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Affaires indiennes et du Nord Canada

TECHNICAL SUPPORT DOCUMENT

ELECTRICAL SYSTEMS IN BUILDINGS
DESIGN CONSIDERATIONS

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ELECTRICAL SYSTEMS IN BUILDINGS
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ELECTRICAL SYSTEMS IN BUILDINGS- DESIGN CONSIDERATIONS

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ELECTRICAL SYSTEMS IN BUILDINGS- DESIGN CONSIDERATIONS

1.0 INTRODUCTION

1.1 Purpose

This publication is a technical support document to DRM 10-7/51, Building Design. It provides guidance in the selection of electrical equipment and systems that are technically acceptable to the Department. It also brings to the attention of the designer, the implications of the building's location.

In a remote location especially, the degree of sophistication of the design must be considered and equipment selected with regard to future operation and maintenance of the facility.

1.2 Background

The shape, size and cost of a building evolves from the project team's coordinated efforts, (planners, architects, engineers, owner), with limitations imposed by the appropriate building codes.

When selecting the most suitable electrical equipment and systems, the engineer must carefully consider many technical factors. These include building use, occupancy, location, size, possible future expansion, services, and life cycle cost of equipment (capital, operating and maintenance costs and salvage value over the life of major items). The degree of technical consideration given to each of these factors varies with each building. The choice of electrical system will, however, affect other components of the building and must be considered in the initial design planning phase.

1.3 Users

This publication is intended to be used by engineers and technologists designing electrical systems for buildings, and by engineers and architects engaged in design planning and the preparation of project briefs and terms of reference for building projects which are more sophisticated than dwelling units.

The considerations required to develop electrical systems design are presented. This approach helps designers and planners to organize and visualize the considerations for most types of building. The order in which these factors are presented generally reflects the development of the design, from inception to completion of working drawings and specifications.

1.4 Project Information

Before carrying out any design work, the building electrical services designer must be fully briefed on the function, occupancy and general requirements of the building or structure. Before the architect begins detailed design drawings, a briefing session should be arranged by the project managers with the owners, engineers and architects, in addition to the written DIAND project design brief. This ensures that all factors influencing the type, arrangement and complexity of the electrical system are technically assessed by the building electrical services designer.

The designer may not require an in-depth briefing on projects with relatively standard electrical systems. It might suffice to obtain a joint written brief or statement of requirements (from the owner, engineer, and architect) giving the required data.

It is important that all design team members have a clear understanding of the effect of the building electrical system on the total building design. Experience has shown that many major design problems result from the design team's lack of attention to this aspect. Good communication must be maintained by all within the project team to ensure quick response to changing project conditions.

2.0 DESIGN REQUIREMENTS AND CRITERIA

Once the project information is obtained, the designer should consider the various design criteria and requirements outlined in 2.1 and 2.2. This information is common to most contemporary building projects.

The designer's approach must comply with the accepted standards of the industry. The systems and equipment selected shall be as simple as possible for the application required.

2.1 General Considerations

The general design considerations for electrical systems in buildings are as follows:

a. Determine the purpose and use of the building.

b. Ensure that the design meets the minimum requirements of the "Measures for Energy Conservation in New Buildings" for the building's intended use and occupancy.

c. Ensure that wiring methods and materials meet the requirements of the Canadian Electrical Code (as amended by the provincial authorities), and CSA standards.

d. Consider reliability, ease of servicing and availability of replacement parts when selecting systems and equipment.

e. Evaluate the maintenance servicing which will be available. In remote locations it may be unreliable.

f. Standardize parts and equipment as much as possible for maintenance purposes, particularly in remote locations.

g. Consider the ease of transporting the equipment to the building site particularly in isolated locations.

h. Determine the extent to which standby power equipment and spare parts should be provided, (for example complete stand-by, or something less to ensure continued operation in specific areas of the building).

i. Establish the degree of sophistication of electrical systems and controls required to meet the use and occupancy requirements of the building.

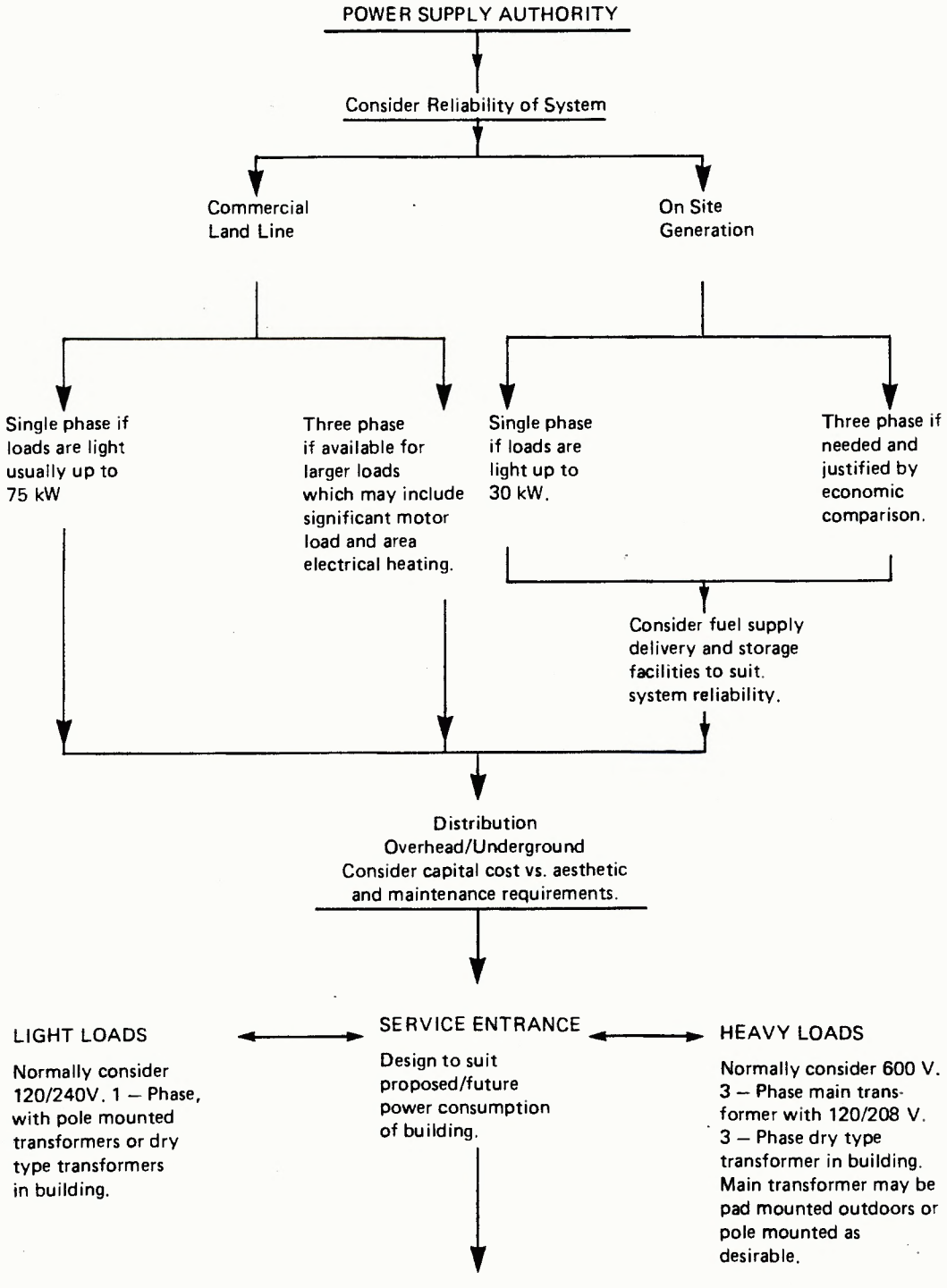
j. Determine the degree of concealment required for conduit and wiring systems in finished areas, based on use and occupancy of these areas. Evaluate the service spaces available for concealment (for example crawl spaces, attic spaces, drop ceilings and basements).

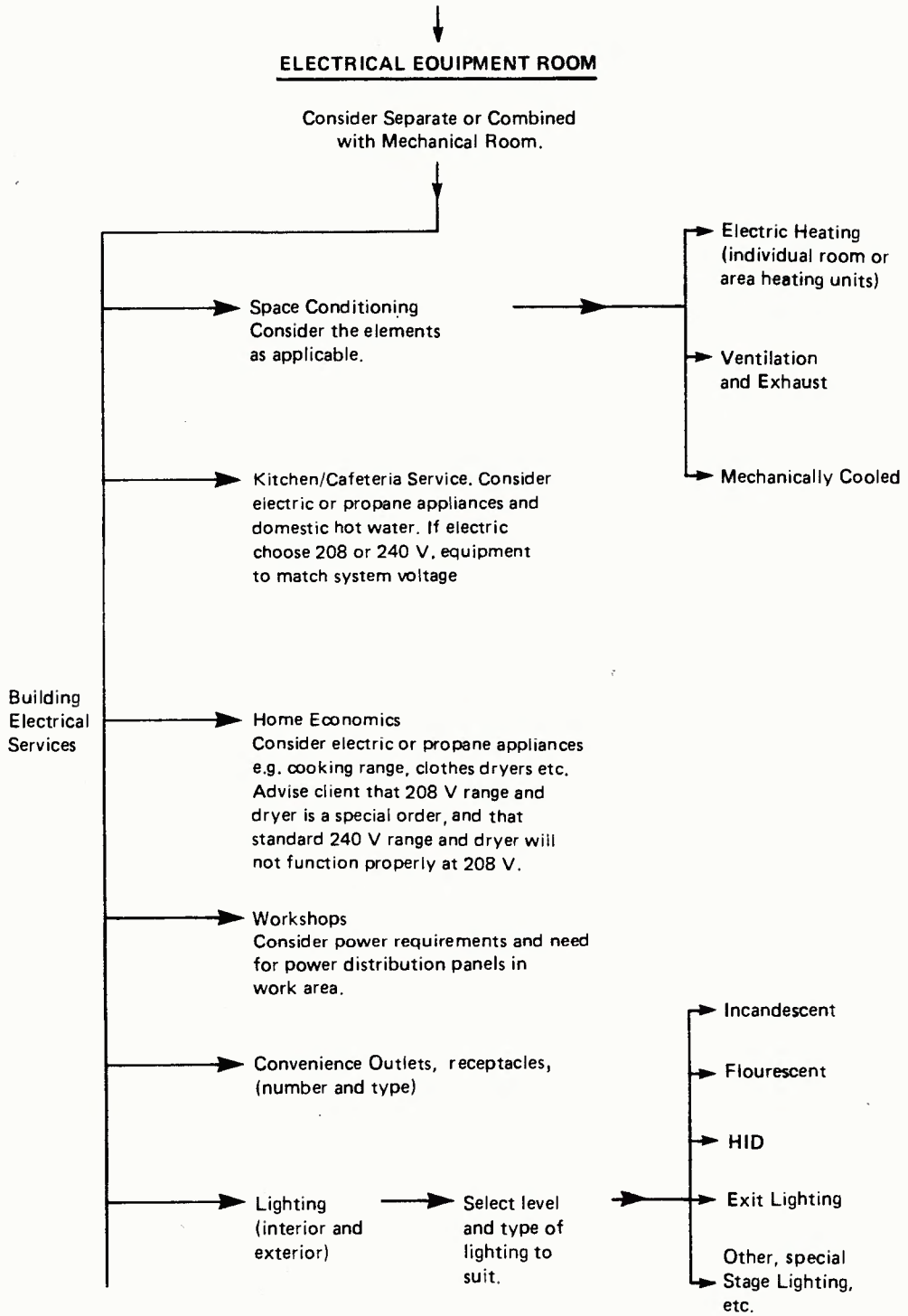
k. Consider expansion of the system to meet future demands, and changes required, including the supply to adjacent or nearby buildings.

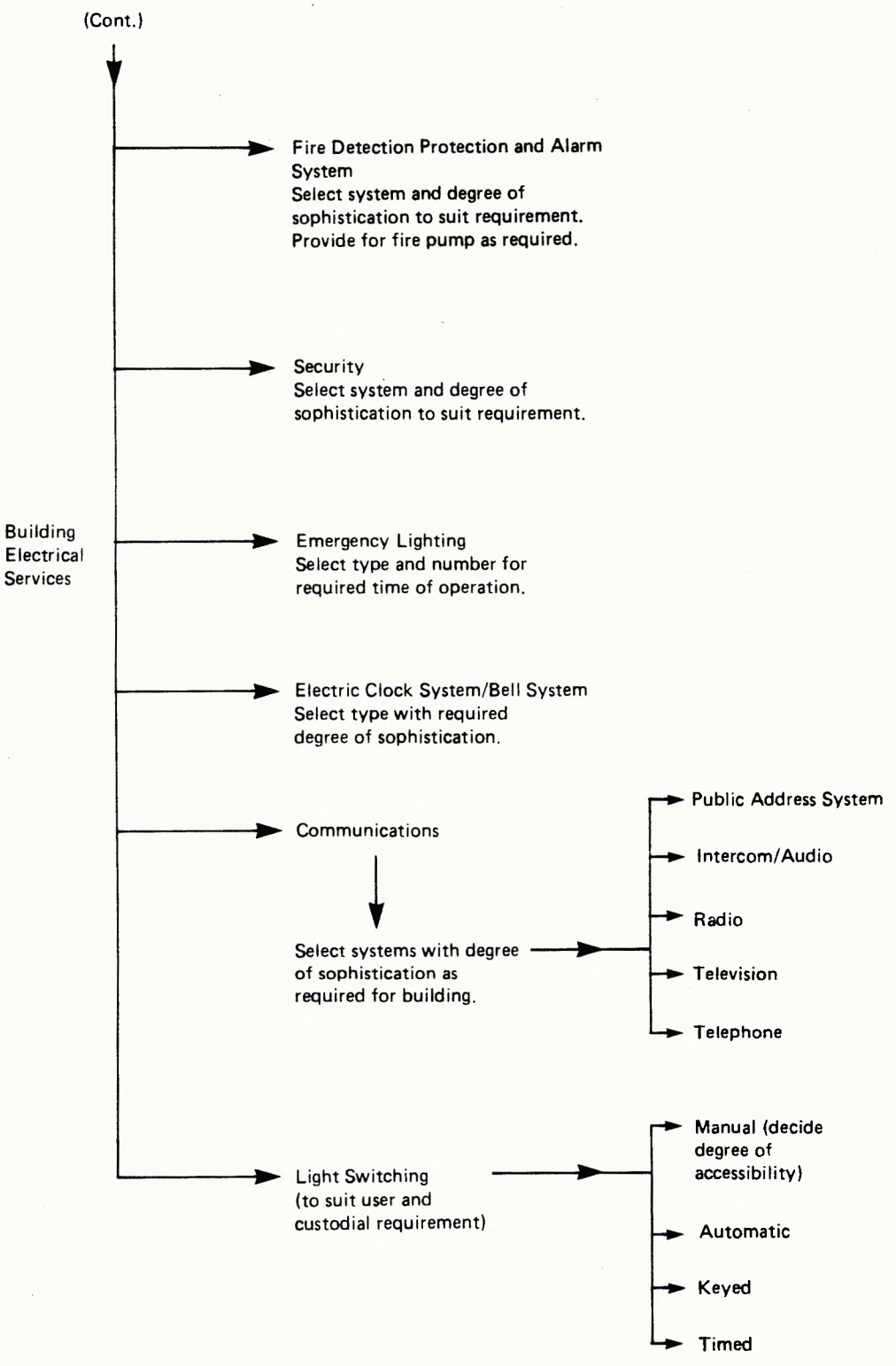
l. Conduct a cost analysis to determine the feasibility of various power supply systems, (for example, cost to update from 1-phase to 3-phase or the capital cost contribution from the power supply authority towards installation of main service conductors, transformers, etc.).

m. Estimate the electrical demand load using the Canadian Electrical Code for the building type to determine the capability of the supply system.

2.2 Specific Considerations




ELECTRICAL EQUIPMENT ROOM
Consider Separate or Combined with Mechanical Room.
Building Electrical Services
Space Conditioning Consider the elements as applicable.
Electric Heating (individual room or area heating units)
Ventilation and Exhaust
Mechanically Cooled
Kitchen/Cafeteria Service. Consider electric or propane appliances and domestic hot water. If electric choose 208 or 240 V. equipment to match system voltage
Home Economics Consider electric or propane appliances e.g. cooking range, clothes dryers etc. Advise client that 208 V range and dryer is a special order, and that standard 240 V range and dryer will not function properly at 208 V.
Workshops Consider power requirements and need for power distribution panels in work area.
Convenience Outlets, receptacles, (number and type)
Lighting (interior and exterior)
Select level and type of lighting to suit.
Incandescent
Flourescent
HID
Exit Lighting
Other, special Stage Lighting, etc.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Building Electrical Services
Fire Detection Protection and Alarm System
Select system and degree of sophistication to suit requirement.
Provide for fire pump as required.
Security
Select system and degree of sophistication to suit requirement.
Emergency Lighting
Select type and number for required time of operation.
Electric Clock System/Bell System
Select type with required degree of sophistication.
Communications
Select systems with degree of sophistication as required for building.
Public Address System
Intercom/Audio
Radio
Television
Telephone
Light Switching (to suit user and custodial requirement)
Manual (decide degree of accessibility)
Automatic
Keyed
Timed

3.0 REFERENCES

Published reference data on all aspects of building electrical systems is assumed to be in the designer's technical library. No attempt is made to list this material. However, the Department has issued some specific guidelines on DIAND's preferred approach to certain design elements. These guidelines are:

TSD-54-1 Intercom and Audio Systems for Schools

TSD-51-37 Energy Conservation - Electrical Systems in Buildings