

## **Technical Specifications**

### **Chapter A: Project Overview**

GOAL Turkey in collaboration with the Adana Municipality will construct a Greenhouse for year-round flower production. The Greenhouse will be managed by a Women's Cooperative and provide employment opportunities for vulnerable women in Adana. GOAL is tendering for a turnkey Greenhouse with supply and construction of physical infrastructure and systems per the technical specifications below. The CONTRACTOR will be required to provide training on the operational and management of all systems and warranties as detailed in the technical specifications, The CONTRACTOR will adhere to all application safety regulations, obtain all necessary permits and licenses and have adequate insurance cover for staff, visitors, and equipment for the duration of the construction phase. The CONTRACTOR will also be responsible for all costs related to mobilization, demobilization and security during the construction phase.

### **Chapter B: Explanation and Details**

#### **B.1. Infrastructure Works**

The area on which the greenhouse will be built will be graded at the levels determined according to the length and width measures with the machineries. With laser grading, herringbone slope will be ensured and the land should have 0.08% slope. During the leveling the top soil and sub base material (soil) will be removed. For the grading of the land with smooth slope, the rainwater drainage is very important. In case the length of the greenhouse is longer than 50 m, it shall be graded as double-flow. The above infrastructure works will be completed by the Adana Municipality prior to the handover of the site to the CONTRACTOR. The Adana Municipality will pay for all expenses related to infrastructure works. The CONTRACTOR will confirm that the infrastructure works are acceptable during the handover inspection.

#### **B.2. Greenhouse and Tunnels**

##### **B.2.1. General Explanation and Overview**

The greenhouses shall be built by the CONTRACTOR on the area allocated as a result of the agreement concluded within the framework of the project carried out with the cooperation of GOAL International ("**GOAL**") and Adana Metropolitan Municipality ("**AMM**").

The greenhouses to be built by the CONTRACTOR shall be built as 10 greenhouses side by side as Gothic greenhouses, each with a width of 9.6 m and length of 105 m. Nine (9) tunnels totaling 9072 m<sup>2</sup> will be used for production purposes. One (1) tunnel of 1008 m<sup>2</sup> will contain an entrance area (disinfection area) equipment area with tanks and spayers needed for irrigation and the Greenhouse Control Room. All connections shall be made with the connection elements such as bolt and nut and shall

be in the modular greenhouse concept. The connections shall certainly not be made as welded.

### **B.2.2. Warranty Terms and Conditions**

The CONTRACTOR shall undertake at least 2 years warranty of the greenhouse as a whole connections of systems, structures and 10 years maintenance and repair service. For the greenhouse metal construction 10 years warranty, for the greenhouse cover 3 years warranty, for the solar energy system 15 years warranty, for the automation and control units 10 years warranty and for the service and technical maintenance 10 years shall be undertaken.

### **B.2.3. Physical Properties of the Greenhouse**

Total Area	10.080 m <sup>2</sup>
Type of Greenhouse	Gothic Greenhouse – Sides 8 mm polycarbonate and reinforced polyethylene coating with a lifetime of 36 months
Tunnel Length of the Greenhouse	105 meters
Number of Tunnels	10
Width of the Tunnel	9.6 meters
Under-Gutter Height	4.0 meters
Height of the Arch	6 meters
Type of Gutter to be Used	40 x 2 mm galvanized steel
Gutter Drainage Type	150 gutter-end drainage suitable for PVC pipe
Door of the Greenhouse	At least 2.30 meters x 3 meters
Side Columns	80 x 80 x 2,0 mm 4.000 mm
Façade Under-Gutter Columns	80 x 140 x 2,5 mm 4.000 mm
Inner Columns	80 x 80 x 2,0 mm 4.000 mm
Front Façade Columns	80 x 140 x 2,5 mm 4.000 mm
Anchorage	70 x 70 x 2,5 mm 1.200 mm

#### **B.2.3.1. General Technical Specifications of the Construction**

The anchor bolts of all construction elements shall be 8x8 steel products (DIN-931, DIN-933, DIN-985, DIN-125, DIN-7504N and DIN-934). In all construction systems with movable mechanism (hinge clamps, all connections of window profiles, engine connections of curtain mechanisms and etc.), fibered nut shall be used.

The manufacturing and installation of the construction shall be carried out according to the science and craft rules and during the project design and assembly stages shall be carried out according to TS-EN/13031-1 standard greenhouse design criteria.

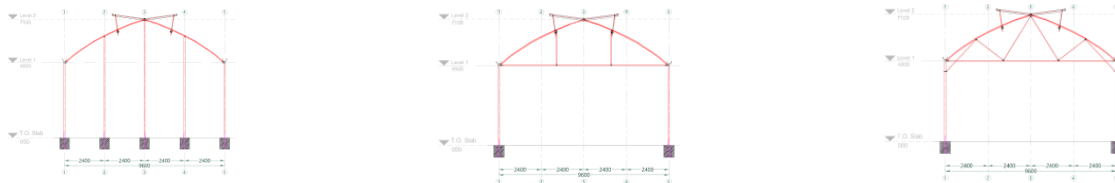
In the constructions, generally, St37 class steel shall be used and 100-275 gr/m<sup>2</sup> galvanizing shall be applied in all constructions. The qualities of the columns and gutter steel subject to electrostatic galvanizing shall be s235jr and qualities of the trusses and other greenhouse connection clamps and special production various steel materials shall be dx51.

### B.2.3.2. Design Criteria

- The greenhouse construction structure shall be disassembled.
- The greenhouse construction shall resist to 110-120 km/h wind speed and 35 kg/m<sup>2</sup> plant load.
- The ventilation shall be manufactured as butterfly ventilator.

### B.2.3.3. Gothic Roof Elements

FRONT and REAR TRUSS (M1), MIDDLE TRUSS (M2)



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### “M1-Front and Rear Trusses” and “M2-Middle Trusses”

While designing the truss, for the balanced distribution of the static loads, the plant hanger axis has been divided into 3 equal parts and all connections have been tied to the load-balance points. The truss profiles, according to the load-balance calculations and shade ratios, are with a diameter of Ø60 mm – Ø27 mm.

<b>For M1 Truss</b>	
Truss Spring Pipe	Ø 42 x 1,5 mm Galvanized Pipe
Roof Ridge	T: 1 mm Galvanized sheed
<b>For M2 Truss</b>	
Truss Spring Pipe	Ø 42 x 1,5 mm Galvanized pipe
Truss Knitting Connection Pipes	Ø 27 x 1,5 mm Galvanized pipe
Truss Beam Pipe	Ø 42 x 1,5 mm Galvanized pipe

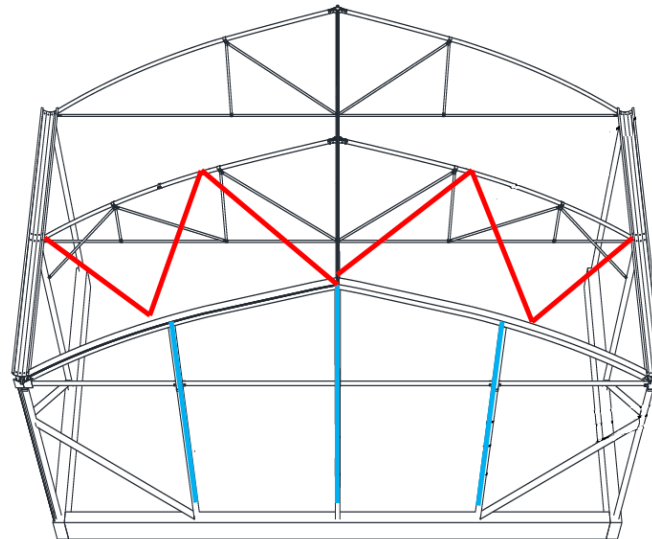
### B.2.3.4. Side and Roof Connection Profiles

The rainwater gutters have been produced from 2 mm galvanized sheet. The gutters will be processed plain and afterwards, the clip bearing will be assembled separately.

Self Ring Rain Gutter	400 x 2 mm galvanized sheed
32Roof Profile	32 x 1,2 mm galvanized sheed
Ventilator Box Profile	32 x 1,2 mm galvanized sheed
Double Side Purlins	50 x 1,2 mm galvanized sheed
Double Front Purlins	50 x 1,2 mm galvanized sheed
Double açade Spring Profile	50 x 2 mm galvanized sheed

### B.2.3.5. Wind Ties

M1- M2 Wind Connection	Ø 27 x 1,5 mm galvanized pipe
Façade Cross Tie	Ø 42 x 1,5 mm galvanized pipe
Side Column Ties	Ø 27 x 1,5 mm galvanized pipe

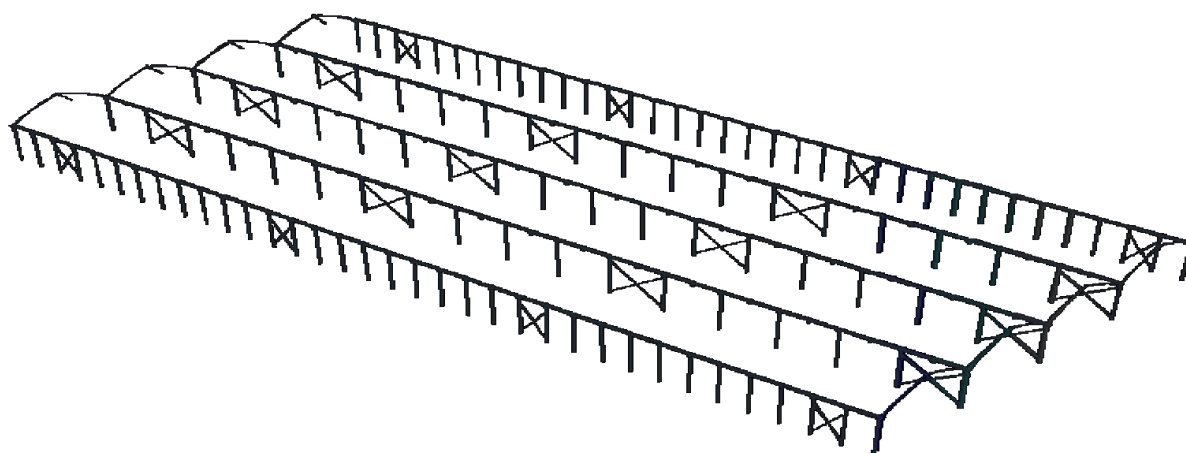


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Since the greenhouses are to be built in the north-south direction, against the winds from the relevant directions, the blue colored columns, as can be seen in the above image, shall be assembled as 80 x 80 x 2.5 mm galvanized profile at the façades.

### B.2.3.6. Wind Support System

Between the under-gutter and poles of the greenhouse in the north-south direction, 2 cross pipes 25-30 meters apart and between the inner columns of 5 m, Ø32 x 1.5 mm cross pipes shall be used.



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### B.2.3.7. Ventilation

- Considering the weather conditions in Adana, in order to minimize the energy consumption for the air-conditioning, the greenhouses shall be manufactured and built as to ensure more natural air circulation.
- For each tunnel ventilation, double butterfly ventilator shall be used.
- For each tunnel, the ventilation shall be designed as double wing and shall have the feature to be independently activated according to the wind direction.
- The rack to be used in the ventilation shall have silent operation feature.
- The length of the rack gear level shall be 150 cm.
- At the starting and ending point of each window system, at the first 2.5 m space, Ø32 x 1.5 mm window cross profiles shall be used.
- At the starting and ending point of each window system, 2 window winders shall be used.
- The profiles to be used shall be 100 gr/m<sup>2</sup> galvanized steel.

Switched Reduction Set	0.55 kW/h 50 Hz 380 V
Rack Gear Set	2.5 mm galvanized sheet
Roller Shaft Bearing	1.5 mm galvanized sheet
Ventilation Shaft Pipe	Ø 34 x 3mm galvanized pipe
Ventilation Profile	35 x 40x 1.5 mm

### B.2.3.8. Greenhouse Rainwater Gutter Landing

The opening of the sheet to be used in the gutter structure, the rain gutter with 478x2 mm sheet opening should have a water carrying capacity of 35 kg/m<sup>2</sup>.

A solution should be created by using galvanized sheet gutters with the condensation gutters on the right and left of the bottom of the gutter, which have the maximum capacity to carry the condensation water along the rain gutter. The thickness of the said condensation gutters will be 1.2mm. Galvanized thickness should be minimum

100 gr/m<sup>2</sup>. These waters should be collected with a special reservoir on the forehead surfaces of the right - left and lower condensation gutters of the gutter edges according to the greenhouse slope and given to the greenhouse internal drainage system.

Steel silicone should be used for sealing in the groove joints during the groove assembly. For this purpose, 1 tube of steel silicon will be used in the junction of 3 grooves.

Rain gutter descent suitable for Ø100 mm pipe installation should be left at the ends of the gutter in the direction of slope of the greenhouse forehead surface.

On the lower surfaces of the greenhouse rainwater landings, the landings will be taken by means of Ø100mm diameter waste water pipes. Collection and disposal of rainwater is the responsibility of the contractor. The municipality will identify the disposal location.

Discharges of the side and lower condensation gutters on the forehead surfaces of the rain gutter landings will also be carried out with appropriate fittings by using socket necklaces with burglar bolts to the rain gutters.

### **B.2.3.9. Warranty Terms and Conditions of the Steel Construction**

The steel construction system, in accordance with the workmanship, design and maintenance conditions, should be supplied with minimum warranty for a period of 24 months.

The BUSINESS OWNER is liable to inform the CONTRACTOR in writing within 5 days at the latest as of being informed about the defects of the materials within the framework of the warranty. With respect to the materials, the CONTRACTOR can repair the defects within the framework of the warranty on site or when necessary, at his own facilities on condition of receiving the relevant material from the relevant site at his own cost. In case of any defect, as a principle, the relevant piece shall be repaired; however, in case it is technically impossible to repair, shall be changed. Under the below mentioned situations, the materials shall be deemed as outside the scope of warranty:

- Failure of the BUSINESS OWNER and/or its personnel to use as specified in the terms of use,
- Use of spare parts of unauthorized third parties by the BUSINESS OWNER or modification of the materials used,
- Repair or assembly or maintenance by unauthorized third parties without the approval of the BUSINESS OWNER,
- Normal wear and tear of the materials,
- Failure of the BUSINESS OWNER to carry out the maintenance of the materials at all or on time,
- Filling and grading the land inappropriately,

- Damage caused by fire, earthquake, flood, strike of lightning, storm, excess of the snow load declared and calculated, crash of any vehicle (air-land-sea) and
- Damage of the materials due to high or low voltage electric current.

### **B.3. Door**

In order to ensure that the trainees or employees entering the greenhouse do not carry any viral, bacterial or fungal diseases, at the entrance and exit doors of each greenhouse, there shall be entrance cabins with the below mentioned technical details ensuring full disinfection.

#### **B.3.1. Technical Specifications of the Entrance Doors:**

- There shall be 2 doors with a width of 250 cm \* height of 250 cm \* depth of 100 cm. Air insulation area shall be created by placing one of the aforementioned door at the entrance and the other at the exit.
- The cabins shall also be covered with polyethylene material with the same specifications.
- Under the cabins, in order to ensure the disinfection of the personnel entering or exiting or materials, there shall be chlorinated water pool with a depth of 100 cm same with the cabin and with a vertical depth of 20 cm at the base.



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### **B.4. Covering**

#### **B.4.1. Roofing Specifications**

The greenhouse and ventilation caps shall be covered with single layer 200 micron polyethylene cover. The greenhouse cover shall have UV + IR + LD + AF + Amist + EVA + AntiDust + Diffused film feature for at least 36 months. PVC clips shall be assembled as ringed clips.

#### **B.4.2. Side and Façade Covering Specifications**

The side and façade areas of the greenhouse shall be covered with 8 mm transparent two-walled polycarbonate plates. The polycarbonate plates shall be fixed on 35 x 25 x 1.2 mm polycarbonate profile and this relevant profile shall be positioned with at most

1.10 m apart. The polycarbonate plates shall be screwed with pressure bars rather than direct self-tapping screw. The polycarbonate plates shall be connected with H type aluminum strip.

#### **B.4.2.1. Polycarbonate Plates**

- The façade and side areas of the greenhouse shall be covered with 8 mm two-walled transparent polycarbonate plates.
- The plates shall have minimum -40 + 120 c heat resistance.
- The plates shall have minimum 76% luminous transmittance.
- The luminous transmittance resistance shall be  $u=3.04 \text{ w m}^2/\text{k}$ .
- The inter connections shall be H type aluminum profiles.
- The plates shall be screwed with pressure bars.

#### **B.4.3. Warranty Terms and Conditions of the Covering**

The polycarbonate plates shall have a manufacturer's warranty of 10 years against color change.

The chemical additives of the polyethylene covering shall have a manufacturer's warranty for 3 years. The tearing is outside the scope of warranty.

#### **B.5. Surrounding Concrete Wall**

The greenhouse shall be protected against floods with C 25 / 30 concrete 8 – 12 ribbed iron retaining wall / border wall, which has a width of 25 cm and height of 40 cm and is in compliance with TS EN 206 and TS 13515 standards, at all four sides of the greenhouse. At the same time, the surrounding poles of the greenhouse shall be inside this relevant concrete structure.

#### **B.6. Floor**

The floor of the 1,000m<sup>2</sup> greenhouse, as stated in the project, shall be completely reinforced concrete (with minimum of 6mm mesh) and corundum aggregated surface hardening shall be applied with a concrete helicopter. And for the 9,000m<sup>2</sup> greenhouse of flooring, the same concrete works stated in the plan project shall be carried out and again surface hardening shall be applied. The areas outside the concrete areas of the 9,000m<sup>2</sup> greenhouse flooring shall be graded with pebbles and sand fill and afterwards, UV extra white tear resistant cover shall be used on the floor. The floor cover shall have minimum 100 gr/m<sup>2</sup> feature. The floor cover shall be fixed to the floor by using Ø6 nail and galvanized thermal curtain weights and the adding layers shall be have a width of 20 cm.

#### **B.7 Concrete Walkways**

For each greenhouse 9.6 meters wide, and greenhouse walking paths shall be planned as 1 meter on the left and right sides, and 2 meters between the stands and concrete



walkways shall be prepared for training and walking throughout the greenhouse (105 meters) with castings of up to 25 meters.

## **B.8. Fogging, Fertilizing and Pest Control System**

The misting system must be able to adjust the irrigation interval and irrigation amount, spraying and fertilizer dosage, ph levels manually and automatically via electro valves.

Pipe couplings, attachment and termination apparatus, valves, excavation and excavation, etc. All of these matters are included in the unit price of the Plastic Water Pipe.

### **B.8.1. Fertilizing, Spraying, pH system**

- Fertilizer and spraying system; dosing and operation of the system will be controlled manually and automatically by the fertilization and spraying computer.
- System for the whole greenhouse; It will consist of 8 group fertilizer tanks (liquid fertilizer and water-soluble granular fertilizer tanks will be separate), 1 spraying tank, 1 ph tank.
- The system will be selected as 8+1 and a single fertilization automation device will be selected for all tunnels.
- Fertilization automation device will create the fertilizer recipe from 2 tanks and 1 acid tank separately for each tunnel and send it to the relevant tunnel with electrovalve control. 8 fertilizer tanks will be used as 2 fertilizers for each greenhouse.
- Fertilizer tanks will be mixed with a 0.37 kW blower.
- All fertilizer tanks will be 300 liters each. There should be 1 10 tons spare water tank.
- The placement of the tanks will be planned within the Greenhouse area.
- It will be delivered in working condition after all connections of fertilization and spraying systems are made and leak and leakage checks are made.

### **B.8.2. Fogging System**

- The fogging system will be made with nickel nozzles with a min. 60 lt/hour capacity and each positioned at 1.5 m intervals.
- There will be filtration in the installation.
- There will be automation to enter the pump.
- Multi-pump systems will have a coordinated operation feature.

- It will be possible to adjust the flow rate on the pump when requested.
- Fogging laterals will be made at a height of at least 80 cm from the bench, in a way to center the bench.
- High pressure polyamide pipes will be fixed to the rope with a black cable tie every 50 cm at most. In addition, it will be fixed by throwing a cable tie both in front and behind the nozzles.
- While hanging the hose on the rope, it will be stretched and fixed as a straight line. If it is determined that the hoses are curved when viewed from below, the necessary revisions will be made by the contractor.
- The lines will be re-examined 1 month after they are completed, and the deflected lines, if any, will be stretched.
- After the hose laying is completed, the system will be completed by connecting it with the pump, and it will be ready for operation and will be reported to the administration.
- In order to control the aforementioned fogging mechanism like electric heaters and fans, it will be designed in such a way that the desired air temperature - circulation, humidity rate can be controlled differently or the same in each tunnel greenhouse by the control units (PLC-Artificial Intelligence controllers) located in the main control center. .
- In the control to be carried out by the administration, it will be checked that the system works fully and completely and the process will be completed.
- Items and technical specifications of the Cooling System are listed below. The contractor will take all these issues into account while pricing and will deliver the system to the administration in working condition by making the productions.

0.2 mm Anti-Drip Cleanable Nickel Nozzle

3/8 Nickel Nozzle Carrier

12mm Steel Rope – Rope Clamp and Rope Tensioner

#### **B.8.2.1. 0.2mm Anti Dip Cleanable Nickel Nozzle:**

a) Nozzle will be placed every 1.5 meters (at most) in the system. If there is less than 1.5 meters at the end of the line, a nozzle will be placed at the end of the line. However, if the distance is less than 0.5 meters at the end of the line, it is not necessary to add an additional nozzle. Here, line distances will be measured from console to console. Rope tensioners are included in the line length.

b) The direction of the nozzles will be determined by the administration.

c) Nozzles to be used in the system; With a hole diameter of 0.20 mm at least 0.016", consuming at least 0.075 lt / min water per minute, Spray Type: Fan Curtain Shape, with variable spray angle (angles will be determined by the administration during application), Made of 304 stainless steel, spray tip 316 stainless steel , antidrip (anti-drip)

d) Nozzles must have the features to spray with a pressure of at least 4 bar and to spray under 150 bar pressure without any problems.

e) Nozzles can be adapted to 3/8" high pressure pipe as quick connection and will be internally filtered.

#### **B.8.2.2. 3/8 Nickel Nozzle Carrier:**

a) Each nozzle will be connected to a 3/8 Nickel Nozzle Carrier. It will be connected to 3/8" high pressure pipes in nozzle carriers.

b) Connection apparatus and fitting materials to be used in the system; It must be made of 304 stainless steel.

c) Nozzle carriers should have fast and compression connection features, should be able to work under 70 - 150 bar pressure, and should have features to prevent pressure loss.

d) Nozzle carriers 3/8" pipe inlet - Thread connection for 3/16" nozzle - 3/8" pipe outlet pipe inlets push and plug - quick connector and Chrome-nickel plated stainless.

#### **B.8.2.3. 12mm Wire Rope – Rope Terminal Block and Rope Tensioner:**

a) Steel ropes will be manufactured with the following specifications.

b) Ropes to be protected against corrosion shall be at least 12mm thick, uninsulated and coated with standard zinc (according to TS EN 10244-2 18.06.2014).

c) Rust, notches, etc. on the wires used in rope making. there will be no defects and the coating quality of the wires will be homogeneous and flawless.

d) Ropes will be in a feature that will not be affected by external influences (air, water, humidity, etc.).

e) Steel rope clamp will be suitable for 12 mm rope. It will be galvanized against rust and corrosion.

f) Steel rope tensioning apparatus shall be suitable for at least 12mm steel rope. will be in size.

g) Steel rope tensioning apparatus will be galvanized against rust and corrosion.

h) One end of the wire rope tensioning apparatus will be a hook and the other end will be an eye-shaped round ring.

i) While the ropes are being terminated, they will be fixed one after the other with at least two rope clamps of appropriate size. No rope connection will be made without using the rope clamp.



### **B.8.3... Warranty Conditions of Irrigation and Fertilization**

Devices to be used for irrigation and fertilization are covered by the manufacturer's warranty.

### **B.8.4 Pest Control System**

#### **B.8.4.1. Fly Net**

A 40 Mesh fly net shall be used. 3 years warranty shall be given under good usage conditions. There shall be 160 pores in 1 cm<sup>2</sup>. The width of the net shall be 2 m.

During the opening and closing of the fly nets, they get stuck between the gears of the opening system and break up over time. In order to prevent this, a tensioning apparatus shall be used to prevent the fly nets from getting stuck in the gear by keeping the fly nets tense within the greenhouse system. In this way fly nets shall maintain their durability for a longer period of time.

Galvanized corner sheets shall be used for the length of the rack gear in order to protect the fly net at the corner point of each window system.

#### **B.8.4.2. Warranty Conditions of the Fly Net**

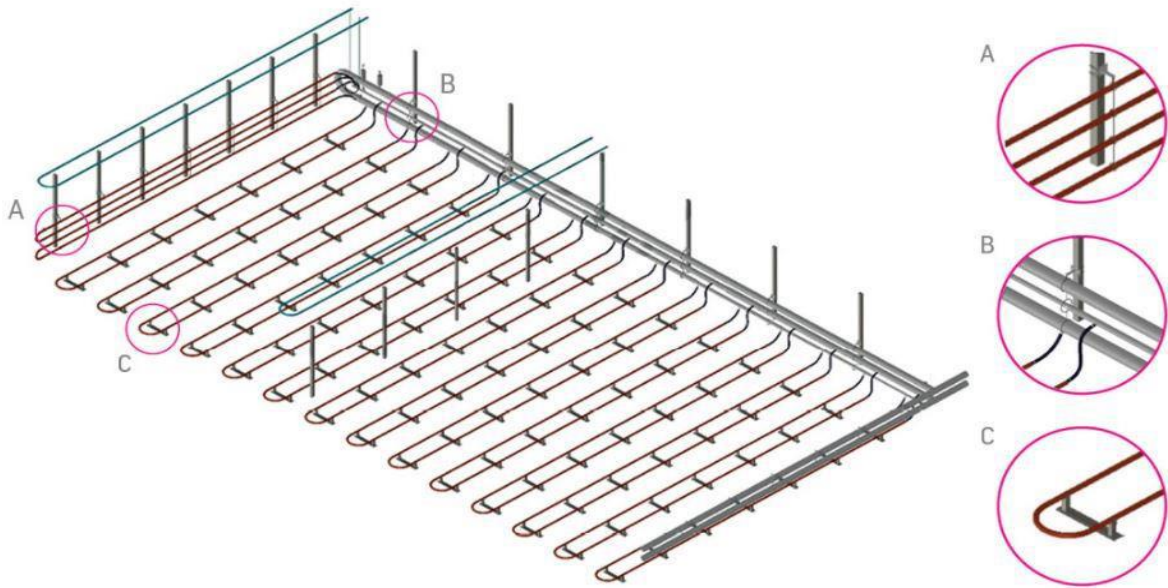
Tearing is out of warranty. UV additive should be guaranteed for 2 years.

### **B.9. Heating**

- At least 4 rows of pipes with a high heat permeability of at least 28 for heating purposes should pass under all flower pots (tables).
- Around the greenhouse (on the perimeter walls), at least 4 rows of pipes with a high heat permeability of at least 48 for heating purposes should pass.
- According to DIN 4102 standard, it will be at least B2 class.
- It will be corrosion resistant, calcification and rust free.



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The pipes mentioned in the previous article will be connected to the inputs and outputs of the electric heater in the heating system building; As will be mentioned in the next articles, in order to control these electric heaters, the desired air temperature will be controlled by the control units (PLC-Artificial Intelligence Controllers) in the main control center in a way that each tunnel greenhouse will be different or the same.

#### **B.9.1. Industrial Type Electric Heater Features:**

- Each water heater will have a minimum capacity of 1000 liters.
- Total kw equivalent to a minimum heating load of 94,000 kcal per tunnel will be calculated.
- Two 6 m<sup>3</sup> steel water tanks will be installed for electric heaters and these will be connected to the heaters (5 water heaters + 5 water heaters).
- It will be operable at variable flow rates.
- Each electric water heater will have the opportunity to operate independently of each other.
- The user should be able to set the temperature at 30 – 90 °C.
- The water heater will operate automatically with a digital thermostat and have a stainless inner tank feature.
- Three-phase electrical resistance power selection range will be 9-240 kW.
- Rockwool will be insulated

- There will be a safety thermostat against scalding.
- There will be a safety valve against excessive pressure.
- There will be cathodic corrosion protection.
- There will be a liquid level relay to prevent the resistances from working without water and burning.
- Silicone cables should be used.
- An alarm system that should work in any emergency situation will be housed.
- There will be flanged connection.
- There will be a thermostatic safety valve.
- There will be an overflow stone.
- There will be extra fixing apparatus.
- The panel will have a cooling fan.
- There will be circulation pump automation.
- There will be at least 2 years of warranty and 10 years of service support.

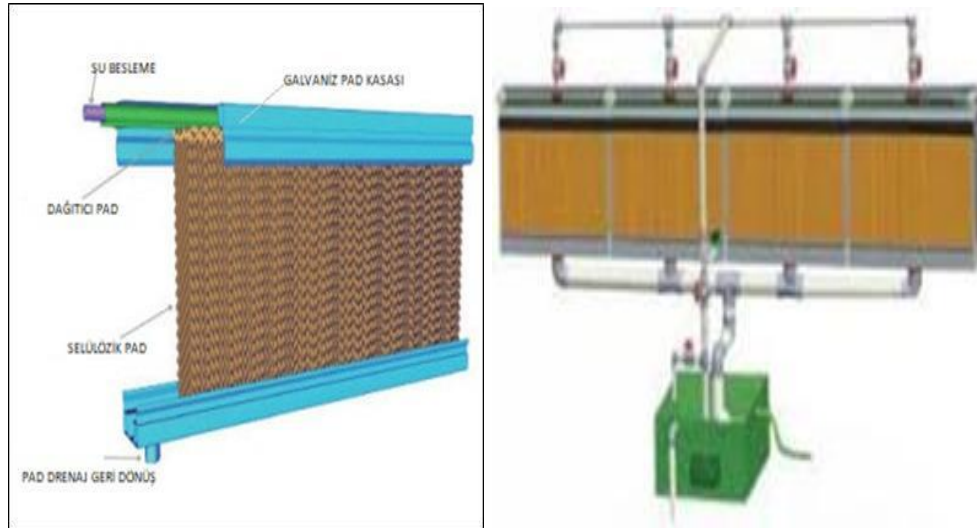
#### **B.9.1.2. Industrial Type Electric Heater Warranty Conditions**

There will be at least 2 years of warranty and 10 years of service support. The manufacturer's warranty terms apply.

#### **B.10. Cooling System**

- A cooling evaporative pad system with a width of 9.6 meters shall be used on one forehead of each tunnel.
- The pads shall have a minimum size of 100x3000x2000mm and will be cellulosic pads.
- The pads shall be designed as 1.2mm 100gr/m<sup>2</sup> galvanized sheet casing and self-corrugated.
- The system shall consist of a circulation pump, check valve, manual valves and PE min 3000 lt horizontal tank.
- Exhaust fans shall be 1490x1490mm in size and have automatic blinds.
- Fan flow rate shall be 44,000 m<sup>3</sup>/h
- Fans shall be selected as 380 V 50 Hz min 1.1 kW.
- Shall have an electrical panel that can work manually and with automation.

- The heating core material shall have high evaporation and homogeneous wetting properties. Water overflow shall not happen on the pad surface or its casing.



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### **B.10.1. Warranty Conditions of the Cooling System**

The manufacturer's warranty terms shall apply.

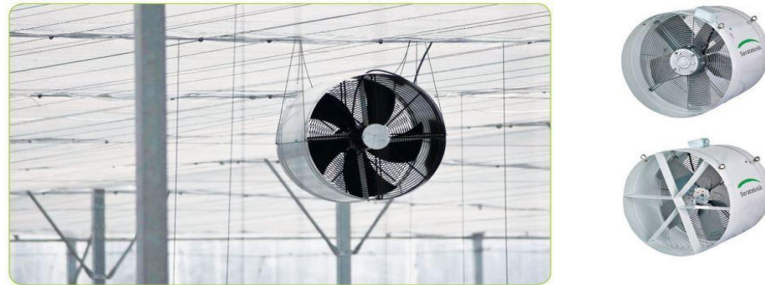
### **B.11. Circulation Fans**

For refrigeration air conditioning and air circulation in each tunnel greenhouse (1000m<sup>2</sup>), at least 3 circulation fans calculated using the fluid mechanics method and the technical specifications below shall be placed, and the electrical connections of



these fans shall be made as specified in this technical specification. Again, in order for these fans to be controlled like heaters, the desired air temperature-circulation shall be designed in a manner to be controlled by the control units (PLC-Artificial Intelligence Controllers) located in the main control center.

- Shall have a capacity of at least 7,400 m<sup>3</sup> / 0.4 KWh.
- Shall have a nominal blade speed of at least 900 RPM.
- Shall work with three-phase electricity.
- Shall be at least IP 55 protected.
- Shall be galvanized.
- Shall have an electrical panel that can work with manual and automation.



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#### **B.11.1. Warranty Conditions of the Circulation Fans**

Shall be covered by a 2 year warranty. Malfunctions that may occur in the motor due to voltage changes in electricity are not covered. The manufacturer's warranty terms shall apply.

#### **B.12. ScreenSystem**

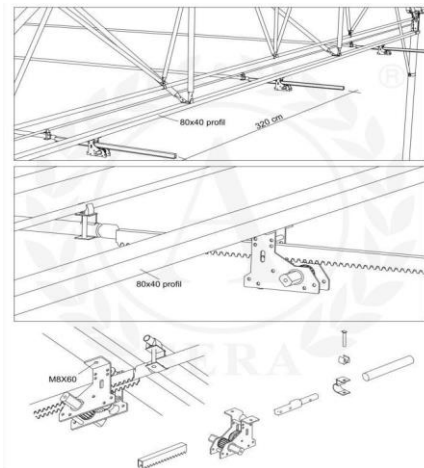
There shall be a retractable shading and heat screen along the entire greenhouse ceiling.

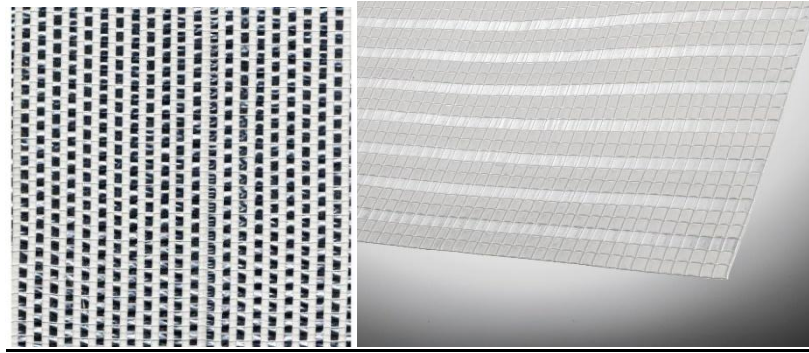
##### **B.12.1. Minimum technical specifications of the screen (curtain);**

- Shall be produced with ISO 9001, CE or Food Contact Compliance (EU and USA) certificates.
- Shall have UV protection.
- Shall be manufactured from aluminum-added or nylon-added reflective material.
- Shall provide 55% shading.

- Shall be placed in each greenhouse tunnel as a PUSH-PULL System.
- The system shall have a mechanism that moves through shaft pipes and rack gears driven by self-switching gearmotors..
- Said PUSH\_PULL system curtain mechanism shall be designed to be controlled by control units (PLC-Artificial Intelligence Controllers) in the main control center such as electric heater and fan for each tunnel.
- The motor shall be 0.75 kW 380V 50hz self-switched.
- For curtain mechanisms, extra reinforcement braces shall be mounted on the foreheads and in the middle of the greenhouse..
- Movement pipes of the mechanism shall be 32x1,5mm galvanized, curtain hanger pipes shall be 19x1,2mm aluminum.
- Mechanism shaft pipe shall be minimum 32x2.5mm galvanized pipe.
- The system shall operate at a 5 meter axle distance.
- The lower and upper carrier shall be supported with nylon threads and the thread support profiles shall be mounted on the middle axis of the greenhouse. The profile should be min 50x50x2,5 mm galvanized.
- The entire curtain system shall be mounted with bolts

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### **B.13.2. Warranty Conditions of the Curtain System**

Curtain textile is covered by a 5-year warranty, excluding tears and external factors.

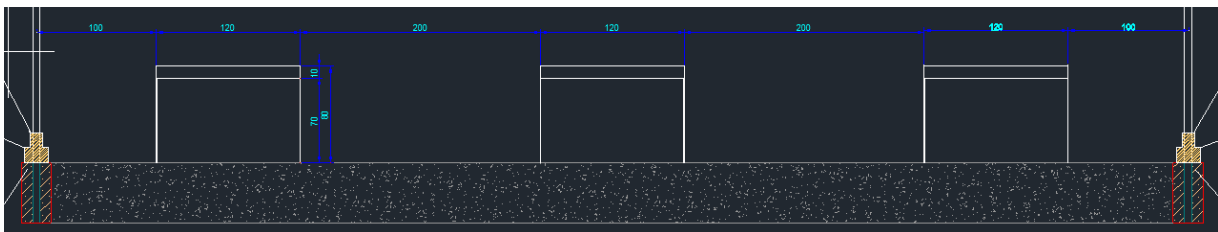
The mechanism is guaranteed for 2 years against assembly errors.

### **B.14. Plant Growing Benches**

3 benches consisting of galvanized 30-inch box profiles and brackets shall be placed at a width of 1.20 m and a height of 80 cm from the ground. The benches shall be detachable and designed as modular. Each piece shall be placed at a maximum length of 6 meters.

Perforated tables or knitted wire plates (pots) shall be placed on the benches that are planned to be placed, with a width of 1.20 meters and a length of approximately 100 meters throughout the greenhouse.

Tunnel greenhouses shall be purified from weeds and fungal diseases by applying crushed stone chips under these tables and a black plastic cover on them.



REPRESENTATIVE IMAGE



REPRESENTATIVE IMAGE

#### **B.14.1. Warranty Conditions of Plant Growing Benches**

Shall be under 2 year warranty

#### **B.15. Control Room**

A tunnel of the greenhouse shall be reserved for control, automation devices, irrigation system and storage. The roof covering of this section shall be in the form of canvas to reduce the sun effect. The canvas shall be at least 200 gr/m<sup>2</sup>. Shall have UV protection against harmful sun rays. The walls of this area shall be separated from the greenhouse by 8 mm polycarbonate coating. The floor of the area shall be reinforced concrete at least 15cm thick. The control room to be built shall vary depending on the needs determined by the employer and the design of the contractor company.

##### **B.15.1. Warranty Conditions of the Control Room**

The conditions for coating shall apply

#### **Section C: Solar Power**

The estimated electricity consumption for 10000 m<sup>2</sup> Greenhouse shall be 41kw/h by making use of natural ventilation and circulation (Solar panels will not be placed on greenhouse roofs, and only administrative buildings will be installed with panels, and therefore panels that will work with maximum efficiency will be selected) therefore, A Solar Energy System (GES) shall be created using a solar panel produced with Monocrystalline-PERC (Passivated Emitter and Rear Cell) technology (architecture) which will be able to produce DC electrical energy from at least 250 Watt / hour solar energy with a minimum performance ratio of 0.19.

#### **Technical features of the panels and inverters to be used:**

- The panels shall have the ability to reflect light.
- Photovoltaic panels shall be guaranteed for at least 10 (ten) years of product and physical strength, and 25 (twenty-five) years of linear energy. The linear energy guarantee shall be such that the system will provide at least 90% of the panel power at the end of 10 (ten) years and at least 80% at the end of 25 (twenty-five) years.
- The panels shall comply with TS EN 61215, TS EN 61730-1 and TS EN 61730-2 standards.
- The junction box of the panels shall be at least IP 65 protection class.
- All of the panels used shall be of the type and power specified in the project and panels of different models and powers shall not be used in the same system.
- The instantaneous power output tolerance of the solar panels shall be in the range of 0-5w.
- Panel frames shall be pressed and punched at the same time. There shall be drainage hole, grounding hole and mounting holes on the frame. Frames mounted with bolts shall not be accepted.
- The frame shall be made of corrosion resistant material and shall be stainless. The frame shall be designed in such a way that it can be assembled without drilling.
- The glass/plastic covering the solar panels shall not reflect sunlight. The glass shall be tempered in EN 12150 standards and have a transmittance level of at least 92%. The strength of the glass calculated according to the EN 12150 standard shall be 90 N/mm<sup>2</sup>.
- Solar panels and fasteners shall be capable of withstanding wind resistance at a speed of at least 130 km/h or 2400 Pascal.
- The panels shall operate in a temperature range of -40°C to +85°C, at the height of the area where the solar plant shall be installed, at a relative humidity of 0 to 85%, and the conformity of the panels to the conditions in question shall be guaranteed in writing by the manufacturer.
- Inverter input voltage range shall be kept wide (250V – 1000V)
- The system shall be accessible from any portable device with standard wifi and configuration shall be made using the inverter interface.

- The energy quality and security requirements of the network (islanding mode) shall be met in due manner.
- The system shall include the network support mode (reactive power support mode, etc.) feature that shall be requested by the network operators in the future.
- The system shall have remote monitoring, display and communication features, shall be able to be followed locally or over the internet, and data shall be provided as web and graphics.
- The efficiency of the inverter to be selected shall be 99% full sine and above.
- The total harmonic distortion of the inverter to be selected shall be 3% and below.
- The power factor of the inverter to be selected shall be nominally 0.995 and above. In addition, it shall be adjustable in the range of 0.95 capacitive and 0.95 inductive according to the reactive power to be provided.
- All interconnection cables and equipment that shall be needed in the relevant Solar Power Plant shall be supplied with the system.

Building roof and building facade area or to a suitable ground in the field (ground arrangement is under the CONTRACTOR's obligation) shall be allocated to the CONTRACTOR and the company will fix the state-of-the-art solar panels, whose minimum performance values are specified above, with steel constructions in these areas and therefore shall set up the system in the direction and angle that will use the sun most efficiently (under the direction of the consultant assigned by AMM - Goal International cooperation).

In order to disable the panels that receive insufficient or excessive photon energy and not to adversely affect the system, power optimizers with a minimum of 650 watts shall be used, one for each solar panel.

Depending on the area, building or roof where the system will be installed, the required amount of solar cables and solar connectors shall be used.

An AC collection panel shall be installed and the power generated from the panels shall enter the inverters, and the power from the inverters shall enter this AC collection

panel. In this process, all necessary AC cables and connectors shall be supplied and installed by the CONTRACTOR.

2 DC/AC inverters with a minimum rating of 27.6 kW or inverters with multiple independent maximum power point follower inputs shall be used.

- Shall be on Grid (connected to City Grid).
- The DC current obtained from the solar energy panels shall be converted to full sine AC current.
- For use in greenhouses and/or constructions, the system shall be wired up to the construction main and greenhouse main panels with the necessary AC cables.
- If the electrical energy used in greenhouses and constructions is more than the system produces; the system shall receive electricity from the city grid and, on the contrary, shall transmit electrical energy to the city grid in the allowed form and amounts. In both cases, the electrical energy sold to the city grid or purchased from the city grid shall be measured instantly with the help of meters. The system shall have the feature of notifying the total expenditures or the electrical energy sold (transferred) to the system in kW at any time desired.
- Shall have EN 50438 certificate.
- The system shall have configurable input voltage for home appliances and personal computers with LCD settings.
- Shall be compatible with mains voltage or generator power.
- There shall be circuit protection for situations such as Overload / Over Temperature / Short Circuit and shall be activated in a maximum of 0.5 seconds. This shall be reported as an error code to the automation devices that the entire system is connected to.
- The inverter input voltage range shall be kept wide (250V – 1000V).
- Access shall be provided via standard wifi from any portable device and configuration shall be made using inverter interface.
- The system shall meet the energy quality and safety requirements of the Network (islanding mode).

- The system shall include the network support mode (reactive power support mode, etc.) feature, which will be requested by network operators in the future.
- The system shall have remote monitoring, display and communication features, shall be able to be followed locally or over the internet, and data shall be provided as web and graphics.
- The efficiency of the inverter to be selected shall be 99% full sine and above.
- The total harmonic distortion of the inverter to be selected shall be 3% and below.
- The power factor of the inverter to be selected shall be nominally 0.995 and above. In addition, it shall be adjustable in the range of 0.95 capacitive and 0.95 inductive according to the reactive power to be provided.
- Shall have 3 phase output.

All wiring for solar energy system shall have above ground cable trays and hot-dip galvanized cable tray suitable for heavy use. DC cables to be laid underground shall be laid by passing through HDPE corrugated pipes in appropriate sizes. In addition, all cable channels shall be constructed in accordance with "TEDAŞ / Electricity Distribution Networks / Energy Cables Installation (Application) Procedures and Principles".

An LCD screen shall be placed in the main control center for the installation conditions specified in Article 38 to monitor the Solar Power Plant system. Inverters shall be installed in structures where Solar Power Plant panels are located.

All project design, engineering and TEDAŞ/EPDK acceptance contracts and plans of the aforementioned Solar Power Plant system shall be conducted by the CONTRACTOR.

If the connection agreement is approved by Turkey TEDAŞ/EPDK as LV (Low Voltage), the connection shall be established as LV and if the approval cannot be obtained, the MV (Medium Voltage) revision shall be requested by the contractor from TEDAŞ/EPDK and all engineering, project design, TEDAŞ/EPDK acceptances shall be conducted by the CONTRACTOR.



All related transportation, installation, electrical and mechanical assemblies of the aforementioned Solar Power Plant system shall be made by the CONTRACTOR.

The aforementioned Solar Power Plant system and all materials (cable, cable clips, connectors, etc.) to be used for the integration of this system into construction and greenhouses shall be provided by the CONTRACTOR and its distribution to buildings and greenhouses shall be made in underground cable channels in accordance with EPDK standards and regulations.

The CONTRACTOR shall establish a Solar System Control Center with an area of 15 square meters, 3 meters wide, 5 meters long and 2.65 meters high, within the 1000 m<sup>2</sup> area specified in B2.1 the greenhouse, for the automation of all these systems, which are planned to be monitored and controlled from a single point. The Solar System Control Center shall be established in the Greenhouse outdoor area in Ready-made or Prefabricated form as the CONTRACTOR deems appropriate. The CONTRACTOR shall propose the location of the Solar System Control Center in their technical application.

The CONTRACTOR shall comply with the Occupational Health and Safety Management System standards of the Republic of Turkey.

The CONTRACTOR is obliged to meet the above conditions and the conditions in the administrative specification exactly during the establishment of the smart greenhouse system that can produce all its own energy, and also has to provide the items listed below:

- All panels to be installed shall have power supplies that will be activated in case of power cut, and ventilation or air conditioning as a precaution against heating.
- All cables and components shall be labeled according to the name indicated in the diagram. The error code, sensor or cable name shall be indicated. In case of any failure the design shall be easy to find.
- The CONTRACTOR shall access and intervene in the entire system with the permission of GOAL .

- The CONTRACTOR shall prepare the recommended spare parts list for the equipment / system and shall periodically provide the checklist for the system components.
- The CONTRACTOR shall forward the calibration procedure to GOAL and AMM for all equipment used.
- In any case caused by system failure, the CONTRACTOR shall provide the technical authorized contact person to GOAL for consultation and immediate problem solving for all mechanical, electrical and software problems.
- The CONTRACTOR shall comply with the safety specifications and the risk analysis of all machinery and equipment in terms of safety shall be made by the CONTRACTOR. The CONTRACTOR shall cooperate with the third party companies / institutions that will prepare the audit compliance report and sign it as the responsible party. According to these analyzes and reports, the CONTRACTOR shall take the necessary security measures. The CONTRACTOR shall also notify GOAL of the signs to be hung.
- The Contractor shall deliver the mechanical assembly and electrical, pneumatic, lubrication, foundation, plant condition and schematic drawings to GOAL within 2 weeks following the signing of the contract. These presentations shall include the following items:
  - A hard copy of each drawing,
  - Electronic copy of each drawing in DWG format (ACAD compliant),
  - Any specially designed system, fixture, etc. shall be fully detailed and become the intellectual property of GOAL.
  - List of Consumables and Spare parts required for 2 years of operation and standard maintenance (file format must be provided in both .xls and .pdf). This list shall include recommended suppliers and current pricing as well as delivery times. A spare part offer shall be added as an option to the final offer.
  - Each interface and document shall be submitted to GOAL in Turkish by the CONTRACTOR (touch screens, reports, etc.). If documents are available in other languages those versions should also be submitted.

- The software files shall be delivered to GOAL completely and in CD or external disk format by the CONTRACTOR.
- Every machine, equipment and component to be used by the CONTRACTOR in the above-mentioned systems shall have a CE declaration. Any non-compliance with the CE shall be promptly remedied under the contractor's responsibility.
- After the CONTRACTOR has installed the entire system or intermediate systems, GOAL and AMM shall carry out the final test work together with the existing supplier representatives. If the test becomes successful, supplier representatives shall train GOAL and AMM staff.
- A list of periodic system checks shall be communicated to GOAL and AMM prior to training.
- If any item in the timeline is not completed according to plan, GOAL shall be notified immediately.
- All deliveries within the system shall be made by the CONTRACTOR.
- In cases where subcontractors are used, the installation costs, including the travel expenses of the subcontractors, shall be borne by the CONTRACTOR.
- The CONTRACTOR shall bear all costs related to the installation inspection.
- The CONTRACTOR shall cover all risks directly related to the installation with its own insurance.

#### **Section D: Training requirements**

- A training session shall be held during pre-admission. This training session shall involve the project manager / process engineer and possibly the production manager and a maintenance staff member. This training session shall include general operation, maintenance, minor repair and troubleshooting of the equipment. This session shall be primarily for the operator and shall include operation and minor troubleshooting.

- Training documents and/or videos shall be prepared by the CONTRACTOR after the Installation and delivered to GOAL and AMM or other institutions.

### **Section E: General Requirements**

- The CONTRACTOR shall establish a main point of contact (a project manager). This contact shall frequently communicate directly with the GOAL and AMM project manager during the project to provide updates.
- Detailed specifications shall take precedence. In the event of a discrepancy, the detailed specifications shall be followed. GOAL and the AMM project manager shall approve all exceptions in writing in the form of a document signed by both parties. The Supplier shall submit these lists of exceptions (one each for the General and Detailed Specifications) as separate pages in the proposal.
- During the warranty period, the CONTRACTOR (not the component supplier) shall be responsible (at no charge) for prompt repair or replacement of defective material, including parts and labor/travel costs. If the GOAL employee cannot fix the problem over the phone, supplier technicians shall be provided on-site by the CONTRACTOR to fix the problem within 48 hours at the supplier's expense.
- Outside of the warranty period, the CONTRACTOR shall be responsible for resolving the error or supplying spare parts within 48 hours.
- Any machine problem that interrupts production shall be displayed as an error code on the control panel.
- Alarms and system interruption control shall be provided to prevent unwanted system operation.
- The proposal for all equipment shall include the equipment price, delivery schedule and exceptions to specifications.
- The CONTRACTOR shall comply with the New Machinery Directive 2006/42 / EC, the Low Voltage Directive 2006/95 / EC and the Interaction Electromagnetic Compatibility Directive 2004/108 / EC, which came into force on 29.12.2009.

### **Section F: AUTOMATION**

All electrical equipment and connections to operate in tunnels, greenhouses and the main control center shall comply with the relevant standards and specifications of EPDK (Energy Market Regulatory Authority), TEDAŞ, TOROSLAR EDAŞ and EMO (Chamber of Electrical Engineers).

All top and side covers of the greenhouse shall be controllable with gearmotors. The position information of each of the doors indicates the location, and the information shall flow to the controllers in the main control center and shall be monitored from this control center.

Greenhouse heating, cooling, ventilation operations shall be done with the climate automation device and the sensors inside, and in addition to this, manual and PLC control shall be made for precautionary purposes.

In order for the automation device module to obtain smooth data and save energy; there shall be heat, CO<sub>2</sub> (carbon dioxide), CO (carbon monoxide), humidity sensors in the pots, 1 in every 10 meters and outside the greenhouse, there shall be wind direction and intensity sensors.

As a result of deep-learning from these data; the automation module shall decide whether the doors are opened or closed, the greenhouse is heated and cooled, ventilated, sprayed, watered or fogged.

The automation module should be capable of collecting, classifying, selecting valuable data, and performing self-learning deep learning.

The computer/server where the automation module will be operated is 11th generation with I9 intel processor, Windows 11 pro operating system, at least 32 GB of ram, at least 8 GB 256-bit graphics card, at least 32 inch Full HD screen and to be able to do all these operations, a minimum of 2 TB ( 1 TB + 1 TB) (terabytes) internal, 50 TB external storage. Considering that it will get very hot while performing these operations, the cooling system should be added to the system internally and externally. Data from all the aforementioned covers will be combined in a main point, either wired or wirelessly, at this point, it should be controlled by manual buttons as well as by PLC and Artificial intelligence application. All aforementioned electrical or electronic components data will be combined in a main control center, either wired or wirelessly,

at this point, it will be controllable both with manual buttons as well as with PLC automation.

Greenhouse heating, cooling, ventilation, fogging, energy curtain opening/closing and fertilization operations will be done by Artificial Intelligence and for additional precautionary purposes; It will also be done manually. Temperature, humidity, light, carbon dioxide and photosynthetic active radiation (PAR) sensors will be placed on an area of 1000 square meters for automation (for the artificial intelligence module to work properly so that it can obtain correct data). In addition, a meteorology station will be placed outside the greenhouse. As a result of deep-learning obtained from these data, the artificial intelligence module will decide whether to open and close the doors, to heat and cool the greenhouse, to ventilate, irrigate or fog it. Solar energy systems will be managed by an artificial intelligence-based algorithm for solar energy generation and distribution as a separate algorithm on the hardware system to be installed for artificial intelligence, and thanks to this algorithm, Turkey is responsible for providing 220v 50HZ Full Sine, the power parameters requested by EMRA. The aforementioned algorithm should also be able to deactivate the faulty panels and return them to the system when corrected. All automation materials, software and sensors; It will consist of products that are actively used in greenhouse cultivation and that are internationally accepted.

After the installation, the CONTRACTOR will be obliged to provide sufficient training to the personnel of the institution on the use of all machinery and equipment.

Each heater will be positioned in the tunnel greenhouse that it will heat itself. Each tunnel will be individually controllable for the greenhouse and their working principles will be allowed to be controlled by the automation systems mentioned above. Communication connection will be made to these automation systems.

### **SectionG: Manual Seeding Machine**

The CONTRACTOR is also obliged to supply and install 1 manual seeding machine in the Greenhouse.

#### **Technical Specifications of Manual Seeding Machine:**

- There shall be a vibrating seed hopper made of stainless steel.
- There shall be a vacuum rod with holes on it to receive the seeds.

- After taking the seeds, the stick shall be brought to the desired order on the viol and the seeds shall be left in the viol compartments.
- To seed the next row, the viol shall be pushed by hand and the operation shall be repeated.
- The vibration of the seed chamber and the vacuum power in the rod shall be easily adjustable for seeds of different sizes and weights.
- Along with the machine, there shall be 3 (three) seed catching sticks in different criteria suitable for the seeds to be preferred / determined by the administration.
- For small seeds (lobelia and pansy) the hole diameter in the tube shall be 0.3 mm at most.
- For larger seeds (clipped marigolds, etc.), the hole diameter in the tube shall be 0.5 mm at most.
- There shall be more holes in the tube depending on the request of the ADMINISTRATION.
- The machine shall be in a set with a small compressor that can be easily carried anywhere.

## **SectionH: Machinery and Electrical Integration**

### **New Machinery Directive 2006/42 / EC:**

- In general, the directive sets free trade conditions for machines, interchangeable equipment, safety components, chains, ropes and unfinished machinery, among others.
- The following points are very important for any machine project and form the basis of project manager involvement during the planning phase, pre-acceptance and final acceptance of the target:
  - The manufacturer's obligation to perform a risk assessment, on,
  - CE mark and manufacturer's declaration of conformity,
  - Providing the user manual,
  - Prioritization of preventive measures (elimination of risks by design).
- The Low Voltage Directive and the Machinery Directive do not prevail each other. If there is a risk, the assessment indicates a higher electrical risk, then the Low Voltage Directive applies and vice versa. Electromagnetic compatibility always applies.

- The Plant / Machine shall bear the CE label. The Supplier Company shall take all these necessary precautions. Matters not specified in the specification are the basic reference points of CE standards. The declaration of conformity and the risk analysis result report shall be attached to the file.
- All components used in the system shall first be guaranteed by the subcontractor company from which the contractor has purchased the components.
- All spare parts, their suppliers, order codes, quantities, specifications, dimensions, hardness levels shall be defined in the spare parts list.
- For a 10-year period, all preventive and planned maintenance activities shall be listed and scheduled on a timetable. Change periods and active replacement periods for critical spare parts shall be listed.
- All parts shall be easy to access for autonomous and planned maintenance activities. Fewer parts (time savings) to be removed during maintenance activities shall be considered in the design.
- All filters, seals, O-rings etc. that need to be replaced periodically shall be shown in the drawings and coded accordingly. Replacement and cleaning periods shall also be specified in a list.
- Safe working limits should be indicated in green and extreme values in red.
- All descriptions, instructions and labels on the machine, equipment and component shall be in Turkish.
- Start-up instructions, autonomous maintenance instructions, periodic maintenance instructions, diagnostic feedback, and troubleshooting and repair instructions shall be prepared and made available in triple printed hard copies.
- All working pressures shall be displayed on the machine.
- There shall be a flow meter or gauges on the inlet and outlet side to measure the consumption of heat, gas, oil, water and all other liquids.
- The SUBCONTRACTOR shall guarantee the spare parts supply and service need for at least 10 years.
- Chain, gear, belt, reducer and other transmission systems shall be securely closed, but all must be visible to the naked eye for control.



- For systems with intensive lubrication periods, there shall be automatic or manual self-lubricating systems.
  - During the design phase of the project, the sustainability of the system shall be taken into account and optimal design solutions shall be provided.
  - Control areas shall be visualized.
  - The direction of rotation of the motors and the inlet and outlet directions of all piping shall be labeled. Red color shall be chosen for hot water lines, blue color for cold water lines and black color for return arrows.
- Panels and field assembly shall be made according to the following standards:
- The power supply between phases is 400 volts, phase, neutral 230 volts AC and 50 Hz.
- The Machine/Equipment shall bear the CE label. The Supplier Company shall take all these necessary precautions. Matters not specified in this specification are the basic reference points of CE standards. The declaration of conformity and the risk analysis result report shall be attached to the file.
- The machine shall be designed according to electromagnetic compatibility 2006/42 /EC EC (machine directives) 2004/108 / EC EMC and 2006/95 / EC LVD, low voltage directive.
- Unless otherwise specified, power and control cabinets shall be either floor-mounted or wall-mounted cabinets, depending on the usage;
- IP55 Security class
  - DKP sheet product
  - Electrostatic powder paint shall be made.
- The electrical panel shall contain the appropriate black and yellow color label indicating the voltage level and lightning flash.
- Wall mounted cabinets shall be made of 1.5 mm thick sheet metal and the mounting plate shall be galvanized sheet. Floor-mounted cabinets shall be 2mm thick sheet metal and the mounting plate shall be galvanized sheet.
- Cabinets smaller than 40\*60cm shall be polyester if needed.

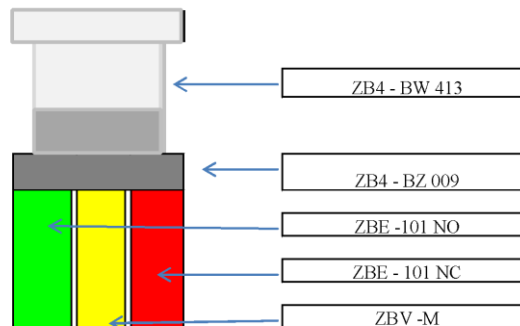
- There shall be a separate main switch and undercurrent protection fuse for power supply at the entrance of each of the independent cabinets.
- Every machine / equipment with an installed power of 10 kW or more shall be of the Entes MPR63 type and have an electronic three-phase electricity meter and the pulse leads shall be connected to the terminals.
- When dispensing bars in the cabinet, they shall be labeled as follows:
  - L1 bar is red, L2 bar is yellow, L3 bar is purple and Neutral bar is white.
  - Insulated bars shall be labeled and the label shall be 2cm wide.
  - The vertical mounting bars from left to right shall be as L1, L2, L3; front-to-back neutral, horizontal mounting shall be as L1, L2 and L3
  - Grounding rods shall be 5 cm wide and with yellow-green stripes and the grounding symbol shall be displayed.
  - The bars shall be covered with plexiglass covers against the contact of unauthorized persons.
  - There shall be a standard voltage label showing the voltage level on the plexiglass cover.
  - Gerekirse faz numaralandırma rölesi bulunmalıdır.
- On the input side of the main cable, the black1 colored wire shall be matched to L1, brown colored to L2, black2 colored to L3 and yellow-green colored to ground.
- The main grounding cable with a cross section of 70 mm<sup>2</sup> shall be cabled with a yellow-green outer insulated cable, for sections higher than 70 mm<sup>2</sup> a grounding rope shall be used.
- Neutral and ground lines shall never come into contact.
- Ground terminals in the cabinet shall be in standard norms and all peripheral equipment shall be grounded.
- All wire colors in the cabinet shall meet the standards in terms of color and insulation. "Unit E - Displays electrical circuit wiring colors"
- In terminal connections, there shall be phase separation between the phase plates, there shall be an end plate at the end of the groups, the terminals shall be numbered and the numbers shall be recorded in the circuit diagram.

- Power components and Control components (PLC, converter, etc.) shall be installed in separate sections in the cabinet and EMC protection shall be a high-quality type.
- In wall-mounted cabinets, cooling inside the cabinet shall be done with ventilation and fans. Floor-mounted cabinets shall be cooled and used to meet the heat flow requirement. If AC was not installed during the initial installation and later on when needed, GOAL reserves the right to have the supplier install the AC.
- In floor-fixed cabinets, lighting shall start automatically when the door is opened.
- Control cabinets shall be designed to have 25% spare free space for other needs.
- There shall be a single-phase Turkish norm socket fed with a separate fuse and rail mounted.
- The control circuit shall be designed for 24 VDC.
- All AC motors shall be protected by a circuit breaker as standard.
- AC motor drives shall be of the filtered supply type.
- All cables shall be selected as h: 6cm or h: 4cm according to the channel and all channels shall be closed.
- Cables at raceway outlets shall be protected with locking fittings and spiral cable hoses.
- All cable ends shall be insulated with a cable ferrule.
- All screw connections shall be equipped with washers.
- All end influencers shall be labeled at both ends and the labeling shall be the same as shown in the diagram.
- Standard AC motors cable connections shall be 4X2.5 mm<sup>2</sup> Fvv-n and speed control motor connections shall be 4X2.5 mm<sup>2</sup> EMC shielded cables.
- All sensor types (photocells, inductive sensors and limit switches) shall be protected against knocks, jams and knocks.
- All sensor types shall have socket connections.
- All valve and sensor sockets shall have LED indicators.
- There shall be the required number of emergency stop buttons that meet Turkish safety rules (with the button label "Emergency Stop").
- All equipment (E-stops, fence switches, light barriers, etc.) shall meet safety standards and norms.

- Labels on the cabinet and peripheral equipment shall correspond to the concerned schematic and all schematics shall be updated.
- When necessary, the distribution box shall only be used in accordance with IP66 norms and all connections shall be connected with terminals.
- To make the I/O units more visual they shall be as shown below



- The verification buttons for the lines shall be as shown below and the lamp shall be green.



- For wire-connected moving parts, special precautions shall be taken against sudden impacts.
- The whole project shall be handled on the basis of sustainability. GOAL has the right to make the requested changes to the supplier company free of charge until the preliminary acceptance date.
- The cabinet (Telemecanique XVB series) shall have audible alerts and light status indicators and mode switches.
- Stationery cables in the facility shall be routed in a raceway and mobile cables shall be protected with protective hoses and locking fittings as shown below.



False



Correct

- There shall be 15% spare I/O space for further needs for PLC applications.
- Subcontractor Company shall present the electrical diagrams in three copies as hard and soft. Electrical projects shall include these items listed below.
  - External dimensions of the cabinet
  - Power circuit diagram
  - Cabinet layout (terminals, relay and all equipment shown in layout)
  - Control circuit diagram
  - Terminal plans
  - Power plant electrical scheme
  - Layout for end effectors, actuators and sensors I/O
  - Spare parts list describing details and order codes
  - Installation instructions
  - Spare parts list
  - CE declaration
  - Risk analysis report
  - 10-year scheduled maintenance timeline
  - Autonomous maintenance periods and zones
- All programs and parameters shall be submitted to the maintenance department as soft copy on DVD. All programming shall be open source; there shall not be any party specifically or completely blocked in the program.
- The plant/machine shall be designed based on the energy efficiency margin.
- The documentation shall consist of these items;
  - The component tree diagram shall demonstrate “subplants, substations, subcomponents”.
  - Electrical, Pneumatic and Hydraulic circuit diagrams shall be prepared both in hard copy and soft copy. (Electrical diagrams shall be in both ".pdf" and "eplan projects" format)

## ANNEX 1- Technical Specifications

- If a "vector" drive is to be used in AC motor drives, a single scope shall demonstrate the Velocity-Scope curves containing the entire loop. For the respective drive conditions, it shall be taken into account that the respective system does not exceed 150% of the motor rated current.
  - A list of parts needed periodically and their periods shall be prepared.
  - A list shall be prepared showing the points that need to be checked periodically and their norm values (position, temperature, etc.) and times. All checkpoints shall be visualized according to the TPM concern.
- As part of the project acceptance period, machine usage training for operators and machine/plant maintenance and installation training for maintenance technicians shall be provided and all necessary documentation shall be prepared.
- Button colors to be used in cabinets and control boxes shall be as in the diagrams

