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Generation, Distribution and Installation of Utility Services in Multi Storey Buildings

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Abstract— *Driven by the same option of that utility that had inspired vested, Faraday, in 1831 discovered that an electric current was produce in a wire moving near a magnet. This is the principle of the generator and the basis of modern electricity. Large scale electricity is generated and transmitted from power station generators. Sources of water to multi-story buildings are numerous. Water Distribution could be Direct Distribution from main (non-storage) or Indirect Distribution from tanks (storage) and installation of any system should be carried out as stated by the water bye-laws in order to prevent vibration or mechanical damage, so as to avoid air locks within the installed system. This could be from rivers, lakes springs, boreholes, wells, ponds, stream, and large rainwater storage tanks. Gas is mainly supplied to multi-storey building as a source of heat in appliances such as heater, cookers, water heater, washing machines, and refrigerators etc. The use of gas on the other as a means of artificial lighting, has been superseded by the use of electricity.*

Keywords— *Electricity, Gas, Multi storey building, Utility services, Water supply*.

I. INTRODUCTION

A long process of development by trial and error during the late nineteenth century resulted in the establishment of a set of rule for utility services and layout of sanitary installations which when followed ensured satisfactory performance. It was not necessary for designers to understand the basic principles involve. Departures from established solution even if justified by satisfactory performance and based on sound and principles, were not acceptable. In recent years, problems of size of installation and particularly height of building, unprecedented in within habitats have had to be solved. Economy of established method has been questioned. Fundamental studies of the hydraulic behavior of utility services have been made principally by the American national bureau of standards and the building research establishments. New problems and methods and the freedom to design for a standard of performance infarct impose considerably more responsibility, required from designers if improved installation are to result, and much more fundamental knowledge than was previously the case (Burberry 1970).

II. RANGE OF UTILITY SERVICES

The ranges of utility services are:

1. water supply
2. gas installation
3. Electricity

Installation is used in electricity for power supply, lighting and communication and in water supply for drinking, bathing, and the likes. These are now essential provision in virtually every building. In many cases sophisticated installation for control of alarm, security and other wiring such as electrical control gear are modest when compared with most of other utility services, it is important for everyone consigned with the design, construction and use of the building to be familiar with the general layout and accommodation of utility services and to have an approach of the way such installation function.

Factors to be considered include;

a. Durability
b. Non-blocking
c. Traceable and accessible for maintenance
d. Economy
e. Adequate discharge capacity
f. Aesthetics

2.1 Electricity

The era of large-scale power distribution arguably began towards the end of the nineteenth century. The remarkable achievement that transform to modern electricity generation, transmission, and distribution was made possible by a series of invention and discoveries made during the preceding two century involving the generation and transportation of electric energy. Some of the discoveries were conceptual while others were technical and some involved developing a technology to the point where it was economically practical to produce and transport an electric power.

In the production of electricity practice came first then concept followed. By beginning of the eighteenth century there was an agreement between a group of experimenters (sciences) that rubbing various materials such as glass produce a condition that was called' electric' and associated with this condition were sparks and properties attraction and repulsion. In 1820, Michael faraday in London showed how this relationship could be used to produce motion.

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2.1.1 Electricity generation

Large scale electricity is generated and transmitted from power station generators by prime movers are employed in large electricity generation.

Depending on the prime mover employed, power station can be classified into four groups:

1. Steam/Thermal power station
2. Hydro power stations
3. Nuclear power station
4. Solar power unit

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2.1.2 Distribution to multi storey buildings

Supply of electric services to building could be by single phase 2 wire system distributions radial or by ring distribution, or rising main distribution for Multi storey building (hall 1994).

Radial Distribution

As name the implies, the service to subsidiary distribution panels radiate from the main panel. The main panel normally consist of main switch connected to fuse switches through a bus bar chamber several feeder cable are run from the main intake panel to the subsidiary distribution panels, which may be situated in separated buildings or at a strategic point inside one building. In radial distribution system, each of the three phases and neutral has fused switch gear at the intake and connections to a horizontal bus chamber. In factories the chamber of trucking runs around the building interior for convenient access for cables to be bottled to the exposed copper bus bar.

Ring Main Distribution

In large development schemes having several buildings around the perimeter of the site, a ring main circuit would be taken around the site with supplies taken into each building.
The main system of distribution has the following advantages.
1. Each building and individual section of the ring may be isolated without switching off the entire installation.
2. The current may flow in either direction which reduces the voltage drop.
3. The ring may be sized to take account of the individual factor for all building but it is unlikely that such a load will be required for all the building simultaneously.

Rising Main Distribution

Rising mains are essential electricity infrastructure for distribution of electricity in a building. The rising mains installation shall comply with the Electricity Ordinance (Cap. 406) and its subsidiary Regulations and the requirements of the latest Code of Practice for the Electricity (Wiring) Regulations. Any building of more than four floors including the ground floor and designed for occupation of more than one customer shall be provided with 3-phase 4- wire electrical rising mains with 3-phase and neutral tee off at each floor unless otherwise agreed by the electricity supplier. Each rising mains installation shall be protected against overcurrent and earth leakage and shall be equipped with suitable means of isolation. Where supply for rising mains installation is taken directly from HK Electric transformer or underground cable, the main switch or circuit breaker shall be rated at a short-circuit breaking capacity of 40kA symmetrical at low voltage. In premises intended for multiple occupations, separate riser earthing conductors shall be provided to earth all the units. The minimum cross-sectional area of riser earthing conductor shall be 70 sq.mm for copper and 150 sq.mm for aluminum.

2.1.3 Electrical installation to multy-storey buildings

The electrical demand in large building such as block of flats, factories, officers, etc., will necessitate an intake of all 3 phases and neutral to operate and satisfy a wide distribution of electricity to machinery, lift and multiple banks of lighting. The largest of buildings campuses will have their own 11kv sub-station and transformers to various disposed subsidiary system. There are three methods of distribution for large buildings: radial ring main and rising main distribution. In radial distribution system, each of the three phases and neutral has fused switch gear at the intake and connections to a horizontal bus chamber. In factories the chamber of trucking runs around the building interior for convenient access for cables to be bottled to the exposed copper bus bar.

For multi storey buildings there are two main methods of supplying the floor

1. To pass conductors, whether cables or bars into isolation or fused switches at each floor.
2. To pass conductors into and out of a subsidiary distribution board at each floor. With the first method, the supply can be isolated at each floor, but not the second method (hall 1994).

The 15th edition of the institute of electrical engineers (IEE) regulations requires that when cables, conducts, dust, or trucking pass through walls, partitions, or floor, the surrounding space left must be made well with cement master or similar fire resisting material to the full thickness of the structure. In addition, where cables, conducts, or conductors are installed in channels, ducts, trucking which pass through floors or walls, suitable internal fire resisting barriers shall be provided to prevent spread of fire.

2.2.1 Water Supply

Pure and portable water is one of the most vital of human needs. More essential on short term basics than food, it also serve human comfort and conveniences in providing the means of washing, bathing , cooking, cleaning and laundering. In the improvement of food production, irrigation has a measurable effect on the yield and quality of fruits and vegetable just as the washing of livestock has no meat.

The safety of building occupants and the protection the material value of combustible structures and the content of both fire and non-fire proof building is enhanced when fire – hose stand pipe installations are available and overhead sprinkler systems are standing ready to cooperate at any dangerous rise in temperature.

The control of environment comfort is often provided by circulating warns water for heat during the writer and chilled water for the removal of heat in summer .In the planning of building the architect, builder, and other engineers assume the possibility if proving for adequate water supplies in the correct quantities, flow rates, and temperatures with proper arrangement for changes and building expansion.

For drinking, the water must be palatable bacteriological pure. It is Essential that its inherent chemical contents be controlled or modified to render it useful and to avoid clogging or corroding pipe and equipment.

Controls must provide that the section of the building or its equipment can be valued off to permit repairs or changes. Values, controls, and all equipment must be easily accessible with sufficient space for inspection and repairs. To avoid the

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encroachment of plumbing on the general aesthetic designs in the later stages of planning both must be considered integrally from the first. (Guinness 1971)

2.2.2 Water distribution

Sources of water to multi-story buildings are numerous. This could be from rivers, lakes springs, boreholes, wells, ponds, stream, and large rainwater storage tanks.

The latter are still in wide use today. The main objective of water supply installation is to ensure that water supplied remains uncontaminated, and that there should be no waste of water during supply.

As such the school water supplier has a duty every building is provided with the quantity of water available but with the collection ad storage in order to cover the agreed variations and requirements.

Water Distribution could be by:

1. Direct Distribution from main (non-storage)
2. Indirect Distribution from tanks (storage)

Direct Distribution

In this system all cold water draw-off points are fed directly from raising service pipe with the cistern, where provided, serving the role purpose of a feed cistern. For this system to be satisfactory there most be a constant supply of water of sufficient pressure during points of peak demand.

Indirect Distribution

The indirect system has only one draw-off point provided for fresh water but all other points are supplied from a storage cistern.

2.2.3 Plumbing installation

The installation of any system should be carried out as stated by the water bye-laws in order to prevent vibration or mechanical damage, so as to avoid air locks within the installed system.

The materials chosen should be of the right kind for various purposes. Before any material is chosen the following consideration should be taken: Durability of the piping material, Resistance to corrosion, Cost of the pipe, Cost of handling and placing, Cost of maintenance, Method of fixing, Site condition, Cost of repairing.

2.3.1 Gas installations

Gas is a combustible fuel which burns with the luminous flame. It has the virtues of giving almost pollution free production of combustion entirely acceptable in clean air zones, and of flue requirement which are smaller than often very much simpler than those of solid fuel or oil. Recently the use of gas as a fuel has been revitalized by the discovery of natural gas under the North Sea. This has happened at a time of increasing expense and shortage of other fuel, and consequently also manufactured town gas. As a result all gas supplies in the world being converted to natural gas. The government policy is to ensure, as far as possible, the provision of a piped gas supply to domestic consumers, particularly to new building development, as a means of discouraging the future growth of liquefied petroleum gas cylinder. In this regard, a piped gas supply in the form of town/natural gas or from a bulk liquefied petroleum gas (LGP) storage installation should be planned for new developments.

2.3.2 Internal Installations

These usually commences at the consumer control, and consists of a governor to stabilize the pressure and volume ,the meter which records the volume of gas consumed, pipe work to convey the gas supply to the appliances.

Pipe work can be mild steel, solid drawn copper pipe and flexible tubing of rubber or metallic pipe for use with portable appliances such as gas pokers. The side of installation pipes will depend upon such factors as gas consumption of appliances, frictional loss due to length of pipe runs and bends. Gas pipes are fixed by means of pipe hooks, clips, or rings brackets at approximately 1.500m centers. All pipes should be protected against condensation, dampness, freezing, and corrosion. (Burberry 1970).

Pipes which pass through walls are housed in a sleeve of non-corrodible material surrounded by packing of in – combustible materials such as asbestos to facilitate every replacement and to accommodate small differential movements.

2.3.3 Gas Supply To Multi-Storey Buildings

Gas is mainly supplied to multi-storey building as a source of heat in appliances such as heater, cookers, water heater, washing machines, and refrigerators etc. The use of gas on the other as a means of artificial lighting, has been superseded by the use of electricity.

Gas is supplied by area boards under the general coordination and guidance of the gas council, the supply may be in the form of natural gas North Sea gas or manufactured gas/ town gas. The pressure, burning rate, and amount of air required for correct combustion varies with two forms of gas supply and therefore it is essential that the correct type of burner is fitted to the appliance. The installation of gas is carried out by local area board in three district stages:-

1. *Main Service Internal installation*

The pipe arrangement from the main to the building is not dissimilar to that of water supply, although the pipe must fall towards the main so that condemnation may drain.

2. *Inside the building*

A main control cock proceeds the gas meter which may be sited conveniently for access. Sometimes a pressure governor is fitted before the meter, and sometimes particularly for large installation meter can be very substantial in size requiring special accommodation and sometimes lifting tackle underground service pipes must be protected by bituminous or other wrapping. Pipe runs after the meter can be dictated by convenience and neat appearance. It is acceptable to bury gas pipes in floor sourced

3. *During building*

An entry for gas pipe should be formed in the foundation, verified clay pipes may be used and the gaps after installation packed with bituminous filling, but mild steel pipes should be

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wrapped to prevent corrosion if they are buried in plaster. Pipe sleeves should be used where ever gas pipes pass through walls and floors not only for neatness but also to ensure that thermal movement and settlement sternness are prevented.

III. CONCLUTION

The remarkable achievement that transform to modern electricity generation, transmission, and distribution was made possible by a series of invention and discoveries made during the preceding two century involving the generation and transportation of electric energy. Some of the discoveries were conceptual while others were technical and some involved developing a technology to the point where it was economically practical to produce and transport an electric power. Sources of water to multi-story buildings are numerous. This could be from rivers, lakes springs, boreholes, wells, ponds, stream, and large rainwater storage tanks. In the improvement of food production, irrigation has a measurable effect on the yield and quality of fruits and vegetable just as the washing of livestock has no meat. Most gas appliances are connected directly to the pipe work. In the case off cookers and refrigerator, however it is becoming increasingly usual to provide flexible connection to allow the appliance to be moved for cleaning. The installation of gas is carried out by local area board in three district stages, Main Service Internal installation, inside the building and during building. These usually commences at the consumer control, and consists of a governor to stabilize the pressure and volume, the meter which records the volume of gas consumed, pipe work to convey the gas supply to the appliances and Pipe sleeves should be used where ever gas pipes pass through walls and floors not only for neatness but also to ensure that thermal movement and settlement sternness are prevented.

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