

Good

Better

# Best of BEST

“1<sup>st</sup> Class, High Performing, 21<sup>st</sup> Century Schools”

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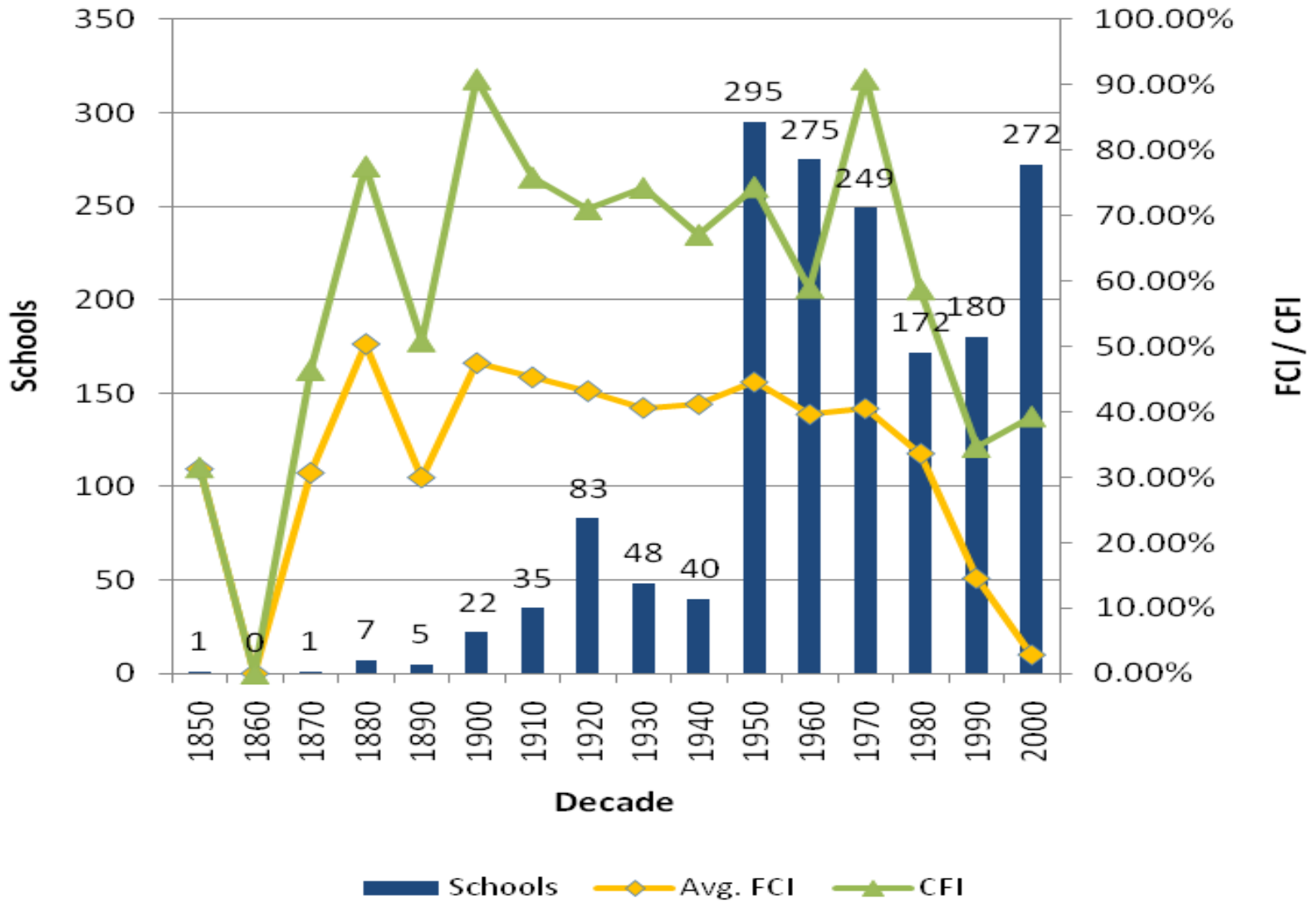
[hughes\\_t@cde.state.co.us](mailto:hughes_t@cde.state.co.us)

Website:

<http://www.cde.state.co.us/cdefinance/CapConstMain.htm>

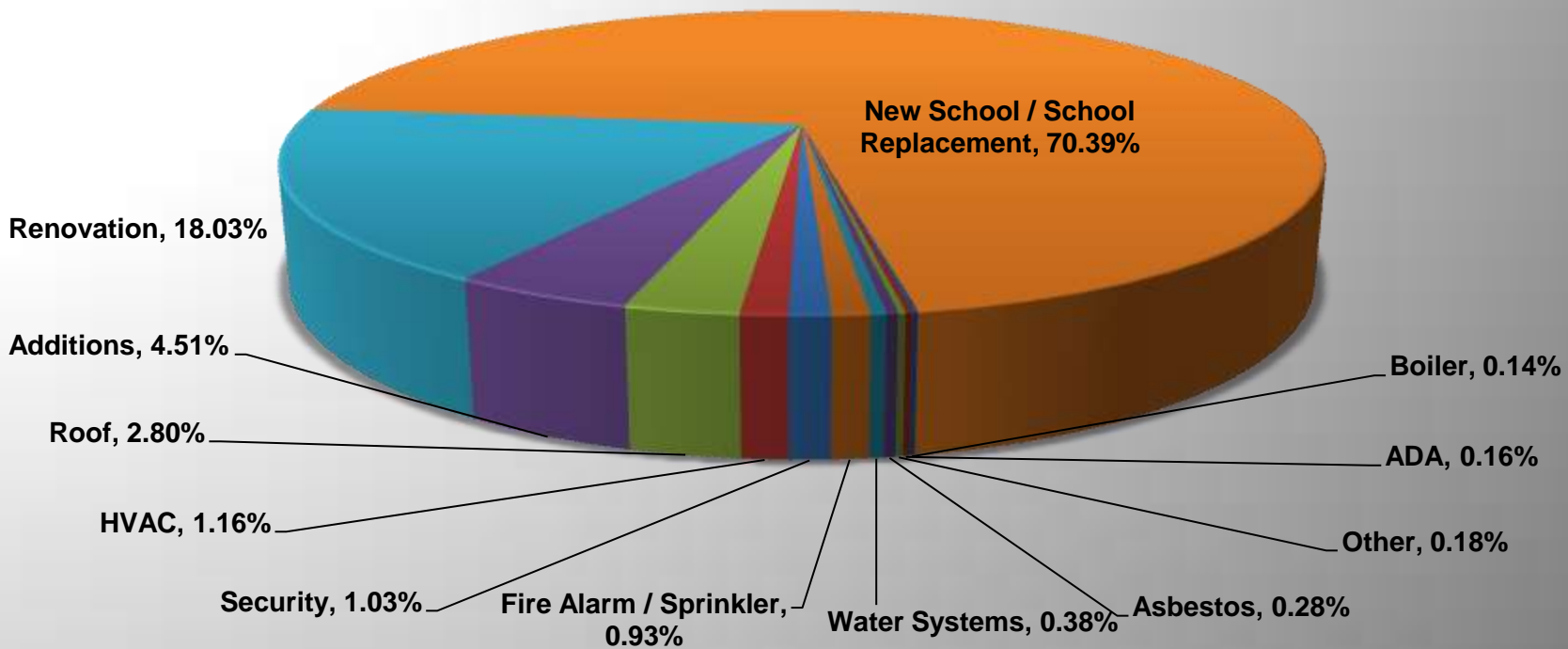
**Building Excellent**

# Schools by Decade Built



# How is the BEST Funding Dispersed?

- To date, BEST has awarded 115 projects for a total of \$389,585,952;
- 40 of these were New Schools, Renovation or Additions.



# Sangre De Cristo School District RE-22J

## New PK-12 School

- Horizontal geo-exchange field with water-to-water heat pumps to generate hot water heating.
- Energy recovery ventilators with evaporative cooling and displacement ventilation for ventilation and cooling.
- Highly efficient building envelope using spray foam to increase the R-value and reduce air infiltration and thermal bridging.
- Demand control ventilation provides fresh air as necessary and saves energy associated with ventilating unoccupied spaces.
- Future photovoltaic farm infrastructure for 300 kW system.



# Sangre De Cristo School District RE-22J

## New PK-12 School

- Individually tuned glazing to minimize glare and optimize daylight and views.
- 20% lower lighting power density than ASHRAE 90.1-2007.
- Preferred building orientation.
- Daylighting w/ Integrated dimming controls throughout learning spaces and corridors.
- Tubular daylighting device (TDD's) with dimming option for A/V mode.



# Sangre De Cristo School District RE-22J

## New PK-12 School



- Xeriscape and native plants used with only small areas of grass
- Low water demand kitchen.
- LEED compliant finish materials & recycle program.
- School food waste recycling program.
- Using rain gardens and intelligent contouring, the site controls and treats storm water to maintain it within the site bounds, thus making it available for the on-site well.

**Cost of Project – \$22.8 Million**  
**Square Footage – 80,025**  
**Completion date – April, 2011**

**Number of Students - 396**  
**Cost per Sq. Ft. - \$285**  
**22 kbtu/sf/yr**

# Silverton School District 1

## PK-12 School Renovation

- Geo-exchange wells or biomass system with water-to-water heat pumps to generate hot water heating.
- Energy recovery ventilators and ductwork for improved energy performance and indoor air quality.
- Efficient climate controls and energy management automation system.
- Healthy indoor environment with controlled ventilation and low VOCs



# Silverton School District 1

## PK-12 School Renovation

- High performance low-E window glazing compatible with historic exterior requirements to optimize energy performance.
- Window coverings tailored to south/north building orientation.
- Lower lighting needs with switching and occupancy controls.
- Day lighting with exceptional views and sunlight.



**Cost of Project – \$10.4 Million**

**Number of Students - 64**

**Square Footage – 31,500**

**Cost per Sq. Ft. - \$330.00**

**Estimated kBtu/sf/yr – 45.6**

**Completion date – July 2011**

# Silverton School District 1

## PK-12 School Renovation

- LEED Innovation for Sustainable Education, Curriculum, and Green Housekeeping.
- Drought tolerant landscaping and storm water use for plantings.
- Reduced water use with conserving fixtures and appliances.
- Regional and recycled materials and construction recycling program.
- On-site renewable energy with PV roof panels.
- Existing urban site conducive to pedestrian and bike transportation.



# Salida School District R-32

## New High School & Building Renovation



- Building is designed to optimal orientation for daylighting and solar control.
- Daylight will be introduced into the school through the use of windows, skylights, and light shelves to enhance the visual comfort and quality of learning.
- High performance glazing and efficient building envelope to minimize energy use.
- Electric lighting design to 30 foot-candles in classrooms and a power density of 0.8 w/sf or less.

# Salida School District R-32

## New High School & Building Renovation

- Geo-exchange field with heat pumps for heating and cooling. System would service both the new high school and the renovated Kesner Building. The system could potentially be expanded to include the middle school for a campus-wide system.
- Energy recovery ventilation for improved indoor air quality while maintaining energy performance.
- Building automation system to integrated control building component systems.
- Metering of utilities and sub-metering of selected systems to measure and verify performance of systems.
- Energy cost reduction of 40% or higher compared to the 90.1-2007 baseline used in LEED-NC.



**Cost of Project - \$ 29.0 Million**

**Number of Students - 336**

**Square Footage - 98,190 SF**

**Cost per Sq. Ft. - \$295/SF**

**Completion Date - Fall 2012**

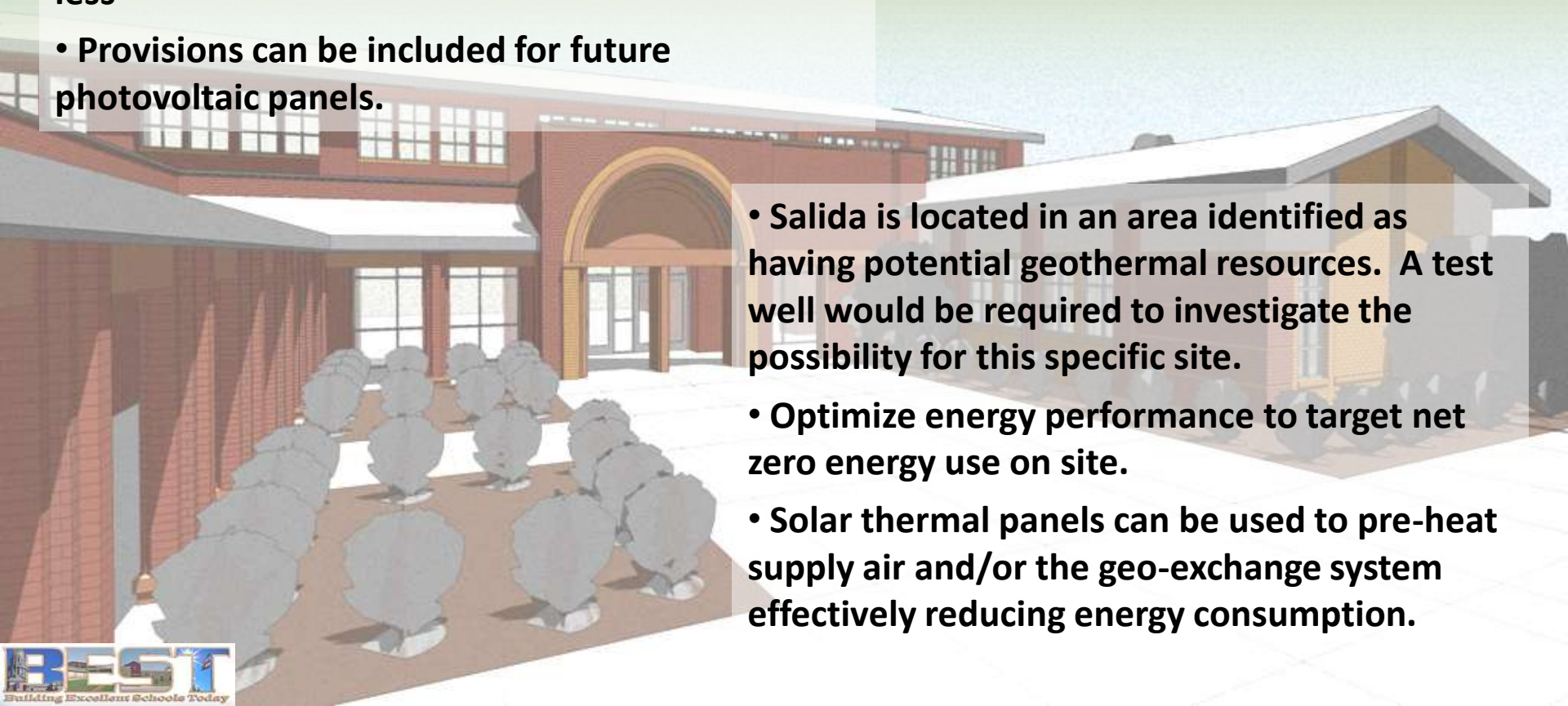
**kBtu Goal: 45 kbtu/sf/yr or less**

**Energy Star Goal: 85 or greater**

# Salida School District R-32

## New High School & Building Renovation

- Acoustical comfort will be designed into core learning areas to enhance legibility of speech and minimize disruptive noise.
- Water use of 2.4 gallons per building sf/yr or less; irrigation of 4.5 gallons per sf of turf/yr or less
- Provisions can be included for future photovoltaic panels.

- 
- An architectural rendering of a school building with a courtyard. The building is constructed of red brick with large windows and a prominent arched entrance. The courtyard in the foreground is paved and contains several young trees in planters. The sky is a clear, light blue.
- Salida is located in an area identified as having potential geothermal resources. A test well would be required to investigate the possibility for this specific site.
  - Optimize energy performance to target net zero energy use on site.
  - Solar thermal panels can be used to pre-heat supply air and/or the geo-exchange system effectively reducing energy consumption.

# Sargent School District RE-33J

## New High School



- Water source geo-exchange system with in-floor radiant heating/cooling system that saves energy.
- Tankless water heater saves energy by only heating water when there is demand.
- Demand controlled ventilation provides outside air only to occupied spaces, thus saving energy.
- Energy recovery ventilators captures free heat from exhaust air and preheats incoming air.
- 48% less energy costs than a conventional building.

# Sargent School District RE-33J

## New High School

- 93% of regularly occupied classroom space and 70% of other regularly occupied spaces are day-lit.
- Optimal building orientation, tuned glazing, sunshades, light shelves, sloped ceilings and light wall colors maximize daylight potential.
- Solar tubes were used in the Gym, Cafeteria and Serving Area to provide additional day lighting.
- Occupancy sensors in classrooms.

**Cost of project: \$17.6 Million**

**Number of students: 206**

**Square Footage: 62,463**

**Cost per SF: \$282**

**Completion: August 13, 2010**

**50.2 kBtu/sf/yr**



# Sargent School District RE-33J

## New High School



- 91% of construction waste diverted from landfill (1,222 tons).
- 40% less water use than a conventional building
- 72% less water used for landscape irrigation .
- 100% of wastewater treated on-site to tertiary standards.
- Multiple dry-wells increase water infiltration and eliminate storm water run-off.

- Low-emitting VOC materials selected for adhesives, sealants, paints and carpeting used in the interior of the building. All composite wood products contain no urea-formaldehyde resins.
- Reduced heat island effect through the use of reflective roofing materials and 100% concrete hardscape.
- Indoor Air Quality management plan and building flush-out ensures that occupants will be entering a healthy building that promotes learning.



# Centennial School District R-1

## New PK-12 School



**Cost of Project: \$17.6 Million**

**Number of students: 246**

**Square Footage: 79,600 SF**

**Cost per Square Foot: \$221**

**Energy Star Rating Goal: 99**

**kBtu Goal: 13.5 kBtu/sf/yr**

**Completion Date: July 2011**

- **Super building envelope—insulated concrete forms.**
- **Additional mass for thermal storage –adobe trombe wall & exposed concrete floors.**
- **Dark roofing materials which save energy over the course of a year in a heat dominated climate.**
- **Geo-exchange combined with displacement ventilation.**
- **Natural cooling and ventilation –tower and operable windows.**

# Centennial School District R-1

## New PK-12 School

- Water conserving plumbing fixtures.
- Used materials with high recycle content .
- Light fixtures which include daylight harvesting that detect motion and light.
- Waste management post occupancy with recycle centers throughout the building.
- Reduce quantity of material such as suspended acoustic tile and carpet on the floors.



- The building is modeled to use 83% less energy than the average Colorado school.
- Net-Zero ready. Electrical is in place for a 250 KVA photo-voltaic system.
- Xeriscaping introduced to the site through landscape design.
- Showcased in ASHRAE's Net-Zero Conference
- Building commissioning

# Park County School District RE-2



## PK -12 Campus Upgrade

- Efficient building envelope. Walls are designed to achieve R-22 and roofs R-40.
- The exterior of the building is primarily a brick veneer over insulated stud wall back-up or concrete masonry back-up (insulated cavity wall). The stud wall back-up assemblies incorporate insulating sheathing, batt insulation and spray foam.
- High level of recycled and local content.
- All exterior lighting selected will reduce light pollution on the site.

Description	Heating EUI	Electric EUI	Total EUI	Estimated LEED Points
<i>LEED Baseline (Wisness Wood Chips)</i>	57	23	80	-
<i>Proposed Boilers</i>	47	24	71	0
<i>Proposed AHU System</i>	53	16	69	5
<i>R-22 Exterior Walls</i>	52	15	68	5
<i>R-40 Roofs</i>	51	15	66	6
<i>Improved Windows</i>	48	15	63	6
<i>Efficient Lighting</i>	50	12	62	13
<i>Daylighting</i>	50	11	62	15
<i>Heat Recovery</i>	42	11	53	17
<i>DCV</i>	42	11	53	17
<i>Solar Wall Preheat (2500 sqft)</i>	39	11	51	17



# Park County School District RE-2

## PK -12 Campus Upgrade

- Bio-swales.
- Water - efficient landscaping - irrigation requirements will be greatly reduced up to 50%.
- Alternative transportation - bike racks and preferred parking spaces for fuel-efficient vehicles and carpools.
- Potable water - the building plumbing fixtures such as lavatory faucets, toilets and shower heads will save approximately 35% over the Energy Policy Act's baseline.



**Cost of Project: \$30.1M**

**Number of students: 605**

**Square Footage: 125,000**

**Cost per Square Foot: \$240.80**

**kBtu Goal: 53 kbtu/sf/yr**

**Completion Date: Dec 2012**



# Park County School District RE-2

## PK -12 Campus Upgrade



- IAQ - low VOC sealants, adhesives, paints, coatings, CO2 monitoring and carpets throughout.
- HVAC - high efficiency condensing and bio-mass boilers intended to provide up to 75% of the heating for the building at peak load.
- Heat recovery air handling units capture heat from exhaust air and preheat incoming air.
- Lighting - high efficiency lighting fixtures throughout, natural daylighting and the light fixtures are controlled by sensors and the building's energy management system.