

# **Life Cycle Analysis (Building)**

### Life Cycle Overview

Buildings don't last forever. Materials wear, surfaces become more absorbent, and roofing, mechanical and electrical equipment fail. Joints weaken and eventually even the foundations of buildings will deteriorate to the point that they can no longer support the weight above them. Most buildings in the United States are demolished and replaced when they reach approximately seventy to eighty years of age.

From 1950-1965, the baby boom created the need for more housing and community infrastructure. Some buildings were built quickly but not built for the long term; they were constructed as a stop gap measure to get through the next thirty to forty years. Many of the buildings constructed during this period have reached or are nearing the end of their life cycle. Extensive renovations can bring life back to these schools; however, many of these older schools were not designed to sup-

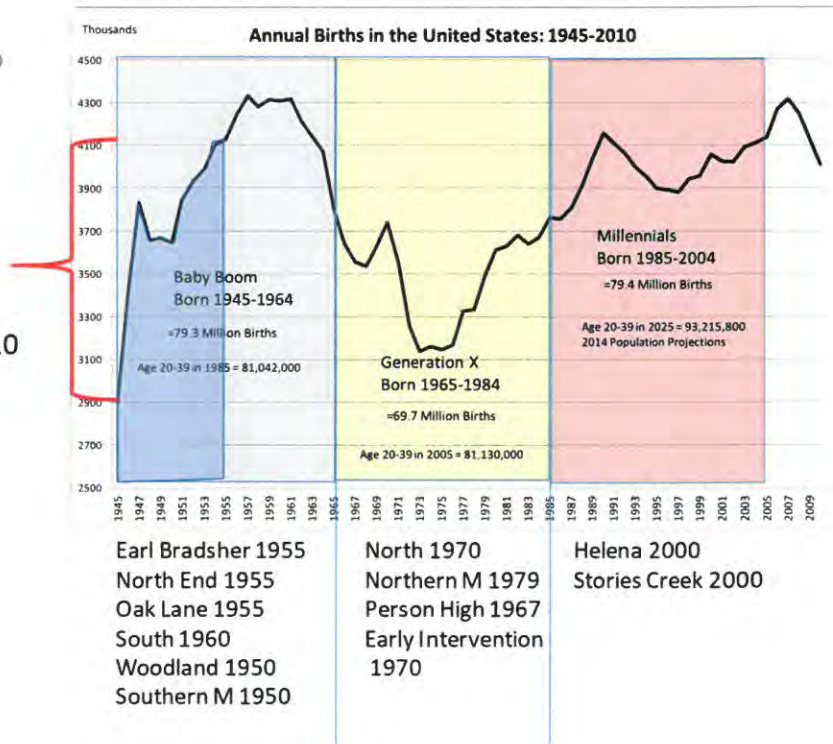
port a twenty-first century educational program, were not designed for air conditioning, and have other limitations with respect to security that may make them undesirable as a long term solution. The question of whether to rebuild or renovate involves consideration of the historical value of a particular structure and renovation costs versus a long term solution for educational space and new construction costs.

This section deals with the projected life cycle of the overall building, not its component parts. Items such as replacement of HVAC units or roofing are addressed as deferred maintenance items located with the individual school and are based on actual observations. When there is a major renovation of a building with respect to its structure, the building life cycle can be partially reset but may require additional renovations to truly extend its useful life.

### Life Cycle Analysis

Population related to Construction Means and Methods

1.25 M Additional Students in 10 years



### Excerpt from NCES on Building Life Cycle

*"In 1998, the average public school building in the United States was 42 years old. The mean age ranged from 46 years in the Northeast and Central states to 37 years in the Southeast (table 1). On average, schools located in the Northeast and Central regions of the country were older than those located in the Southeast and the West. Many of America's schools may be at an age where frequent repairs are necessary. According to Ornstein (1994), when a school is 20 to 30 years old, frequent replacement of equipment is needed. Between 30 and 40 years old, the original equipment should have been replaced, including the roof and electrical equipment. After 40 years, a school building begins rapid deterioration, and after 60 years most schools are abandoned.*

*About one-fourth (28 percent) of all public schools were built before 1950, and 45 percent of all public schools were built between 1950 and 1969 (table 1). Seventeen percent of public schools were built between 1970 and 1984, and 10 percent were built after 1985. The increase in the construction of schools between 1950 and 1969 corresponds to the years during which the Baby Boom generation was going to school."*

Source: National Center for Education Statistics, January 1999  
<http://nces.ed.gov/surveys/FRSS/publications/1999048/>

**Table 1.—Year of school construction and mean age of school, by school characteristics**  
 Year built

School characteristic	Year built				Mean age
	Before 1950	1950-1969	1970-1984	1985 or after	
	(Percent of schools)				
<b>All public schools</b>	<b>28</b>	<b>45</b>	<b>17</b>	<b>10</b>	<b>42</b>
Instructional level					
Elementary	29	46	15	11	43
Secondary	24	46	23	8	40
Size of enrollment					
Less than 300	40	39	14	8	48
<b>300 to 999</b>	24	48	17	11	40
1,000 or more	23	44	22	11	39
Locale					
City	34	44	13	9	46
Urban fringe	20	53	17	10	40
Town	24	47	20	9	40
Rural	32	38	17	12	42
Region					
Northeast	30	49	15	6	46
<b>Southeast</b>	23	43	20	14	37
Central	33	46	14	8	46
West	25	44	19	13	39
Percent of students eligible for free or reduced-price school lunch					
Less than 20 percent	20	48	20	11	39
<b>20 to 49 percent</b>	29	44	16	11	41
<b>50 percent or more</b>	<b>34</b>	<b>42</b>	<b>14</b>	<b>10</b>	<b>44</b>

NOTE: Percentages may not sum to 100 due to rounding.  
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System, "Survey on Advanced Telecommunications in U.S. Public Schools, Fall 1996," FRSS 61, 1996; "Survey on Advanced Telecommunications in U.S. Public Schools, K-12," FRSS 57, 1995; "Survey on Advanced Telecommunications in U.S. Public Schools, K-12," FRSS 51, 1994.



### Building Life Cycle Graphic / Table

The following is a graphic representation of the buildings on individual campuses depicting their projected overall life cycle. They use data from Thompson Allen's 2017 Values of Buildings dated 12/6/17 and include the actual construction methods and materials of the individual buildings themselves. The graphic and the associated charts do not fit nicely onto the standard 8 1/2 x 11 inch paper, so only the graphic is depicted in this section. The table relating to the dates, age, and expected remaining life of the individual buildings are shown with the campus information.

### Building Life Cycle Summary Person County Schools Summary - Table

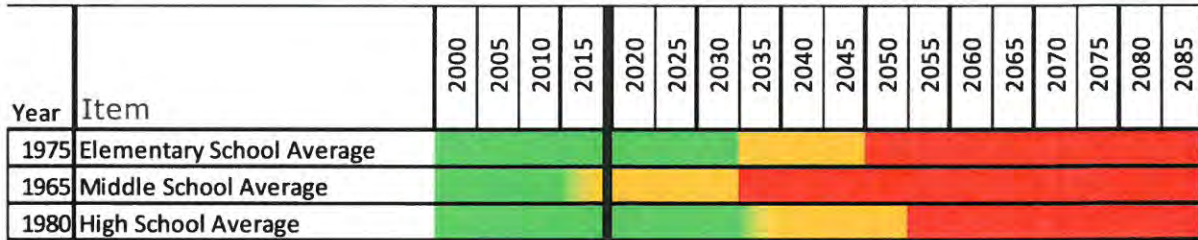
2018

- Length of Life Expectancy, in Years
- Variations in Life Expectancy
- Exceeds Life Expectancy, in Years
- Life Cycle may be reduced due to environmental issues.

Year	Item	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085
<b>Earl Bradsher Preschool</b>																			
1955	Main Building																		
1960	Addition																		
2000	Mechanical Upgrades																		
<b>Helena Elementary</b>																			
2000	Main Building																		
<b>North Elementary</b>																			
1970	Main Building																		
2000	Classroom Wing Addition																		
2000	Mechanical Upgrades																		
<b>North End Elementary</b>																			
1955	Main Building																		
1964	Media Center																		
2000	Classroom Wing Addition																		
2000	Mechanical Upgrades																		
<b>Oak Lane Elementary</b>																			
1955	Main Building																		
1964	Media Center																		
2000	Classroom Addition																		
<b>South Elementary</b>																			
1960	Main Building																		
2000	Classroom Wing Addition																		
2000	Multipurpose Addition																		
2000	Mechanical Upgrades																		
<b>Stories Elementary</b>																			
2000	Main Building																		
<b>Woodland Elementary</b>																			
1950	Main Building																		
1960	Main Building																		
1964	Main Building																		
2000	Administration and Classrooms																		
<b>Northern Middle</b>																			
1979	Main Building																		
2018	Mechanical Upgrades																		
<b>Southern Middle</b>																			
1950	Main Building																		
1993	Gym plus Addition / Renovation																		
<b>Person High</b>																			
1967	Main Building																		
1967	Main Gymnasium Complex																		
1992	Classroom Additions																		
1992	Auxillary Gym																		
1990	Stadium Restrooms																		
<b>Person County Learning Academy</b>																			
1995	Main Building																		
2010	Renovation																		
<b>Person County Early Intervention</b>																			
1970	Main Building																		
1995	Classroom Additions																		
<b>Person County Bus Garage</b>																			
2008	Bus Garage																		

### Life Cycle Summary

The graph below shows a system wide view of Person County Schools. This is the mathematical average of the ages of all instructional facilities operated by the school system. Although there are some buildings that are approaching the end of their useful life, the many additions over the past thirty years have contributed to the youthful profile of the buildings within the school system. This shows a rough view of the overall nature of the system.



Included below is a table indicating the average remaining life for the system as well as a breakdown of the average elementary, middle, and high school ages. Overall, the middle schools appear to be the oldest with an average age of forty-one years.

Item	Remaining Life	AVERAGE LIFE EXPECTANCY (IN YEARS)	LOW	HIGH	Year Placed Or Replaced	YEARS IN SERVICE
Elementary School Average	31	64.44	55	74	1975	43
Middle School Average	17	60.00	50	70	1965	54
High School Average	37	65.00	55	75	1980	39

### Square Footage of Buildings Related To Age of Facility

Below is a depiction of the square footage of each school and when the particular addition was placed. The total square footage of the school is listed at the top of the chart next to the year. These are the actual square footage of the buildings, not what is listed on the insurance data.

It should be noted that Woodland is the oldest school still in operation and is noted as sixty-eight years old. This is quickly followed by; Earl Bradsher, North End, and Oak Lane which were all built in 1955 and are currently about sixty-three years of age.

Square Foot per Year								
	1948 - 1957	1958 - 1967	1968 - 1977	1978 - 1987	1988 - 1997	1998 - 2007	2008 - 2018	Total
Totals	175,445	293,446	52,423	95,744	54,803	206,819	12,170	890,850
Earl Bradsher	24,856	5,787						
Helena Elementary School						78,099		
North Elementary			44,900			12,660		
North End Elementary	27,135	3,704				9,578		
Oak Lane Elementary	19,777	7,305				11,883		
South Elementary		43,350				16,271		
Stories Creek Elementary						70,797		
Woodland Elementary	23,521	3,757				7,531		
Northern Middle				95,744				
Southern Middle	80,156				39,549			
Person High		229,543			14,271			
Learning Center								
Early Interventions and Fam			7,523		983			
Learning Academy							12,170	



### Square Footage of Buildings Related To Age of Facility

Below is a table charting out the construction dates covering the last one hundred years. In the table, you can quickly see the increase in square footage due to the population growth from the mid 40's to the mid 60's, defined as the baby boom. Later during the early 90's, you again see an uptick in the number of square footage being placed, due to overall population growth and what has been termed the baby boom echo (1989-1993).

With fifty percent of the total square footage at fifty to seventy years old, it is appropriate to discuss how long the community is willing to continue to invest in these older facilities.

The chart below visually depicts the number of square footage that was placed in a given year.

Age of Building Square Footage  
8/20/2018

Year Range	Approximate Age	Square Footage	Percentage
1918 - 1927	90 to 100 yrs		0.00%
1928 - 1937	80 to 90 yrs		0.00%
1938 - 1947	70 to 80 yrs		0.00%
1948 - 1957	60 to 70 yrs	175,445	19.69%
1958 - 1967	50 to 60 yrs	293,446	32.94%
1968 - 1977	40 to 50 yrs	52,423	5.88%
1978 - 1987	30 to 40 yrs	95744	10.75%
1988 - 1997	20 to 30 yrs	54,803	6.15%
1998 - 2007	10 to 20 yrs	206,819	23.22%
2008 - 2018	Less than 10	12170	1.37%
<b>Total</b>		<b>890,850</b>	

