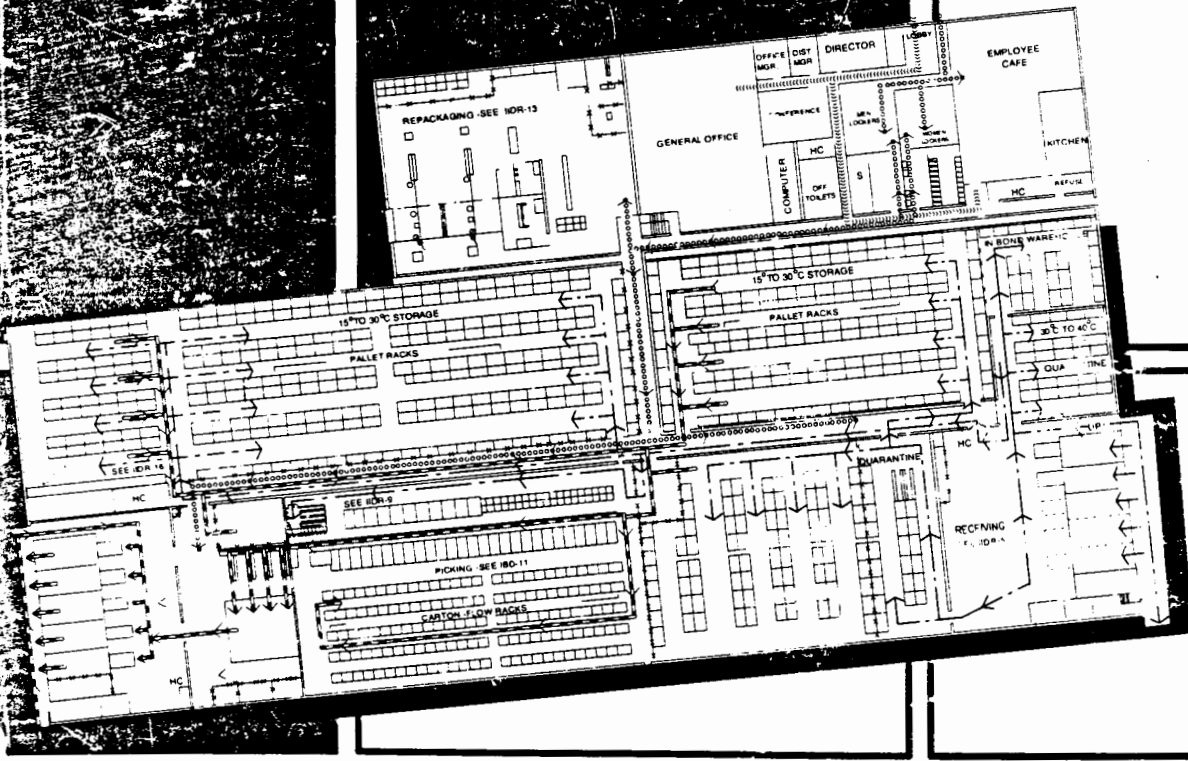
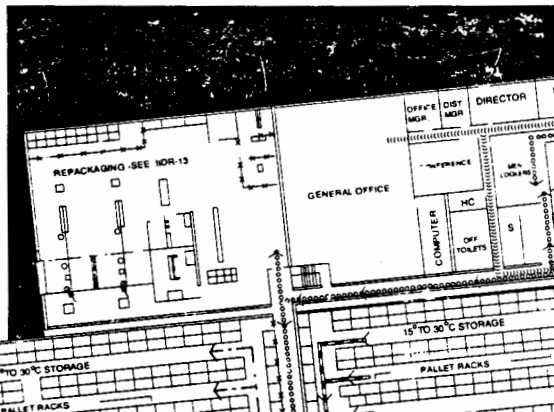
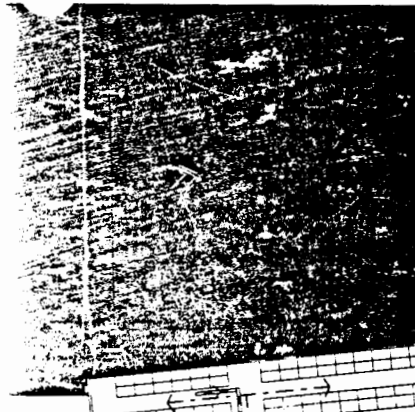
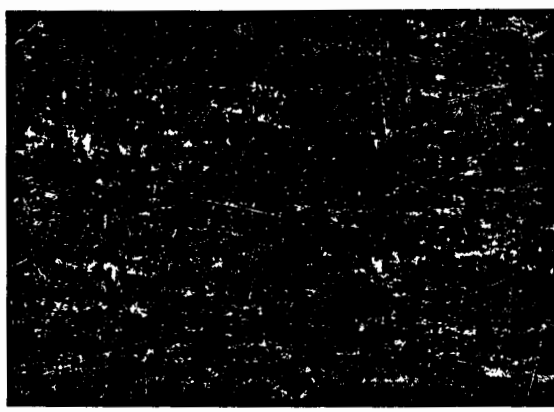
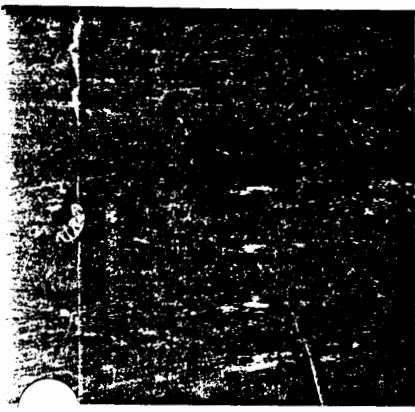
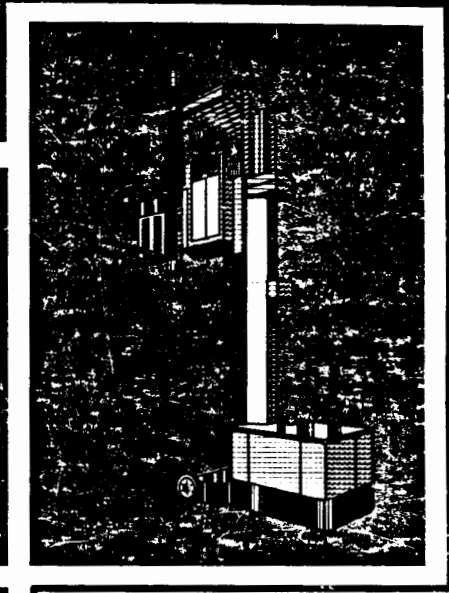


GUIDELINES FOR MEDICAL SUPPLIES DISTRIBUTION CENTERS

Volume No. 1
REGIONAL AND CENTRAL CENTERS
PLANNING, DESIGN AND CONSTRUCTION



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Foreword

The Plan for Priority Health Needs in Central America and Panama (PPS/CAP) in 1984 made drugs one of its seven priority areas.

Drugs constitute one of the inputs with a high impact on health care costs, representing on average an estimated 20 to 30% of total expenditures on health, and from 40 to 50% of the cost of all inputs utilized in the health services. This situation, in conjunction with other factors, such as the lack of access to drugs by the entire population, population growth, and the economic and financial difficulties facing the countries, evoke reflection about the effort to be made in order to optimize current investments in drugs through efficient supply systems.

Storage is one of the phases of supply process that directly influence both the quality of the product and its cost. The former derives from adequate preservation of the initially established therapeutic and pharmacological quality of the drug, which requires the maintenance of suitable environmental conditions, in accordance with the particular requirements of each product during the time that it is in the warehouse.

The influence of storage on cost manifests itself both in relation to the maintenance of inventory levels, and to the losses that result from the damage, deterioration, theft, and expiration of products caused by inadequate storage.

The Pan American Health Organization, given the above factors and in light of the problems related to the situation in Central America, saw the need to develop this technical document providing guidelines for the planning, design, and construction of storerooms at the central and peripheral levels, as well as minimum storage requirements, with a view to improving the conditions of drug supply in the Region.

This book, published in Spanish and in English, consists on four volumes, the first three related to regional and central distribution centers, and the fourth aimed at local distribution centers.

Volume 1, Standards for Planning, Design, and Construction, covers in detail the three phases which any engineering project must pass through. Planning is discussed in the first fourteen chapters, from the concepts of organization of working equipment up through criteria to be used in surveys to select an appropriate site for a center to receive, store, distribute and repackage

medical supplies. Consideration is given to safety and the prevention of losses, as well as to appropriate storage practices. There is an analysis of the critical factors that affect spatial planning, a list for identifying the different types of interior space that are required, and a description of methods and procedures for determining the amount of space needed. There are also two chapters devoted to an extensive discussion of appropriate equipment, including selection and installation costs, as well as environmental standards for the various classes of interior spaces for a medical supply complex.

The topics of design and construction are covered in the chapters that follow in Volume 1. The purpose is to emphasize approaches to technical aspects, costs, and administration which will allow a project to be brought to completion, both in the anticipated amount of time and within the prepared budget. The technical information that is found in this part is perhaps unique because it refers specifically to the problems and solutions that present themselves at centers for the distribution of medical products as a result of the various types of supplies that are handled, the types of services provided for community health care, and the fact that are considered to be essential buildings.

Volume 2, Standards for Technical Specifications provides general guidelines to specifications for materials, products, equipment, and installation techniques for some of the industrial equipment, installations, or construction components in industrial-type buildings designated for the receiving, storage distribution and repackaging of medical supplies. It is not an exhaustive document to be used for the purpose of making construction bids, but rather a guide that provides engineers and architects in charge of a project of this type with useful information and criteria. For this reason, the standards have been broken down into three areas: architectural standards, mechanical standards and fire safety standards. Each unit includes general information, materials, products, and execution.

Volume 3, Reference Drawings, is a graphic supplement to Volumes 1 and 2. It presents 70 drawings, most of them drawn to scale, which display general details applicable to the planning and design of regional and central buildings and installations. Each drawing has a separate, brief explanation of its principal characteristics and mentions the chapter in which these are indicated. The intention of this set of drawings is to provide administrative, planning, and design teams with information which may be adopted to the specific conditions of their own projects and serve as a reference during the preparation of their respective construction drawings.

Volume 4, is devoted to local distribution centers. The planning, design, and construction of this type of center is covered in six chapters, and graphic information is provided in six reference drawings.

As a whole, this work develops generic guidelines to planning the requirements, facilities, and equipment for the prototype of a center to be used in the storage and distribution of medical supplies. It presents guidelines and methods for the design and construction of such storage centers, in accordance with this planning criteria, and it proposes modes of administration.

Although originally conceived of for Central America, the technical excellence and stimulus associated with this effort makes it applicable to other developing countries.

The technical content of this document was prepared by the Pan American Health Organization, and, along with this publication, was financed by the United States Agency for International Development (U.S./AID), under the Plan for Health Priority Needs in Central America and Panama

Introduction:

The Pan American Health Organization is publishing the present guidelines on the planning, design, and construction of distribution centers at the central, peripheral and local levels, and on minimum storage requirements, as a contribution to the efforts that the governments of the Region are making to improve drug availability for the entire population.

Drugs play an important role in disease prevention and the restoration of health, thus helping significantly to attain the goal of HFA/2000, as a priority component of primary health care. The processes of drug storage and distribution currently differ greatly in the Region, and there are serious problems in the administration of that input which lead to significant losses, higher costs and greater unevenness of quality, availability, and use. The guidelines being published now are an attempt to help solve these problems.

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INDEX

Introducción

PLANNING

Chapter 1

PLANNING GUIDELINES

1.1 Project Planning's Objective.....	3
1.2 Project Planning Team.....	3
1.3 Defining the Scope of the Project and the Project Schedule.....	4
1.4 Importance of Knowledge of Equipment in Planning.....	5
1.5 Space Planning.....	5
1.6 Purpose of the Guidelines.....	8
1.7 Benefits of Guidelines.....	9
1.8 Renovating Existing Facilities.....	9
1.9 Workflow of a Typical Central Distribution Facility.....	9
1.10 The Project Planning Team's Scope of Work.....	10
1.11 How to Measure Success.....	11
Summary.....	11

Chapter 2

GEOGRAPHIC LOCATION CRITERIA

2.1 Definitions.....	13
2.1.1 Central Receiving, Warehousing and Distribution Facility.....	13
2.1.2 Central Receiving and Warehouse.....	13
2.1.3 Central Distribution Center.....	13
2.1.4 Reimbursement.....	14
2.1.5 Regional Distribution Center.....	14
2.1.6 Local Distribution Center.....	14
2.1.7 Trans-Shipping Point.....	14

2.2 Choosing a Location for the Central Receiving, Warehouse, and Distribution Center.....	14
2.3 Regional Distribution Centers.....	16
2.4 Diversity of Demand.....	17
Summary.....	18

Chapter 3

SECURITY AND LOSS PREVENTION

3.1 Security.....	22
3.2 Loss Prevention.....	22
3.3 Security, Loss Prevention, and Insurance.....	22
3.4 Planning for Security and Loss Prevention Installations.....	23
3.5 Security and Loss Prevention Facilities and Installations.....	23
3.5.1 Site Selection.....	23
3.5.2 Planning.....	24
3.5.3 Fences.....	25
3.5.4 Security Lighting.....	25
3.5.5 Fence Alarms and Surveillance Systems.....	25
3.5.6 Wells or Water Reservoirs.....	26
3.5.7 Access Control to the Site and on the Site.....	26
3.5.8 Disposal of Solid Wastes.....	27
3.5.9 Hazardous Materials.....	27
3.5.9.1 Location of Hazardous Materials.....	28
3.5.9.2 Handling Hazardous Materials.....	29
3.5.9.3 Hazardous Materials Order Picking.....	29
3.5.9.4 Special Installations.....	29
3.5.10 Personnel Regulations.....	30
3.5.11 Exit and Entry Controls to Buildings.....	30
3.5.11.1 Doors.....	30
3.5.11.2 Windows.....	31
3.5.11.3 Glazing.....	31
3.5.11.4 Exit Lights.....	32
3.5.12 Battery Charging.....	32
3.5.13 Emergency Electrical Power.....	32
3.5.14 Emergency Lighting.....	32
3.5.15 Static Electricity.....	32
3.5.15.1 Bonding and Grounding.....	33
3.5.15.2 Lightning Protection.....	33
3.5.16 Repackaging of Flammable Liquids.....	34
3.5.17 Computer Installations.....	34
3.5.18 Earthquake.....	34
3.5.19 Housekeeping Facilities.....	34
3.5.20 Access to Storage, Picking, and Packing Areas.....	34
3.5.21 Low Temperature Storage Facilities and Alarms.....	35
3.5.22 Guard Dogs.....	35
3.5.23 Security Guard Clock Stations.....	35

3.5.24	Fire Protection Systems.....	35
3.5.24.1	Smoke Detectors.....	36
3.5.24.2	Automatic Sprinkler Systems.....	36
3.5.24.3	Fire Hydrant, Hoses and Extinguishers.....	37
3.5.24.4	Fire Prevention Construction Considerations.....	37
Summary		38

Chapter 4

CRITERIA FOR IDENTIFICATION OF FUNCTIONAL SPACE REQUIREMENTS

4.1	Functional Space Requirements Checklist.....	39
4.2	Glossary of Functional Areas.....	41
4.2.1	Inbound Package Staging.....	41
4.2.2	In Bond Quarantine.....	41
4.2.3	Truck Driver Waiting Areas.....	41
4.2.4	Rejected Product.....	42
4.2.5	Hazardous Materials.....	42
4.2.6	Order Check Area.....	42
4.2.7	Outbound Package Staging.....	42
4.2.8	Returned Goods.....	42
4.2.9	Product Destruction.....	42
Summary		42

Chapter 5

CRITICAL FACTORS THAT AFFECT SPACE PLANNING. GOOD STORAGE PRACTICES

5.1	Introduction.....	45
5.2	The Golden Rules for planning Central Receiving, Warehousing, and Distribution Facilities.....	45
5.3	"External" Factors Affecting the Golden Rules.....	47
5.3.1	The Medical Supply Distribution System's Impact on Space Requirements.....	47
5.3.2	The Impact of Customer Service Level on Space Requirements.....	48
5.3.2.1	Degree of Order Fulfillment.....	48
5.3.2.2	Speed of Delivery.....	49
5.3.3	The Impact of Conflictive Distribution Operations Goals on Space Requirements.....	49
5.3.4	The Impact of Seasonality, Procurement Efficiency, and Supplier Delivery Performance on Space Requirements.....	50
5.4	Strategic Alternatives to Minimize "External" Factors' Impact on Space Requirements.....	51
5.5	Statement of Planning Goals.....	52
5.6	Good Storage Practices.....	53
Summary		58

Chapter 6

EQUIPMENT AND EQUIPMENT SELECTION

6.1	Introduction	61
6.2	Equipment Selection and Information	63
6.3	Justifying Equipment Requirements	64
6.3.1	General Justification.....	64
6.3.2	Financial Justification.....	64
6.3.3	Nonfinancial Justification.....	65
6.4	Unitized Product Movement	65
6.4.1	Introduction.....	65
6.4.2	General Considerations.....	66
6.4.3	Pallets.....	68
6.4.4	Pallet Patterns.....	70
6.4.5	Box, Bin, and Collapsible Container Pallets.....	72
6.4.6	Slip Sheets.....	72
6.4.7	Plastic Tote Boxes.....	72
6.5	Dock Equipment	74
6.5.1	Dock Boards.....	74
6.5.1.1	Permanent Dock Boards.....	74
a.	Built-in Dock Levelers.....	74
b.	Free-standing Dock Levelers.....	77
c.	Added-on Dock Levelers.....	77
6.5.1.2	Portable Dock Boards.....	78
6.5.2	Truck Levelers and Dock Lifts-Permanent or Semipermanent.....	79
6.5.3	Portable Ramps.....	80
6.5.3.1	Heavy-duty Ramps.....	80
6.5.3.2	Light-duty "Slider" Ramps or "Slider" Conveyors.....	81
6.5.4	Dock Loading Lights.....	82
6.5.5	Electrical Energy Saving Device for Docks-Flexible Strip Doors.....	82
6.5.6	Dock Conveyors.....	83
6.6	Power Vehicular Equipment	85
6.6.1	Stacking Power Lift Trucks.....	86
6.6.1.1	Counterbalanced Lift Trucks.....	86
a.	Sit Down Counterbalanced Lift Trucks.....	86
b.	Stand Up Counterbalanced Lift Trucks.....	87
6.6.1.2	Narrow Aisle Lift Trucks.....	88
a.	Narrow Aisle Riding Types Straddle Lift Trucks (Non Reach).....	88
b.	Narrow Aisle Stand Up Reach Lift Trucks (Non-straddle).....	91
c.	Narrow Aisle Turret (Sideload) Lift Trucks.....	93
d.	Narrow Aisle Walking (Stacking) Lift Truck (Reach or Straddle).....	94
e.	Narrow Aisle Order Picking Trucks.....	95
6.6.1.3	Attachments for Stacking Lift Trucks.....	96
6.6.2	Non Stacking Power Lift Trucks.....	99
6.6.2.1	Low Lift Walking Trucks.....	99
6.6.2.2	Low Lift Riding Trucks.....	99

6.6.3	Personnel and Package Carriers.....	99
6.6.4	Where to Begin with Powered Vehicular Equipment Selection.....	100
6.6.4.1	New Facilities.....	100
6.6.4.2	Existing Facilities Without Powered Vehicular Equipment.....	101
6.6.4.3	Existing Facilities With Powered Vehicular Equipment.....	101
6.6.5	Determining The Proper Equipment for the Job.....	102
6.6.5.1	Cost.....	102
6.6.5.2	Equipment Size and Building Limitation Factors.....	102
6.6.5.3	Characteristics of Load Types and Move Characteristics.....	103
6.6.5.4	Safety and Environmental Considerations.....	103
6.6.5.5	Equipment Standardization Considerations.....	103
6.6.6	Determining the Quantity of Lift Truck Vehicles Required.....	104
6.6.7	Selection of Power Source.....	105
6.6.7.1	Liquefied Petroleum Gas (LPG), Diesel, and Gasoline Powered Truck.....	105
6.6.7.2	Electric Powered Trucks.....	106
6.6.8	Batteries, Battery Chargers, and Battery Hoists.....	107
6.6.8.1	Batteries.....	107
6.6.8.2	Battery Chargers.....	107
6.6.8.3	Connectors.....	108
6.6.8.4	Battery Hoists.....	108
6.6.9	General Specifications for Power Vehicular Equipment.....	109
6.6.9.1	Power Source.....	109
6.6.9.2	Speed Control.....	109
6.6.9.3	Hour Meter.....	109
6.6.9.4	Tires and Wheels.....	109
6.6.9.5	Steering.....	110
6.6.9.6	Tine Length.....	110
6.6.9.7	Ramp Travel.....	110
6.7	Manual Vehicular Equipment.....	110
6.7.1	Two-wheel Trucks.....	111
6.7.2	Floor Trucks.....	114
6.7.2.1	Platform Floor Trucks.....	116
6.7.2.2	Shelf Type Floor Trucks.....	116
6.7.3	Hydraulic Pallet Trucks.....	117
6.7.4	Dollies.....	118
6.8	Fixed Storage Systems.....	119
6.8.1	Static Storage Systems.....	120
6.8.1.1	Shelving.....	120
6.8.1.2	Pallet Racks.....	124
6.8.1.3	Drive-in Pallet Racks.....	130
6.8.1.4	Drive-Through Pallet Racks.....	131
6.8.1.5	Cantilever Racks.....	131
6.8.1.6	Pallet Stacking Frames.....	132
6.8.1.7	Mezzanines.....	133
6.8.1.8	Refrigerators and Freezers.....	134
6.8.2	Dynamic or Combination Static/Dynamic Storage Systems.....	134
6.8.2.1	Gravity Flow Racks for Cartons.....	134

6.8.2.2	Carton Flow Rack Mezzanines.....	140
6.8.2.3	Gravity or Power Flow Racks for Pallets.....	145
6.8.2.4	Powered Vertical Carousels.....	145
6.8.2.5	Powered Horizontal Carousels.....	14
6.8.2.6	Rotary Bins.....	146
6.8.2.7	Movable Aisle High Density Storage Systems.....	146
6.9	Conveyors and Vertical Transporters.....	147
6.9.1	Conveyors.....	147
6.9.1.1	Power Portable Adjustable Height Belt Conveyors - Folding or Nonfolding.....	149
6.9.1.2	Horizontal Gravity Roller or Skate Wheel Conveyors.....	149
6.9.1.3	Power Horizontal Belt Through Conveyors.....	150
6.9.1.4	Power Table Top Chain Conveyors.....	151
6.9.1.5	Power Belt Table Conveyors.....	154
6.9.1.6	Power Vertical Conveyors/Transporters.....	155
6.10	Distribution Packing, Labeling, and Miscellaneous Warehouse Equipment.....	156
6.10.1	Packing Stations.....	156
6.10.2	Labeling and Marking Packed Containers.....	156
6.10.2.1	Stenciling.....	157
6.10.2.2	Labeling.....	157
6.10.2.3	Coding.....	158
6.10.2.4	Marking.....	158
6.10.2.5	Printing.....	158
6.10.3	Tying, Bag Taping, Strapping, and Heat Sealing Machines.....	158
6.10.3.1	Tying Machines.....	158
6.10.3.2	Bag Taping Machines.....	159
6.10.3.3	Heat Seal Tabletop Strapping Machines.....	159
6.10.3.4	Thermal Impulse and Heat Sealing Machines.....	159
6.10.4	Shrink Wrapping.....	160
6.10.5	Stretch Wrapping/Stretch Netting.....	161
6.10.6	Styrofoam Popcorn and Peanut Dispensers for Shipping Con- tainer Fillers.....	161
6.10.7	Tape Dispensing Machines.....	162
6.10.8	Stapler/Stitchers.....	163
6.10.9	Scales.....	163
6.10.9.1	Platform Scales.....	164
6.10.9.2	Floor Scales.....	164
6.10.9.3	Low Profile Floor Scales.....	164
6.10.10	Portable Safety Ladders/Portable Safety Picking Ladders.....	165
6.10.11	Carton Cutter.....	166
6.10.12	Pallet Puller.....	166
6.10.13	Safety Mirrors.....	167
6.10.14	Truck Wheel Chocks with Anti-theft Chains.....	167
6.10.15	Strapping Machines for Metal or Plastic Straps.....	167
6.11	Housekeeping Equipment.....	169
6.11.1	Housekeeping Carts.....	169
6.11.2	Power Floor Strubbers and Vacuum Sweepers.....	169
6.11.2.1	Battery-powered Wet/Dry Floor Scrubbers.....	169
6.11.2.2	Battery-powered Vacuum Sweepers.....	170
6.11.3	Floor Polishers/Cleaners.....	171

6.11.4	Portable Industrial Vacuum Cleaners with High Efficiency.....	171
6.12	Repackaging Equipment.....	172
6.12.1	Introduction.....	172
6.12.2	The Relationship Between Package Design, Package Development, and Equipment Selection.....	172
6.12.3	How to Request Packaging Equipment Information and Quotations.....	174
6.12.4	Packaging Equipment Specifications Checklist.....	175
6.12.5	Container Cleaning Equipment.....	179
6.12.5.1	Make It Clean/Keep It Clean.....	179
6.12.5.2	Container Blowing/Vacuums with/without Container Inversion.....	180
6.12.5.3	Container/Component Washing and Drying.....	181
6.12.6	Power Rotary Unscrambling/Accumulating Tables and Conveyors.....	181
6.12.6.1	Automatic Container Feeding Machines.....	182
6.12.6.2	Rotary Unscrambling Tables.....	182
6.12.6.3	Hoppers for Manually Feeding Containers.....	183
6.12.6.4	Rotary Accumulating Tables.....	183
6.12.6.5	Roller and Belt Conveyors.....	183
6.12.7	Container, Label, Carton, and Film Printing.....	184
6.12.7.1	Label Printers/Counters.....	184
6.12.7.2	Label and Carton Printers.....	185
6.12.7.3	Roll Stock Printers for Strip or Blister Packaging Laminates.....	185
6.12.7.4	Noncontact Container Printers.....	185
6.12.7.5	Contact Container Printers.....	186
6.12.8	Filling Equipment.....	186
6.12.8.1	Mechanical Configurations for Filling Equipment in Repackaging Areas.....	186
6.12.8.2	Liquid Filling Equipment.....	188
6.12.8.3	Cream, Paste, and Very Viscous Product Fillers.....	192
6.12.8.4	Granule and Powder Fillers.....	193
6.12.8.5	Tablet and Capsule Fillers.....	195
6.12.8.6	Strip (and Sachet) Packaging Equipment.....	201
6.12.8.7	Tablet/Capsule Blister Packaging Equipment.....	202
6.12.8.8	Catch cover Machines for Strip Packaged Products.....	204
6.12.9	Rigid Container Capping, Plugging, and Tamper Evident Sealing Equipment.....	205
6.12.9.1	Press on Caps, Plugs, and Fitments.....	206
6.12.9.2	Screw on Caps.....	207
6.12.9.3	Roll on Caps.....	208
6.12.9.4	Other Tamper Evident Seals on Containers.....	210
6.12.9.5	Torque Testing Equipment.....	211
6.12.9.6	Capping Equipment Costs.....	212
6.12.10	Container Labeling Equipment.....	213
6.12.10.1	Label Gluers.....	215
6.12.10.2	Semiautomatic Labelers.....	215
6.12.10.3	Automatic Labelers.....	216
6.12.11	Miscellaneous Repackaging Equipment.....	218
6.12.11.1	Cartoning Equipment.....	218

6.12.11.2	Shrink Wrapping.....	218
6.12.11.3	Tape Machines.....	218
6.12.11.4	Staplers/Stitchers.....	218
6.12.11.5	Temperature/Humidity Recorders.....	21
6.13	Safety Equipment.....	219
6.13.1	Hazardous Flammable Liquid Dispensing Equipment.....	219
6.13.1.1	Nonsparking Drum Wrench.....	220
6.13.1.2	Self-closing Safety Faucet.....	221
6.13.1.3	Rotary Transfer Pump.....	221
6.13.1.4	Pressure/Vacuum Relief Drum Vents.....	221
6.13.1.5	Fill Funnels.....	221
6.13.1.6	Safety Storage Cans.....	221
6.13.1.7	Bonding Cables and Clamps.....	221
6.13.2	Portable Fire Extinguishers.....	222
6.14	Maintenance And Laundry Equipment.....	222
6.14.1	Laundry.....	222
6.14.2	Maintenance Equipment.....	222
6.15	Offices and Office/Personnel Service Equipment.....	223
6.16	Security Equipment.....	224
6.16.1	Watchman's Clock and Key Stations.....	224
Summary		226

Chapter 7

PROCESS EQUIPMENT LISTS, COST ESTIMATING, AND LAYOUTS

7.1	The Process Equipment List.....	237
7.2	Estimating Process Equipment and Installation Costs.....	241
7.3	Equipment Layouts.....	242
Summary		243

Chapter 8

FUNCTIONAL SPACE SIZING CRITERIA

8.1	Office Space Planning.....	245
8.1.1	Long-range Personnel Forecast.....	245
8.1.2	Office Equipment List.....	248
8.1.3	Working Relationships/Workflow Chart.....	249
8.1.4	Office Space Standards.....	249
8.2	Personnel Services Space Planning.....	249
8.3	Space Planning In Warehouse, Distribution, and Repackaging Areas.....	249
8.4	Dock Area Space Planning.....	250
8.5	In Process Quality Control and Inspection Laboratory Space Planning.....	252

8.6	Quarantine, Warehousing, and Low Temperature Storage Space Planning.....	254
8.6.1	How to Define Temperature Requirements for Products in Quarantine, Storage, Picking, and Repackaging Areas Where the Product is not Directly Exposed to the Environment.....	254
8.6.2	Warehouse and Quarantine Space Planning.....	256
8.6.2.1	What (and What Not) To Stock.....	258
8.6.2.2	Purchase Order Frequency and Purchase Order Volume's Effects on Space Requirements.....	258
8.6.2.3	Safety Stock and Customer Service Level's Effect on Space Requirements.....	259
8.6.2.4	Storage Techniques Effects on Space Planning --Random or Dedicated Storage Locations.....	260
8.6.2.5	Why Quarantine Space Planning is Different Than Warehouse Space Planning.....	263
8.6.2.6	When to Use Shelving, Pallet Racks, and Pallet Stacking Storage Methods.....	264
8.6.2.7	How To Select Storage Methods, Storage Equipment, and Determine Storage and Quarantine Space Requirements.....	265
	8.6.2.7.a Selection of Standard Storage Methods For Each Inventory Item -Schedule A.....	265
	8.6.2.7.b Analysis of Storage Methods -Schedule B.....	273
	8.6.2.7.c Analysis of Storage Space Requirements - Schedule C.....	276
	8.6.2.7.d Conversion of Net Storage Area to Gross Storage Area to Accommodate Elements of Building and Building Service Systems.....	281
8.6.3	Central Distribution Center Space Planning.....	282
8.6.3.1	Picking Area Space Planning.....	282
	8.6.3.1.a Picking Methods.....	282
	(1) Order Picking Method.....	283
	(2) Zone Picking Method.....	283
	(3) Combination Order/Zone Picking Method.....	283
	(4) Picking Methods and Materials Handling Equipment.....	284
	(5) Combining Picking/Storage for Slow Moving Items And Items that Have Low Total Inventory Quantities per Item.....	284
	(6) Items that Should be Picked Directly from the Storage Area.....	284
	8.6.3.1.b Selection of Picking and Very Low Volume Picking/Storage Equipment -An Example.....	284
	8.6.3.1.c How to Determine Picking Area Space Requirements.....	289
	8.6.3.2 Packing Area Space Planning.....	290
8.7	Repackaging Area Space Planning.....	291
8.7.1	What (and What Not) to Repackage.....	293
8.7.2	Hazardous Materials and Super Potent Drug Repackaging.....	293
8.7.3	When to Consider Repackaging of Nonhazardous Materials.....	293
8.7.4	Analyzing Repackaging Requirements.....	297

8.7.5 Typical Repackaging Process Sequences.....	298
8.7.6 Capacity Planning -How to Convert the Long-range Unit Forecast for Repackaged Product Into Repackaging Equipment and Facilities Requirements.....	298
8.7.7 How to Define Environmental Requirements for Repackaging Areas.....	308
8.7.8 Considerations to Facilitate Future Expansion.....	309
Summary	309

Chapter 9

ENVIRONMENTAL STANDARDS, ROOM CLASIFICATION AND FACILITY DESIGN CRITERIA

9.1 Definitions	311
9.2 How to Classify Rooms	311
9.3 Internal Atmospheric Environmental Controls	314
9.4 Comparison of Internal Atmospheric Environmental Controls	315
9.5 Format of Environmental Standards	316
9.6 Room Classifications	317
Class 1: Oral Solid and Oral and Topical Liquid Filling with Product Exposure.....	317
Class II: General Packaging.....	324
Class III: Incoming Inspection Laboratories.....	328
Class IV: Offices/Gatehouses.....	331
Class V: Utilities and Maintenance.....	335
Class VI: Sanitary Facilities, Locker Rooms, First Aid, Waiting Rooms, and Cafeterias.....	337
Class VII: Warehouse.....	339
Class VIII: Low Temperature Storage.....	343
Class IX: Housekeeping Closets.....	348
Class X: Dog Kennel.....	350
Class XI: Hazardous Materials and Wooden Pallet Storage.....	351
Class XII: Facilities for Product Destruction, Incineration, and Temporary Storage of Solid Wastes for Disposal.....	355
Class XIII: Computer Rooms.....	358
Summary	361

Chapter 10

CONTROLLED DRUGS

10.1 Controlled Drug Classifications	363
10.2 Special Equipment and Installations Required for Controlled Drugs	364
10.2.1 Schedule I and II Controlled Drugs.....	366
10.2.2 Schedule III to V Controlled Drugs.....	366

10.2.3 Combined Controlled Drug Storage Areas.....	367
Summary.....	367

Chapter 11

FACILITY LAYOUT ALTERNATIVES

11.1 How to Develop Facility Layouts.....	369
11.2 Facility Layout Alternatives.....	370
Summary.....	371

Chapter 12

LAND AREA REQUIREMENTS

12.1 How to Determine Land Area Requirements.....	373
12.2 The Impact of Configuration on Land Area Requirements.....	373
12.3 The Impact of Topographical and Subsurface Configurations on Land Area Requirements.....	373
12.4 Use of Facility Layouts to Develop Land Area Requirements -An Example.....	374
Summary.....	375

Chapter 13

SITE SELECTION CRITERIA AND SITE SURVEYS

13.1 Site Selection -When Should It Be Done?.....	377
13.2 How to Make an Economic Evaluation of Different Sites Using Site Survey Data.....	377
13.3 Sources of Information for Site Surveys.....	378
13.4 How to Make a Comparative Evaluation of Alternative Sites.....	378
Summary.....	383

Chapter 14

PLANNING REGIONAL DISTRIBUTION CENTERS

14.1 Validate the Need for a Regional Distribution Center.....	385
14.2 The Advantages of Minimizing the Number of Regional Distribu- tion Centers.....	387
14.3 Guidelines for Planning Regional Distribution Centers.....	387
Summary.....	389

DESIGN AND CONSTRUCTION

Chapter 15

INTRODUCTION TO THE DESIGN AND CONSTRUCTION GUIDELINES

15.1 Purpose of the Design and Construction Guidelines	391
15.2 Use of the Design and Construction Guidelines	392
15.3 Benefits of the Design and Construction Guidelines	392
15.4 The Project Design and Construction Management Team's Scope of Work	393
15.5 How to Measure Success	393
Summary	393

Chapter 16

PROJECT TEAM ORGANIZATION

16.1 Design Team Organization	395
16.1.1 Project Manager.....	396
16.1.2 Project Engineer.....	397
16.1.3 Architect/Engineer.....	397
16.1.4 Geologist/Soil Engineer.....	398
16.1.5 Environmental Control Engineer.....	398
16.1.6 Sanitary/Plumbing, Electrical, and Fire Protection Engineers.....	398
16.1.7 Structural Engineer.....	399
16.1.8 Specification Writers.....	399
16.1.9 Equipment and Industrial Engineers.....	399
16.1.10 Project Scheduler.....	399
16.1.11 Cost Engineer.....	399
16.2 Construction Team Organization	399
16.2.1 Project Manager.....	400
16.2.2 Project Engineer.....	400
16.2.3 Resident Engineer.....	401
16.2.4 Site Accountant.....	401
16.2.5 Site Clerk.....	401
16.2.6 Testing Consultant.....	401
16.2.7 Architect/Engineer.....	402
16.3 Qualification of Design Consultants and Construction Contractors/Subcontractors	402
16.3.1 Design Consultants.....	402
16.3.2 Construction Contractors/Subcontractors.....	402
Summary	403

Chapter 17

SITE INVESTIGATION, SPACE DISTRIBUTION STUDIES AND MASTER PLANNING

17.1 Site Investigation	406
17.1.1 Land Survey.....	406
17.1.2 Topographical Survey.....	406
17.1.3 Geotechnical Investigation.....	406
17.2 Space Distribution Studies	407
17.3 Master Planning the Site	407
Summary	408

Chapter 18

SITE DEVELOPMENT

18.1 Earth Moving	409
18.2 Perimeter Fencing	410
18.3 Paved Sidewalks, Roads, and Parking Areas	410
18.4 Final Grading And Landscaping	410
Summary	411

Chapter 19

UTILITIES AND SERVICES

19.1 Electrical Power	413
19.1.1 On Site Power Generation.....	413
19.1.2 Utility Company Supplied Power.....	413
19.1.3 Emergency Power Supply.....	414
19.1.4 Diesel Oil Fuel Tanks for Generators.....	415
19.1.5 Selection of Voltages.....	415
19.1.6 Step Down Transformers.....	415
19.1.7 Electric Power Conditioning and Voltage Control.....	416
19.1.8 Power Factor Correction.....	416
19.2 Water	416
19.2.1 City Water.....	416
19.2.2 Well Water.....	416
19.2.3 Water Quality.....	417
19.2.4 Water Cistern Sizing Criteria.....	417
19.2.4.1 Fire Protection.....	417
19.2.4.2 Industrial Use.....	418
19.2.4.3 Domestic Use.....	418
19.2.4.4 Landscaping.....	418
19.2.4.5 Cistern Design and Volume.....	418
19.3 Sewers	419
19.3.1 Storm Sewers and Drainage Systems.....	419

19.3.2 Sanitary Sewers.....	420
19.4 Telephone.....	420
19.5 Locating Underground Mains, Sewers, and Electrical Installations.....	42
Summary.....	421

Chapter 20

ARCHITECTURE

20.1 General Facility Design Criteria.....	423
20.2 Special Requirements for Pest Control.....	424
20.3 Special Requirements for Hazardous Materials.....	425
Summary.....	426

Chapter 21

STRUCTURAL SYSTEMS

21.1 Structural Alternatives.....	427
21.2 Structural Grid.....	428
21.3 Building Heights.....	429
21.4 Seismic Design.....	430
21.5 Prototype Distribution Facility Structural Design Alternatives -An Example.....	430
21.6 Design Considerations to Facilitate Future Expansion.....	432
21.7 Coordination of Structural Design With Other Design Disciplines.....	432
21.8 Verification of Actual Soil Deformation Under Load.....	433
Summary.....	433

Chapter 22

ARCHITECTURAL SYSTEMS

22.1 Introduction.....	435
22.2 Design Criteria for New and Renovated Facilities.....	435
22.3 Architectural Design Criteria.....	436
22.3.1 Floors.....	436
22.3.2 Walls.....	437
22.3.2.1 Exterior Walls.....	437
22.3.2.2 Interior Walls.....	438
22.3.3 Roofing.....	439
22.3.3.1 Roof Slab or Roof Deck.....	440
22.3.3.2 Insulation.....	441
22.3.3.3 Vapor Barrier.....	442
22.3.3.4 Above Deck Fills.....	442

22.3.3.5	Weather Proofing.....	442
22.3.3.6	Solar Barrier.....	444
22.3.3.7	Expansion and Flashing Joints.....	445
22.3.3.8	Cants.....	445
22.3.3.9	Roof Inspection and Testing.....	445
22.3.4	Ceilings.....	446
22.3.5	Doors.....	447
22.3.5.1	General.....	447
22.3.5.2	Dock Doors.....	447
22.3.5.3	Doors to Private Offices.....	448
22.3.5.4	Wire Mesh Gates.....	448
22.3.5.5	Hollow Metal Doors.....	448
22.3.5.6	Fire Doors.....	448
22.3.5.7	Special Provisions for Exterior Doors.....	458
22.3.6	Windows.....	449
22.3.6.1	Exterior Windows.....	449
22.3.6.2	Interior Windows -Repackaging.....	449
22.3.6.3	Glazing in Doors and Windows.....	450
22.3.7	Hardware.....	450
Summary	451

Chapter 23

STORM SEWERS AND DRAINAGE SYSTEMS

23.1 Storm Sewers Outside of Buildings.....	454
23.2 Storm Sewers Inside of Buildings.....	455
Summary.....	455

Chapter 24

SANITARY SEWERS SYSTEMS

24.1 Sanitary Sewers Inside of Buildings.....	458
24.2 Sanitary Sewers Outside of Buildings.....	460
Summary.....	461

Chapter 25

COMPRESSED AIR, HOT AND COLD POTABLE WATER SYSTEMS

25.1 Piping Systems' Design.....	463
25.2 Fixture Location.....	464
25.3 Water Piping.....	464
25.4 Compressed Air Piping.....	464
25.5 Instrumentation and Controls Compressed Air Piping.....	464

25.6 Hoses.....	465
25.7 Piping Support.....	465
25.8 Piping Insulation.....	465
25.9 Testing.....	46
25.9.1 Flushing, Testing, and Disinfecting Water System Piping.....	465
25.9.2 Purging and Testing Compressed Air Systems.....	465
25.10 Piping Identification.....	466
25.11 Guideline Specifications for Piping Systems.....	466
25.12 Domestic Hot Water Heating.....	466
25.13 Compressed Air.....	466
25.13.1 Classification of Compressed Air Systems.....	466
25.13.1.1 Plant compressed Air (CA).....	467
25.13.1.2 Oil Free Compressed Air (CA-OF).....	467
25.13.1.3 Instrument Compressed Air.....	467
25.14 Oil-free Dry Compressed Air Systems.....	467
25.15 Oil-free Air Compressors.....	468
25.16 Compressed Air Drying.....	468
Summary.....	468

Chapter 26

ELECTRICAL SYSTEMS

26.1 Electrical Systems' Design.....	472
26.2 Design Analyses.....	472
26.3 Electrical Systems' Description.....	472
26.4 Classification of Building Areas.....	473
26.4.1 Safety.....	473
26.4.2 Wet Areas.....	473
26.4.3 Clean Areas -Environmental Class I.....	474
26.5 Primary Substations.....	474
26.5.1 Transformers for Power and Light.....	474
26.6 Classification of Electrical Enclosures.....	475
26.7 Raceways, Conduit, Fittings, and Conductors in Underground Installations.....	476
26.8 Conduit.....	476
26.8.1 Types of Conduit to Use.....	477
26.8.2 Conduit Installation.....	478
26.9 Boxes.....	479
26.10 Conductors.....	479
26.10.1 Selection Criteria.....	479
26.10.2 Splices, Taps and Terminations.....	480
26.10.3 Installations and Color Coding.....	480
26.10.4 Identification.....	481
26.10.5 Testing.....	482
26.11 Main and Secondary Panel Boards.....	482
26.11.1 Power Panels.....	482
26.11.2 Power Distribution Panels.....	483
26.11.3 Lighting Panels.....	48

26.11.4	Lighting Distribution Panels.....	484
26.11.5	Receptacle Panels.....	485
26.12	Motor Controls.....	485
26.12.1	Motor Starters.....	485
26.12.2	Motor Control Centers.....	486
26.12.3	Control Stations.....	486
26.12.4	Disconnecting Means.....	486
26.13	Wiring Devices.....	486
26.13.1	Switches.....	487
26.13.2	Convenience Outlets.....	487
26.14	Lighting.....	487
26.14.1	Voltage.....	487
26.14.2	Switches for Rooms with Large Floor Areas.....	487
26.14.3	Fixtures.....	487
26.14.4	Lamps and Ballasts.....	489
26.14.5	Lighting Intensities.....	490
26.15	Motors.....	490
26.15.1	Energy Efficient Motors.....	490
26.15.2	Selecting the Horsepower for an Energy Efficient Motor.....	491
26.15.3	Motor Selection - Electrical and Mechanical Characteristics.....	491
26.15.4	Enclosure Type.....	494
26.15.5	Finish.....	494
26.16	Identification and Labeling of Electrical Equipment Installations.....	494
26.17	Grounding.....	497
26.17.1	System Grounding.....	497
26.17.2	Equipment Grounding.....	497
26.17.3	Static Bonding and Grounding.....	498
26.17.4	Lightning Protection.....	500
26.18	Emergency Power Generation.....	501
26.18.1	Engine.....	501
26.18.2	Generator.....	501
26.18.3	Cooling System.....	502
26.18.4	Fuel System.....	502
26.18.5	Exhaust System.....	502
26.18.6	Automatic Diesel Engine Starting System.....	503
26.18.7	Main Line Circuit Breaker.....	504
26.18.8	Generator Control Panel.....	504
26.18.9	Automatic Transfer Switch (Enclosed Type).....	505
26.18.10	Emergency Power Generator Alarms.....	505
26.19	Alarm Systems.....	505
26.19.1	Fire Alarm System.....	506
26.19.2	Automatic Fire Protection Sprinkler Alarm System.....	506
26.19.3	Smoke Detection and Alarm System.....	506
26.19.4	Emergency Power Generation Alarm System.....	507
26.19.5	High/Low Temperature Alarms for Low Temperature Storage Units.....	507
26.19.6	Security Alarms.....	507
26.20	Telephone.....	507
26.21	Whatchman's Clock Security Tour System.....	508
26.22	Testing of Electrical Equipment and Installations.....	508
Summary	509

Chapter 27

ENVIRONMENTAL CONTROL SYSTEMS

27.1 Environmental Control Systems' Design	512
27.2 Codes and Standards	512
27.3 Environmental Control Systems' Description	512
27.3.1 Hot Water Heating System Description.....	513
27.3.2 Primary/Secondary Distribution Systems' Description.....	513
27.3.3 Chilled Water Systems' Description.....	514
27.3.4 Air Handling Systems' Description.....	515
27.4 Minimum Requirements for Initiating Design of Environmental Control Systems	515
27.5 Design Analyses	515
27.6 Mechanical Ventilation Systems' Design	515
27.6.1 Ventilation Requirements for Temperature Control.....	516
27.6.2 Ventilation Requirements for Control of Airborne Contaminants.....	516
27.6.3 Air Filtration.....	516
27.7 Air-Conditioning Systems' Design	516
27.7.1 Cooling Load Calculations.....	516
27.7.2 Air-Conditioning System Selection.....	517
27.7.3 Refrigeration Equipment Selection.....	518
27.7.4 Cooling Coils.....	518
27.7.5 Condensers and Cooling Towers.....	518
27.7.6 Insulation.....	519
27.8 Controls	519
27.9 Fire Dampers	519
27.10 Locating Environmental Control Equipment	519
27.11 Guideline Specifications	520
27.12 Maintenance of Environmental Control Systems	520
Summary	521

Chapter 28

FIRE PROTECTION SYSTEMS

28.1 Codes and Standards	526
28.2 Definition of Fire Protection Design Criteria	526
28.3 Preconstruction Phase Approval Requirements	527
28.4 Design Calculations and Drawings Required	527
28.5 Fire Protection Design Criteria	527
28.5.1 Fire Areas - Barriers, Walls, Openings.....	527
1. Fire Barriers.....	527
2. Fire Walls.....	527

3. Fire Openings (Doors/Windows).....	528
28.5.2 Fire Barriers Penetrations.....	528
28.5.3 Roof Construction.....	529
28.5.4 Smoke and Heat Venting/Draft Curtains.....	529
28.5.5 Fire Aisles.....	529
28.5.6 Pallet Rack Row Length.....	530
28.5.7 Clearances.....	530
28.5.8 Drainage.....	530
28.5.9 Structural Steel Building Members.....	530
28.5.10 Automatic Fire Protection (Sprinkler) Systems.....	531
28.5.11 Fire Hose Cabinets or Hose Reels.....	534
28.5.12 Fire Hydrants.....	535
28.5.13 Ring Fire Main.....	535
28.5.14 Fire Department Connections.....	536
28.5.15 Fire Pumps.....	536
28.5.16 Reserve Fire Water Volume Requirements and Supply.....	537
28.5.17 Backflow Prevention.....	538
28.5.18 Cathodic Protection.....	538
28.5.19 Portable Fire Extinguishers.....	539
28.5.20 Smoke Detectors and Alarm Systems.....	540
28.5.21 Special Fire Suppression Installations for Computer Equip- ment.....	540
28.5.22 Fire Protection Classifications of Hazardous Areas.....	541
28.5.23 Ventilation Requirements for Hazardous Locations Where Volatile Liquids are Present.....	544
28.5.24 How to Determine Electrical Requirements in Hazardous Locations Where Volatile Liquids are Present.....	544
28.6 Guideline Specifications.....	447
Summary.....	448

Chapter 29

REQUIRED DESIGN CALCULATIONS AND DRAWINGS

29.1 Definitions.....	549
29.2 Ownership of Original Drawings.....	549
29.3 Confidentiality of Drawings.....	550
29.4 Drawings, Design Calculations, and Other Services Required from the Project Design Team.....	550
29.4.1 Services Required from Design Consultants.....	550
29.4.2 Design Calculations Required.....	550
29.4.2.1 Electrical.....	550
29.4.2.2 Structural.....	550
29.4.2.3 Sanitary Piping.....	551
29.4.2.4 Environmental Control.....	551
29.4.2.5 Fire Protection.....	551
29.4.3 Drawing Requirements.....	551
29.4.3.1 General Drawing Requirements.....	551

29.4.3.2 Specific Drawing Requirements.....	552
29.4.3.3 Special Drawings and Instructions.....	552
29.4.4 List of Drawings Typically Required for a Central Distribution Facility.....	55
Summary.....	569

Chapter 30

SHOP DRAWINGS

30.1 What Are shop Drawings?.....	571
30.2 What Are Certified Shop Drawings?.....	572
30.3 When Are Shop Drawings Needed?.....	572
30.4 How is the Preparation, Submittal, Review, and Approval of Shop Drawings Managed?.....	572
30.5 Shop Drawing Submittal and Control Schedule.....	573
Summary.....	577

Chapter 31

AS BUILT OR RECORD DRAWINGS

31.1 The Importance of As Built Drawings.....	579
31.2 How to Assure That As Built Drawings are Prepared.....	580
31.3 Preparing As Built Drawings.....	581
31.4 Where to Store As Built Drawings.....	581
Summary.....	581

Chapter 32

PROYECT, DESIGN, AND CONSTRUCTION SCHEDULES

32.1 Introduction.....	583
32.2 Design Schedule.....	584
32.3 Construction Schedule.....	584
32.4 "Fast Track" Design/Build Schedule.....	584
32.5 Contractual Uses of Design and Construction Schedules.....	585
Summary.....	585

Chapter 33

COST ESTIMATING

33.1	Introducción	587
33.2	A Day in the Life of the Cost Engineer	588
33.3	Types of Cost Estimates	590
33.3.1	Order-of-Magnitude cost Estimate.....	590
33.3.2	Preliminary Cost Estimate.....	590
33.3.3	Engineering Cost Estimate.....	592
33.4	Preparation Of a Cost Estimate	595
33.4.1	Code of Accounts Format.....	595
33.5	Responsibilities for Developing Cost Estimates	596
33.6	Code of Accounts for Cost Estimating	598
	Summary	602

Chapter 34

DRAFTING GUIDELINES, SYMBOLOGY, AND ABBREVIATIONS

34.1	Types of Design Drawings	603
34.1.1	Layouts.....	603
34.1.2	Sketches.....	603
34.1.3	Plans.....	604
34.1.4	Elevations.....	604
34.1.5	Sections and Details.....	604
34.1.6	Isometrics.....	605
34.1.7	Composite Drawings.....	605
34.1.8	One-line Diagrams.....	605
34.1.9	Piping and Instrument Diagrams (P & ID's).....	605
34.2	Classification of Drawings for Assignment of Drawing Numbers	605
34.2.1	Architectural.....	606
34.2.2	Structural.....	606
34.2.3	Mechanical.....	606
34.2.4	Electrical.....	607
34.2.5	Process.....	608
34.3	Assigning Drawing Numbers	608
34.3.1	Application of Drawing Numbering System.....	608
34.3.2	Site Codes and Building Numbers.....	608
34.3.3	Discipline Identification.....	609
34.3.4	Drawing Register.....	609
34.4	Revisions to Drawings	609
34.4.1	Definition of a Revision.....	609
34.4.2	Identifying Revisions.....	610
34.5	Drawing Sizes and Format	612
34.6	Title Blocks, Key Plans, Orientation and Direction Indicator, and Drawing Titles	612
34.6.1	Title Blocks.....	612
34.6.2	Key Plans.....	612

34.6.3 Orientation and Direction Indicator.....	612
34.6.4 Drawing Titles.....	613
34.7 Scale of Drawings.....	613
34.8 Signatures and Dates.....	61
34.9 Lettering on Drawings.....	613
34.10 Line Definition on Drawings.....	614
34.11 Notes on Drawings.....	614
34.12 Cross-Referencing Drawings - Sections, Details, Isometrics.....	616
34.13 Drawing Sheet Materials.....	616
34.14 Symbols and Abbreviations.....	630
Summary.....	630

Chapter 35

DESIGNING AND CONSTRUCTING REGIONAL DISTRIBUTION CENTERS

35.1 Introduction.....	631
35.2 Building Systems' Description.....	632
35.2.1 Structural/Architectural.....	632
35.2.2 Environmental Control and Utilities.....	633
35.2.3 Fire Protection.....	633
Summary.....	634

PLANNING

This section of the guidelines contains data that relate primarily to the planning phases of a facility project. These data include:

- organizational concepts for the project planning team
- a typical project schedule
- criteria for determining where to establish a central receiving, warehousing, and distribution facility
- security and loss prevention considerations for essential buildings
- factors that determine when and where regional centers should be considered
- critical factors that affect space planning
- a checklist to identify the distinct types of interior space that are required
- good storage practices
- information on materials handling and repackaging equipment, equipment selection, equipment (process) layouts, equipment list preparation, and estimating equipment installation costs
- methods and procedures for determining how much of each distinct type of interior space is required
- environmental standards for 13 distinct classes of rooms that may be required in a distribution facility
- data on conversion of the information above into a facility layout that is then used to define land area requirements
- criteria for site surveys and site selection and a site survey checklist.

These varied activities comprise the planning phase of a facility project for receiving, warehousing, distributing, and repackaging medical supplies.

1

PLANNING GUIDELINES

1.1 PROJECT PLANNING'S OBJECTIVE

The objective of the entire planning effort is to define the types of space, environmental conditions, equipment, service requirements, and distribution operations support facilities and auxiliary services required. In other words, the work effort is to (1) identify the scope of the project, and (2) define the design criteria. This is a task for a project planning team, NOT THE ARCHITECT! This is information the architect needs from the team!

1.2 PROJECT PLANNING TEAM

Typically, the project planning team for a central receiving, warehousing, and distribution facility is lead by a project manager and supported by the technical, administrative, and operational resources required by the project. No two projects are ever the same; therefore, the project team must be organized in such a way as to meet the requirements of a particular project. A typical project planning team organization for planning a central distribution facility might be as shown on Figure 1-01.

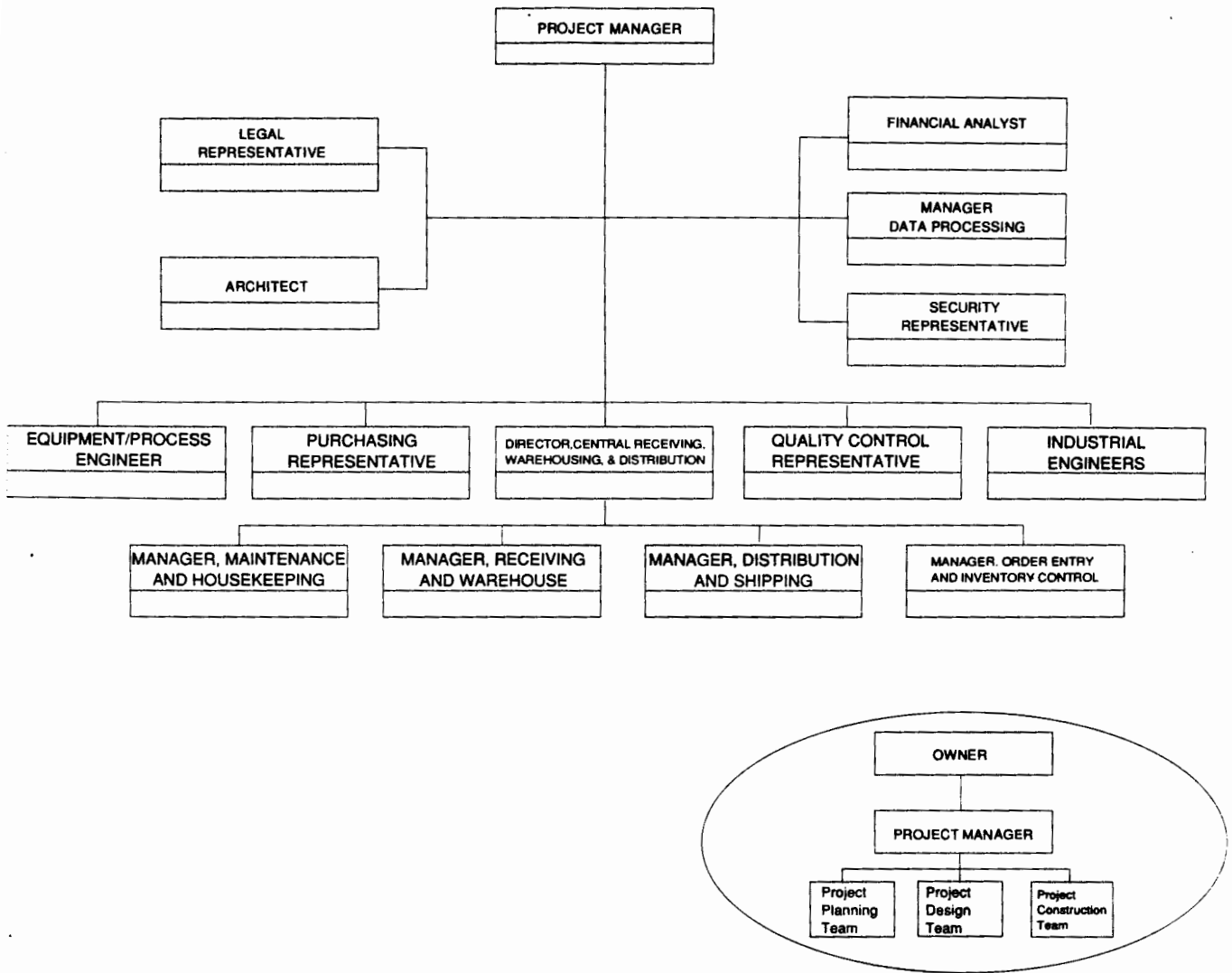


Figure 1-01.

1.3 DEFINING THE SCOPE OF THE PROJECT AND THE PROJECT SCHEDULE

To begin to define the scope of the project, it is first necessary to determine WHAT must be done and WHEN it must be done. For example, since land area requirements for a facility are usually based on 60 percent occupancy of a site when the facilities are fully expanded, it would not be very logical to initiate a site search when building area requirements are to tally undefined. A project schedule helps define WHAT must be done, WHEN it must be done, and provides a means to estimate how much time it will take to do the task. Project Schedule I describes the activities that generally may be required by the project planning, project design, and project construction teams to implement a major central distribution facility project. In essence, project schedules are graphic action plans for each of the project teams. The project schedule for the project planning team, therefore, is a plan for planning.

1.4 IMPORTANCE OF KNOWLEDGE OF EQUIPMENT IN PLANNING

Planning warehouse and repackaging space, installations, and equipment requires a methodical semiquantitative to quantitative approach to this multifaceted, fairly complex topic. Comprehensive knowledge of the types of materials handling and repackaging equipment available is a prerequisite, because, in many instances, it is the type and amount of equipment required that establishes the special services and space requirements for the facility.

The importance of select members of the project planning team having a comprehensive knowledge of materials handling and repackaging equipment cannot be overemphasized. Both of the diagrams below and the methods provided later in this section for space planning require work that is intensely equipment related, both directly and indirectly. Therefore, these guidelines include a chapter on equipment in which the basic types of equipment that should be generally applicable to Central American operations are discussed. Nevertheless, if project planning team members responsible for equipment selection lack this comprehensive knowledge, they will have a difficult time executing their responsibilities. This will lead to mistaken or unnecessary investment in equipment and a long chain of related problems that will also adversely affect facility investment requirements and operating efficiency. At the minimum, personnel responsible for equipment selection should attend international exhibits where these types of equipment, and others, can be seen and their applications discussed with manufacturers' representatives. Further information on these exhibits is provided in Chapter 6, Equipment and Equipment Selection.

1.5 SPACE PLANNING

The diagrams on figures 1-02 and 1-03 graphically describe the general warehouse and repackaging space planning activities that are further developed in detail in this planning section of the guidelines.

PLANNING WAREHOUSE SPACE

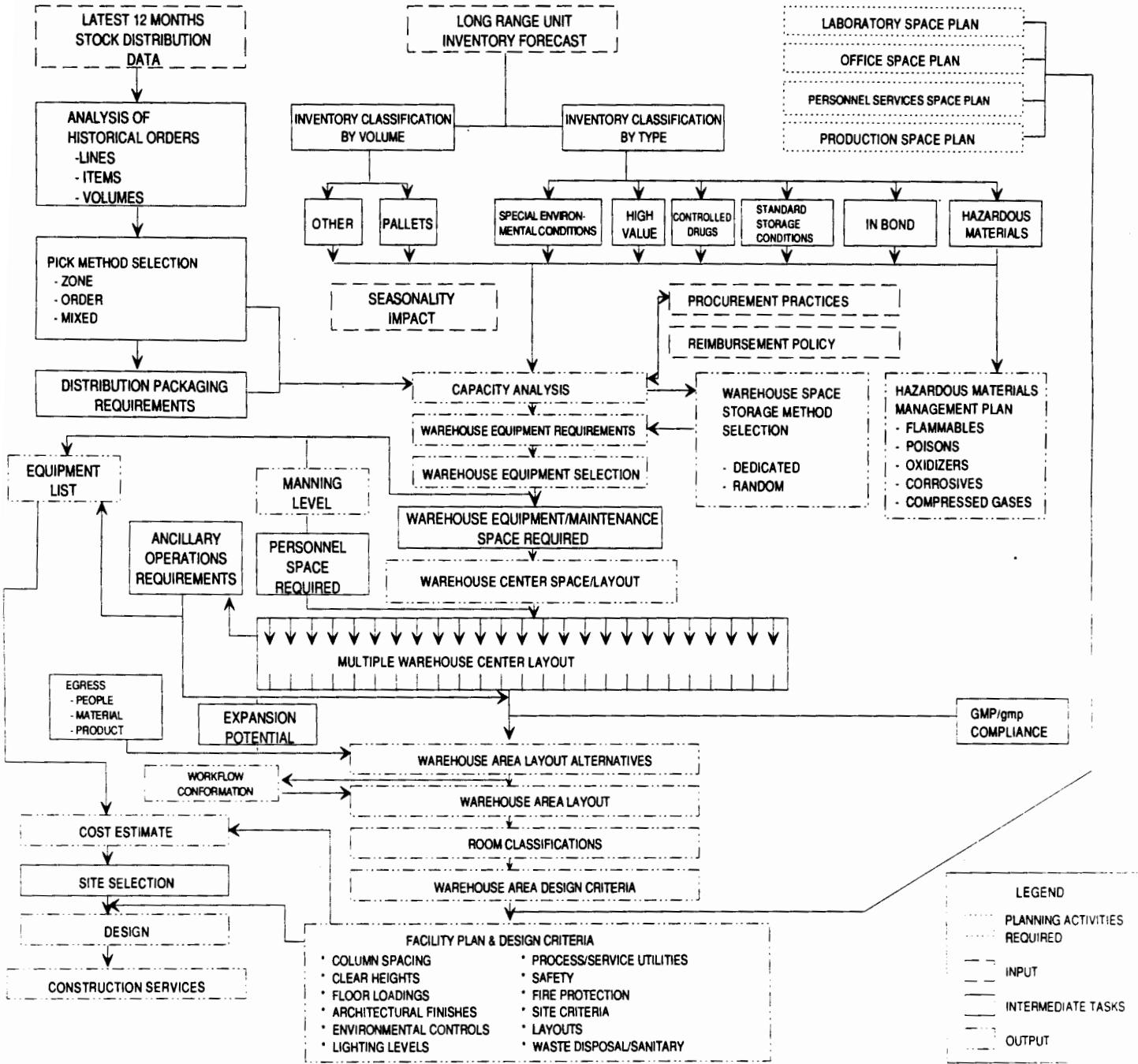


Figure 1-02.

PLANNING PRODUCTION SPACE

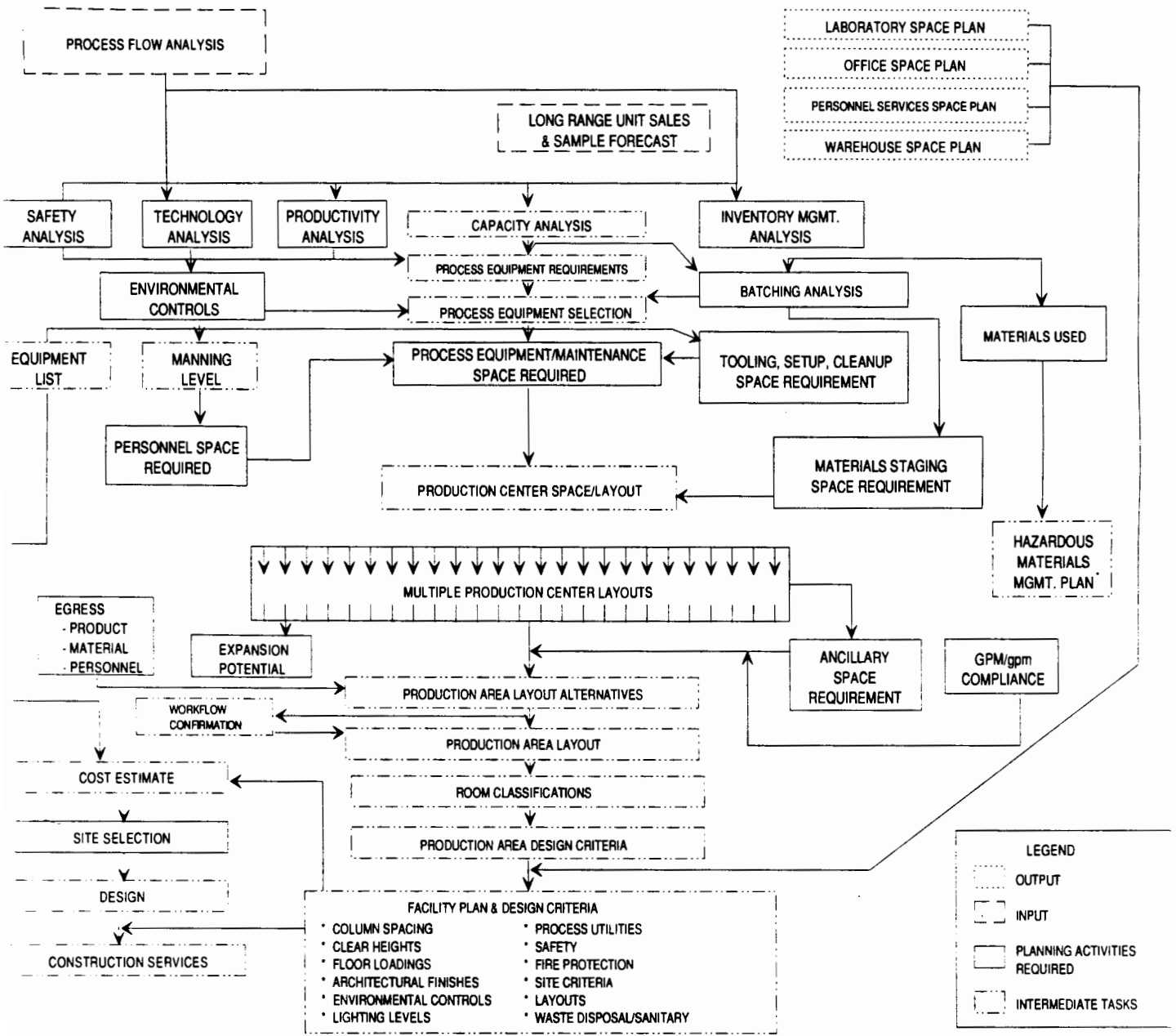


Figure 1-03.
Reprinted by courtesy of TPM Strategic Planners, Libertyville, IL, USA.

The planning section of these guidelines also includes a series of reference drawings that graphically describe many of the site, facility, equipment, and installed services concepts and relationships discussed in the guidelines. The planning phase's reference drawings form the basis for the design phase's reference drawings that are also included in volume 3 of these guidelines.

1.6 PURPOSE OF THE GUIDELINES

It is the intent of these guidelines:

- to emphasize technical, cost, and administrative management techniques that help assure the satisfactory completion of a project on time and within budget, and
- to provide technical information on many specialized and perhaps unique facility features that medical supply distribution facilities require because of the many types of products they handle, the types of services they provide to the health care community, and their classification as essential buildings.

The managerial and technical data provided are not intended to be an exhaustive or totally complete treatise on project management, equipment and facility planning, or site survey and site selection, etc. Rather, these guidelines deal with a wide range of topics that represent special technologies generally required by these types of facilities and/or that resolve special situations that sometimes arise when projects of this type are undertaken. When these special technologies and special considerations are combined and complemented with the classical professional skills, services, and experience of qualified project planning, design, and construction personnel, the entire project effort should be a project planning, design, construction, and operational success.

The planning and design guidelines, the guideline specifications, and the reference drawings have been developed for use by all personnel, including outside consultants and contractors involved in the planning, design, and maintenance of physical receiving, warehousing, distribution, and repackaging facilities (e.g., site, buildings, equipment, and installations). They take into account such factors as quality, cost, safety, security, appearance, maintenance, and the many special requirements dictated by the medical supplies and pharmaceutical materials that will be in the facilities, as well as the materials handling and storage equipment that will be utilized.

It should be noted that though the guidelines are intended to be in compliance with all applicable national and local codes and with other applicable regulatory requirements, they are not all-inclusive documentations that deal with every conceivable requirement. Rather, they are guidelines that are intended to highlight, or interpret, areas where a particular feature is especially important to the successful planning, design, construction, and operation of a distribution facility or where an aspect of technology is involved that currently may not be widely used in Central America because these types of industrial facilities are not frequently planned, designed, or constructed.

It is expected that the members of the project planning team will be provided with complete sets of the guidelines and will review them thoroughly before initiating any planning work, so that they can fully appreciate how their work affects the work of others, equipment, buildings, and installations.

Throughout the guidelines, statements that use the terms "shall," "will," "must," or "is (are)" and "to be" are very strong recommendations. Statements using "should" are indications of preference or guidance. Even those statements that are indications of preference or guidance should be followed as much as possible, since they indicate desirable practices. Definite economic and noneconomic advantages accrue from this consistency.

1.7 BENEFITS OF GUIDELINES

The benefits of a set of guidelines include:

- defining acceptable quality levels for facilities
- avoiding repetitive, unproductive planning and design efforts, thereby reducing both the cost and the time required for the planning and design phases of the project
- expediting and improving planning and design work as a result of clear direction
- achieving greater consistency in quality and designs, without unreasonable restrictions of individual ingenuity
- helping in the training of new planners, architects, engineers, draftsmen, technicians, and operating personnel
- providing guidance to field staff during construction and start-up of operations.

1.8 RENOVATING EXISTING FACILITIES

In the case of renovation of existing facilities, use of the guidelines should be tempered in light of existing conditions, placing primary emphasis on assuring product integrity by means of procedures, equipment, and environmental controls. This will determine the need for renovation and establish the scope of work necessary to obtain desired environmental conditions on an acceptable minimum risk basis, often with lower levels of capital expenditure.

1.9 WORKFLOW OF A TYPICAL CENTRAL DISTRIBUTION FACILITY

The planning guidelines have been developed based on the normal operational flow of work in a typical medical supply central receiving, warehousing, and distribution facility as follows:

- Truck arrives with a full or partial load of supplies ordered by the Ministry
- Security verifies the truck's business, informs Receiving of its arrival and contents, and directs the driver and truck to a truck waiting area
- Receiving calls the truck/driver to enter the receiving dock area
- Truck enters the dock area
- Driver goes to the driver waiting room to present delivery documents to the Receiving office and the truck is unloaded
- Items received are placed onto pallets
- Items received are verified by comparing to a receiving copy of a purchase order
- Items received are sorted by the type of storage required (viz., in bond, quarantine,

standard, hazardous) and the type of environmental storage conditions required (viz., 30° to 40°C, 15° to 30°C, or low temperature 4°C or -20°C)

- Items are moved to the appropriate quarantine, in bond, or storage locations
- Items requiring quarantine are sampled, the samples tested, and approved or rejected (items in bond remain in bond until customs formalities are completed and then are moved into quarantine or storage areas, as indicated)
- Rejected supplies are moved to the rejected goods storage area until their commercial disposition is determined or they are destroyed
- Approved supplies from quarantine are moved to their storage location
- Items are moved from storage into the picking areas when low stock levels in picking indicate the need for replenishment of stock
- The order processing department provides picking lists for each order to the picking department
- The picking department picks the order in accordance with the picking list and verifies the accuracy of their work
- Picked orders are moved to a packing area for final packing for shipment
- Packed orders are staged either by geographic distribution zone or freight carrier, depending on the shipping methods used
- Vehicles arriving to pick up shipments follow a procedure similar to that described for arriving delivery vehicles
- Truck drivers are called to the shipping dock area; driver goes to the driver waiting room to pick up shipping documents from the Shipping office; trucks are loaded; and the truck is dispatched

1.10 THE PROJECT PLANNING TEAM'S SCOPE OF WORK

It is assumed in these guidelines that the goals of the project planning team are to plan requirements for equipment, buildings, and installations for the activities described above and to:

- develop a realistic project planning schedule as an aid in defining the work to be done, and for management reporting and project control purpose
- determine requirements for materials handling and repackaging equipment including an order of magnitude estimate of its installed cost
- prepare process layouts
- determine constructed space and land area requirements

- select the environmental criteria that establish the internal design criteria for a facility
- identify and quantify requirements for security, loss prevention, services, maintenance, and any special installations that may be required
- initiate site surveys and begin the site selection process, and finally
- summarize the above data and incorporate it into a design requirements document that defines the scope of work required of the project design team.

1.11 HOW TO MEASURE SUCCESS

The entire project team's success will be measured by:

- the owner-occupant's initial and continuing level of satisfaction with the new facility's ability to operate efficiently in accordance with the agreed upon scope of work defined at the conclusion of the planning phase of the project
- on time project completion, and
- project completion within budget.

It has often been said that planning, because it tries to peer into the future, may not be very useful because it will be wrong somewhere. This undoubtedly is true; however, without planning, the project will very likely be wrong everywhere.

A successful medical supplies distribution facility maximizes the use of resources while satisfying the requirements of its customers. This means the effective use of space, equipment, and personnel to accommodate and protect the medical supplies present until they are needed.

SUMMARY

Careful planning of a distribution facility project is crucial to its successful outcome. Chapter 1 outlines the components necessary for successful planning and presents an overview of the planning guidelines that follow.

This overview includes brief statements about the objective of the project planning -to define the scope of the project and the design criteria for facilities- and about the composition of the project planning team. An organization chart for a typical project planning team is included for easy reference. In addition, there is an explanation of the relationships between definition of the scope of a project and the project's schedule.

Because a comprehensive knowledge of the types of equipment -both materials handling and repackaging- that are available and appropriate is a critical prerequisite to determining the services and space requirements of a distribution facility, the importance of learning about equipment before or during the planning phase is emphasized in this first chapter. The consequences of being unfamiliar with the equipment and trying to execute the planning responsibility are explained, and suggestions about how to gain equipment knowledge are provided.

A preview of the space planning activities is included in this introductory chapter. This is accompanied by two flow charts, one on planning warehouse space and one on planning production (repackaging) space.

The purpose and benefits of planning guidelines are discussed. Also, there is a short statement about how to adapt these guidelines for use in planning the renovation of existing facilities. In addition, because the development of the planning guidelines has been based on the normal operational flow of work in a typical facility, a normal workflow is outlined to facilitate understanding the premise of the planning guidelines.

Finally, the project planning team's scope of work and its goals are listed along with a means of measuring the team's success.

2

GEOGRAPHIC LOCATION CRITERIA

The geographical location of distribution facilities should be based on an assessment of both qualitative and quantitative considerations. It is an analytical process that broadly defines where in the country the central center should be located and then generally where (viz., north, south, east, or west) within that area the best location may be. Site selection of a specific piece of land is accomplished at a later time after space and land area requirements are defined clearly. (See Chapters 4 through 13.) Locations for regional centers and the number required depend on distribution practices and assessment of factors that may temporarily isolate certain regions of the country.

2.1 DEFINITIONS

For the purposes of the discussion that follows, it is necessary to define clearly the types of distribution facilities and certain operations that are found in most distribution systems:

2.1.1 CENTRAL RECEIVING, WAREHOUSING, AND DISTRIBUTION FACILITY

A location, usually on one site and in one building where these functions are performed.

2.1.2 CENTRAL RECEIVING AND WAREHOUSE

Receives medical supplies from national and international vendors, holds them in quarantine (or in bond) until their adequacy for use is determined by others (or customs formalities completed), and upon release from quarantine (or bond) stores and maintains an inventory of them until they are needed by the central distribution center.

2.1.3 CENTRAL DISTRIBUTION CENTER

Receives all medical supplies from the central warehouse, maintains an inventory of all medical supplies to service orders (i.e., pick, pack, ship) from other distribution regions as well as from local centers within its own distribution region.

2.1.4 REIMBURSEMENT

The act of shipping or moving supplies from the central warehouse to the central distribution center, or from the central distribution center to any other distribution center location to replenish their inventory.

2.1.5 REGIONAL DISTRIBUTION CENTER

A location generally distant from and outside of the central distribution center's region that receives supplies from the central distribution center and maintains an inventory of supplies to service orders (e.g., pick, pack, ship) from local distribution centers within its region. It does not ship supplies to other distribution regions except under emergency conditions. Regional distribution centers generally are located near or within a large local distribution center such as a regional hospital. The regional distribution center should service orders from most or all local centers in the region, as well as the orders from the nearby hospital.

2.1.6 LOCAL DISTRIBUTION CENTER

A location that receives medical supplies from the central or regional distribution center and utilizes them either internally to provide medical services (viz., a hospital) or dispenses them to patients (viz., outpatient clinic, health center, etc.). It does not ship supplies to other local distribution centers except under emergency conditions.

2.1.7 TRANS-SHIPPING POINT

A location that receives distribution packaged supplies from central or regional distribution centers already packed in the quantities ordered by the customer. This location then temporarily stores the supplies for a few days until all the packages (1) are delivered to the customers by the trans-shipping point's vehicles following scheduled predetermined delivery routes, (2) are picked up directly by the customers, or (3) are delivered by local freight carriers to the customers. A trans-shipping point does not maintain any inventory nor does it get involved in any picking or packing operations.

2.2 CHOOSING A LOCATION FOR THE CENTRAL RECEIVING, WAREHOUSE, AND DISTRIBUTION CENTER

The ideal geographical location for a central warehouse and distribution center is generally near the statistical center of demand for supplies within the country and within its own central distribution region.

An analysis of historical order incidence and order sizes, in cubic meters and weight and by regional distribution zones, generally will reveal that, for example, the total orders, cubic meters, and kilograms shipped were distributed as follows:

	Order Incidence	Cubic Meters	Kilo- grams
Metropolitan Zone	38 %	47 %	57 %
Interior Zone 1	18	16	19
Interior Zone 2	12	9	8
Interior Zone 3	10	8	5
Interior Zone 4	9	8	5
Interior Zone 5	7	7	4
Interior Zone 6	6	5	2
	100 %	100 %	100 %

The density of large hospitals is usually highest in metropolitan areas. Hospitals tend to consume more of the heavier inventory items (viz., solutions, compressed gases, etc.) as well as a much greater range of supplies than do clinics and health centers. In the example above, if the Metropolitan Zone was adjacent to Interior Zone 1, the ideal geographic location for the central facility would probably be somewhere in the vicinity of the boundaries of the Metropolitan Zone and Interior Zone 1. As the level of consumption also relates somewhat to population densities, it is probable that Interior Zone 1 has a city of substantial size in it or is a densely populated suburban area. There is usually a tendency for two adjacent urban areas to grow toward each other. Therefore, a location situated an appropriate distance from each city may be indicated to facilitate reimbursement to both regions from a single point.

If, on the other hand, the Metropolitan Zone and Interior Zone 1 are at opposite ends of the country, it would seem appropriate to locate the central distribution facility in the immediate vicinity of the metropolitan zone, but not necessarily in the center of it since this could pose access problems.

Another critically important consideration in selecting the geographical location for a distribution center is the method of distribution. If private freight carriers are used to ship supplies, a study of their freight rates and zones should be made. Sometimes freight rates are based on weight of a shipment, sometimes on the cube of a shipment, and still other times on the number of boxes being shipped to each customer or on a percentage of the value of the shipment. To complicate matters, freight rates generally will also vary by geographic zones (freight zones) within a country. An analysis of freight rates and freight zones and estimates of projected freight costs from several different locations should reveal where significant operational cost savings can be obtained. Something as seemingly insignificant as locating a distribution facility on the correct side of the street, if it happens to be the street that separates two different freight rate zones, may result in very significant differences in freight costs.

The frequency of deliveries from the central point to all of its customers nationwide should also be reviewed. If the metropolitan zone is responsible for receiving the dominant portion of all shipments, perhaps the frequency of shipment to major hospitals, for example, should be weekly on a predetermined day and to all other customers in the metropolitan zone twice a month on predetermined days. Outside the metropolitan zone, shipments might be a mixture of twice a month or monthly on predetermined days. Shipments of a lesser frequency (e.g., quarterly) may result in lower customer service levels (see Chapter 5, Critical Factors That Affect Space Planning) and will lead to excessive investment in inventory and storage space at both central and interior locations. Frequency of delivery will influence where the distribution facility should be located and

will also impact storage space as well as the quantity of picking, packing, outbound staging, and shipping dock space required.

A central warehouse and distribution center must be strategically located with good access to ports, airports, truck terminals, key national highways, and intracity thoroughfares. Surveys of existing and planned main roads, highways, and freeways; the locations of the largest customers within the distribution zone; the availability of qualified operating personnel; the locations of large national manufacturers of large volume supplies; the locations of the ports, airports, and truck terminals; and the directions and rate of urban growth are all key considerations in determining the best geographical location for a central distribution facility. Heavily industrialized and inner city locations are generally extremely poor choices because of traffic congestion that may even include restricted hours when truck traffic is permitted in the central zone of the city, the high cost of land, and security and loss prevention considerations (see Chapter 3, Security and Loss Prevention).

2.3 REGIONAL DISTRIBUTION CENTERS

When should regional distribution centers be considered and where should they be located? The number and location of regional centers are the result of a compromise between the conflicting goals of:

- maximizing customer service (see Chapter 5 for additional information),
- minimizing the national investment in inventory and distribution space,
- minimizing the operating costs, including transportation costs, of the nation's distribution system, and
- assuring that regions subject to isolation because of seismic or seasonal climatic events (viz., floods, frequent landslides, etc.) have sufficient quantities of supplies to reasonably cover the region's requirements until conditions return to normal and/or temporary alternative means of delivering supplies (viz., air) can be organized and put into operation.

It is generally recommended that any region subject to isolation because of seasonal climatic or seismic events, which may result in closure of the access routes from the central distribution center, be a candidate for a regional distribution center.

In addition, countries with very large land masses, such as Argentina, Australia, Brazil, Canada, or the US, or countries with very difficult topography, extended and slow transportation routes, and difficult climatic conditions, such as Bolivia, Colombia, and Peru, need regional distribution centers. These types of conditions exist in Central America only in isolated regions.

Since communications, transportation systems, and highways are generally good throughout most of Central America and distances between the central distribution point and the vast majority of the local distribution centers are modest, the need for regional distribution centers should be very limited because the time to transport supplies from the central distribution center directly to the customer is minimal, usually 10 or fewer hours of direct travel time. Therefore, regional locations at a significant geographical distance from the central center, in addition to those required for regions subject to isolation, are the only regional centers that should be considered.

Maximum utilization of the trans-shipping point concept should be considered, rather than regional distribution centers, because trans-shipping points decrease total inventory and space investment, help increase inventory rotation, reduce expiration dating and handling losses, and

lower administrative distribution operations costs. They generally also will help improve customer service levels. Chapter IV E "Delivery Strategies" in Management Services for Health's publication *Managing Drug Supplies*, copyright 1981 and 1983, (Management Sciences for Health, 165 Allendale Road, Boston, MA 02130, USA) provides very useful additional information on design and development of the drug delivery system.

The central distribution center that is located within the central receiving, warehousing, and distribution complex should very probably ship directly to all local distribution centers that are up to one half day direct travel time. Regional distribution centers should not be located in the relatively large distribution area serviced by the central distribution center. To provide good service at an acceptable cost to local centers located within this zone but near the outer fringes of it, the trans-shipping concept described at the beginning of this chapter and graphically described in Figure 2-01 at the end of this chapter may be utilized where applicable for shipments to such areas within the zone.

Will having the absolute minimal number of regional distribution centers decrease customer service levels if there is a shortage of some supplies? No! Actually, having the majority of the supplies that are at a low inventory level located at the central distribution center gives distribution management the ability to (1) allocate the available inventory among its customers to gain the maximum benefit from the minimal quantities available so that no one runs completely out of stock or is only out of stock for the absolute minimum of time and (2) take advantage of the diversity of demand.

2.4 DIVERSITY OF DEMAND

All customers in the nation will not need reimbursement of the items that are temporarily in short supply at the same time. By having the supplies in the central distribution center, rather than spread around the country in regional distribution centers, the central center can make the best of a difficult situation. This may require some extra freight expense to ship promptly to those customers who are the closest to being completely out of stock, but this is better than having "dead inventory" at some regional centers where demand from local centers is low, while in other distribution regions local distribution centers are completely out of stock. This is the diversity factor. Put diversity of demand to work in your distribution system!

By minimizing the number of regional centers, the total national investment in inventory and distribution space should decrease dramatically, because there will be little regional inventory and the quantities of inventory on hand at anytime at the local level will be lower because shipments are received more frequently. Also, with fewer inventory points and more frequent reimbursement, the rotation of inventory will be higher, which should reduce losses on expiration dated products. The flow of information will be less subject to administrative delay or confusion and distribution operating costs, excluding freight, will decrease. Freight costs (and investment in vehicles if a captive freight fleet system is used) will increase. Because of more frequent reimbursement, higher diversity, and better customer service levels, the need for space at the local levels should not be materially affected. Customer service levels will improve dramatically.

See the following chapters for specific information on site surveys and site selection:

Chapter 12 Land Area Requirements

Chapter 13 Site Selection Criteria and Site Surveys

Chapter 17 Site Investigation, Space Distribution Studies, and Master Planning.

SUMMARY

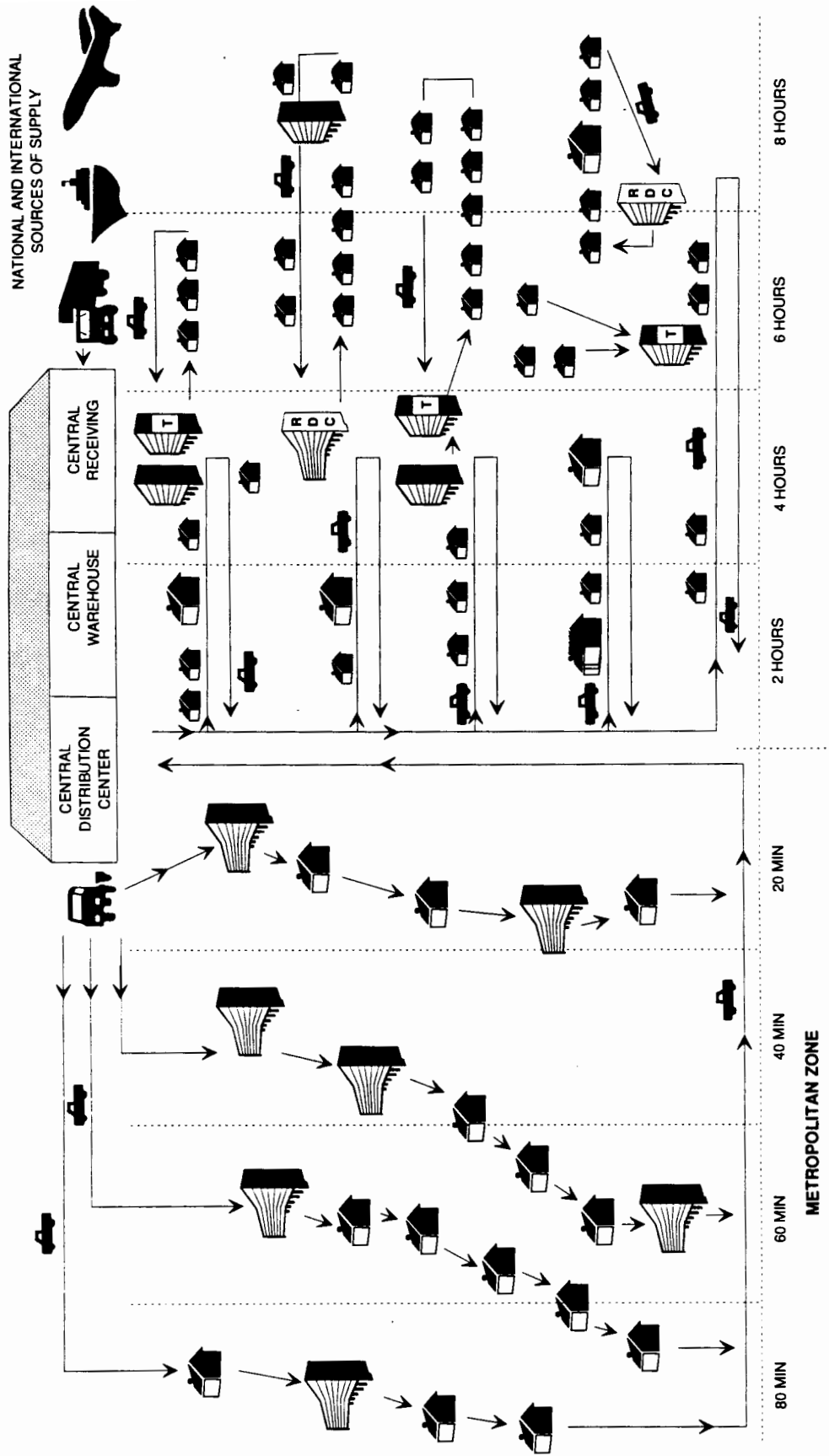
Determining the geographical location of distribution facilities is based on defining the general area within a country where a central facility should be located and then deciding where within that area the best location is. Geographic location is not to be confused with site selection: site selection of a specific parcel of land cannot be accomplished until a later time after space and land area requirements have been carefully defined.

To help specify the geographic location criteria, definitions of the types of distribution facilities and certain of their operations are provided.

With these definitions in mind, guidelines for selecting a general location for a central receiving, warehouse, and distribution center are presented. Because the ideal location for a central warehouse and distribution center is near the statistical center of demand for supplies within the country and within its own distribution region, system, an example of an analysis of historical order incidence and order sizes is given. This type of analysis is combined with a study of the method of distribution (for example, freight carriers); of the frequency of deliveries from the central point to all customers; and of access to ports, airports, truck terminals, key national highways, and intracity thoroughfares. Consideration of all these factors is crucial to pinpointing the best location for a central facility.

The need for and location of regional distribution centers are also considered. The number and location of regional centers result from the compromise of maximizing customer service as well as minimizing inventory, space, and operating costs while at the same time assuring that regions vulnerable to isolation because of seismic or climatic factors have sufficient supplies to service their areas should they become isolated. A general explanation of the specific conditions under which a regional center is advisable is provided. In addition, reasons for not considering using regional centers are enumerated, and the use of the trans-shipping point concept is emphasized as a more efficient method of operation. Diversity of demand -namely, the fact that all customers will not need reimbursement of items in short supply at the same time- is also considered a reason to minimize the use of regional centers. By minimizing the number of regional centers, total investment in inventory and space decreases, inventory losses drop, information flow is more efficient, and distribution operating costs are reduced. Therefore, regional centers are recommended only in those areas at a significant geographical distance from the central facility or in those areas subject to isolation.

TYPICAL PHYSICAL DISTRIBUTION SYSTEM



TRAVEL TIME FROM THE CENTRAL CENTER








- LEGEND
-  LARGE HOSPITAL
 -  REGIONAL HOSPITAL
 -  CLINIC
 -  HEALTH CENTER
 -  LARGE HOSPITAL AND REGIONAL DISTRIBUTION CENTER
 -  REGIONAL HOSPITAL AND DISTRIBUTION CENTER
 -  REGIONAL HOSPITAL WITH TRANS-SHIPING

Figure 2-01

3

SECURITY AND LOSS PREVENTION

A central receiving, warehousing, and distribution facility's loss prevention program should contain the following eight key elements:

1. Safety organization
2. Safety programs and activities
3. Safety work rules and procedures
4. Employee safety work practices
5. Emergency preparedness program
6. Preventive maintenance program
7. Self evaluation and corrective action program
8. Loss prevention facilities and installations

This chapter provides guidelines only for the last key element, since it is the only loss prevention element that significantly involves facilities and equipment. The other elements pertain to operating and personnel practices, and, although they are extremely important and influenced by the physical installations, they are, nevertheless, outside of the scope of this manual. (Guidelines for operating practices may be issued at a future time.)

A distribution facility's security program should contain the following six key elements:

1. Security organization
2. Security programs and activities
3. Security work rules and practices
4. Emergency preparedness program
5. Internal security (inside and between buildings)
6. External security (outside of buildings on the distribution facility's site and its perimeter)

This chapter provides guidelines only on the last two key elements of internal and external security for the same reasons cited above.

3.1 SECURITY

Security is providing an environment in which loss or harm is not likely to occur. Generally it includes security guards who make periodic patrols of facilities; guard dogs; security fencing; security lighting; and alarm systems including fire, smoke detection, and other warning systems. It also includes access, entry, and exit controls for visitors, employees, and vehicles onto the site and within or between buildings, as well as telephone use/misuse and theft and burglary deterrent measures.

Medical supply distribution facilities generally contain narcotics, tranquilizers, and similar types of controlled drugs, along with drugs and supplies (viz., surgical instruments) that are of relatively high value. A distribution facility may also have vaccines, blood, blood fraction, or other biological products that will be damaged or destroyed if appropriate low temperature storage conditions are not strictly maintained. Therefore, additional special systems and controls are required if these items are present.

A distribution facility may be a target for sabotage by a disgruntled employee or by a group of demonstrators in times of potential civil unrest. Also, it may have a data processing function with a computer that may contain vital inventory, purchasing, budgetary, and distribution data, loss of which may terminate or seriously compromise the distribution facility's ability to operate. Therefore, the planning and design of a central distribution facility must anticipate all of these security requirements.

3.2 LOSS PREVENTION

A central distribution facility is an "essential building" within the country's health care system. It must be planned, designed, constructed, operated, and maintained in such a way that it will provide safe, secure, efficient, and correct storage and materials handling conditions required by the products under normal operating conditions. It must also be able to serve the needs of the public under emergency conditions after or during potentially catastrophic events such as fire, earthquake, flood, landslide, electric power failure, or other disasters.

Furthermore, the economic value of the inventory in a central distribution facility will be millions of dollars. In addition, the buildings, equipment, and installations will also have a value of several million dollars. If either the inventory or the building is lost because of fire, earthquake, or other disasters, the time to replace them could easily exceed one year and the monetary loss would be significant, not to mention the impact of being unable to supply critical medical supplies on such occasions.

3.3 SECURITY, LOSS PREVENTION, AND INSURANCE

The economic impact of a potential loss of inventory or building can be minimized by purchasing insurance. However, insurance companies, fire districts, and building inspection and construction regulatory agencies have loss prevention standards that the building must physically meet at the minimum, and the loss prevention standards of insurance companies frequently far exceed those of the governmental agencies. Therefore, loss prevention practices, facilities, and installations have a major impact on the cost of insurance.

Insurance premiums, of course, increase as the insured values at risk increase. When certain levels of values at risk are exceeded, the premium will increase at an even higher incremental rate