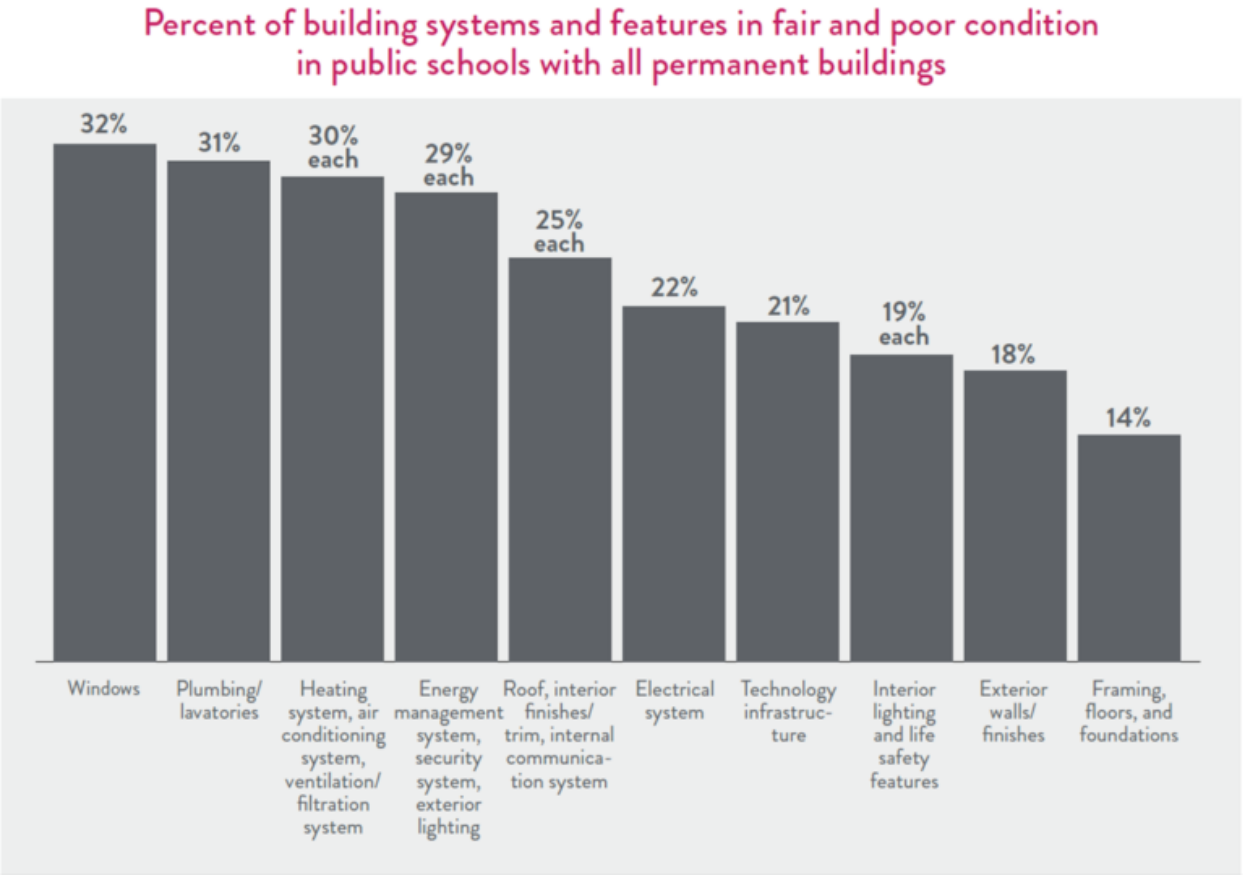
## Question of the Week: What Are the Risks for 40-60 Year-Old Facilities?




Currently, there are approximately 130,000 K-12 schools in the US, including 98,000 public and 32,000 private schools. In the state of Virginia, a recent study showed that 52% of the schools were 50 years old in 2021. In Virginia, that correlates to 1020 schools. Nation-wide, in the US, the average age of a K-12 school is 42 years. 28% of schools were constructed before 1950. 49% of schools were constructed between 1950 and 1969. 17% were constructed between 1970 and 1984. (Jan. 1999 National Center for School Statistics). In summary 94% of schools are more than 38 years old. Federal studies have identified that the average school requires $4.5 million to restore the school to good condition. Older facilities are definitely responsible for a large majority of required reinvestment.

If we extrapolate the $4.5 million x 130,000 schools, we expose a need for almost $600 billion in deferred capital investment. This is a figure that could be required in 2022 to address current needs. How do we prioritize this scope of deferred capital investment? We know of the problem and scope due to studies. Wewill solve the problem and prioritize solutions through further studies. The State of Wyoming is currently embarking on a screening of their 600 school facilities to identify schools with the most significant and

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immediate needs. Other states are in various stages of similar facility condition assessment studies. The state of Maryland passed legislation in January of 2022 to require Facility Condition Assessments of K-12 schools every 4 years.

Many of the schools requiring the most attention fall into the category of 40-60 year-old facilities. This is the age, within facilities, that major renovation should be considered. Problems emerge with issues related to modernization, utilization, and operation that make a cosmetic remodel no longer adequate. As with humans, the issues related to daily operations start to multiply during the decades around 40-60. The issues that humans experience in these decades are not much different than issues faced by aging facilities. Some of my newsletter readers are approaching, passing, or experiencing their 4th, 5th, or 6th decade. There are structural issues, plumbing issues, skin issues, ventilation issues, and electrical/nerve issues that show up in these decades. Systems that previously could be ignored or placated are now asking for serious attention. Knee replacements, stints for cardio systems, and testing for plumbing systems start to become common place. There are many issues related to facility renovation that facility managers should be aware of that impact renovation planning. These issues include manufacturing defects of older systems, code enforcement and compliance issues that surface when structural systems are reconfigured.

Years ago, the city of San Jose, CA was embarking on a master planning exercise for their elementary schools. I convinced the architect, who then convinced the school board, that a facility condition assessment should be completed before the master planning exercise could be completed. Understanding the condition of existing systems was critical before designing more modern facilities. Older facilities have many unforeseen issues that need to be understood before advancing a renovation or master planning exercise. For the purposes of this article, let's concentrate on school facilities constructed in the 1970's. Besides having the unenviable position of being 50 years old, half a century, these schools have the unique position of being built in a period of building experimentation that has afflicted the building industry for the last 50 years. The commercial lending world has looked askance at buildings constructed in the 1970's due to issues known in the lending world as Red Flag issues. Red Flag issues from the 1970's include:

1. **Electrical Systems:**
    1. Aluminum wiring – associated with fires due to aluminum's tendency to short circuit necessary connections. There have been a series of industry solutions involved with changing out outlet devices to deal with difficulty in maintaining connections. Now, at 50 years old, aluminum

wiring is reaching the end of the EUL of electrical wiring. Copper wiring has been used, almost exclusively, since the 1980's.

*Electrical Systems*

2. Federal Pacific Electric – Stab Loc Panels – associated with unreliable breaker switches. Federal Pacific electric panels circumvented Underwriter Laboratory approvals. Replacement parts are no longer made.
3. Fuse Panels – Although fuse panels were introduced before 1970's they were continued to be used in the 1970s. In residential application, fuses required fitting with a non-tamp sleeve to keep tenants from installing pennies to over-ride faulty fuses. Fuse panels were frowned upon by lenders, especially without tamper-proof fuses.


*Fuses*

4. 60 Amp minimum – Residential main fuses were common in the mid-20th century for residential application for apartments with gas-fire equipment. Lenders frowned on this amount of electrical service after increasing use of electrical appliances, laundry equipment, and modern electrical devices. Lenders have required close attention to electrical capacity for fuses and circuit breaker switches.


*60 Amp*

## 2. Plumbing Systems:

1. Galvanized plumbing was used throughout the early part of the 20th century and was still being used in the 1970's. Copper piping has been preferable for many decades, along with CPVC and PEX piping in recent decades. Galvanized piping corrodes prematurely at joints and is susceptible to mineral build-up in hard water conditions. Galvanized piping has tended to last just 40 years while copper will typically last 60 years.

*Example of galvanized piping*

2. Polybutylene plumbing was introduced in the 1970's as a flexible pipe. However, poly-piping tended to split at approximately 20 years of age due to chlorine intolerance or 10 years, near water heaters, due to heat intolerance. The original poly-piping was connected with glue that also




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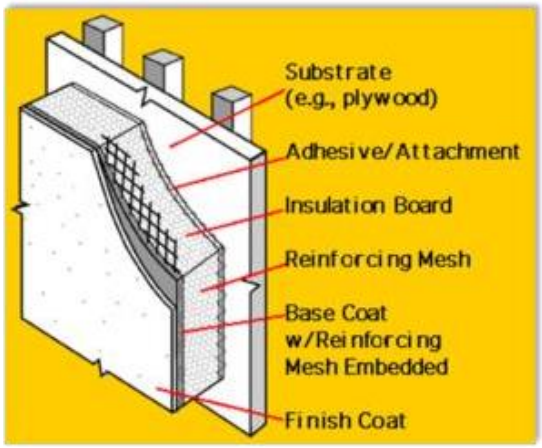
tended to fail early. Later versions had brass fittings that performed better, but chlorine issues prevailed, causing splits in plumbing lines.

3. ABS soils lines, manufactured by several manufacturers, between 1984 – 1990 has been shown to be brittle and can have premature cracking at joints.
4. Copper water lines in Washington DC have been documented as failing early – 40 years due to overtreatment of the water supply. Other regions of the country typically have a EUL of 60 for copper.

### 3. Exterior Finishes – Skin:

1. Masonite and T-111 plywood siding were inexpensive materials used in exterior finishes, especially at spandrel panels near windows. Both materials were highly susceptible to moisture fatigue.
2. EIFS – Exterior Insulation Finish System was introduced in the 1970's for application to existing masonry walls. The EIFS system (often refereed to as Dryvit) was originally applied to the exterior of walls to improve insulation, providing a synthetic stucco finish that could be sculpted to simulate stone. However, the early versions of EIFS did not allow proper drainage and significant law-suites and corrective action was necessary in early applications of this system. Later EIFS systems were designed with cavity drainage systems.




### 4. Structure:

1. Fire retardant plywood was introduced in wood frame construction in the 1970's. This material was typically used for pitched, wood-frame roofs to provide fire protection within 4' of fire -walls. Unfortunately, when this product got wet, moisture caused the plywood to disintegrate.

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Besides the issues associated with problematic building systems used in 40- to 50-year-old buildings, there are a variety of other issues that should be considered for these older buildings. These issues include:

1. **Systems that have a natural EUL of 40 to 60 years include:**
    - Plumbing systems including both waste and domestic water lines
    - Electrical systems including both panels and wiring
    - Metal roofs
    - Fire and Water-tube boilers
    - Air handlers
    - Hydraulic elevator pistons
    - Air distribution systems
    - Fire Alarm systems
2. **Systems that may be on their 2nd – 20-30 year replacement cycle**
    - Asphalt
    - Roofing
    - Windows
    - Doors
    - Lighting
    - Restrooms
    - Ceiling finishes
    - HVAC systems
3. **Systems that may be on their decade-based repair or replacement cycle**
    - Carpeting or Vinyl flooring
    - Sealants
    - Exterior Painting
    - Mortar pointing
4. **Systems that may be triggered by code enforcement due to structural changes**
    - Fire alarms and devices
    - Insulation and other energy performance-enhancements
    - ADA conformance

As noted above, there are several issues that should be considered for aging facilities. However, the list continues.

**Manufacturing Supply Issues:** Typically, manufacturer's stop making replacement parts for their equipment somewhere between 30-40 years. Systems that are integral to

building operation, such as heating, cooling, and elevator systems need to be replaced circa 40 years, so that minor system replacements don't cripple the use and operations of the building while waiting weeks for manufacturers to replicate replacement parts.

**Synchronistic Systems:** Systems that are correlated with other systems should be reviewed at 40-60 years. Roof replacement may accelerate the need to replace HVAC equipment on the roof due to similarity and integration. Replacing all of the HVAC systems, when roofing is replaced, can prolong the life of the roof. Ceiling replacements can trigger replacement of fire suppression, fire alarm, and VAV air distribution systems.

**Energy Laws and ADA Compliance Issues:** New energy laws require certain upgrades and standards to be met. Pay special attention to NYC and Washington DC which have very aggressive energy laws that went into effect in 2021. These laws typically affect buildings greater than 50,000 square feet in size. Renovation – involving structural changes can trigger many code and ADA compliance changes.

It's no fun to be 50 or 60 years old. Knee replacements, hair loss, eye-sight weakness, plumbing issues and many other health anomalies allow human body issues to closely align with building system issues. Having a comprehensive check-up is the best way to address issues that arise in facilities 40-60 years of age. For a facility, understanding the systems in use, understanding their performance, understanding their costs and replacement cycle, understanding code conformance issues are central to understanding the cost and scope of embarking on major renovations for 40-60 year-old facilities.

Roth Integrated Asset Management Solutions is well positioned to help Schools, Universities, Municipalities, and other large institutions with gathering defensible data on building systems to help clients create capital planning with an emphasis on asset management. The 40-60 year renovation cycle demands an experienced consultant to help prioritize and coordinate issues that are unique to older buildings. To get started, we have created a Building Performance Toolset that helps us to pre-screen facilities for adequacy, efficiency, and capital investment requirements to help school systems prioritize facilities that are ready or in need of building performance improvements including capital investment. Defensible data can be provided through in-depth asset condition inventory, energy audits, retro-commissioning, ADA audits, space utilization studies, demographic studies, facility operations and cleaning audits to build the bridge that connects facility management to asset management and funding.




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