Establishing sustainable strategies in urban underground engineering

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Key words: urban underground, utility tunnel, sustainable design

ABSTRACT: Growth of urban areas, the corresponding increased demand for utility services and the possibility of new types of utility systems are overcrowding near surface underground space with urban utilities. Available subsurface space will continue to diminish to the point where utilidors (utility tunnels) may become inevitable. Establishing future sustainable strategies in urban underground engineering consists of the ability to lessen the use of traditional trenching. There is an increasing interest in utility tunnels for urban areas as a sustainable technique to avoid congestion of the subsurface. One of the principal advantages of utility tunnels is the substantially lower environmental impact compared with common trenches. Implementing these underground facilities is retarded most by the initial cost and management procedures. The habitual procedure is to meet problems as they arise in current practice. The moral imperative of sustainable strategies fails to confront the economic and political conflicts of interest. Municipal engineers should act as a key enabler in urban underground sustainable development.

1. Introduction

Use of underground space for utilities is by far the most extensive use of the urban subsurface. The total cost of all types of urban utility systems in the developed Western world was approximately $US25 billion per year in 1987. Demands for all existing urban utilities due to the growth of urban areas and the possibility of new types of...
utility systems are increasing. Municipal engineers face one of their most daunting challenges: available underground space will continue to diminish. As is well known, utilities have been permitted to utilise the street subsurface for location. Buried utilities are overcrowding urban underground space to meet the domestic and commercial needs of an ever-expanding population. Moreover, placement of utility services underground has not been generally accomplished in any systematic manner resulting in a veritable maze in high-density districts. Urban engineers have called this density of utilities “the spaghetti subsurface problem”.

These factors have led to an increasing interest in urban utility tunnel systems as a feasible technique for the effects produced by congestion of the shallow urban underground. According to U.S. Army Corps of Engineers, a utilidor, utility corridor or utility tunnel, is a conduit that may contain multiple utility systems such as water, sewerage, fuel oil, gas, electrical power, telephone, and central heating in various combinations or in some cases all together. Utilidors avoid incessant excavations, which are responsible not only for traffic delay and congestion, but also affect urban street structure, requiring additional maintenance and early reconstruction. The most striking feature of these underground facilities is that they integrate urban utilities in an easily accessible space at any point of their length (see Figure 1). Accessibility can be planned in two ways: on the one hand, the utility tunnel can be accessible in a selective form (e.g. through removable roof panels), but easy personnel entry along its length is not possible due to its reduced cross-section; on the other hand, we can find utility tunnels that can be accessible by man through their length. The type of accessibility is perhaps the most important parameter used to classify utility tunnels, and it must be taken into account at the beginning of any project on this matter. This feature also contributes to one of the European Union environmental strategies, e.g. utility tunnels improve the evaluation and administration of risks and the reaction capacity before the event of accidents and catastrophes.

Figure 1. Utility tunnel integrates urban utilities in an easily accessible space at any point of their length.