At BG Consultants, Inc we understand that higher performance schools can provide a better, healthier, and safer learning environment, while reducing life cycle costs through energy conservation and natural resources. Our team has striven to provide unique, comprehensive, and logical comprehensive, safety, and sustainable improvements within the design of the bond project tailored to support the USD 497 vision for better education facilities. The following case studies represent measures and other features, incorporated through design, that are included in school facility improvements for USD 497 Package 3.
Below: Liberty Memorial Central Middle School Corridor Flooring Improvements
Broken Arrow Elementary School

Building Area  40,000 Existing Square Feet  0 New Square Feet  40,000 Total Square Footage

Types and Numbers of New Spaces

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure Entry</td>
<td>1</td>
</tr>
<tr>
<td>Administrative Suite</td>
<td>NA</td>
</tr>
<tr>
<td>Staff Workroom</td>
<td>NA</td>
</tr>
<tr>
<td>Classrooms</td>
<td>NA</td>
</tr>
<tr>
<td>Storm Shelter Areas</td>
<td>NA</td>
</tr>
<tr>
<td>Learning Pockets</td>
<td>4 renovated</td>
</tr>
<tr>
<td>Gymnasium</td>
<td>NA</td>
</tr>
<tr>
<td>Cafeteria</td>
<td>NA</td>
</tr>
<tr>
<td>Kitchen</td>
<td>NA</td>
</tr>
<tr>
<td>Media Center</td>
<td>NA</td>
</tr>
</tbody>
</table>

Comprehensive Improvements Summary:

- Incorporation of a secure entry with communication window, reception desk, and limited office remodel.
- Spatial and ADA improvements to Music Room, creation of storage spaces for music and physical education.
- Construction of an interior ramp providing ADA access between the main learning wing and the following key spaces: Gymnasium, Music, Cafeteria.
- Incorporation of glass partitions between commons area and gymnasium to create enhanced visual connectivity between activity and learning areas.
- Creation of 3 distributed special education rooms totaling 456 square feet and remodel of existing learning pockets for enhanced flexibility.
- Centralization of restrooms within building core.

Interior Improvements to existing spaces:

- Paint and flooring in commons areas
- Low-maintenance and low-life cycle cost epoxy resin for floor and walls in restrooms.
- Installation of carpet tile with long-wearing performance characteristics and 50% minimum recycled content.
- Acoustical ceiling improvements providing acoustic control and for plenum maintenance access.

Technology Improvements:

- Expansion of existing building telecom system to accommodate the additional data outlets in the remodeled reception and music areas.
- Provided security camera at the receptions secure entry.

Mechanical, Electrical, and Plumbing Improvements:

- Auto flush valve control upgrades.
- Introduction of fresh air into central learning wing core to improve indoor air quality and ventilation using energy recovery ventilators.
- Replacement of exterior wall and grade mounted flood lights with LED.

Site Improvements:

- NA
Below: Southwest Middle School Restroom Improvements typical of all schools
Comprehensive Improvements Summary:

- Incorporation of a secure entry with communication window and 2,000 square foot administrative office remodel. Spaces modified include Flex Room, Principal Office, Clinic, Reception, and Workroom.

Interior Improvements to existing spaces:

- Paint and flooring in commons area.
- Low-maintenance and low-life cycle cost epoxy resin for floor and walls in restrooms.

Technology Improvements:

- Expansion of existing building telecom system to accommodate the additional data outlets and wireless access point in the remodeled receptions area.

Mechanical, Electrical, and Plumbing Improvements:

- Energy modeling was performed to understand life-cycle costing and systems performance.
  - Proposed boiler replacement to switch to high efficiency boilers.
  - Proposed domestic water heater replacement to switch to high efficiency water heaters.
- Alternate for Chiller replacement improvements.
- Replacement of HD parking lot lights with LED.
- Replacement of exterior building mounted lights with LED.
- Auto flush valve control upgrades.

A life cycle cost analysis was performed to determine the feasibility of a complete HVAC system replacement. The existing multi-zone system was compared to a Variable Refrigerant Flow Zoning (VRF) System. The results of the analysis yielded a greater than 20 year payback. USD 497 administration directed us not to pursue a complete HVAC replacement. In lieu of a complete system replacement, certain equipment was targeted to provide energy improvements at this school. This equipment includes:

1. Replacement of two chillers with one, high efficiency variable flow unit. (This item requires piping distribution changes)
2. Replacement of both heating hot water boilers with high efficiency units and installation of a variable flow pumping system.
3. Replacement of the kitchen domestic water heater with a high efficiency unit.

Items 1, 2, 3 will be noted as alternate bid items on the construction documents.

Site Improvements:

- NA
Below: Quail Run Elementary School Roof Replacement and Addition
Quail Run Elementary School

Building Area 49,324 Existing Square Feet  2126 New Square Feet  51,450 Total Square Footage

Types and Numbers of New Spaces

Secure Entry  1  Administrative Suite Renovated  Staff Workroom NA  Classrooms NA
Storm Shelter Areas 1 (part of 2 classrooms)  Learning Pockets  4
Gymnasium NA  Cafeteria NA  Kitchen NA  Media Center NA

Comprehensive Improvements Summary:

• Incorporation of a secure entry with communication window.
• Addition of 2 new 780 square foot classrooms that function also as one safe room.
  • Incorporation of windows at storm shelter to add natural daylight and reduce artificial lighting use.
• Net Usable Area increase of one existing kindergarten classroom to meet district standards.
• Creation of 4 learning pockets totaling approximately 900 square feet.
• Incorporation of operable glass partition wall between Commons and Gymnasium to create enhanced visual connectivity between activity and learning areas.

Interior Improvements to existing spaces:

• Paint and flooring in commons area.
• Dyed and polished concretes in corridors to reduce maintenance and for long life-cycle cost value.
• Low-maintenance and low-life cycle cost epoxy resin for floor and walls in restrooms.
• Installation of carpet tile with long-wearing performance characteristics and 50% minimum recycled content.
• Acoustical ceiling improvements providing acoustic control and for plenum maintenance access.
• Entry walk-off mats and replacement to control entry of pollutants into building.

Technology Improvements:

• Expansion of the existing building telecom system to accommodate additional data outlets, wireless access points, and security cameras.
• Provided additional security cameras in the new building addition along with other areas within the existing building footprint that was not under surveillance previously. This includes interior and exterior security cameras.
• Each classroom affected by the bond project received an interactive short throw projector.

Mechanical, Electrical, and Plumbing Improvements:

• Mechanical system replacement for improved indoor air quality and energy efficiency, including installation of new VRF system throughout non-assembly spaces.
• Packaged units used for assembly spaces are equipped with energy recovery wheels, and variable capacity scroll compressors to maximize energy efficiency.
• Dedicated outdoor air system will be used with VRF system and will use energy recovery wheels.

Site Improvements:

• Limited sidewalk improvements / replacement as affected by the work of construction.
Safe Room design criteria:

- Incorporation of a net usable 1,562 square foot two-classroom internal safe room to accommodate approximately 312 occupants.
- Design Intent: The safe room was designed to meet structural performance requirements of the “Design and Construction Guidance for Community Safe Rooms” document prepared by FEMA, however, was not specified to be or required to be FEMA rated or registered. Safe room structural design criteria as follows: Risk Category III, ultimate design wind speed of 250 mph, wind exposure category C.
- Enclosing structure is solid grouted concrete masonry unit (CMU) wall construction with reinforcing steel, and 8 inch reinforced concrete roof assembly cast on structural metal decking.
- Opening construction includes:
  - Frame Construction: 12-guage steel frames fully grouted and secured with four 1/2" diameter anchors each jamb.
  - Steel doors and shutters of 14-guage steel channels as the hinge and lock rails and 16-gauge channels at the top and bottom with 12-gauge minimum hardware reinforcement. The skin welded the full height of the door/shutter. The weld spacing on the lock and hinge rails established at a maximum of 5 inches on center. The skin welded to the 14-gauge channel at the top and bottom of the door/shutters with a maximum spacing of 2 1/2 inches on center. The interior construction of doors/shutters were specified to include internal 20-gauge steel ribs. Infill between internal stiffeners was permitted to be either polystyrene or a honeycomb core.
  - Hardware was specified to meet tornado resistant approvals. Three heavy duty hinges and three grade 1 points of locking each leaf.
Sunflower Elementary School

Types and Numbers of New Spaces

- Secure Entry: 1
- Administrative Suite: 1 relocated
- Staff Workroom: 1 relocated
- Classrooms: 3 new, 2 renovated
- Storm Shelter Areas: 1 (part of 2 classrooms)
- Learning Pockets: 4 renovated
- Gymnasium: NA
- Cafeteria: NA
- Kitchen: NA
- Media Center: NA

Comprehensive Improvements Summary:

- Incorporation of a secure entry and relocated administration offices to building entry.
- Addition of 3 new 950 square foot classrooms to create a total of 23 regular classrooms, of which two classrooms will function as a safe room.
  - Incorporation of windows at storm shelter to add natural daylight and reduce artificial lighting use.
- Creation of an additional 800 square feet of learning pocket space. Finishes and furniture upgrades to existing.
- Relocate Art room to 860 square foot area in addition to Kiln area and separate storage space.
- Creation of a BEST classroom.
- Incorporation of secure classroom hardware.
- Update restroom fixtures.

Interior Improvements to existing spaces:

- Paint and flooring in commons area and learning pockets.
- Alternate for dyed and polished concretes in corridors to reduce maintenance and for long life-cycle cost value.
- Low-maintenance and low-life cycle cost epoxy resin for floor and walls in restrooms.
- Installation of carpet tile with long-wearing performance characteristics and 50% minimum recycled content.
- Acoustical ceiling improvements providing acoustic control and for plenum maintenance access.
- Entry walk-off mats to control entry of pollutants into building.

Technology Improvements:

- Upgraded the building telecom system infrastructure to accommodate the new building addition and the remodeled areas within the school. This includes an additional data cabinet, data outlets, wireless access points and security cameras.
- Upgraded the building security cameras in existing locations. Provided additional security cameras in the new building addition along with other areas within the existing building footprint that was not under surveillance previously. This includes both interior and exterior security cameras.
- Each classroom in the new building addition received an interactive short throw projector.

Mechanical, Electrical, and Plumbing Improvements:

- Auto flush valve control upgrades.
- Replacement of exterior HID/CFL with LED.
- VRF system with dedicated ERV unit will be proved for the new classroom addition and office remodel area. (one system for each area)
- Replacement of exterior building-mounted lights with LED type.
Site Improvements:

- Alternate for driveway and parking circulation improvements.
  - 5 new dedicated drop-off/pick-up stalls.
  - Transition to one continuous circulation route through use of traffic control bollards.
  - Incorporation of dedicated exit turn lanes to reduce vehicular stacking issues.

Safe Room design criteria:

- Incorporation of a net usable 1,916 square foot two-classroom internal safe room to accommodate approximately 383 occupants. Design includes 1 unisex restroom each classroom.
- Design Intent: The safe room was designed to meet structural performance requirements of the “Design and Construction Guidance for Community Safe Rooms” document prepared by FEMA, however, was not specified to be or required to be FEMA rated or registered. Safe room structural design criteria as follows: Risk Category III, ultimate design wind speed of 250 mph, wind exposure category C.
- Enclosing structure is solid grouted concrete masonry unit (CMU) wall construction with reinforcing steel, and 8 inch reinforced concrete roof assembly cast on structural metal decking.
- Opening construction includes
  - Frame Construction: 12-guage steel frames fully grouted and secured with four 1/2" diameter anchors each jamb.
  - Steel doors and shutters of 14-guage steel channels as the hinge and lock rails and 16-gauge channels at the top and bottom with 12-gauge minimum hardware reinforcement. The skin welded the full height of the door/shutter. The weld spacing on the lock and hinge rails established at a maximum of 5 inches on center. The skin welded to the 14-gauge channel at the top and bottom of the door/shutters with a maximum spacing of 2 1/2 inches on center. The interior construction of doors/shutters were specified to include internal 20-gauge steel ribs. Infill between internal stiffeners was permitted to be either polystyrene or a honeycomb core.
  - Hardware was specified to meet tornado resistant approvals. Three heavy duty hinges and three grade 1 points of locking each leaf.
West Middle School

Building Area  122,409 Existing Square Feet  0 New Square Feet  122,409 Total Square Footage

Types and Numbers of New Spaces

- Secure Entry  1
- Administrative Suite  Remodel
- Staff Workroom  NA
- Classrooms  NA
- Storm Shelter Areas  NA
- Learning Pockets  NA
- Gymnasium  NA
- Cafeteria  NA
- Kitchen  Remodel
- Media Center  NA

Comprehensive Improvements Summary:

- Secure entry and administrative office remodel to incorporate reception, five (5) offices, one (1) small conference, one (1) standard conference, registrar, unisex restroom, and storage spaces.
- Kitchen remodel including new walk-in freezer and cooler replacement.

Interior Improvements to existing spaces:

- Low-maintenance and low-life cycle cost epoxy resin for floor and walls in restrooms.

Technology Improvements:

- Expanded the existing building telecom system to accommodate additional data outlets and wireless access points in the remodeled reception and kitchen areas.

Mechanical, Electrical, and Plumbing Improvements:

- HVAC replacement at renovated administration area. A new VRF system with dedicated energy recovery ventilator was provided in the office/nurse area.
- Auto flush valve control upgrades.
- Fire alarm control panel, device, and wiring replacement upgrades.
- Electrical distribution replacement.
- Replacement of exterior wall packs with LED type for efficiency.

Site Improvements:

- NA
Below: West Middle School Secure Vestibule
Comprehensive Improvements Summary:

- Secure entry improvements to include door control hardware.
- Skylight replacement and partial re-roof.
- Incorporation of storm windows at auditorium windows for enhanced thermal performance and to reduce maintenance and historic window degradation.

Interior Improvements to existing spaces:

- Interior finish improvements in commons areas including accent painting and corridor flooring replacement with carpet tile.
- Addition of acoustical tectum ceiling tile in Loumis Gymnasium.
- Low-maintenance and low-life cycle cost epoxy resin for floor and walls in restrooms and in corridors on second and third floors.

Technology Improvements:

- NA

Mechanical, Electrical, and Plumbing Improvements:

- Replacement of HVAC system performed by separate contract.
- Replacement of exterior wall packs with LED type for efficiency.

Site Improvements:

- NA
Below: Liberty Memorial Central Middle School Storm Window Improvements
South Middle School

Building Area  114,469 Existing Square Feet  0 New Square Feet  114,469 Total Square Footage

Types and Numbers of New Spaces

- Secure Entry  1
- Administrative Suite  Remodel
- Staff Workroom  NA
- Classrooms  NA
- Storm Shelter Areas  NA
- Learning Pockets  NA
- Gymnasium  NA
- Cafeteria  NA
- Kitchen  NA
- Media Center  NA

Comprehensive Improvements Summary:

- Secure entry and administrative office remodel to incorporate one (1) flex space.

Technology Improvements:

- Expanded the existing building telecom system to accommodate additional data outlets in the remodeled receptions area.

Mechanical, Electrical, and Plumbing Improvements:

- Auto flush valve control upgrades.
- Replacement of exterior flood lights and wall packs with LED type for efficiency.

Site Improvements:

- NA
Below: South Middle School Secure Vestibule
Southwest Middle School

Building Area 131,531 Existing Square Feet 0 New Square Feet 131,531 Total Square Footage

Types and Numbers of New Spaces

<table>
<thead>
<tr>
<th>Type</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe Entry</td>
<td>Modified</td>
</tr>
<tr>
<td>Administrative Suite</td>
<td>NA</td>
</tr>
<tr>
<td>Staff Workroom</td>
<td>NA</td>
</tr>
<tr>
<td>Classrooms</td>
<td>NA</td>
</tr>
<tr>
<td>Storm Shelter Areas</td>
<td>NA</td>
</tr>
<tr>
<td>Learning Pockets</td>
<td>NA</td>
</tr>
<tr>
<td>Gymnasium</td>
<td>NA</td>
</tr>
<tr>
<td>Cafeteria</td>
<td>NA</td>
</tr>
<tr>
<td>Kitchen</td>
<td>NA</td>
</tr>
<tr>
<td>Media Center</td>
<td>NA</td>
</tr>
</tbody>
</table>

Comprehensive Improvements Summary:

- Secure entry improvements including design of 1 flex room.

Interior Improvements to existing spaces:

- Wayfinding Signage improvements throughout.

Technology Improvements:

- NA

Mechanical, Electrical, and Plumbing Improvements:

- Auto flush valve control upgrades.
- Replacement of exterior wall packs with LED type for efficiency.
- Replacement of parking lot lights with LED type for efficiency.

Site Improvements:

- NA
Top Left: Quail Run Elementary School Commons Operable Partition Wall. Top Right: South Middle School Flex Room and Administration Office. Below: Southwest Middle School Secure Vestibule with Mascot. Next Page: Typical Learning Pocket at Quail Run Elementary School.