PROGRAM PLAN FOR REMODELING AND EXPANSION OF FACILITIES AT W. D. HOLLEY PLANT ENVIRONMENTAL INSTRUCTIONAL-RESEARCH CENTER AT COLORADO STATE UNIVERSITY

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Prepared in the Office of
University Planning and Budgets
J. R. Hehn, Vice President

August 1, 1974
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PREFACE AND SUMMARY

The Colorado State University overall physical development plan calls for the remodeling and expansion of the W. D. Holley Plant Environmental Instructional-Research Center (formerly called the Plant Environmental Research Center - PERC) located on a 9.6-acre Lake Street site. This program plan speaks to the rational and justification of the project. Colorado State University FY 1975-76 capital construction seeks $703,000 for physical planning, construction and equipment for both Phase I and Phase II of the remodeling and expansion project.

In the spring of 1974, the legislature appropriated $5,000 for the program planning of this project. Detailed magnitude cost estimates have been provided by the staff of the Physical Plant to document the remodeling and new construction costs of the project. All prices have been escalated to the instruction period in accord with the justification as set forth in the "Program Plan for Building Construction Costs Escalation for Projects at Colorado State University for FY 1975-76 Capital Construction Budget Requests."

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HISTORY OF THE FACILITY

Original greenhouse facilities were constructed prior to 1920 on a site adjacent to the old Horticulture Building (1891) located on the corner of Laurel and Mason Streets on the northeast corner of the central area of the main campus. In 1948, a major portion of the facilities located on the present Lake Street site were constructed for horticulture with State funds. Subsequent industry funds provided for some research facilities at this site. With the completion of the Plant Sciences greenhouses in 1961, the original facilities on Laurel Street were allocated to the Physical Plant and resident instruction and vegetable research were moved to the Plant Sciences facilities. The original building adjacent to the Laurel Street greenhouse was subsequently razed in 1971. The greenhouse still remains, being utilized by the Physical Plant. In 1967, a 6,600-gross-square-foot greenhouse was erected on a five-acre site located on the Bay Farm adjacent to Spring Creek on the south area of the main campus. At this time, it was believed that this would be the new site for the entire Floriculture complex, which was to be relocated from the Lake Street location. In 1968, the U. S. Department of Agriculture (U.S.D.A.) sugar beet section vacated two quonsets on the Lake Street site and this space was subsequently allocated to the Department of Horticulture. This space is used for classrooms, student offices and storage.
LOCATION PHILOSOPHIES

The present approved facilities master plan calls for the permanent establishment of the Center at its present Lake Street location. As the Colorado State University trailer court is phased out in 1974, the Center will expand to the west. The site will then contain approximately 9.6 acres. The present facilities at the Bay Farm would then be assigned to the Physical Plant, thereby allowing the razing of the Laurel Street greenhouse. Several factors lead to the 1972 decision to make the Lake Street site the permanent home for the Floriculture facilities, after an analysis determined that the cost trade-offs of a relocation would not be practical. The existing Lake Street structures are basically sound and renovation will provide a more economical solution while maintaining the benefits of the location in close proximity to the academic core. The basic lack of utilities in the Bay Farm area (steam, gas and water) and being located in the Spring Creek flood plain were main factors in the determination to remain at the Lake Street site. In addition, the Lake Street location would provide a logical green open buffer at the periphery of the campus in keeping with the overall philosophies of maintaining open vistas into and from the University, plus making an open-air teaching laboratory available for all to enjoy.
PROGRAMS

The present Lake Street facilities provide for undergraduate and graduate student instruction including opportunities for actual job experience. Research is continued largely on special commodities in horticulture and extension projects. Research programs have provided up-to-date information on problem solutions and new practices in a form immediately usable to the industry in the state and provides professional education and training for industry leaders to have a firm background in decision-making.

Refer to Appendix Exhibit A for academic course curriculum.
PROJECTS DEVELOPED AT COLORADO STATE UNIVERSITY
OF BENEFIT TO STATE INDUSTRY

1. Systems for freeing plant stock of all serious diseases.
2. Systems for reselecting vigorous stock and providing new varieties to improve the genetic potential.
3. Systems to provide summer cooling and winter ventilation for growing structures, with optimum temperatures specifically tailored to Colorado climatic conditions.
4. Systems for automatic fertilization and irrigation.
5. Use of supplementary CO₂ in greenhouses.
6. Tailoring of fertilizer recommendations to the particular water supply.
7. Substitution of soil with inert media such as gravel.
8. Determining effects of ethylene on cut-flower longevity and assessment of the effects of ethylene from air pollution in the Denver region.
9. Requirements necessary to prevent ethylene pollution from natural gas heaters.
10. Use of supplementary incandescent lighting to control crop timing.
11. Effects of the air pollutant ozone on cut-flower longevity.
12. Methods to improve cut-flower longevity and handling qualities.
13. Improvements in greenhouse cooling.
14. Use of hydrophilic materials in root media to conserve water.
15. Survey mass marketing procedures.
16. Testing of systematic chemicals for disease control.
Space presently devoted to the programs for instruction, research and service include 15,810 square feet of greenhouse area as well as supporting laboratory and office space, partially funded by the Colorado Flower Growers Association. The space varies, with interchange between other studies on related crops. Equipment not actively used in a particular project is employed in classroom and laboratory instruction, and in other projects within or outside the department. Most expensive items are shared with other projects. Environmental records and specialized calibration facilities are made available to any individual that may require them.

Undergraduate students are employed wherever possible in greenhouse and laboratory operations. Graduates are responsible for the complete cultural technique in their program, as well as assisting in general operation. This practice of foregoing permanent technicians is considered a part of the instructional process and has been markedly successful in instilling proper working habits and enthusiasm.
DEPARTMENTAL GROWTH PROJECTION AS TAKEN FROM
ACADEMIC MASTER PLAN PATTERN FOR THE '70s PHASE III

COLLEGE OF AGRICULTURAL SCIENCES

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SECTION V

NEED

Methods and technology are continually changing and with the previous assumption that the facilities were to be relocated, minimal maintenance has been accomplished on the facilities. Therefore, with the new philosophy to remain at the Lake Street site, considerable remodeling is required on the existing facilities to bring them up to current standards.

SUMMARY OF REMODELING - PHASE I

A. Recover 24,650 square feet of existing greenhouse surface with fiber-reinforced plastic current in the industry. Most facilities are presently covered with glass, which has an extremely high maintenance factor. Fiberglass significantly reduced hail damage to a negligible factor and greatly enhances cooling.

B. Remodeling of heating and cooling and control systems in the main greenhouse:
   1. The main steam supply, the present boiler, is in serious condition and extremely unreliable. The condensation reduction system is badly corroded and should be replaced.
   2. The present cooling system is approximately one-half that as recommended by the Greenhouse Manufacturers' Association and does not meet industry standards.
   3. Replace existing thermostat and control system.

C. Remodel main Headhouse (Building 22).

D. Remodel service facilities in the main corridor of the Headhouse.

E. Remodel south quonset facilities (Building 20).

F. Remodel north quonset facilities (Building 19).

G. Improve temperature control in cooling systems in existing temperature houses to conform with that of the main range (Building 18).

H. Pave driveways and parking area as severe dust and mud cause maintenance problems.
The remaining structures 11 through 16 and 16' X 18' light houses special testing units and are not in need of remodeling.

Refer to Appendix Exhibit B for detailed descriptions of each of the above.
COST SUMMARY OF REMODELING
W. D. HOLLEY PLANT ENVIRONMENTAL
INSTRUCTIONAL-RESEARCH CENTER

(Not Including Bay Farm Facility - No Changes from Previous Estimate)

I. MAIN RANGE
1. Remove glass and wood bars, recover with 6 oz. Tedlar fiberglass, fire retardant
2. Double number of cooling fans in houses 3, 4, 6, 7. Install new pads in houses 2, 3, 4, 5, 6, 7
3. Wiring to fans including 24 v.a.c. motor relays
4. Concrete corridor with steel grating and frame over existing channels
5. Additional corridor vents - motor operated
6. Shield ducting in corridor for remote sensing/24 v.a.c./alarm
7. Mechanical in corridor only
   -- Insulate steam line
   -- Replace treated water line
   -- Replace control air line with new copper line
8. Communications system (included in South Quonset estimate)
9. New 1,512 square foot propagation house east of Headhouse
10. Smoke detection system and alarm to campus central
11. Reopen access to overhead door and end of corridor, remove coolers and access to door and ends of houses. Make them operable again - bring in line with code exit requirements (N.F.P.A. 101-14-2131, 2161)

$125,080

II. HEADHOUSE
1. Walls and paint - 1,590 square feet
2. New 2" to 3" concrete topping 2,660 square feet; new 4" slab with welded wire fabric on compacted fill, 400 square feet
3. Repair leaks in roof and reconstruct equipment platform and ladder
4. Cut and remove existing boiler
5. Demolish and haul away walls, pipes, etc. to be gutted
6. New solid core doors in metal bucks (5)
   Double solid core doors in metal bucks (1)
7. Base cabinets, polywud finish - 130 lineal feet
   Wall cabinets, polywud - 115 lineal feet
   Colorseran countertops or work counters - 46 lineal feet
   Formica countertops - 96 lineal feet
8. Stainless sinks and rough-in
9. 4 soil bins for work bench
10. 5 outside peat, perlite and soil storage bins - concrete block, waterproofing, floor drains, steel doors and frames to inside
11. New gravel, concrete walks and benches in existing propagation and turf area
12. New still
13. Pot storage area - shelves, fence with gate
14. Gas and oil storage facilities
15. New locker and restroom facilities with weatherproof access to rear of panels
16. Six new pre-fabricated walk-in coolers to replace those being removed from main range corridor, with galvanized steel doors, floor drains, refrigeration machinery and controls
17. Chemical and paint storage cabinets
18. Drying oven and mist pump
19. Face exterior walls with pre-cast tilt-up architectural concrete panels
20. Replace double sliding doors to Headhouse
21. Move wood and metal working machinery and miscellaneous shelves and racks
22. Distilled water, gas, air, acid waste in main Headhouse and backflow preventer on main water supply
23. New electric panels and miscellaneous rewiring in Headhouse
24. Suspended ceiling

$ 92,470

III. QUONSETS

SOUTH:
1. Replace v.a.t. floor, 2,800 square feet
2. Paint - 10,000 square feet
3. Intercom system - master and 8 stations
4. Sewer - South Quonset to main - under main range corridor
5. Lighting and electrical up-date
6. New benches - polywud finish - 100 lineal feet
   Countertops - colorseran - 100 lineal feet
7. Stainless sinks and rough-in (2) with acid waste system, new shower and rough-in
8. Shelving - 70 lineal feet X 5 high
9. Block and insulate 1 window, infill 3 doors, cut and install one new door
10. Hood for radioactive carbon with utilities
11. Closet wall and sliding doors in caretaker's apartment - cut to fit slope ceiling
12. Kitchen stove and hook-ups
13. Air-condition apartment

NORTH

14. Replace incandescent lights with fluorescent and install additional convenience outlets
15. Replace large sliding steel door
16. Paint exterior

$26,670

IV. TEMPERATURE HOUSE
1. Repair ventilators
2. Replace partition glass with fiberglass

$4,360

V. PAVE DRIVEWAY AND PARKING LOT
1. 1,850 square yards 2 inch asphalt and 500 lineal feet asphalt curb

$12,120

*$Construction and site work cost only, June, 1974 base

TOTAL ESCALATED CONSTRUCTION COST - PHASE I REMODELING JUNE 1974 PRICES

Construction costs escalated to bid period
($260,700 \times 128) = $333,700*

Contingency - 10% 33,700
Architectural and Engineering - 8% 26,600
Supervision 6,000

TOTAL ESTIMATED COST - PHASE I $400,000

*Escalated in accordance with the "Program Plan for Building Construction Costs Escalation for Projects at Colorado State University for FY 1975-76 Capital Construction Budget Requests."
NEW REPLACEMENT FACILITY - PHASE II

History of Project

In 1967, a cooperative program with the Nexus Corporation was initiated. A greenhouse comparable to those used in industry was needed so heating and ventilating studies could be made using normal growing practices. Two houses, one with pipe framework and the other with a combination of wood and pipe, were constructed during the summer of 1967. Construction criteria were also evaluated. A second structure designed for plant tissue culture and partially financed by the Colorado Flower Growers Association (CFGA) was constructed in 1968. The Bay Farm location was used in anticipation of the entire Floriculture facilities being relocated at that site. Subsequent change in the master planning philosophy calls for the entire Floriculture facility to remain at the present Lake Street site. This decentralization poses many problems.

Phase II speaks to the centralization (relocation of these facilities on the Lake Street site). Currently there are no supporting facilities such as adequate stream, restrooms, headhouse or storage capabilities on the Bay Farm site. With the construction of the new facilities on the Lake Street site, the existing Bay Farm facilities would be converted to Physical Plant usage, thereby enabling the razing of the present Physical Plant greenhouse on Laurel Street, as called for in the overall physical development plan. The proposed greenhouse facilities would enable greater utilization of equipment, materials and personnel to meet the needs of a growing horticultural-oriented society. Recently the U.S.D.A. Cheyenne horticulture field station was phased out and many of the plant materials were moved to Fort Collins. Facilities are needed to continue important programs to meet the future needs of Colorado residents. Colorado is noted for its high amount of solar energy and relatively warm winter temperature and is becoming more of a potential vegetable growing area, which will have an impact on the overall state economy.

Description of Facilities

The construction of two ridge and furrow greenhouses, 30' by 108', or an equivalent standard structure with 10-foot eaves will be covered with Tedlar-coated fiberglass reinforced plastic (FRP) panels. A central
gutter will separate the two houses. Steam with a trombone pipe system will be utilized for heating and employed for cooling fan and pad cooling with main air flow the length of the house. Lysimeter plots will be constructed in the ground in one house with proper drainage tile.
W. D. HOLLEY PLANT ENVIRONMENTAL INSTRUCTIONAL-RESEARCH CENTER

PHASE II - NEW FACILITIES
East of Existing Facility

The new facilities consist of a 65' by 108' greenhouse (including corridor replacement for Bay Farm), two proposed 36' by 32' vegetable greenhouses and a 90' by 45' headhouse.

New greenhouses - 9,325 square feet @ $6.50/sq. ft.  $60,600
New headhouse - 4,050 square feet @ $30.00/sq. ft.  121,500
Site preparation (clearing, grading, etc.)  3,000
Utilities to headhouse (steam, gas, water, sewer)  12,300

TOTAL ESCALATED CONSTRUCTION COST - PHASE II NEW CONSTRUCTION
JUNE 1974 PRICES

Construction costs escalated to bid period ($197,400 x 128) = $252,600*
Contingency - 10%  25,200
Architectural and Engineering - 8%  20,200
Supervision  5,000

TOTAL ESTIMATED COST - PHASE II  $303,000

*Escalated in accordance with the "Program Plan for Building Construction Costs Escalation for Projects at Colorado State University for FY 1975-76 Capital Construction Budget Requests."

PHASE I $400,000
PHASE II 303,000
TOTAL $703,000
DEPARTMENT OF HORTICULTURE
Office in Plant Science Building, Room 122
Professor K. M. Brink (Head)

The courses in horticulture are designed to train students in the application of basic principles of plant growth, handling, harvesting, and storing of products and in the theories and principles of landscape design on small properties and large area developments. Students may elect one of two majors: horticulture (with options in floriculture, fruit, horticulture products, industries management, and vegetables) or landscape horticulture (with options in landscape design, nursery and landscape management, and turf management). Students who wish to prepare for graduate or advanced study may register for additional basic science courses. By careful choice of electives in cooperation with an adviser, students may develop skills in highly specialized areas.

Major in Horticulture

This curriculum is planned for students interested in the production, handling, and processing of horticultural products, in horticultural business fields, in service activities, in sales, and in preparation for research and teaching.

192 credits are required for the degree of bachelor of science, including a minimum of 40 credits in horticulture courses. Students must complete the core curriculum and choose one of the five options offered in the major.

CORE CURRICULUM

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Five options are available to the horticulture major. The following required and suggested courses will supplement the core curriculum within each area:

FLORICULTURE OPTION

Required courses are BG 305, H 123, 162, 310, 311, 312, 411; M 121; PH 110. Suggested electives are BA 200; BG 260; BN 301; IS 151, 231.

FRUIT OPTION

Required courses are AG 367; B 308; H 321, 351, 356, 362, 461; M 121; PH 110. Suggested electives are BA 200, H 162, IS 202, 264; ZE 307, 451.

HORTICULTURE PRODUCTS OPTION

Required courses are C 242, 243, 244; FT 452, H 362, M 121, 165; MB 221; PH 121, 122. Suggested electives are FN 130; H 351, 356; MB 300, 414.
INDUSTRIES MANAGEMENT OPTION

45 credits in economics, agricultural economics, and business; 30 credits in social sciences, humanities, and languages; 11 credits in mathematics and statistics; and PH 110 are required. General course requirements are those listed under the interdepartmental major in agricultural industries management. Additional courses in horticulture and other disciplines will be arranged to meet the specific interests of the student.

VEGETABLES OPTION

Required courses are AG 367; H 310, 351, 356, 362; M 121; PH 110. Suggested electives are AG 406, 414, 515; B 308, 450; BG 260; ST 201.

Major in Landscape Horticulture

This curriculum is for students interested in the selection, production and use of landscape plants. It is designed to provide training in the specialized areas of landscape design, nursery and landscape management, turfgrass management, and allied fields.

A minimum of 40 credits in horticulture courses and a total of 192 credits are required for the bachelor of science degree. Students must complete the core curriculum and choose one of the three options offered in the major.

CORE CURRICULUM

Freshman Year

Choose either the freshman year in professional agriculture or the freshman year in agricultural-biological science. H 100, Basic Horticulture, is required.

Sophomore Year

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Senior Year

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Three options are available to the landscape horticulture major. The following required courses will supplement the core curriculum in each area:

LANDSCAPE DESIGN OPTION

Required courses are AG 353; AR 101; CE 178; H 123, 422, 432; IS 122, 411; JT 330.

NURSERY AND LANDSCAPE MANAGEMENT OPTION

Required courses are AG 330, 355, AT 300, B 361, 440, BN 301, 310; C 140b; H 260, 261, 310, 321, 422, 464.

TURF MANAGEMENT OPTION

Required courses are AG 330, 355, 367; AT 300, B 308, 361, 440; BN 301, 310; C 140b; H 260, 261, 321, 441, 464.

Graduate Programs in Horticulture

Programs leading to the degrees of master of agriculture, master of science, and doctor of philosophy are offered in genetics, fruit and vegetable production and handling, floriculture, landscape design, and turf management.

Facilities are available for research in laboratories, greenhouses, and on the horticultural farm. A student's program can be planned so that courses in areas of special interest such as plant physiology, plant pathology, extension education, and business administration can be stressed equally with horticulture or used as supporting fields.

In recent years, there have been more positions available to students with graduate degrees than there have been candidates to recommend. These positions have been in all areas of research, business, teaching, and in regulatory fields.
HORTICULTURE COURSES

Horticulture Department
College of Agricultural Sciences

H 100. Basic Horticulture. W. S. 5(4-2). Credit not allowed for both H 100 and H 201.
Principles of horticulture science as applied to the propagation and culture of horticulture crops, landscape design, and improvement of plants.

*H 123. Indoor Plants. W. 3(2-2).
Systematic identification and culture of tropical and subtropical plants and their use in indoor landscaping.

Evaluating, market classes of fruit, vegetables, and flowers. Methods of organizing and staging horticulture workshops and contests used in fairs, garden clubs, and community projects.

H 201. Suburban Horticulture. S. 3(2-2). Credit not allowed for both H 100 and H 201.
Selection and maintenance of plant materials, elementary indoor and outdoor landscape planning and use of garden accessories, as applied to suburban living.

H 221. Landscape Plants. F. 3(1-4). Prerequisite: H 100.
Identification based on morphological comparisons (fruits and autumn characteristics), evaluation and environmental requirements of plants used for landscape purposes. Woody, evergreens, and herbaceous plants.

H 222. Landscape Plants. S. 3(1-4). Prerequisite: H 100.
Identification of woody and herbaceous plants based on the blossoms and new shoot growth. Evaluation of plants for landscape uses.

Theories, principles and techniques of sexual and asexual propagation procedures involving actual practice in seedling, transplanting, layering, grafting, budding, making of hardwood and softwood cuttings, and propagation of evergreens.

Science of plant propagation including a broad range of plant material, specific seasonal techniques, and evaluation of plants which are difficult to root and of those with long-temperature propagation requirements.

H 301. Interaction of Environment and Horticulture. F. 3(3-0).
Geographic relationship of horticulture to technology in the United States and the world, origins and development, climatic influences and problems.

Use of enclosed structures for manipulation of environment, effects on growth and development of plants propagated in controlled environments, methods of controls, production and marketing costs.

Commercial culture and marketing of bedding plants and major flowering pot plants.

The growing of pot plants, varieties, propagation, soil handling for shipment, disease, and insect problems.

Basic concepts in the art of floral design; construction of floral pieces for numerous occasions.

The nursery industry, organization, management, equipment, plants, planting, storage, protection, and shipping. Trips to nurseries.

Principles and theories of landscape composition, types of drafting work, and simple problems in designing small lots and city property.

*H 334. Landscape Management. F. 5(4-2).
Principles, practices, economics, and relationships of maintaining woody and herbaceous plants on landscaped grounds, parks, highway plantings, institutions, etc., in vigorous condition and attractive appearance.

*H 341. Turf Management. F. 4(3-2). Prerequisite: BY 111, AG 250.
Turfgrass propagation and maintenance on lawns, parks, and golf courses as influenced by species, environment, and utilization.

*H 351. Vegetable Crops. W. 5(4-2). Prerequisite: H 100.
The history, classification, development, culture, and methods of improvement of vegetable crops.

*H 356. Fruit Production. S. 5(4-2). Prerequisite: H 100.
Tree and small fruit production; selection of site and layout. Planting, pollination, pruning, fruit thinning, soil management, fertilization and irrigation.

H 362. Horticultural Products Technology, W. 3(3-0).
The post-harvest physiology of horticulture products in relation to prepping, storage, and transportation.

H 410. Plants in Teaching Biology. SS. 3(2-2). Prerequisite: One course in Teaching Biology. Credit not allowed for both H 310 and H 410.
Use of plants for horticultural and plant physiological demonstrations and experiments including methods of controlling greenhouse and growth chamber environments for maximum use.

*H 411. Carnation Production. S. 3(3-0).
Worldwide production and marketing of carnations and planting stock.

*H 420a, b. Landscaping. SS. Offered as needed.
a 2(2-0) b 3(3-0)
Planning, design and maintenance of public and private areas.

*H 422. Retail Nursery Management. F. 5(4-2).
Management of retail nurseries and garden centers. Modern methods and techniques of personnel management, advertising, display, credit, packaging, and stocking. Sales promotion, property design and services. Trips to garden centers.

Design problems on areas larger than home grounds. Integration of such planning and zoning of cities and counties.
Special emphasis on the rapid changing technology in turfgrass science as it relates to specific management practices.

Ecological and physiological principles involved in the selection and maintenance of woody plants for landscape use. Diagnosis of plant problems and pest control.

Status, progress, and methods of breeding the important horticultural crops.

H 464. Arboriculture. S. 5(4-2-0). Prerequisite: Junior or senior standing.
Professional management and culture of trees in urban communities. Development and administration of urban landscape programs.


Calibration and use of instruments for measuring environmental parameters in and above plant covers; outdoors and in environmental facilities.

H 690. Research Techniques in Horticulture. W. 5(5-0) Prerequisite: Consent of department head.
Methods and practice with instruments, laboratory and field techniques, and research procedures.

Biochemical genetic systems with emphasis on genetic duplication and recombination.

H 752. Biochemical Genetics II. W. 3(3-0). Prerequisite: H 751.
Elementary genetic units emphasizing transcription and coding.

H 753. Biochemical Genetics III. S. 3(3-0). Prerequisite: H 752.
Study of gene-protein relationships with emphasis on regulatory systems.

Genetic control of multicellular development, emphasizing differentiation in animal systems.


H 798. Supervised College Teaching. F, W, S, SS. Credit varies. Prerequisite: Written permission of department head and instructor prior to registration.


Replacement of the above area with new facilities in a different location would likely exceed $750,000. But structures are fundamentally sound and renovation would be less expensive while retaining benefits of an outstanding location. Major problems are gradual obsolescence and insufficient maintenance for a number of years. The following sections cover the various changes required to bring the facility up-to-date and to improve appearance. In all instances, improvements should meet the requirements of the Occupational Safety and Health Act.

A. **Recover all existing greenhouse surfaces** with six-ounce Tedlar-coated fiber-reinforced plastic, paint superstructure, remove existing wood sash bars and ventilators with the exception of Houses 1 and 2 and the corridor. Total estimated surface area, including gables, side walls and corridor is 246,500 square feet. However, House 7 was recovered in 1973 and the Temperature House in 1974.

The range is largely glass-covered. With inadequate maintenance, it has gradually deteriorated. Glass-covered greenhouses are no longer constructed in Colorado. Fiberglass significantly reduces maintenance, reduces hail damage to a negligible factor and greatly enhances cooling. Adequate provision for fire warning, however, is necessary.

B. **Renovate heating, cooling and control systems** in main range and Temperature House

1. **Main steam supply**: The existing boiler is in serious condition and unreliable. With the construction of Art, Phase II, the main campus supply will be sufficiently close to warrant the main stream to be extended to the main range. Cost is included under Utilities and Site Development FY 1975-76. The condensation system is seriously corroded and should be replaced. It is proposed to bring the main steam under the Headhouse floor. Removal of the boiler and attendant piping would significantly increase usable space and permit the roof to be lowered.
2. **Increase cooling capacity**: The present system is about half that recommended by the 1971 Greenhouse Manufacturers' specifications. These specifications call for a base level of 8 CFM per square foot of floor area, a correction for altitude of 1.20, and for solar radiation 1.40. For a 7°F temperature rise, the factor remains one. The resultant requirement is 13.44 CFM per square foot. If the present fans are retained, two additional fans of comparable size should be installed. This would permit four cooling stages for fan operation.

The pad area should be doubled unless pad efficiency can be significantly increased (150 CFM per square foot pad area). Tests are presently underway on a new type of permanent pad said to last 9 to 10 years, with an efficiency exceeding 80%. However, these cost $30.00 per lineal foot of pad, 4 feet high.

Additional ventilator capacity in the main corridor will be required and possible modification of the corridor ventilators for doubling air entry area are suggested.

3. **Replace existing thermostatic control system** to include automatic corridor ventilator operation: Increasing the number of fans, or their sizes, will require additional controls. Aside from gradual obsolescence and lack of parts, the pneumatic system has proven dependable and accurate. All thermostats are to be shielded and aspirated.

C. **Renovate and remodel main headhouse**: Building 22 shows the existing area and general arrangement. Building 22 is in more detail and shows the proposed changes.

The main objectives are to improve efficient utilization of existing space, provide better working conditions and remove non-conforming O.S.H.A. conditions.

1. **Remodeling and renovation** of the soil testing laboratory, chemical storage and weighing laboratory, and changes in the propagation include:
a. Separation of the soils lab and weighing room into two distinct rooms with additional safe storage provisions for hazardous and toxic chemicals.

b. Enlargement of the north adjacent area for efficient soils handling.

c. Reconstruction of an additional 765 square feet for turf and ornamentals on the east end of the Headhouse, so the propagation house may be enlarged and improved.

Note that a good location for soils handling is not now available. The new location includes provision for unsteamed and steamed soil storage and a large sink for washing and disinfecting. The entire floor area would be poured concrete and considered as an extension of the main Headhouse. The present water still is inadequate and causes ethylene pollution if operated at capacity.

2. Provision of pot and miscellaneous storage along the north wall of the Headhouse, enclosed by a high security fence: The cover for the gas meter will be improved, with provision for gasoline and oil storage. Storage areas are presently widely separated from the work areas, difficult to keep clean and easily pilfered.

3. Remodeling of present one-room apartment into a tool and equipment storage area for better security: While most tools are easily accessible, there are several locations and security is difficult. Note, however, that the apartment is to be replaced in the quonset.

4. Relocation of existing remote recording equipment and alarms: This amounts to building a new panel a few feet east and enlarging the wall area, with better access to the rear of the instruments. The location is central, requiring minimum lead length.

5. Remodeling and enlargement of existing restroom and shower with better facilities for washing and to include a locker room for workers: There is no provision for students to change clothes between classes and working hours nor to safely store valuables.

6. Reconstruction of six coolers in the area now occupied by the existing boiler: This will provide a centrally located area for
temperature controlled storage research and replace present walk-in coolers. Present refrigeration equipment on the coolers at the south end of the corridor could be used for four of the six chambers. Better access would be provided. Such temperature controlled facilities are vital to much of the research.

7. **Remodeling and reconstruction** of existing storage cabinets and benches in the grading room and general work area: As it is proposed to eliminate existing overhead storage, it is vital that as much cabinet space be provided as possible.

8. **Evaluation of all utilities** in the area, with piping for distilled water, gas and compressed air: Sufficient outlets for electrical apparatus on all work areas and improved lighting. Additional heating will be required.

9. **Remove and relocate** drying oven and high-pressure mist pump: Two coolers will be dismantled and replaced in conjunction with four other walk-in coolers. This will improve the traffic flow into the main corridor and to the propagation area.

10. **Resurface floor** with epoxy: The present concrete floor is unsightly and very difficult to clean, with a high dust hazard.

11. **Replace existing roof** with a flat, insulated roof: The present roof is a heavy corrugated transite with steep pitch and high heat loss. Lowering the roof would eliminate dusty and hazardous storage areas that do not conform to O.H.S.A. standards. The result would provide better instrument location and easier access to the instruments.

12. **Install emergency electrical generator**: Power failures are a serious hazard to research and every attempt should be made to provide dependable power and heat.

13. **Face existing wall** with stone to conform with campus style: The present wall is rough and unsightly. A thin stone veneer would enhance appearance without greatly increasing bulk.

14. **Replace existing double doors** which are not tight or secure.
D. Renovate service facilities in main corridor and houses: Over the years, numerous additions and deletions have been made to service facilities in the corridor until the present maze is unsightly, hazardous and causes considerable difficulty in tracing breakdowns and preventing instrument interference. Some water supply lines are seriously corroded. The main air supply line is inadequate.

The following services to each house on the main corridor are required:

1. Main steam supply and condensate return.
2. Single and 3-phase power.
3. Control air supply, two lines, one with constant 20 psi, the other with 15 and/or 20 psi for remote indexing.
4. Working air supply, 40 to 60 psi.
5. Fertilizer water supply.
6. Fresh water supply.
7. Distilled water supply.
8. 6-inch ducting for CO$_2$ supply.
9. Alarm and fire detection circuits. (Low or high temperature)
10. Low voltage (24 v.a.c.) power supply.
11. Natural gas supply.
12. Shielded ducting for very low voltage instrumentation.
13. High-pressure mist line.

In addition, an antisiphoning, back-flow preventer should be installed at the main water valve. Note that instrumentation leads should be shielded in exposed conduit so they may be modified easily.

It is proposed to pave the corridor with concrete and reconstruct benches to provide for miscellaneous crop area.

The electrical wiring in each house is old and hazardous, some power lines being exposed. Provision should be made for numerous outlets for apparatus, and to rewire for the cooling system. Controls should be easily accessible, capable of being modified if necessary.

E. Remodel and improve South Quonset facilities (Building 20): The front three rooms of the second floor are to be remodeled into an apartment
for the greenhouse caretaker since the existing one-room apartment will be replaced by tool storage. The photosynthesis laboratory will be moved to the noted location with installation of a laboratory sink and hood for radioactive isotope work. Outlets should be provided in the apartment for remote alarm indication and intercommunication from the main range.

The first floor is to have more cabinet storage and work benches installed as noted. Floors are to be resurfaced and the sewer system connected into the main sewer line.

The environmental and postharvest laboratories are presently air-conditioned. The apartment should also be air-conditioned.

F. Remodel and Improve North Quonset (Building 19): by installing better lighting, more convenient outlets and main sliding door replacement on the west side. The second floor is storage only. The two south rooms are fertilizer and equipment storage. The present restroom may be removed to provide more space.

G. Improve cooling system and temperature controls in existing Temperature House to conform with the main range. Re-do or replace dividing partitions and install new ventilators.

H. Pave driveways and parking areas: With increased traffic, the gravelled area causes severe dust and mud problems. Janitorial service is significantly increased.
EXHIBIT C

MASTER PLAN LAYOUT OF W. D. HOLLEY PLANT
ENVIRONMENTAL INSTRUCTIONAL-RESEARCH CENTER

LEGEND:
A. Lath house
B. Proposed mist house for ornamental (materials for construction on hand)
C. Greenhouses 1 through 7 (Floriculture)
D. Tectrol CO₂ generators
E. Temperature House (Floriculture)
F. Greenhouse covering test racks
G. Pilot greenhouse
H. Main water supply to quonsets
I. Calibration table
J. North Quonset: Fertilizer and equipment storage. Boiler for light houses 4 through 7, CO₂ analyzer, remote recording equipment, high-pressure mist pump, treated and fresh water for light houses and laboratory for reproductive temperature studies
K. South Quonset: Lecture room, photosynthesis laboratory, environmental measurements laboratory, environmental measurement equipment storage, environmental measurement library, postharvest physiology and stress laboratory and offices for graduate students
L. Gas meters
M. Main Headhouse (Floriculture)
N. Propagation house (presently split in half between Floriculture Propagation and Turf)
O. Proposed reconstruction of greenhouse to house turf and ornamentals
P. Floriculture greenhouses
Q and R. Proposed vegetables (presently U.S.D.A.)
S. Proposed extension of Meridian Drive to coincide with Whitcomb Street
T. Proposed turf, ornamental and vegetable Headhouse
U. Proposed relocation of Bay Farm greenhouse
V. Proposed vegetable greenhouses
W. Proposed storage racks for soil, pots and miscellaneous
X. Present field plots for trial gardens, ornamentals and turf
Y. Proposed storage area with high security fence
LEGEND:

1. Security fence for outdoor equipment storage area
2. Gasoline and oil storage
3. Pipe rack and miscellaneous steel
4. Pot and plastic container storage
5. Peat moss and perlite storage bins
6. Soil storage, unsteamed, fillable from outside and accessible from inside

**7. Work benches, no storage underneath necessary
   7a. Work benches with cabinet storage (laboratory style)
8. Arc welder
9. Main, single phase supply panel
10. Single phase distribution panels for Headhouse
11. Emergency electrical generator
12. Sink for washing pots and containers, disinfecting tools, etc. in soil handling area, other sinks standard, large laboratory sinks for corrosive chemicals

#13. Ceiling-hung storage cabinets
14. Drill press and grinder
15. Bench saw
16. Condensate pump for propagation, ornamentals and turf area
17. Sign-in desk
18. Main cooler compressor
19. Drying oven
20. Paint storage
20a. Liquid chemical storage, acids, base, corrosive chemicals
20b. Pesticide storage, toxic chemicals
21. Hot water heater
22. Fold-down ladder to roof instrumentation
23. Sitting bench
24. Locker room
25. High-pressure mist pump
26. Chemical storage and weighing room
27. Soil testing laboratory
28. Instrumentation panel (access to back from 24 and 29)
29. Shower and restroom
30. Shower
31. Main three-phase panel
32. Main working air compressor
33. Control air compressor
34. Bicycle rack
35. Water still, hung from ceiling
36. Coat and book rack

** Work bench in soil handling area to have bins for steamed soil

# Storage cabinets along north wall of grading, cooler and locker rooms are floor to ceiling.

Natural gas to 26 and 27. Distilled water to grading room, 26 and 27. Compressed air to tool crib, coolers, soil handling area and 26 and 27. Conduit for instrumentation leads should be accessible. Soil storage as well as remainder of building will require heating to be installed. Floor to be refinished.
EXISTING LAYOUT

PLANT ENVIRONMENTAL RESEARCH CENTER
PLOT PLAN

COLORADO STATE UNIVERSITY - SUMMARY OF SPACE PER BUILDING FOR FALL QUARTER 01/05/73 PAGE 7

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EXHIBIT E

SUMMARY:

1. Recover roof, walls, gables and corridor with fiberglass, six-ounce Tedlar-coated FRP
2. Renovation of heating and cooling systems
3. Double the number of ventilators in the corridor
4. Increase size of cooling systems
5. Pave corridor
6. Vacating of area for vegetables by U.S.D.A.
7. Reconstruction of greenhouse for turf and ornamentals
8. Renovation and alterations of the main propagation area
9. Removal of existing coolers at south end of corridor and reconstruction in Headhouse
10. Removal of existing boiler and installation of campus steam supply
11. Renovation of utilities in the corridor
Proposed alterations in the second floor of the South Quonset:

1. Installation of sink and hood in the photosynthesis laboratory, primarily use of radioactive carbon. Supply and drains are present.
2. Renovation of floor.
3. Slight alteration of traffic pattern in front three rooms (right), with air-conditioning of these rooms. Primary objective is to provide for the greenhouse caretaker.
4. Installation of remote alarm signal and intercommunication set.
Second floor — South Quonset (proposed)