

**Designing Schools To Reduce On-Going**  
**And Future Maintenance and Repair Costs**

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## **Designing Schools To Reduce On-Going And Future Maintenance and Repair Costs**

For many years, school district's budgets have been severely limited for maintenance and repairs of buildings, and the State Major Maintenance Fund, while improved in recent years, is not expected to increase significantly in the foreseeable future. Therefore districts should consider strategies for reducing long term maintenance costs by emphasizing a life-cycle cost approach when designing and constructing new schools and modernization projects. Examples of some strategies and concepts to consider are as follows:

**1. Roofs:** Pitched roofs with 25-30 year composition shingles have proven to be a very cost-effective solution, since they provide an extremely durable, vandal resistant, leak resistant and long life product. Flat roofs with single-ply membrane or built-up tar and gravel are prone to leakage, faster deterioration from weather, and damage from foot traffic and vandalism. Standing seam metal roof products with baked enamel are a more attractive alternative to composition shingles, but are more expensive to install than composition shingles, and finish coatings may peel in 10-15 years. While most concrete tile and clay tile products have a longer life than many other products, they are more expensive initially, are heavy and very brittle, resulting in breakage and expensive repairs. The extra weight of concrete or clay tiles also increases the cost of the building structure.

**2. Wood:** Exposed wood should be avoided or minimized. Exposure to weather results in the requirement for frequent painting and eventual replacement. Exposed wood should be pressure treated whenever possible, and should be allowed to dry out before painting or staining to prevent leaching of chemicals and failure of paint finishes. Fascias and large beams can be constructed from stucco or concrete as an alternative to wood.

**3. Metal:** The use of exposed metal should be minimized. Flashings and trim should be galvanized (preferred solution) or baked enamel (more attractive but subject to long term peeling). Handrails should be galvanized steel, powder coated steel, or anodized aluminum. Painted steel rails will chip, peel and rust, resulting in high maintenance costs and poor appearance. Fencing should be galvanized or, preferably, epoxy coated for long term durability and appearance.

**4. Wall Surfaces:** Exterior walls should be finished in stucco with integral color, or split-face concrete block for durability and to minimize future painting. Exterior walls should be treated with a water sealer and anti-graffiti coating. For *interior corridor walls*, hard plaster or concrete block is recommended for durability. Gypsum board (drywall) is easily damaged and, if selected, should be double-layered or backed with plywood to avoid holes and major damage. If drywall is used in corridors, application of a durable wainscoting material is recommended over the drywall. Traditional vinyl wall coverings in corridors are easily damaged by peeling, and therefore

should be avoided. Painted or vinyl-covered drywall in classrooms has proven to be satisfactory.

**5. Doors:** Exterior doors should be metal clad for long-term life, fire resistance and security. Solid core wood doors will deteriorate over time due to rain and moisture. Metal doors exposed to direct sun, particularly in interior valley locations, will become very hot, resulting in possible injuries, and therefore should be recessed or otherwise shaded from direct exposure.

**6. Windows:** Anodized aluminum windows offer low maintenance in most climate areas. Aluminum windows in areas with a marine environment will oxidize more quickly than in drier climates, and should be coated with finishes proven to be resistant to salt air. Fiberglass or vinyl clad wood windows hold up well in severe climates and may be worth the extra cost where appropriate. Traditional painted wood or steel sash windows should be avoided because of high maintenance. In areas of frequent vandalism and/or intrusion, several options should be considered. Windows with small panes should be specified to prevent intrusion. Glass should be tempered, laminated or wire-glass to prevent or minimize breakage. Lexan or other polycarbonate materials should be avoided as they can be scratched easily, burned, or removed due to “oil-canning”. Several security screen products are available to prevent both breakage and intrusion. These screen products are both functional and attractive, and may be worth the added expense in high-security areas.

**7. HVAC Systems:** Gas-fired central hot water systems and electrically driven chilled water systems with zone or individual room fan coil units are often the most energy efficient systems. However, if the main boiler or chiller fails, the entire system for the school must be shut down. Therefore, having the school being supported from two or three boiler/chiller systems provides a better opportunity for maintenance and repair of portions of the total system without shutting down the entire school. Individual small zone or room heater/airconditioner package units provide maximum flexibility for maintenance and control, but can be more costly to operate. Most solar heating systems for building heating have not proven to be cost effective in life-cycle cost studies. However, some solar products may be appropriate for swimming pool heating and domestic hot water pre-heating, depending on the climate and life-cycle cost analysis.

**8. Hardware:** It is important to specify and install door and lock hardware with which the district has had good experience. Safety, security and durability should be of primary concern in the selection of key systems. Loss or theft of keys is a serious and on-going problem. Districts should use a key system which can be rekeyed easily by district staff, and which cannot be duplicated by unauthorized persons.

**9. Restrooms and Plumbing:** The highest quality sink and toilet fixtures should be specified. They should be brands and units with which the district has had good experience. Polymer toilet partitions are highly vandal resistant and are preferred over metal units. Plywood should not be used. Tile or terrazzo on walls and floors is more expensive initially, but has long-term durability. Sealed concrete floors are inexpensive but durable, if aesthetics is not a concern. Vinyl tile on floors should be avoided in student bathrooms. Countertops should be of a polymer composition. Traditional plastic laminate materials do not hold up, especially in student areas.

**10. Flooring:** Sheet vinyl and vinyl composition tiles work well in corridors, classrooms, multipurpose rooms and most other areas with light traffic where ease of cleaning is important. Ceramic tile should be considered in high traffic areas such as lobbies and entry halls where maximum durability is required. Preparation and serving *kitchens* should have quarry tile floors; other products such as seamless vinyl and synthetic coated systems have not proven to be durable enough. In *gymnasiums*, traditional hardwood floors perform well, but require frequent maintenance and refinishing. Other products to consider include poured-in-place polyurethane or “seamless” sheet materials. Polyurethane is resilient and long lasting, but separation from the substrate can occur. Another product is vinyl coated, “seamless” synthetic wood flooring, similar to residential flooring. The product is too new in schools to be able to evaluate at this time.

**11. Carpet:** Most installations use direct-gluedown carpet. Premium-grade carpet with a warranty against wearout and raveling should be specified. Carpet with an integral moisture barrier between the face of the carpet and the pad should be used to prevent spilled liquids from going through to the pad. Once the pad is stained or saturated, the stain can never be removed without replacing the carpet/pad. Also, care should be taken to select a color and pattern which minimizes the appearance of minor stains and dirt. Carpet is not well suited for corridors and other areas of high traffic and/or spillage.

**12. Roads, Parking and Playgrounds:** Most roadways, parking lots and playgrounds are paved in asphalt concrete. The key to long lasting paving is installation of an adequate base and good maintenance. The engineer should determine what thickness base is needed for the existing soil conditions and anticipated vehicular traffic, with special emphasis on size and frequency of buses. Attempting to economize on the base will result in premature failure of the paving. A plan for periodic sealcoating is also essential to paving durability. Around trash dumpsters, high strength portland cement concrete should be used, because the concentrated loads generated by trash trucks quickly destroy standard asphalt paving.

**13. Miscellaneous Items:** Other areas where districts should pay particular attention to selection and design are potentially costly systems including telephone and intercom systems, fire/intrusion alarm systems, quality of *cabinetry* and cabinet hardware, landscape irrigation systems, and running tracks. Treatment of soil around buildings for *termites* may be a wise expenditure to avoid future infestation and deterioration costs.

**14. Relocatable Classrooms:** Standard factory-manufactured relocatables should be carefully reviewed for design and ordered with durable materials if the budget permits. Painted wood siding and trim should be avoided. Roof systems should be analyzed for durability, and HVAC/heat-pump units should be reviewed for energy efficiency.

These and other features should be carefully studied to avoid high long-term maintenance and energy costs.

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