SUMMARY

All buildings need to be upgraded sooner or later as they age, subject to wear and tear and with time, functional needs and people's aspirations change. If a building is not periodically upgraded, it will soon become obsolete. The mechanical and electrical (M & E) systems in a building have definite useful life-span, beyond which frequent breakdown and excessive maintenance will adversely affect the economic and commercial values of the building. The upgrading or replacement of these systems is thus inevitable when a building has reached certain age. For some buildings, the errors in original design or over-designing could lead to excessive malfunction and inefficient operation of the M & E systems. The overall operation and maintenance costs of the buildings would thus become excessively high.

For a building to succeed commercially, it must be able to present comparative advantages in terms of physical attractiveness, efficient layout and management, as well as rental and financial benefits to the occupants. It would be the building owner's objective to upgrade the image of the building in its totality and hence maximising his return in investment.
Retrofitting work of mechanical and electrical services in building on a large scale has become prominent only in very recent years. The rapid advancement of technology, greater demand for improved environment and working conditions and the need to conserve electrical energy have escalated the scope of retrofitting buildings with modern mechanical and electrical services. In Singapore, the improved economic conditions in 1987 prompted more building owners to upgrade their buildings. As the stock of buildings gets older, the total retrofitting expenditure is expected to increase rapidly over the next five years. The growth potential of the retrofitting sector within the construction industry of Singapore has already been well chronicled.

Between 1984 and 1990, the stock of buildings which turned 10 years old has doubled, from about 25 million square metres to over 50 million square metres. In percentage terms, such buildings currently form 36% of the total building stock. The number of old buildings which require retrofitting work is likely to reach 44% by 1993. Thus the retrofitting market in Singapore is regarded as one of the most rapidly expanding sectors in the construction industry.

This paper highlights the various objectives and benefits of retrofitting old buildings. An analysis of the market size and future prospects of retrofitting work in Singapore are
provided. It also addresses the design considerations and problems in undertaking M & E retrofitting work for occupied buildings. Based on the writer's experience in M & E retrofitting work, case studies are used to demonstrate the economic aspects of retrofitting M & E services for buildings in Singapore. Besides reducing running costs and providing improved working conditions, the public image of the building is further enhanced. Building owners would eventually gain maximum returns of their investments.