber	238
Aidle Tank	239
Sedimentation Tank	240
Effluents	241
Drain Pipes	242-244
ROADS	245-246
Construction	247
Loading Ramps	248

SECTION VIII. AN ADVISORY SERVICE

TRADITIONAL SOURCES OF INFORMATION	249-251
NEW FACTORS	252-255
PRACTICAL EXPERIENCE	256
NEED FOR ADVISORY SERVICE	257
FUNCTIONS OF SERVICE	258-259
FORM OF SERVICE	260

SECTION IX. RECOMMENDATIONS REGARDING THE DAIRY BYELAWS

THE MODEL DAIRY BYELAWS	261
LOCAL VARIATIONS	262
RECOMMENDATIONS FOR AMENDMENTS	263

APPENDICES

- I. ORGANIZATIONS CONSULTED AND FARMS VISITED
- II. LIST GIVING DIMENSIONS OF PRINCIPAL POWER AND HORSE-DRAWN IMPLEMENTS
- III. ECONOMIC CLASSIFICATION OF AGRICULTURAL HOLDINGS, 1927
- IV. NUMBER AND AVERAGE ACREAGES OF TYPES OF SCOTTISH FARMS, 1927
- V. NUMBER OF VARIOUS SIZES OF HOLDINGS IN SCOTLAND, 1938
- VI. EXTRACT FROM POST-WAR BUILDING STUDIES NO. 11, ELECTRICAL INSTALLATIONS

CONTENTS

ILLUSTRATIONS

FIGURE		PAGE
1	Double Dairy-Cow Byre—interior perspective	27
2	Inlet Ventilator (downward type), Cowbed or Standing, Grip, Fireclay Trough, etc.	28
3	Inlet Ventilator—Baffle or Disc type	28
4 & 5	Details as in Figs. 2 and 3 but with Moulded Troughs	29
6	Alternative Methods of Floor Construction for Standings or Cowbeds	30
7	Quick-Release Tie Slide	33
8	Chain Tie	33
9	Chain Tie (Dutch type)	33
10	Yoke Tie	33
11	Single Dairy-Cow Byre—interior perspective	34
12	Lifting Gate for Cow Courts	37
13	Timber Yoke for Cow Courts	37
14	Lifting Hay Heck for Courts	38
15	Travelling Hay Heck for Courts	38
16	Milking Parlour suitable for wide building	41
17	Milking Parlour suitable for narrow building	41
18	Milking Parlour suitable for a corner in a range of buildings	41
19	Dairy Premises suitable for Bucket System of Mechanical Milking	42
20	Dairy Premises suitable for Direct Piping System of Mechanical Milking	42
21	Single Bull Pen and Exercise Yard	45
22	Single Bull Pen with Service Box and Exercise Yard	45
23	Double Bull Pen and Exercise Yard	45
24	Bull Pen with Escape Passage, Service Box, and Exercise Yard	45
25	Stable—interior perspective	46
26	Piggery with Open Runs	49
27	Piggery with Feeding and Dunging Passages	51
28	Piggery with Feeding Passage and Small Food Cooking Room, Boiler House, etc.	51
29	Piggery for 1000 pigs, including Breeding, Rearing, and Fattening Pens, Food Preparation Room, etc.	52
30	Design for inexpensive methods of Roof Construction in Piggeries	55
31	Design for inexpensive methods of Roof Construction in Piggeries	55
32	Design for inexpensive methods of Roof Construction in Piggeries	55
33	Pig Trough with fixed wall at front of Pen	55
34	Pig Trough with "flap door" forming front of Pen	55
35	Pig Trough with open rail front to Pen	55
36	Dungstead with Roof	56
37	Grain-Drying Rack (Richmond type)	61
38	Grain-Drying Rack (Dual purpose type)	61

FARM BUILDINGS FOR SCOTLAND

FIGURE		PAGE
39	Plan of Sheep-Dipper and Collecting Pens or Fanks	63
40	Design for Sheep-Dipper	64
41	Light-Weight Timber Roof Truss suitable for large spans and corrugated steel or asbestos cement sheets	66
42	Light-Weight Steel Roof Truss suitable for large spans and corrugated steel or asbestos cement sheets	66
43	Light-Weight Timber Roof Truss suitable for large spans and curved corrugated steel or asbestos cement sheets or felt covering	66

PLANS

PLAN		PLAYS
A	Steading for Mixed Arable and Dairy Farm (Byre System) for 200 to 250 acres	1
B	Alternative for Design A adapted for the Bucket System of Mechanical Milking	1
C	Steading for Mixed Arable and Dairy Farm (Byre System) for 200 to 250 acres	2
D	Steading for Mixed Arable and Dairy Farm (Byre System) for 200 to 250 acres	3
E	Steading for Mixed Arable and Dairy Farm (Cow Court System) for 200 to 250 acres	4
F	Steading for Mixed Arable and Dairy Farm (Cow Court System) for 200 to 250 acres	5
G	Steading for Mixed Arable and Dairy Farm (Cow Court System) for 200 to 250 acres	6
H	Steading for Mixed Arable and Dairy Farm (Cow Court System) for 200 to 250 acres	7
J	Dairy Steading for 224 cows, etc.	8
K	Commercial Cattle Breeding and Feeding Farm for 200 to 250 acres	9
L	Cattle Feeding Farm for 200 to 250 acres	10
M	Steading for Mixed Arable and Dairy Farm (Byre System) for 75 acres	11
N	Steading for Mixed Arable and Dairy Farm (Cow Court System) for 75 acres	12
O	Steading for Farm of 20 to 30 acres	13
P	Steading for Farm of 20 to 30 acres	13
Q	Highland Croft Steading for 5 to 10 acres	14