

Cost Effective High Performance Schools

**Presented by Douglas R. Hundley, Jr., PE, CGD, LEED AP, CxA
Principal, CMTA Consulting Engineers**



**What is high performance
and what is the typical cost?**



Energy Usage

**Buildings Energy Data Book – U.S.
Department of Energy**

**90 kBtu/sf yr
(High School)**

**ENERGY STAR Target Finder
Score 50**

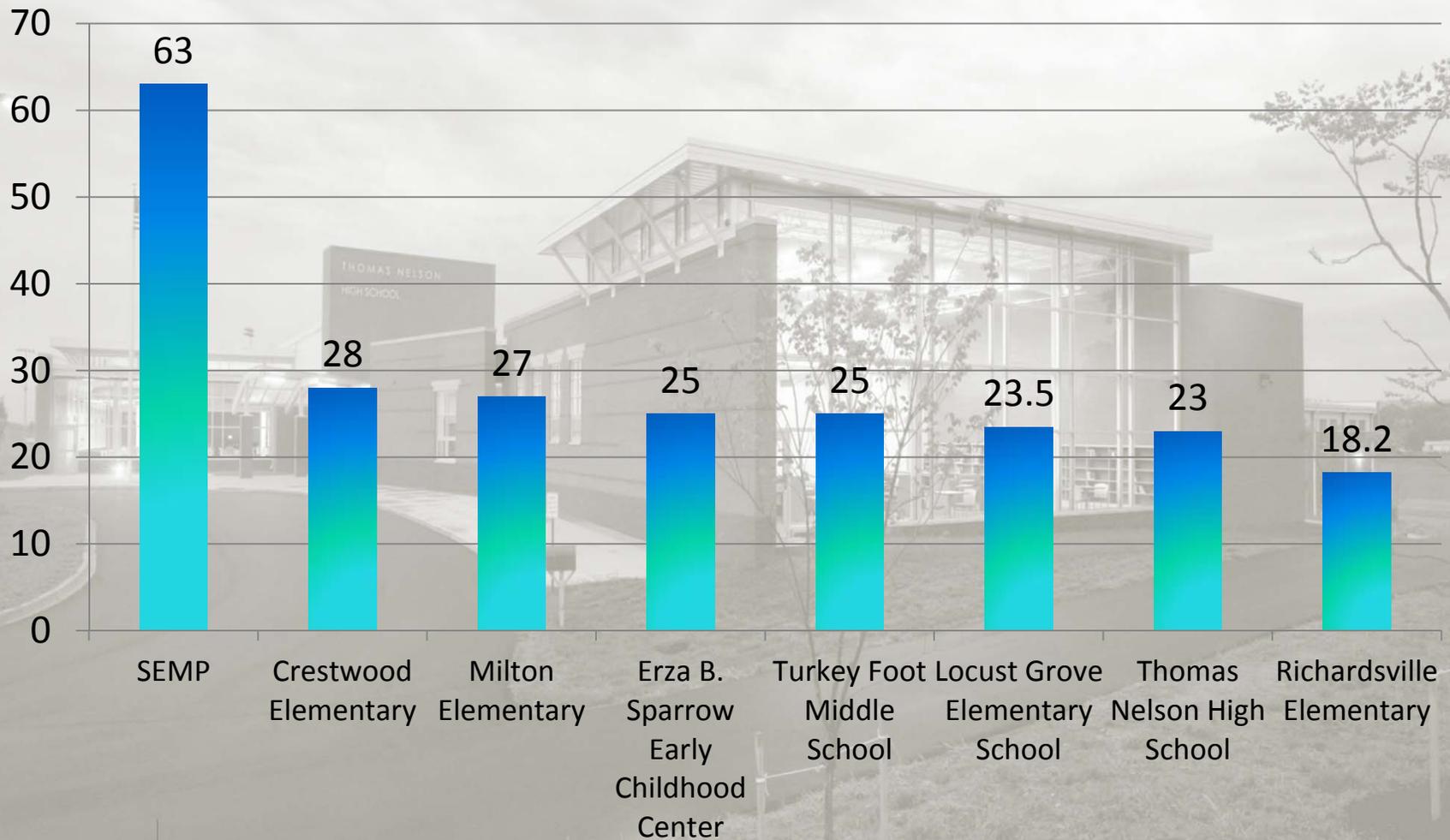
**Elementary/Middle – 47 kBtu/sf yr
High School – 51 kBtu/sf yr**

SEMP – 2011

**63 kBtu/sf yr
(Kentucky Schools)**



How much energy does a high performance school use?

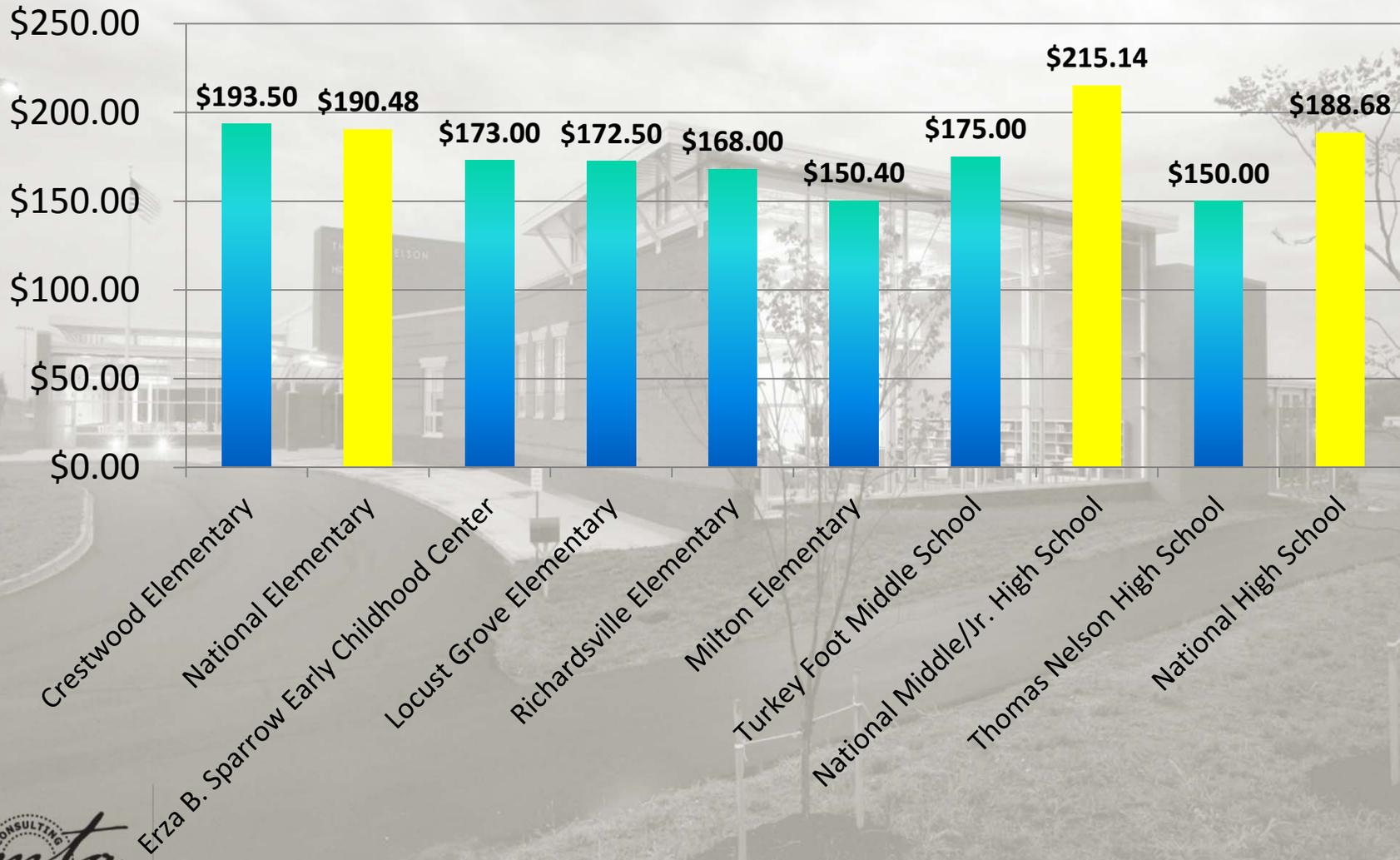


Cost

According to the “2011 Annual School Construction Report” published by *School Planning and Management...*

- **Median regional (KY, NC, SC, TN) construction cost**
 - Elementary School - \$144.96/sf
 - Middle/Jr. High School - \$195.59/sf
 - High School - \$197.39/sf
- **National construction cost**
 - Elementary School - \$190.48/sf
 - Middle/Jr. High School - \$215.14/sf
 - High School - \$188.68/sf

How much does a high performance school cost?



Erza B. Sparrow

Thomas Nelson High School Nelson County School District

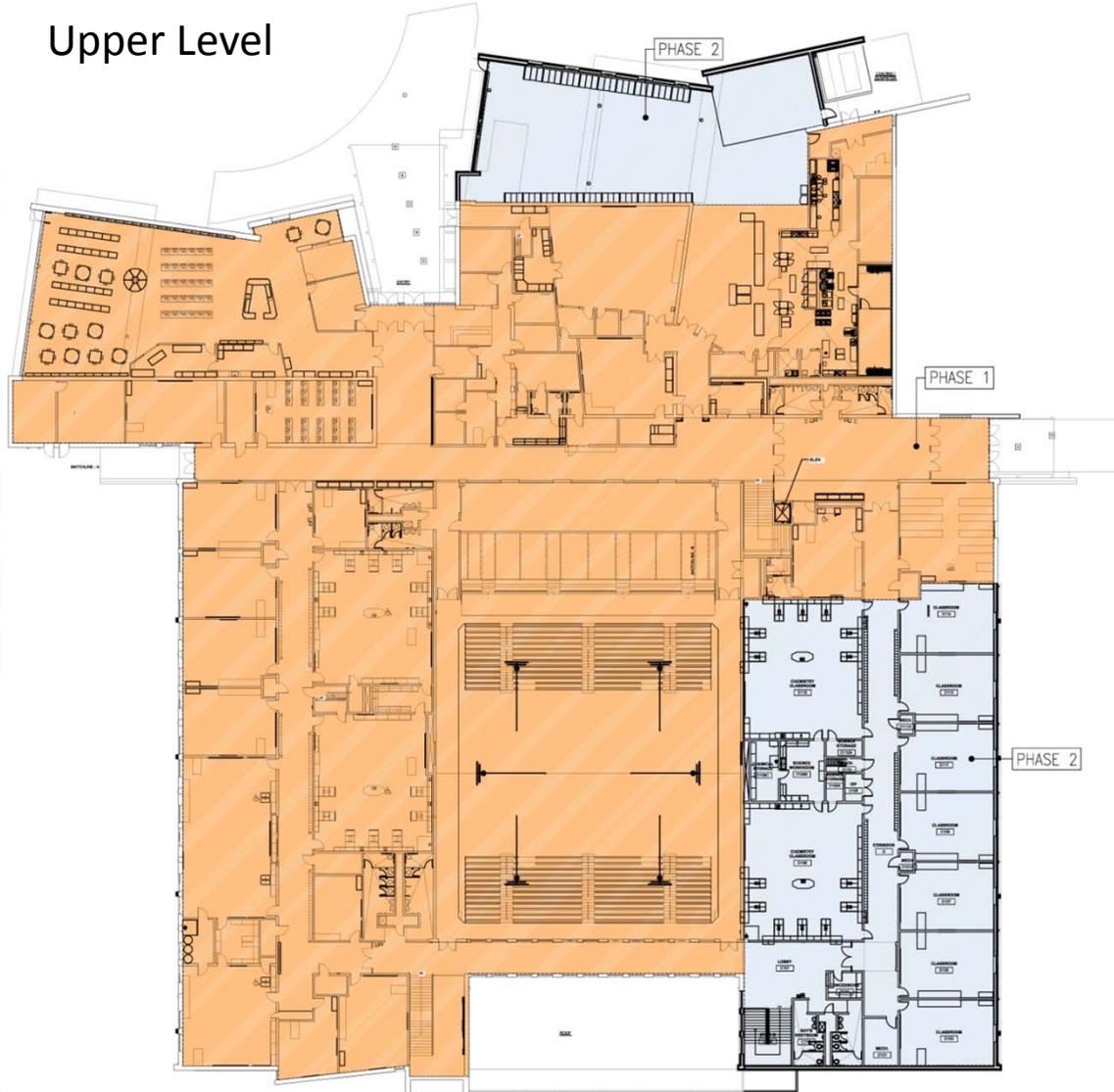


- ✓ 146,000 square feet
- ✓ \$23,557,000
- ✓ \$150/sf including field house (10K sf) and fields
- ✓ Projected 23 kBtu/sf yr
- ✓ Annual energy cost is \$103,164 or \$0.71/sf
- ✓ Field house and playing fields are separately metered
 - Projected 54 kBtu/sf yr
 - \$1.56/sf annual energy cost



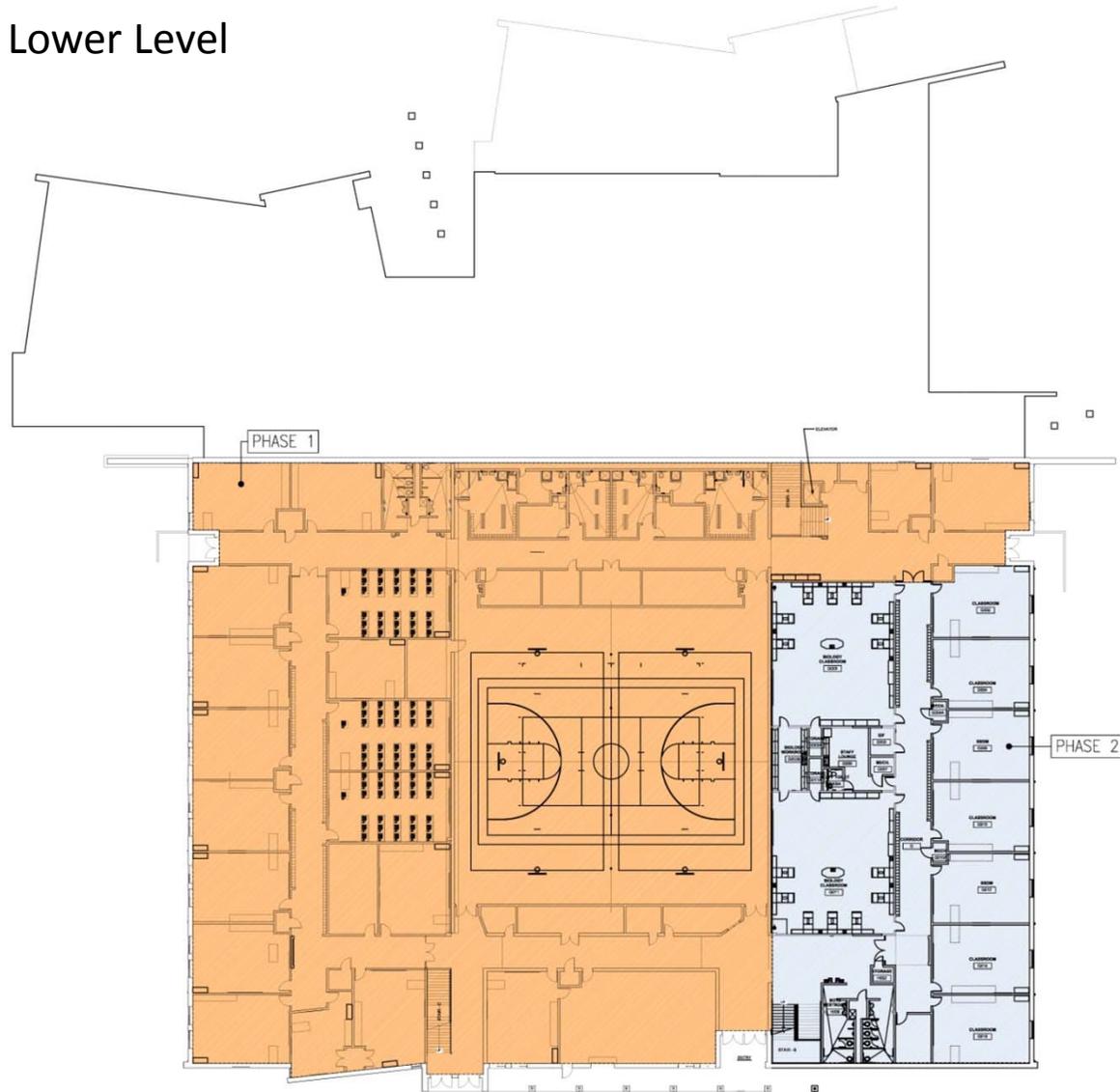
Floor Plans

Upper Level



Floor Plans

Lower Level



Strategies for Energy Savings

- ✓ Two story compact design
- ✓ North/South Classroom Wings
- ✓ Geothermal HVAC with DOAS
- ✓ Energy efficient lighting
- ✓ Daylighting – ROI analysis
- ✓ Optimized controls
- ✓ White roof
- ✓ Geothermal domestic hot water
- ✓ ICF Wall Construction – first cost analysis



Strategies for Cost Savings

- ✓ Cost shift – walls/window
- ✓ Optimized well field design
- ✓ Insulation on geothermal piping
- ✓ One heat pump unit per two classrooms
- ✓ Glycol in geothermal loop



Lessons Learned

- ✓ Geothermal piping temperatures at start-up
- ✓ VRV



Savings

Construction Costs

Thomas Nelson High School (146,000 sf)	\$23,500,000	
National Median High School (146,000 sf)	\$31,000,000	(\$8,000,000)
Regional Median High School (146,000 sf)	\$26,000,000	(\$3,000,000)

Annual Energy Costs

Thomas Nelson High School (23 kBtu/sf yr)	\$105,000	
Regional Median High School (90 kBtu/sf yr)	\$420,000	(\$315,000)
Average Kentucky High School (63 kBtu/sf yr)	\$280,000	(\$175,000)

Average Teacher's Salary in Kentucky	\$50,000	Energy savings = 3 to 6 teachers' salaries (annually)
---	-----------------	--

A photograph of a modern school building, Thomas Nelson High School, with a large glass facade and a sign that reads "THOMAS NELSON HIGH SCHOOL". The building is set against a cloudy sky. In the foreground, there is a paved area and some young trees supported by stakes.

Questions?

dhundley@cmtaegr.com

www.cmtaegr.com

502-326-3085

