By Hiruy Dafla, PE

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Does My Building Need Renovation? Should I Repair or Replace? How Do I Plan for a Major Renovation?

A building in service is in many ways similar to a car. It requires routine maintenance and upkeep for optimal performance as well as to get the best and longest use. After several years of service, regardless of any routine maintenance, there will be a need for a major tune up to replace components that have reached the end of their service life. Similarly a building will eventually need replacement of certain components that have reached the end of their service life. This article discusses typical elements of a building that require a planned replacement and the approach to the decision as to when to replace them and the process involved. Since my experience deals with building envelope and structural rehabilitation, this article will not discuss mechanical or electrical systems of a building though the basic idea would remain the same.

All components of a building have limited service life. For example, the "skeleton" or inner structure of a building, when constructed may have an anticipated service life of 50 to 100 years. We often observe that when these components are well protected from the elements, the structure can often outlast its predicted service life. However, given that the outer layers or "skin" of the building, referred in the industry as the building envelope, are exposed to the elements (e.g., hot, cold, ultraviolet degradation, wind, wetting and drying, freeze-thaw cycling, etc.) these components have a shorter service life. These elements may go through five or more replacement cycles before the building structure itself reaches the end of its service life.

Some of the major elements of a building that require partial or full replacement include protective coatings and sealants or caulk, windows and door assemblies, the roofing system and associated drainage devices such as gutters, scuppers, collector heard, downspouts and roof/deck drains etc., plaza/terrace waterproofing, vehicular traffic membrane, balcony pedestrian traffic membrane, etc. In addition to these, certain components of a building structure have a much higher exposure to the elements and the damaging effects of chlorides, acid rain and carbonation. These structures will at some point in the life of the structure require major repair. These include components such as plaza structural decks, parking garages, balconies, exposed concrete columns and slab edges.

The decision point when a component of a building should go from routine maintenance to a large-scale rehabilitation/replacement project, or major capital project, is often made by comparing the recurring repair costs or the escalation of deferring the repair with the cost to replace the system. For example, a roof system that has a service life of 20 years may leak at year five in a small or isolated area. A minor repair to the roof will put the roof system back on track to provide its intended 20-year service life. This would be considered a cost-effective repair. If however the same roof system starts to produce leaks in year 18, then the extent (i.e., size) of the leak area, the cost of the repairs involved and the frequency of such maintenance repair work should be carefully considered. The same repair that would have been performed at year five will likely not be as cost effective since the roof is so close to the end of its service life and the money invested will not provide as much of a return on investment. Essentially, at this point every dollar spent on maintenance should be compared with the debt service to replace the roof. As maintenance costs escalate, the replacement option will present itself as a better long-term value

For purposes of planning, most building components come with a predictable service life along with a warranty for that period. For example, a modern silicone sealant system such as one installed around the perimeter of windows has an expected life of 20 years and will come with a 20-year warranty from the manufacturer. The planning starts at the first reserve study (i.e., the transition study) for the building. Such studies are general in nature and are intended to identify the expected service life and predicted cost of replacement. Close to the end of the predicted service life, a professional engineer/consultant that specializes in the building component evaluation

needs to perform a more detailed evaluation of the specific system(s). This diagnostic work may involve visual examination, physical sampling and/or field surveillance and testing in order to help evaluate and determine more accurately what the remaining serviceable life is for the particular building system or component. This insight will be very helpful in the decision process as to when to replace and how to replace as well as to help better project the cost of replacement. This assessment may be followed by a design, bidding and construction phase if replacement system is warranted. Such replacement work resets the maintenance cycle and helps extend the serviceable life if quality materials and craftsmanship are coupled with properly scheduled routine maintenance.

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