HIGH SCHOOL SCIENCE LABORATORY

New Construction

I. PROGRAM PHILOSOPHY

Effective science learning enables our students to connect and apply science concepts and processes to everyday events. Students will actively learn science through the following ways: qualitative and quantitative observations; collect and organize data, investigate thoughtful questions, make logical predictions and offer reasonable explanations; explore possible conclusions; communicate their understanding. Our goal is that all students graduate having developed the tools of inquiry.

II. PROGRAM GOALS

During science, students will be taught a set of scientific concepts in a style compatible with their interests and abilities that will provide scientific knowledge necessary for successful involvement in life and future scientific studies. Students will learn to use the scientific laboratory apparatus in all science courses. Students will be able to speak and write in scientific terms and use basic vocabulary of science in today's society. Students will be challenged to participate in rigorous and or accelerated coursework to increase career or college readiness.

III. ORGANIZATIONAL NOMENCLATURE

Teacher - Student Ratio:	1:25
Student Capacity per Period:	Varies, 1:25 maximum
Total Number of Teachers:	1.4
Total Number of Aides:	None
Grade Levels or Age Levels for Which Program is intended:	9, 10, 11, and 12
Hours per Day Space Will Be Used:	6 minimum

IV. INNOVATIONS, EXPERIMENTAL IDEAS, OTHER PLANNED USES

It is possible that these facilities will be used at night, on weekends, or in the summer for enrichment, field trips, or summer camps. Security of the building should be considered to prevent the loss of expensive laboratory equipment, yet flexibility for the instructors to gain access during non-school hours should be maintained.

Preparation (Prep)/Storage Rooms and Project Storage Rooms: Each of the laboratories should access a prep/storage room. Prep/storage rooms may be combined but should be of at least two separate types: Physical Science and Biological Science. Arranging the prep/storage in this way separates the two different types of equipment, and makes each easily available to all teachers. Within the Physical Science Storage area, a separate enclosed room with lockable door should be provided for the storage of chemicals. See science supervisor for sizes and placement.

V. SQUARE FOOTAGE CHANGES EXPLANATION THAT VARIES FROM APPROVED FACILITIES LIST

None

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VI. PROGRAM FURNITURE AND EQUIPMENT REQUEST FORM
*Shown on drawings
#purchased and installed by contractor

Space or Area	Number of Items	Description of Furniture/Equipment Needed
LABORATORIES		
	*13 per room	Tables, 24" x 54" Modified epoxy resin Top, 30" high, 4" x 4" hardwood legs
	25 per room	Standard Student Chairs
	2 per room	Wastebaskets
	*1 per room	Four-Drawer File Cabinet
	*#1	Interactive projector with standard white marker boards
BIOLOGY PREP/STORAGE		
	40	Student Microscopes
	5	Oil Immersion Microscopes
	10	Stereo Microscopes
	15	Triple Beam Balances
	3	Incubators
	2	Autoclaves
	*#1	Refrigerator, 19 cu. ft. with icemaker
	2	Human Torsos
	1	Human Skeleton
	6	Anatomical models
	*2	Tables, 42" x 72" x 30" high
PHYSICAL SCIENCE PREP/STORAGE		
	15	Triple Beam Balances
	6	pH meters
	1	Water distilling apparatus or deionizer
	6	Electronic balances
	1	Drying Oven
	6	Centrifuges
	*2	Tables, 42" x 72" x 30" high
	*#1	Standard dishwasher, installed near sink
TEACHER PLANNING WORKROOM (Includes Demonstration Classroom Requirements)		
	1	Network, Copier/Printer
	8	Calculators
	8	Computers
	*#8	Computer Workstations
	*#8	Teacher Desk/Workstations
	*8	Four Drawer File Cabinets
	14	Chairs
EACH ROOM WITH SINKS		
	*#3	Paper Towel Dispensers - provided by owner, installed by general contractor
	*#3	Soap Dispensers - provided by owner, installed by general contractor

In addition to the above, demonstration desks, prep sinks, wash-up sinks, counters, etc., are needed and described in Section IX, 17A, B , C, and D.

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VII. SPECIAL CONSIDERATIONS

- Heating/Cooling/Ventilation

  In each Laboratory, provide the following:
  One fume hood (such as Kewaunee SH-1004-WG), vented to the outside.
  One 30-Gallon flammable storage cabinet (such as Justrite M-9044), vented to the outside. Exhaust hood over stove/oven (in Biological Storage area only).
  Heating/Air Conditioning with no air return to classrooms or other occupied spaces.
  Instructor switchable exhaust system capable of running during times when air conditioning is not in operation.

  In each Science Laboratory, provide the following:
  Because of the nature of science activities, special attention must be given to providing a heating/air conditioning system capable of greater than normal air flow, fresh air return, humidity control, removal of fumes and odors, and with reduced noise.

  Instructor-switchable forced air exhaust system capable of exhausting the entire room in three (3) minutes.

  Special consideration should be given to placement of exhaust vents, and with provision of makeup air to maximize the effectiveness of the exhaust system.

  Provide exhaust to exterior for range hood.

- Acoustics

  Acoustically treated walls and ceiling shall provide maximum noise control in individual Science Laboratories so that the educational process will not be affected.

- Floor

  All laboratories and prep/storage rooms sheet vinyl.

- Lighting

  General Lighting - LED

  Some incandescent in each Science Lab with rheostat control.

  Two (2) high intensity "can lights" over each demonstration table, provided with switch.

- Plumbing

  Each room must have master cut-off valve for water, easily accessible to the instructor.

  Sinks in laboratories to have cold water only; all others to have hot and cold water supply (may be a demand-heater under sinks). Prefer using vandal-resistant fixtures on all sinks in laboratories.

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VII. SPECIAL CONSIDERATIONS (continued)

- Plumbing (continued)

  In each Science Laboratory
  Seven (7) modified epoxy resin sinks with vandal-resistant faucets in counter (one sink and two faucets in each of the seven student workstations). One large, deep modified epoxy resin utility sink (such as Kewaunee KD323) at the end of the demonstration desk or counter, with swiveling faucets. One modified epoxy resin sink in each demonstration desk and fume hood. One sink in perimeter counter.

  Biological Science Prep/Storage
  One large modified epoxy resin sink with gooseneck faucet for preparing solutions and for washing glassware (similar to Kewaunee FAB-470); one large deep modified epoxy resin utility sink (such as Kewaunee KD323) at end of counter or on wall; one sink in fume hood. Provide water to icemaker and dishwasher.

  Physical Science Prep/Storage
  One (1) large modified epoxy resin sink in counter with gooseneck faucet for preparing solutions and washing glassware (similar to Kewaunee FAB-470); one large deep modified epoxy resin utility sink (such as Kewaunee KD323) at end of counter or on wall; one sink in fume hood.

  Teacher Office Area
  One single sink in work counter

  Provide safety dousing shower w/ emergency eye wash and floor drain.

  All drinking fountains inside buildings shall be electric water-coolers providing chilled water.

- Communications

  Provide one-inch conduit with pull string from a two-gang metal box with single-gang cover plate at teaching wall up to future projector location with extra 10 feet of cable coiled up in ceiling to allow for future ceiling-mounted projector or other visual image projection device.

- Electrical

  Provide master cut-off switch for electricity in each room.

  Laboratories: Fourteen (14) duplex GFI outlets per room (two outlets at each of the student stations). One duplex outlet in each demonstration desk and fume hood. Three duplex wall outlets in the front of each room and one outlet for the U. V. Sanitizer. Provide other wall outlets around room as required. Three duplex outlets above perimeter counter.

  Biology Prep/Storage: Six (6) duplex wall outlets spaced around room. Four duplex outlets spaced along work counter. One 220V outlet for stove/oven. Electrical supply to refrigerator, range hood, and fume hood.

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VII. SPECIAL CONSIDERATIONS (continued)

- Electrical (continued)

  Physical Science Prep/Storage: Six (6) duplex wall outlets spaced around room. Four duplex outlets spaced along work counter. Electrical supply to dishwasher and fume hood.

- Gas and Air

  Gas in each laboratory must have a master shut-off valve.

  Laboratories: Fourteen (14) double gas jets per room (two double jets above counter at each of the seven workstations). One double jet in each demonstration desk and fume hood. Two double gas jets on perimeter counter.

  In each Prep/Storage Room: Two (2) double gas outlets above counter near sink, one gas jet in each fume hood, and two double gas outlets along perimeter counter.

- Safety

  1. Provide master control valve switch for gas, water, and electricity in each room. The master control valves and switches shall be clearly labeled and located in a non-lockable space strategically placed no more than 15 feet from the instructor's work station to allow for emergency cut-off of services and shall be in addition to the regular main gas supply cut-off. Valves shall be completely shut off with a one-quarter (1/4) turn.
  2. Provide safety dousing shower with floor drain and emergency eyewash station in each room.
  3. Provide fire extinguisher and wall-mounted woolen fire blanket in each room.
  4. Provide fire blanket on shelf or in cabinet so that the top of the fire blanket is five (5) feet or less above finished floor in each room.
  5. Provide vented flammable storage cabinet in each prep/storage room.
  6. Provide wall-mounted U. V. Goggle Sanitizing Cabinet in each lab (such as Fisher Scientific S47608).
  7. Provide one acid-resistant base storage cabinet in each prep/storage room.

  The electric stove shall have a safety cutoff switch and an operation/shut off timer, readily accessible to staff.

- Built-in Cabinetry

  A. Built-in work counter

  Each laboratory to include an 8' science demonstration desk (modified epoxy resin top) with instructor's table (such as Kewaunee KTS-108 and KTS-106).

  The three laboratories are each to have seven perimeter tables with island type workstations (such as Kewaunee KTS-380-Q28). These units provide 5-1/2 feet of working space for each two students, plus some counter space against the wall for supplies not directly involved in the experiment. These workstations are 36" high with modified epoxy resin tops.

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VII. SPECIAL CONSIDERATIONS (continued)

- Built-in Cabinetry (continued)

Each laboratory should have 25 lineal feet of perimeter counter along one wall. Counter to be 36" high x 30" deep including backsplash, with modified epoxy resin top. Below counter are large door and drawer arrangement; all provided with locks. Above this counter at 5' height, provide two Kemshield adjustable shelves. At 5' height provide four wall-mounted storage cases, 46.75" long x 30" high x 12" deep. Sinks, gas and electricity for these rooms are described in Section IX-- 9, 11, and 12.

Biology Prep/Storage: Along one wall provide 16-20' of "Wall Table Assembly" which includes: 36" high x 30" deep modified epoxy resin top; one large modified epoxy resin sink; gas, water, and electricity; large door and drawer base cabinets; pegboard drying rack; and fume hood with base cabinet. Along another wall, provide 20' of counter, 30" deep x 36" high, modified epoxy resin top, drawer and door arrangement below. At 5' height as extensively as possible above all cabinets, provide Kemshield shelf with lip.

Physical Science Prep/Storage: Duplicate storage cabinet arrangement as in Biology Prep Area, except base cabinets below the 20' counter to have smaller drawers.

Teacher Planning Workroom – Twenty (20) lineal feet of counter, with sink. Counter to be 36" high x 24" deep with large drawer and door arrangement below - all lockable. 18” deep x 84” high x 48” wide storage cabinet

B. Built-in cabinets/shelving

Biological Science Prep/Storage - A lockable microscope storage cabinet, suitable for 40 microscopes. A lockable storage cabinet large enough to hang a skeleton. A cabinet suitable for storing models, 7' high x 6' wide x 22" deep, with shelves and lockable. Space shall be provided for a 30" range (next to a 220V outlet) and a refrigerator (next to an 110V outlet). Provide a base cabinet for the storage of acids and noxious chemicals.

As extensively as possible, provide island shelving coming from the wall for storing glassware, chemicals, and other supplies. Shelving must be wooden, have backs, 72-84" high, and adjustable. Three sections should have acid-resistant finish with lips on front edges.

Physical Science Prep/Storage: Provide a cabinet suitable for standing up 4' lengths of glass tubing (such as Kewaunee 1A975); a cabinet suitable for the safe storage of strong acids and noxious chemicals; install the dishwasher under a counter or in a separate cabinet.

As extensively as possible, provide island shelving coming from the wall for storing glassware, chemicals, and other supplies. Shelving must be wooden, have backs, 72-84" high, and adjustable. One cabinet should be provided with eighteen (18) small drawers (8" high x 8" wide x 16" deep) for storing small items such as: stoppers, clamps, triangles and other small objects.

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VII. SPECIAL CONSIDERATIONS (continued)

- Built-in Cabinetry (continued)

B. Build-in Cabinets/Shelving

Within this storeroom, provide a separate lockable chemical storage area. This area should contain the vented flammable storage cabinet, and acid-resistant shelving with lips, as extensively as possible along three walls and in the center. These shelves should be wooden (no metal parts), sturdy, 72-84" tall, with backs.

Teacher Planning Area: Provide a cabinet 8' long x 2' deep, with lockable door movable shelves, floor to ceiling, with top and side drawers, and a 16" deep shelf above; a built-in computer workstation approximately 15' long, to provide room for four (4) computers and one (1) printer with 16" deep shelf at 5' height above work surface.

C. Built-in Instructional Aids

All Laboratories: As extensively as possible across the front of each room, provide short throw PLC projector centered on teaching wall along with whiteboards on each side. White boards shall be suitable for erasable marker pens. Also provide six linear feet of tackboard per room.

Biological Prep/Storage and Physical Science Prep/Storage: Provide 4 x 6 markerboard and 4 x 6 tackboard per room.

Teacher Office Work Area: Provide six linear feet of tackboard.

Science Laboratory (Each)
One 4 ft. x 16 ft. magnetic white markerboard, one 4 ft. x 4 ft. tackboard. Standard markerboard to have eraser tray, flag holder and demountable map railing. Install an interactive projector in the center of the markerboards.

Provide wheeled cabinet with doors for sound enhancement equipment and amplifier. Cabinet and equipment shall be located at, or adjacent to, the major teaching wall with tethered wiring harnesses. Equipment purchased with Furniture, Fixtures, Equipment & Technology (FFE&T) funds.

The back of the cabinet must allow connections of white speaker wire for the four speakers used with sound enhancement equipment, a network connection, connection to interactive projector and power.