

## USDA / ARS CROPS RESEARCH LABORATORY AND GREENHOUSES



<b>PROJECT:</b>	<b>Crops Research Laboratory Facilities Modernization</b>
<b>OWNER:</b>	USDA / ARS Crops Research Laboratory, Fort Collins, CO, USA Mr. Dave Mills, Engineering Project Manager
<b>CLIENT:</b>	Jacobs facilities Inc. Arlington, VA, USA Mr James Akkawi, P.E., Project Manager
<b>AREA:</b>	SBRU Greenhouse: 7,250 sf RRRU/SPNR/Common Greenhouse: 5,977 sf Total of 13,227 sf
<b>COMPLETION:</b>	February 2006

The project started in March 2000 with the programming phase. The design phase followed, during which the project was broken in 3 phases. Phase 1 involved the renovation to the main lab building and the headhouse while Phases 2 and 3 saw the demolition of the existing greenhouses and the construction of new ones. Research programs continued during construction.

The project includes two large wings of greenhouses dedicated fields. A total of 15 new research compartments are provided, including one large zone (30 ft x 60 ft) filled with 8-foot square isolator cubicles independently ventilated and insect screened. Two compartments have each their own air conditioning system (air handling unit and compressor), capable of maintaining temperatures of 55 F on a year round basis. These two compartments are also equipped with movable and adjustable light canopies allowing users to reach very high lighting intensity at bench level.

The greenhouse roofs have laminated, tempered glass while the walls are glazed with 16 mm double-wall acrylic sheets. Evaporative cooling is achieved through a fog system in each zone, independently controlled. The benches are not anchored to the floor and allow for any benching arrangement while providing for ADA compliance. Shading systems are provided. Supplementary lighting up to 200 microeinstein is available through HPS and MH fixtures. The greenhouses are ventilated up to 1.75 air changes per minute. Winter ventilation is achieved through positive pressure fans and horizontal airflow fans. All air inlets are screened against insects. Main heating is through radiant finned tubing installed on the perimeter walls while an additional snow-melting system is provided closer to the gutters and roof. RO water, constant-temperature tempered water are provided to each zone and in the central corridor. Each zone is provided with fertilizer injector connections.

The greenhouses are under control of a specialized, dedicated greenhouse computer control system with over 700 distinct input/outputs. In particular, each zone is fitted with sensor input jacks. This allows users to plug in any sensor with either 4-20mA or 0-10V output, read it directly on the control screen and use the data and signal to trigger any function under the computer control or, for that matter, any 120 V piece of equipment that would be plugged in the computer controlled outlet provided also in each room.

