

SECTION 13123 - GREENHOUSE SPECIFICATIONS

PART 1 - GENERAL

1.01 GENERAL

A It is the intent of this portion of the specifications to include the furnishing and erecting of the greenhouse superstructure including all glazing, doors, door hardware, and ventilation as shown on plans and/ or hereinafter described, such work to be the responsibility of the Greenhouse Contractor.

B It is not the intent of this portion of the specifications to cover concrete, grouting, masonry work of any description, plumbing, electrical work, either power supply or control wiring, nor utility connections. This portion shall be the responsibility of the General Contractor or his selected Sub-contractors other than Greenhouse Contractor.

1.02 SPECIFICATIONS, PLANS AND DRAWINGS

A The work shall be executed in strict conformity with the plans, drawings, and specifications, and the Greenhouse Contractor shall do no work without proper drawings and instructions. These specifications are intended to supplement the drawings and, therefore, it shall not be their province to mention any portion of the construction which the drawings are competent to explain and such omissions shall not relieve the Greenhouse Contractor from carrying out such portions indicated only on the drawings and should items be require by specifications which are not indicated on the drawings, they shall be supplied and installed by this contractor.

B The Greenhouse contractor is expected and requested to examine the drawings and specifications, the written portion as well as the printed, including addenda, if there be any, as each word will be held in full force. No failure on his part to understand the drawings and specifications nor to discover any work noted on them or shown thereon or therein will justify a claim for omission of said work from the Contract, or for any extra charge therefore.

C Before fabricating any material, the Greenhouse Contractor shall submit complete shop drawings and details to the Architect for his approval. No field work of any kind required for the greenhouse installation shall be performed by any Contractor until greenhouse plans have been approved.

1.03 MANUFACTURE

A Drawings and specifications are based on all aluminum, clear span truss, "SL Series" Greenhouses of Ludy Greenhouse Mfg., Corp., New Madison, Ohio 45346. Contractor or Sub contractor using materials of the other manufacturer, for such materials, shall furnish evidence satisfactory to the Architect that his product is at least equal to that of Ludy Greenhouse Mfg., and approval shall be obtained from the Architect before such substitution shall be made.

1.04 ERECTION

A The greenhouses shall be erected by the greenhouse manufacturer or by an experienced erector approved in writing by the manufacturer. The Greenhouse Contractor shall be responsible for the coordination of the concrete work and other work in connection with the greenhouses, but not a portion of this section of the Specifications, so that the work shall proceed in a normal sequence without unnecessary delays.

PART 2 - MATERIAL

2.01 MATERIALS

A The intent of this specification is that all materials shall be the best of their respective kinds and grades.

B Glass - All glass shall be 1/8" or 5/32" Clear tempered, depending on width and location, as manufactured by AFG, LOF or Pittsburgh Plate. All cut lites to be annealed glass.

C Glazing Compounds - All glazing compounds used for the bedding of glass shall be of the extruded butyl glazing compound with continuous built in shim manufactured and delivered to the job in the original containers with seals unbroken. The glass shall be sealed on the outside with a bead of gun grade butyl glazing compound throughout its entire length before applying aluminum glazing caps to the bar. Glass laps may be sealed with a bead of clear silicone if desired.

D Acrylic Double Skinned Sheet - All acrylics shall be either 8mm or 16mm Exolite No Drip as manufactured by Cyro Industries or equal.

E POLYCARBONATE Double Skinned Sheet - All polycarbonate double skinned sheet shall be 8mm.

F Glazing Gaskets - All glazing gaskets shall be EPDM rubber or other compatible material used in conjunction with the above mentioned double skinned sheets and compatible with the glazing material.

G Aluminum - Aluminum members shall be mill finish extruded with appropriate heat treatment. All extrusions shall have a high inherent resistance to corrosion with a top rating of "A" in corrosion resistance. No castings shall be permitted for joining members at joints subject to stress in which tensile strength is a factor.

H The various aluminum extrusions shall be of the shapes shown on plans.

I Alloys - Sheet aluminum shall be of alloy 3003-H14. Extruded aluminum shapes shall be of alloy 6063-T6, or 6063-T5. Members shall be designed to carry the following loads:

2.02 ALLOWABLE STRESS

A Materials shall carry the following design loads:

- 1** Dead load
- 2** Live load -- 10 lbs per sq. ft. minimum on horizontal areas
- 3** Wind load -- 10 lbs per sq. ft. minimum on vertically projected areas
- 4** Load carrying capacities shall be increased where necessary due to higher local snow or wind loads

B In designing for the above loads, the loads may be considered to act in any of the following combinations:

- 1** Dead load plus live load
- 2** Dead load plus wind load plus 1/2 live load
- 3** Dead load plus wind load
- 4** Dead load plus live load plus 1/2 wind load

C All structures shall be designed to requirements of state/local building codes.

D Greenhouse structure(s) shall be designed in accordance with current AISI specifications for design of cold - formed steel structural members and AISC specifications for structural steel buildings. Greenhouse structure(s) shall include sufficient bracing for the resistance to wind forces. Bottom chord members as well as other truss members shall be adequate to resist compressive loads produced by horizontal wind loads and roof uplift produced by wind.

2.03 ALUMINUM FRAME

A As all members will be visible, it is the intent of the specifications and plans that the design be uniform and adhere to a set pattern; frame spacing shall be 12' 0" on centers. Connections shall be made with stainless steel bolts and extruded aluminum plates. All field connections shall be bolted. Special care shall be taken in the fabrication of this aluminum work, and tolerances shall be held to an absolute minimum in order to secure proper fit of the aluminum members specified and to eliminate the necessity of cutting glazing material.

B Posts - Aluminum Posts shall be furnished and placed through the length of the greenhouses and across all partitions and gables as indicated on drawings. Posts shall be properly punched or drilled to receive the fittings for attaching the aluminum sills, purlins, gutters, rafters, ect., as the case may be.

C Truss side posts shall extend in each case from the eave of the structure to below walk level as indicated on plan. Side posts shall be spaced 12' 0" on centers and shall be of the size and shape indicated on the drawings.

D Posts for gables and cross partitions shall be channels as indicated on the drawings. They shall extend from below grade as shown on the drawings to the rafters, to which they shall be attached with stainless steel bolts.

E Rafters - Aluminum rafters of the size indicated on plans shall be furnished and placed in the roof of the greenhouse, extending from the eave to the ridge. Each pair of rafters shall be connected together at the ridge by means of aluminum plates.

F Trusses - Where trusses occur, the rafters described above shall be the top chord of the truss. All other truss members and connecting plates shall be aluminum extrusions of the size and shape indicated on the plans.

G Truss Supports - Trusses for eave bar shall be connected at the side post by an extruded aluminum plate so designed as to be bolted to the web of the side post with all bolts in shear and to bolt to the rafter and bottom chord in a concentricity loaded joint. If gutter is used trusses shall be connected at the gutter post by an extruded aluminum plate so designed to be bolted to the web of the side post with all bolts in shear or to utilize a "T" Lug to adjoin the flange of the side post and extruded aluminum plate with all bolts in shear while keeping the rafter and bottom chord in a concentricity loaded joint.

H Purlins - Aluminum purlins in the roof, gables and partitions of the size shown on the plans shall be placed as indicated and connected supporting members with a minimum of two stainless steel bolts into each member connected to. Purlins shall be prefabricated before shipment for the attachment of glazing bars and connecting lugs.

I Miscellaneous - All other structural members not enumerated above, but required to complete the aluminum framework of the greenhouse in accordance with best standard practice, shall be furnished and placed by the Contractor.

2.04 EAVE BAR

A Extruded aluminum eave bar shall be provided where shown on plan. This member shall have a flange to receive glazing bars and shall be provided with weep holes to carry condensation collected from the underside of the roof to the outside of the greenhouse. The eave plate can be adapted to receive a continuous hinge element which will allow the installation of out-swinging sash. Joints of this eave plate to occur at main rafter or post not to exceed 12' 0" in length between joints

2.05 RIDGE

A An extruded aluminum ridge shall be furnished and placed at the peak of the structure. Ridge shall be provided with continuous hinge flanges to receive ridge ventilating sash on each side of the ridge to divert condensation to drip gutters of roof bars.

2.06 GABLE RAFTERS AND CORNER TRIM

A Specially extruded gable rafters and corner trim shall be provided which shall also provide in the same extrusion shoulders to receive specified roof glazing, vertical side and gable glazing and glazing bars and also suitable stops onto which side sash can be closed. This corner trim and gable rafter shall be neatly mitered and spliced at the eave to provide a smooth detail at this point. These shall be securely fastened to the structural members forming the gable end.

2.07 WALLS SILLS

A An extruded aluminum wall sill shall be seated on all foundation walls. The joints of wall sill shall occur at main rafters or posts. The extruded aluminum wall sill shall be of the shape shown on the plans, and shall be capable of receiving either side sash or fixed glazing as the case may be. If side sash is used a continuous neoprene bulb gasket should be designed into the wall sill to act as a weather tight stop for the bottom rail of the transom sash.

2.08 GROUTING

A After the greenhouse contractor has properly placed the wall sills, the mason contractor shall provide the necessary materials and labor to properly place the walls and point up between the wall and the sill to eliminate any discrepancies between the two and produce a finished joint.

2.09 TRANSOM SILL

A An extruded aluminum transom sill shall be furnished where indicated on plan. Transom sill shall be securely fastened to the posts and shall be designed to accommodate either fixed glazing details: provisions for a continuous neoprene bulb gasket to act as a weather tight stop for the bottom rail of the transom sash if sash over fixed glazing is used.

2.10 GLAZING BARS

A Extruded aluminum roof bars of sufficient size and mechanical properties to carry the design loads heretofore specified shall be placed in the roof and spaced 36" or 48" on center to receive the specified glazing material. chamber shall be provided on both the top and the bottom of this bar for fastening purposes. Shoulders to receive the roof glazing and condensation grooves to conduct primary condensation to a suitable disposable point shall be provided. These bars shall extend in one piece from the eave to the ridge and shall be bolted to purlins spaced not over 5'0" apart. Extruded aluminum glazing bars of sufficient size and section modules to carry the design loads heretofore specified shall be placed in the gables, extending from the wall sill to the gable rafter.

2.11 DOORS & FRAMES

A Door frames shall be extruded aluminum shapes complete with stops and provision for hanging 1 3/4" thick aluminum doors. Doors 1 3/4" thick of aluminum construction shall be furnished at all openings of the size indicated on the drawings. A minimum of three (3) aluminum hinges shall be furnished for each 1 3/4" door. Doors 1 3/4" thick on exterior openings shall be arranged to open out. Doors 1 3/4" thick shall be of the size shown on the plan and consist of a lower kick panel of aluminum and upper glazing of safety glass.

2.12 GABLES

A Gables with fixed glazing from sill to gable rafter, except at door openings, shall be constructed in a similar manner to the roof and side using extruded aluminum shapes as indicated on the drawings.

2.13 GLASS GLAZING

A All glass in the enclosure, except that in the roof sash and side sash, shall be

bedded on the special elastic glazing strips. This strip shall cover the glass seat of the glazing bar throughout the entire length of each lite of glass set on the bar. After glass is set in place, a special elastic glazing compound shall be gunned in a bead between the top edge of the glass and the glazing bar. Aluminum bar caps shall then be applied to the bar covering the entire length of each lite of glass and made to conform to the laps in the glass and provide a uniform 1/2" lap. These caps shall be extruded aluminum, shaped with proper forming to exert a uniform, but not excessive pressure, along the entire length of the glass lite. Each cap shall be held with a minimum of two stainless steel hex head self-tapping screws. Screws which hold bar caps shall be spaced not over 15 inches apart, nor shall any screw be placed closer than 1 1/2" from the end of the cap.

B At the rafters , scaffold screws, 1" #14 stainless steel hex head screws shall be used to hold the caps. Such screws shall have sufficient thread to hold the caps firmly in place ,yet provide sufficient shank protruding above the caps for support of scaffold planks.

C All glass used for glazing of sash and doors shall be of such size as to completely fill the space between the various rails and muntions in one piece.

D For roof and side sash an extruded vinyl glazing strip shall be used for bedding and sealing the glass after which caps shall be applied as previously described using stainless steel self-tapping screws.

2.14 ACRYLIC GLAZING

A All acrylic glazing in the enclosure shall be glazed into an aluminum gasketed glazing system approved by the acrylic manufacture. Glazing system shall provide closure for all edges of acrylic glazing panels. The glazing system shall provide a gasketed anti sag spacer at all purlins centered between glazing rafters on roof only. There should be provisions made within the glazing system to handle expansion and contraction as required by the acrylic manufacture.

2.16 POLYCARBONATE GLAZING

A All polycarbonate glazing in the enclosure shall be glazed into an aluminum glazing system as approved by the polycarbonate manufacture in order to meet the specifiers needs spacers and point fasteners must be compatible with the polycarbonate material. There should be provisions made within the glazing system to handle expansion and contraction as required by the polycarbonate manufacture.

2.17 SCAFFOLDING

A The Contractor for the greenhouse shall furnish sufficient scaffolding for one section of the roof on one side between the eave and ridge. Such scaffolding shall be

of specially formed aluminum to extend for one section, fit over the special scaffold screws at the truss members, and present a horizontal walking surface for maintenance and construction workers. This aluminum scaffolding shall be turned over to the owner at the conclusion of the job.

2.18 FLASHING

A All flashing and counter-flashing shall be furnished and placed by the Sheet Metal Contractor. All flashing and counter-flashing shall be either aluminum or lead coated copper.

2.19 PAINTING

A No painting shall be required on aluminum.

2.20 SASH VENTILATION

A Ridge sash of the size indicated on the drawings, shall be furnished at the ridge and connected to the same with a continuous type hinge and arranged to open out. Sash for any given compartment, when assembled and installed, shall be continuous from one end to the other. A common muntin bar shall be used at all assembly joints. Ridge vents shall be made up of a top rail, bottom rail and muntins of extruded aluminum, and bolted together in accordance with manufacturer's instructions.

B Side sash to the size indicated on the drawings with continuous type hinges, either connected to the eave, gutter adapter or transom sill adapter, shall be furnished and arranged to open out. Side sash for any given compartment, when assembled and installed, shall be continuous from one end to the other. A common muntin bar shall be used at all assembly joints. Side sash shall be made up of a top rail, bottom rail and muntins of extruded aluminum and belted together in accordance with manufacturer's instructions.

C All sash shall have provision made at the hinge point to prevent creeping of the sash. All sash shall be dry glazed, utilizing a specially formed glazing gasket or channel that shall border the glazing continuously with no interruptions or joints where the glazing meets the muntin bars and the sash top rail. All sash should close on a continuous neoprene bulb gasket to insure a weather tight seal. All sash should have provisions for operators.

2.21 AUTOMATIC OR MANUAL SASH

A Sash ventilators as indicated on drawings shall be operated by one of two ways: manual operation by use of a hand crank or chain pull machine for each sash; automatic operation with a VC elective control motor for each sash as manufactured by Wadsworth Control Systems. The power unit shall be provided with a quick reversing single phase motor with sufficient power to operate the sash to operate the sash satisfactory under the conditions required with a gear reduction train.

2.22 HEATING

A A separate heating system shall be provided for each compartment to maintain the greenhouse at 70 degrees Fahrenheit with an outside temperature of minus 10 degrees Fahrenheit under conditions of 15 mph wind.

B Control system of the heating system shall be by central control system.

C Gas lines and connections, or oil tank, lines and connections and/or electrical power and control wiring and connections shall be provided by others.

2.23 EVAPORATIVE COOLING

A Supply and install an exhaust fan/pad cooling system designed to achieve maximum cooling performance, properly locating and sizing exhaust fans and cooling pad system according to Acme Engineering's "Climate Control Handbook" using Acme equipment or an approved equal.

2.24 FAN JET VENTILATION

A A fan jet ventilation and re-circulating system of sufficient air flow capacity to maintain proper heat balance and produce thorough mixing of air shall be sized and furnished according to Acme's Engineering's "Climate Control Handbook" using Acme equipment or an approved equal.

2.25 INTEGRATED CONTROLLER

A A solid state sequential controller shall be provided for each compartment to operate all ventilating, cooling, heating, and circulating equipment in proper sequence to provide a full range of controlled atmospheric conditions within a greenhouse from maximum heating to maximum cooling.

B The unit shall contain the ability to switch from day to night setpoints when activated by a photo-electric switch or a manual switch.

C Each stage shall have one temperature adjustment for activating equipment and a separate adjustment to deactivate equipment before temperature reaches setpoint to prevent setpoint overshoot.

D Each stage within the sequential controller shall be individually adjustable + or - 10 degrees from setpoint.

E The temperature sensor shall be an aspirated sensor, using a hood or screen to shield the sensor from direct sunlight.

2.26 ELECTRICAL

A All power and control wiring, motor starters, disconnect switches, lighting and convenience outlets shall be provided by others. It shall be the responsibility of the enclosure manufacturer to provide wiring details of specialty equipment and controls.

2.27 PLUMBING

A Water lines, water connections to equipment, hose bibs and drainage shall be provided by others.

END OF SECTION 13123