.//3

658.23 MAL

Contents

PART	1.	APPROACH	то	PLANT	LAYOUT
			_		

I.	THE ROLE OF PLANT LAYOUT IN MANAGEMENT	1
	1. Plant layout as the blueprint of management	I
	2. Management factors influencing plant planning	2
	3. Rearranging or planning a manufacturing plant	5
	4. Increased productivity without greater effort	7
	5. Position of plant layout in management	10
	6. Plant layout organizations in different plants	13
	7. Personal aptitudes required in plant layout work	14
	8. Qualifications of the plant layout engineer	16
II.	ASCERTAINING THE NEED FOR A RE-LAYOUT	20
	1. When to consider a change in plant layout	20
	2. Revolutionary changes in plant layout design	23
	3. Plant layout as a prime factor of production	25
	4. The advantages of a good plant layout	27
	5. Conditions signifying an improper plant layout	35
	6. Prime objectives in contemplating a re-layout	37
III.	RANGE OF NEW LAYOUT AND RE-LAYOUT PROJECTS	39
	1. Layout stages from job lots to mass production	39
	2. The work station as the basic space unit	43
	3. The work center inclosing an operating group	45
	4. The size and location of plant departments	48
	5. Straight-line flow in mass production	49
	6. The size pattern of manufacturing plants	55
	7. The scope of a plant layout project	57
IV.	BASIS FOR DESIGNING A PLANT LAYOUT	60
	1. Groundwork preceding the layout development	60
	2. Preliminary survey through statistical analysis	62
	3. Information gathered for tentative layout plans	63
	4. Intangible factors underlying a layout project	6 6
	5. Check lists of advance data for the project	67
v.	BENCHMARKS USED IN PLANT LAYOUT WORK	72
	1. Plot plans, area diagrams, and process charts	7 2
	2. Records of existing machinery and equipment	80
	•	

 Field notes on buildings and equipment locations Spotting machinery and equipment on layouts 	8 4 8 6
VI. TECHNIQUES OF PLANT LAYOUT ENGINEERING	90
1. Preliminary template laydowns on layout boards	90
2. Two-dimensional templates for planning layouts	93
3. Scale models for layout projects in miniature	101
4. Procedures for preparing a plant layout	105
5. Perspective drawings and miniature plants	111

CONTENTS

x

PART 2. PLANNING THE PROCESSING DEPARTMENTS

VII. FRAMEWORK OF PLANT LAYOUT PROCEDURE	114
1. Sources and flow of fundamental layout data	115
2. Production data on parts, operations, and machines	116
3. Existing field data on buildings, grounds, and services	117
4. Layouts of existing production facilities and services	118
5. Flow charts of existing and proposed manufacturing methods	120
6. Actual template layouts and operating costs of tentative plans	123
7. Cost information and financial factors for each proposal	124
VIII. DETERMINING THE CAPACITIES FOR THE DESIGN	127
1. Duration and precision of a plant layout design	127
2. Determining the projected output capacity	131
3. Basic factors underlying the output capacity data	133
4. Analysis of performance on the existing layout	135
5. Breakdown of total output into types of products	137
6. Preliminary layout of possible improvements	139
7. The manufacturing program and plant capacity.	144
IX. ANALYZING, BALANCING, AND ROUTING THE OPERATIONS	147
1. Preliminary analysis of the plant layout project	147
2. Operation analysis of manufacturing methods	149
3. Estimates of machine operations and loads	150
4. Determining the labor cost of an operation before final selection	152
5. Final studies of operation time, factory cost, and machine cost	154
6. Functions of process flow charts in routing operations	158
X. PLANNING AND EQUIPPING THE WORK STATION	164
1. Work-station layouts for planning the plant layout	164
2. Methods engineering preceding the design of work stations	167
3. Methods and time study to determine motion economy	168
4. Designing work areas requiring the minimum of motions	170
5. Determining the output capacity of work stations	172

173

6. Service facilities required within work stations

	CONTENTS	xi
XI.	INTERNAL TRANSPORTATION OF PLANT MATERIAL	176
	1. Weight, frequency, and travel of material handled in a plant	176
	2. Transportation burden on output speed and cost	178
	3. Lag in efficiency between material handling and processing	182
	4. Classification and application of material-handling equipment	184
	5. Factors considered before resorting to material-handling devices	191
XII.	PLANNING THE MATERIAL-HANDLING PROJECT	195
	1. Analyzing the material-handling requirements for a layout	195
	2 Physical aspects of the material and its container	108
	3 Building characteristics and safety factors	201
	4 Fitting the equipment operations to the volume of activity	205
	5. Labor cost, equipment operating cost, and net benefits	208 208
	PART 3. DESIGNING PLANT SERVICE FACILITIES	
XIII.	RECEIVING, SHIPPING, AND WAREHOUSE AREAS	211
	1. Determinants of receiving and shipping areas	211
	2. Factors to be considered in a receiving department	214
	3. Design of truck- and rail-loading facilities	215
	4. Plant expansion within fixed boundary lines	221
	5. Warehouse handlings, space, and roof supports	226
	6. Multi-story versus single-story warebouses	228
XIV.	STOREROOMS AND STORAGE FACILITIES	230
	1 Types and functional requirements of storerooms	230
	 Factors for determining storage requirements 	234
	3 Laving out storage hins shelving and racks	238
	4. Adjustable and portable racks and bins	242
XV.	TEST AREAS, INSPECTION POINTS, AND DISPATCH STATIONS	244
	1 Planning for quality control in the layout	944
	2 Levent of a receiving inspection department	21 1 946
	2. Mademization of laboratorica and gauge rooma	240
	4. Locating inspection points in the production line	249 051
	4. Docating inspection points in the production line	201
	5. Planning the general alrangement of a test noor	203
	o. Principles of dispatch-station layout design	204
XVI.	MAINTENANCE FACILITIES, TOOL CRIBS, AND SPRINKLER	0.50
	5191 EW9	259
	1. Planning the maintenance department and facilities	259
	2. Factors in planning and laying out tool cribs	262
	3. Provisions for the reconditioning of small tools	265
	4. Laying out sprinkler systems and water supplies	267

XVII. POWER AND LIGHTING SYSTEMS	271
1. Outline of factory power-plant operation	271
2. Layout of electric power-distribution systems	273
3. Selection and layout of power-motor drives	282
4. Plant lighting requirements, sources, and circuits	2 86
XVIII. PLANNING OFFICE LAYOUTS	290
1. Locating the offices and allocating floor eread	900
1. Locating the ondes and anotating hoor areas	290
2. Types of private and general onces in a plant	294 900
4. Basic plans for laying out groups of officers	290
5. Office light, heat, ventilation, and acoustics	303
XIX. EMPLOYEE SERVICE FACILITIES	307
1. Plant approach, parking lots, and plant entrances	307
2. Cafeterias, lunchrooms, and kitchens	311
3. First-aid stations and medical departments	316
4. Locker rooms, water closets, and lavatorics	318
PART 4. JUSTIFYING THE LAYOUT PROJECT	
XX. BUILDINGS FOR HOUSING THE PLANT LAYOUT	321
1. Plant modernization versus plant construction	321
2. Influence of site limitations on the plant layout	322
3. Blending plant design with creative plant layout	325
4. Shapes and cross-sections of one-story plants	330
5. Column-spacing and clear spans for flexible layouts	334
XXI. CAPITAL OUTLAYS FOR PLANT AND EQUIPMENT	337
1. Amount invested in America's industrial plant	337
2. Distribution of capital expenditures in manufacturing	339
3. Total expenditures for construction and equipment	341
4. Trend of capital outlays for plants and equipment	341
5. Wartime expansion adaptable for peacetime use	347
XXII. PRESENTING THE PROPOSAL TO THE MANAGEMENT	350
1. Prelude to a decision to buy new plant facilities	350
2. Viewing the project on a rendering, model, or layout	352
3. Isolating the proposal on plot and flow plans	357
4. Case presentation of layout proposals for a foundry	359
5. Case development of profits on layout projects	367
Bibliography	373

Bibliography

Index

381