# SPECIFICATIONS

**PROGRAM TITLE:** Potato R&D Center in CAR
**PROJECT 3 TITLE:** "Application of Improved Protective Cultivation System and Storage Technique for Potato Seed Production"
**PROJECT DESCRIPTION:** Construction of Two Fix Vent Greenhouse with Aeroponics and Drip Irrigation System
**LOCATION:** NPRCRTC Demo Farm

**PLANS and SPECIFICATIONS:** All drawings, small scale and detail drawings are intended to collaborate with the specifications and to form part thereof, where figures are given, they are to be followed in preference to measurement by scale. Anything shown in the drawings and not mentioned in the specifications or vice-versa or anything not expressly set forth in either but which is reasonably implied shall be furnished and installed as thought specifically shown in mentioned both.

## I. GENERAL OVERVIEW

The construction of the two fix vent greenhouse is to enclose two irrigation system, the aeroponics and drip irrigation system. This construction project shall meet the following objectives.

Objectives: (1) Improve aeroponic facilities
Functional aeroponic system that can produce 15,000 pcs of foundation seeds
(2) Evaluate the application of drip irrigation in conventional seed production.
An improved conventional technique that can produce at least 10,000 pcs of seed tubers.

These greenhouses will provide reliable enclosure within which an environment favorable for potato crop. The greenhouses will be constructed with the ridge in a North to South orientation to reduce interior shading from the structure itself on the plants. It shall also be located where it will get adequate sunlight. The site shall be well drained and there shall also be ample supply of irrigation water.

### 1. DELIVERY, STORAGE AND HANDLING OF MATERIALS

1.1 All materials shall be so delivered, stored and handled as to prevent the inclusion of foreign materials and the damage of the materials by water or breakage.
1.2 Packed materials shall be so delivered and stored in the original packages until ready for use.
1.3 Packages showing evidence of water or other damages shall be rejected.

### 2. WATER

Water to be use in mixing concrete shall be free from oil, alkali and organic matter on other deleterious substance and shall be reasonably clear and clean. The use of brackish water is not allowed.

### 3. PORTLAND CEMENT

Portland cement shall be, of any standard commercial brand in standard 40kgs.

### 4. FINE AGGREGATES

Fine aggregates or sand used in composition of concrete shall be clean, strong and uncoated grains, free from injurious amount of dust, lumps or flaky particles and shall not contain more than 5% clay.

### 5. COARSE AGGREGATES

Coarse aggregates or gravel shall be well graded as top size ranging from 6mm up to the size, which readily pass between all reinforcing bars and between reinforcement and forms

### 6. METAL REINFORCEMENT

6.1 Reinforcing bars shall be standard commercial, deformed steel such as steel or other locally available equivalent.
6.2 Steel bars shall be free from dust scales, splices in bars shall be made at the critical points of maximum stresses.
6.3 Tie wire shall be standard commercial G.I. wire gauge no. 16

### 7. CONCRETE HOLLOW BLOCKS

## SPECIFICATIONS

7.1 Where the use of CHB is indicated, they shall be true to size without cracks or spurs or other defects which may impair their strength or durability. Standard hollow blocks with three void cells and two half cells at both ends having a total of four.
7.2 All concrete hollow blocks shall be a product of a reputable manufacturer.

8. EXECUTION
Construct form sufficiently tight to prevent leakage securely braced to prevent displacement and to support construction loads, forms shall not be removed until concrete is set.

9. CONCRETE MIXER
Use of concrete mixer
9.1 Class "A" concrete-(20Mpa concrete) for all columns, footings, beams, stiffener, slabs mixture (1:2:4)
9.2 Class "B" concrete-(17.5Mpa concrete) for all wall footing, slabs and stairs on fill and CHB fillers mixtures (1:3:5)
9.3 Class "A" mortars-1:3 by volume for all plastering works.

10. RIVETS and BOLTS

10.1 Rivets and washers shall be galvanized mild iron and shall not be less than 5mm diameter and 10mm length.
10.2 Bolt 3/8 X 2" with Nut and Washer shall be galvanized.
10.3 Bolt 3/8 X 1 1/2" with Nut and Washer shall be galvanized.

11. PAINTS
11.1Aluminum paint-used as primer, mid-coat or finish coat. Heat resistant up to 250°C
11.2Red Oxide Primer undercoat is a quality interior-exterior rust and corrosion inhibiting metal **primer**. 45-560 provides excellent wetting and adhesion to ferrous and non-ferrous metal surfaces
11.3Roller- Brush used to distribute paints to the intended material.

12. GI PIPES
Shall be used as frames of greenhouses and benches for bench/beddings, fabricated different sizes schedule 40.

**PIPE SCHEDULES & WEIGHTS**

| | | SCHEDULE 40 | | SCHEDULE 80 | |
|---|---|---|---|---|---|
| NOMINAL PIPE SIZE | OUTSIDE DIAMETER | Wall Thick. | Wt. Per Ft. | Wall Thick. | Weight Per Ft. |
| 1/8 | 0.405 | 0.068 | 0.245 | 0.095 | 0.315 |
| 1/4 | 0.540 | 0.088 | 0.425 | 0.119 | 0.535 |
| 3/8 | 0.675 | 0.091 | 0.568 | 0.126 | 0.739 |
| 1/2 | 0.840 | 0.109 | 0.851 | 0.147 | 1.088 |
| 3/4 | 1.050 | 0.113 | 1.131 | 0.154 | 1.474 |
| 1 | 1.315 | 0.133 | 1.679 | 0.179 | 2.172 |
| 1-1/4 | 1.660 | 0.140 | 2.273 | 0.191 | 2.997 |
| 1-1/2 | 1.900 | 0.145 | 2.718 | 0.200 | 3.631 |
| 2 | 2.375 | 0.154 | 3.653 | 0.218 | 5.022 |
| 2-1/2 | 2.875 | 0.203 | 5.793 | 0.275 | 7.661 |
| 3 | 3.500 | 0.216 | 7.576 | 0.300 | 10.250 |
| 3-1/2 | 4.000 | 0.226 | 9.109 | 0.318 | 12.510 |
| 4 | 4.500 | 0.237 | 10.790 | 0.337 | 14.980 |
| 5 | 5.563 | 0.258 | 14.620 | 0.375 | 20.780 |
| 6 | 6.625 | 0.280 | 18.970 | 0.432 | 28.570 |
| 8 | 8.625 | 0.322 | 28.550 | 0.500 | 43.390 |
| 10 | 10.750 | 0.365 | 40.480 | 0.500 | 54.740 |
| 12 | 12.750 | 0.375 | 49.560 | 0.500 | 65.420 |

13. ALUMINUM STEELS AND METALS
13.1ALUMINUM LOCKING PROFILE 3M with Zig Zag wire, fixing greenhouse poly sheets. Light weight but durable with smooth edges and flat bottom.
13.2STEEL MATTING -2"by 2" with wire diameter 5mm pre-fabricated, high-tensile strength steel wire into square or rectangular mesh and more uniform stress distribution.
13.3PLAIN SHEET G26-Bending of plain G.I. sheets for various accessories shall be done by machine press. Hand bending shall not be permitted. Ridge, hip rolls, valleys, flashings and counter flashings, gutters and downspouts, when ever required, shall be fabricated from plain G.I. sheets gauge No. 26.
13.4ANGLE BAR 1" ¼ "-conforming to ASTM A36 specification

14. PLASTICS

14.1UV PLASTIC 200 MICRONS- Made of durable low density polyethylene material. It should provides higher light transmission for plant photosynthesis. UV resistant for prolonged sun exposure and creates an optimum greenhouse environment. It shall cover the whole greenhouse structure. Easily cut and manipulated.

14.2BLACK FILM 7MX90M 200 MICRONS

14.3POLYCARBONATE SHEET (OPAL) 4"X8"-ductile properties allowed it to be cut or cold formed on site and at room temperature without cracking or breaking, allowing to make small angle. High mechanical retention up to 140° C , high toughness, intrinsically flame retardant.

15. AEROPONIC SYSTEM and DRIP IRRIGATION SYSTEM

This item shall consist of furnishing and installation of aeroponics and drip irrigation system, inclusive of all pipings and pipe fittings connections,valves, controls, electrical wiring connection and all other accessories ready for service in accordance with the Plans. Materials to be installed shall be from approved product of reputable manufacturer and distributor. Company should be authorized distributor of aeroponic materials and shall have excellent understanding of the product, use, installation and services.

## II. SCOPE OF WORKS

**1. Two (2) GREENHOUSES for AEROPONIC SYSTEM and DRIP IRRIGATION SYSTEM**

**1.1. Greenhouse**

Size: Length= 32 meters
Width=8 meters
Height=5 meters

Framing materials:

GI pipes will be the frames of the greenhouse. That includes the post: foundation, diagonal, balcony; braces: balcony, arch, ante-room, diagonal roof, apex and film roll up. The frames shall adequately support covering and any hanging suspended from the framing. It shall also withstand maximum wind gust if 250 km/hr.

These GI pipes varies in nominal pipe size but all should be schedule 40. These are to be fabricated with different length according to its purpose. After all cutting and welding has been performed, those areas where bare metal is exposed by cutting or welding shall be painted. The end of the pipes to be installed are fastened by the use of bolt with nut and washer. There will be a gutter to be connected and it shall be sloping at 2% for drainage of water. Gutters shall be connected through blind rivets after drilling holes in the post. The Aluminum locking profile will be used to lock the plastic covering in to the poles. It should be compatible with the plastic covering of the greenhouse.

**PIPE SCHEDULES & WEIGHTS**

| | | SCHEDULE 40 | | SCHEDULE 80 | |
|---|---|---|---|---|---|
| NOMINAL PIPE SIZE | OUTSIDE DIAMETER | Wall Thick. | Wt. Per Ft. | Wall Thick. | Weight Per Ft. |
| 1/8 | 0.405 | 0.068 | 0.245 | 0.095 | 0.315 |
| 1/4 | 0.540 | 0.088 | 0.425 | 0.119 | 0.535 |
| 3/8 | 0.675 | 0.091 | 0.568 | 0.126 | 0.739 |
| 1/2 | 0.840 | 0.109 | 0.851 | 0.147 | 1.088 |
| 3/4 | 1.050 | 0.113 | 1.131 | 0.154 | 1.474 |
| 1 | 1.315 | 0.133 | 1.679 | 0.179 | 2.172 |
| 1-1/4 | 1.660 | 0.140 | 2.273 | 0.191 | 2.997 |
| 1-1/2 | 1.900 | 0.145 | 2.718 | 0.200 | 3.631 |
| 2 | 2.375 | 0.154 | 3.653 | 0.218 | 5.022 |
| 2-1/2 | 2.875 | 0.203 | 5.793 | 0.275 | 7.661 |
| 3 | 3.500 | 0.216 | 7.576 | 0.300 | 10.250 |
| 3-1/2 | 4.000 | 0.226 | 9.109 | 0.318 | 12.510 |
| 4 | 4.500 | 0.237 | 10.790 | 0.337 | 14.980 |
| 5 | 5.563 | 0.258 | 14.620 | 0.375 | 20.780 |
| 6 | 6.625 | 0.280 | 18.970 | 0.432 | 28.570 |
| 8 | 8.625 | 0.322 | 28.550 | 0.500 | 43.390 |
| 10 | 10.750 | 0.365 | 40.480 | 0.500 | 54.740 |
| 12 | 12.750 | 0.375 | 49.560 | 0.500 | 65.420 |

*Figure 1 GI PIPES*

## SPECIFICATIONS

Covering of the greenhouse is plastic and it shall be clear enough to provide optimum light transmission. should be able to reflect or absorb infrared radiation, which plants cannot use and which cause greenhouse interiors to overheat. It shall have a minimum thickness of 130 mic. Polyethylene sheet roofing provides good protection from rain and has low investment and need less structural components. UV Plastic 200 mic will be used for the covering of greenhouse. It is easy to install, durable enough to withstand wind gust of 150kph. Anti-insect net with 32 mesh will be installed to screen insects from coming inside the greenhouse. It will be overlapping with the plastic.
Greenhouses to be covered in polyethylene usually do not require an extensive foundation, but the support posts shall be set in concrete footings. The post then will be fixed to the ground through this concrete.

### 1.2. REINFORCING STEEL.

**a. Reinforcing the concrete floor slab**

The reinforcement of slab flooring is for both greenhouses.

There is a need to reinforced the concrete because concrete alone is not a good structural material for there's so many tension stresses that it can't resist by itself. So, by adding reinforcement, it will improve its strength. Reinforcement within concrete creates a composite material, with the concrete providing strength against compression stress while the reinforcement provides strength against tensile stress. Tensile stress is the resistance of an object to a force tending to tear it apart while compressive stress is a force that causes a material to deform to occupy a smaller volume.

Deformed bar are steel bar with protrusions, a bar that is intended for use as reinforcement in reinforced concrete construction. This are the main part for R.C.C structure. So it is important that they will be tested for their tensile stress. This information may be useful in comparisons of materials, alloy development, quality control and design under certain circumstances. Given that these RSB have undergone tensile stress it is important to know what size is applicable to be used for agricultural structures such as greenhouse. For they are going to carry dead (benches) and live loads (plants and people)

Table 1.2 Steel bars weight table

| Nominal Diameter (mm) | Nominal Area ($mm^2$) | Unit Weight (kg/m) | Nominal Weight / Piece (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 6.0m | 7.5m | 9.0m | 10.5m | 12.0m | 13.5m | 15.0m |
| 10 | 78.54 | 0.617 | 3.702 | 4.628 | 5.553 | 6.479 | 7.404 | 8.330 | 9.255 |
| 12 | 113.10 | 0.888 | 5.328 | 6.660 | 7.992 | 9.324 | 10.656 | 11.988 | 13.320 |
| 16 | 201.06 | 1.578 | 9.468 | 11.835 | 14.202 | 16.569 | 18.936 | 21.303 | 23.670 |
| 20 | 314.16 | 2.466 | 14.796 | 18.495 | 22.194 | 25.893 | 29.592 | 33.291 | 36.990 |
| 25 | 490.88 | 3.853 | 23.118 | 28.898 | 34.677 | 40.457 | 46.236 | 52.016 | 57.795 |
| 28 | 615.75 | 4.834 | 29.004 | 36.255 | 43.506 | 50.757 | 58.008 | 65.259 | 72.510 |
| 32 | 804.25 | 6.313 | 37.878 | 47.348 | 56.817 | 66.287 | 75.756 | 85.226 | 94.695 |
| 36 | 1017.88 | 7.990 | 47.940 | 59.925 | 71.910 | 83.895 | 95.880 | 107.865 | 119.850 |

Actual diameters of many bars available in the market are less than their stated diameters. Care must therefore be exercised in procuring steel from local markets.These are the RSB commercial lengths available in the market: 6.0m, 7.5m, 9.0m, 10.5m, and 12.0 m. Though they are available let's consider easy howling of materials from hard wares to the site, and management of the materials during reinforcing.

Reinforcement of the greenhouse will vary considering the benches that will be installed. It will be adjusted in order for some materials to be placed below the ground like drums and the placement of the benches or boxes for drip and aeroponic system. For the overlapping and bending it is safe to multiply it to factor of safety. GI wires #16 will be used to tie intersections and overlapping of RSB, 2-3 joints away. It will be tied to set the equal spacing of RSB and to ensure that the rebars are not being moved when the concrete is being placed.

**b. CHB reinforcement.**

Concrete Hollow Blocks walls are very weak against lateral loads which includes pushing and pulling forces from typhoons and earthquakes. Adding steel reinforcement bars vertically and horizontally inside the CHBs can increase their resistance to lateral loads. One layer of CHB will be installed inside the ground, while the three layers will act as protection to vandalism to the structure.

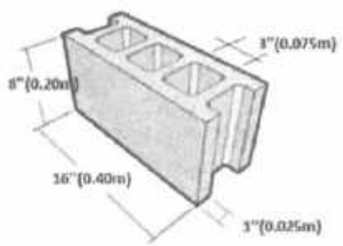
Vertical spacing: Spacing will be 0.8 meter in spacing with respect with the perimeter of the greenhouse and 1 meter in length perpendicular to the perimeter of the greenhouse.
Horizontal spacing and size: Spacing will be 0.8 meters' parallel to the length of the perimeter of the greenhouse with respect to the height of CHB. For vertical reinforcement of CHB it will be cut to the desired length by the use of steel cutter. So given the perimeter of the greenhouse there will be many rebars to be cut. Using hand steel saw would take time so it is recommended to use an equipment that will make it easier to meet the needed numbers of rebars. The cuts also will be more precise and will not leave dips to both ends of the material.

### 1.3. CONCRETE floor slab (reinforced)

Flooring of the greenhouse shall be able to withstand heavy loads. Considering that the greenhouse will be housing benches with aeroponics for potato production, there shall be separate treatment for the benches and the walkways. Inside the benches the concrete shall be laid 2-3% sloping to drain water during irrigation and fertigation. It shall be plastered with mixture of cement and sand. Some part of the flooring will not be cemented because drums will be placed under the ground. Alleys or the walkways should be cemented for easy access of the plants with thickness of 100mm. For sanitation a footbath should be provided. Computation varies for areas that need to be cemented. There shall also be 28 days for curing of the concrete slab.

### 1.4. MASONRY WORKS

CHB (Concrete Hollow Blocks) laying. One layer of CHB will be installed below the ground, while the three layers will act as protection to vandalism and tampering of the structure. The two greenhouses will be laid with CHB.




CHB size: Standard hollow blocks with three void cells and two half cells at both ends having a total of four.
Length: 40 cm.
Width: 20 cm.
Thickness: 20 cm.

In between the CHB layers will be filled with mixture of cement and sand. This filling will allow the reinforcement and CHB to be bounded and will create a wall. The voids will also be filled; this will bind the reinforcement. The wall after being filled will be plaster from the inside and out.

### 1.5. AEROPONIC SYSTEM

**Aeroponics system-**

Shall be installed technically that it shall function to its purpose.

This method consists of enclosing the root system in the dark chamber/aeroponics box and supplying the nutrient solution with a mist device. The system mainly consists of an electrical unit, growth chambers, a nutrient solution chamber, a high pressure pump, filters and spray nozzles.

**Aeroponics box**

The benches or aeroponic boxes are run to the length of the greenhouse to permit long continuous runs of watering lines and plant support technique. The arrangement gives the greatest amount of bench area per unit of aisle space and permits convenient access to all areas. Potato crops will produce under the benches, so bench should be 1.2 meter of height, but considering the suitable averaged size worker 1 meter is already acceptable. The height will also make it easy to manage the growing plants above the bench. Bench size with the width of 1.5 meter is enough to be access on both sides. Its length will be 27 meter along the length of the greenhouse.

## SPECIFICATIONS

Materials to be used are GI pipes. Strong enough to hold the plants grown and the irrigation system to be installed. It will be cut to its usable size then will be welded to the angle bars to create the frame of box. Steel matting will be placed on top of the bench, size of 2"by 2". It is where the plastic pots will be secured. The plastic pots are where the seedlings/cuttings will be positioned. Plain sheets G26 will be the covering of the bench. Black film will be installed inside the bench. Polycarbonate sheet will be its covering.

### 1.6. BEDDINGS FOR PLANTATION

This is where the drip irrigation will be installed. It will be fixated inside the greenhouse. It will be concrete beddings for plantation of potatoes. This design will make it easier to harvest specially root crops. There will be 3 rows having a dimension of 1m width 30. 75m in length and 100 mm deep.

### 1.7. DRIP IRRIGATION SYSTEM

Drip irrigation delivers water precisely to the roots, avoiding leaf moisture, and ultimately fostering a dry environment. Less moisture reduces the risk of potato blight and fungal diseases. Potatoes are heavy feeders; their roost system is shallow and fibrous so they only flourish with consistent nutrition. Precision fertigation brings nutrients directly to the root zone on demand. Drip irrigation distributes your water and nutrients only where the crops grow avoiding waste between the beds. In addition, there is no water loss due to runoff and evaporation.

Prepared by:

**DIOSTONEE A. BALINTE**
Project Staff

Noted:

**HILDA L. QUINDARA**
Project Leader

# PCJ DRIPPER

**COMPACT ON-LINE PRESSURE-COMPENSATING, CONTINUOUSLY SELF-CLEANING DRIPPER**

## APPLICATIONS

- Greenhouses, nurseries, citrus.
- Orchards, deciduous and tree irrigation.

## FEATURES AND BENEFITS

- Pressure compensated: Precise and equal amounts of water are delivered over a broad pressure range. 100% uniformity of water and nutrient distribution along the laterals.
- PCJ-LCNL & PCJ-HCNL with Anti-drain (LCNL & HCNL): Eliminates drainage and refill effect, and improves efficiency in pulse irrigation.
- Continuously self flushing: Continuously flushing debris, throughout operation, not just at the beginning or end of a cycle, ensuring uninterrupted dripper operation.
- TurboNet™ labyrinth assures wide water passages, large deep and wide cross section improves clogging resistance.
- Dripper can be positioned exactly where required.
- Number of drippers can be increased so as to increase water quantity supply aimed at meeting tree growth rate requirement.
- Allows the installation of "spider assembly", splitting the drip supply into a number of drip outlets.

## SPECIFICATIONS

- Recommended filtration: 130 micron / 120 mesh.
  Filtration method is to be selected based on the kind and concentration of the dirt particles existing in the water.
  Wherever sand exceeding 2 ppm exists in the water, a Hydrocyclone is to be installed before the main filter.
  When sand/ silt/ clay solids exceed 100 ppm, pre treatment will be applied according to Netafim™ expert team's instructions.
- TurboNet™ labyrinth with large water passage.
- To be "inserted" into thick-walled pipes (0.90, 1.00, 1.20 mm)
- Injected dripper, very low CV.
- 3 different outlets: nipple, barb to 3 mm ID and barb to 4 mm ID micro-tube.
- High UV resistant. Resistant to standard nutrients used in agricultural.
- PCJ on-line drippers meet ISO 9261 Standards with production certified by the Israel Standards Institute (SII).

## PCJ drippers

| FLOW RATE* (L/H) | WORKING PRESSURE RANGE (BAR) | WATER PASSAGES DIMENSIONS WIDTH-DEPTH-LENGTH (MM) | FILTRATION AREA (MM²) | CONSTANT K | EXPONENT* X | BASE CODE COLOR | CAP COLOR CODE |
|---|---|---|---|---|---|---|---|
| 0.5 | 0.5 – 4.0 | 0.54 x 0.60 x 35 | 1.8 | 0.5 | 0 | Mustard | Black |
| 1.2 | 0.5 – 4.0 | 0.67 x 0.77 x 35 | 2.0 | 1.2 | 0 | Brown | Black |
| 2.0 | 0.5 – 4.0 | 0.98 x 0.79 x 35 | 2.0 | 2.0 | 0 | Red | Black |
| 3.0 | 0.5 – 4.0 | 1.03 x 1.07 x 35 | 2.0 | 3.0 | 0 | Blue | Black |
| 4.0 | 0.5 – 4.0 | 1.32 x 0.92 x 35 | 2.0 | 4.0 | 0 | Gray | Black |
| 8.0 | 0.5 – 4.0 | 1.60 x 1.08 x 35 | 2.0 | 8.0 | 0 | Green | Black |
| 12.0 | 0.5 – 4.0 | 1.60 x 1.08 x 17 | 2.0 | 12.0 | 0 | Fuchsia | Black |
| 15.0 | 0.5 – 4.0 | 1.60 x 1.08 x 17 | 2.0 | 15.0 | 0 | Black | Black |

*Within working pressure range

## PCJ-LCNL drippers

| FLOW RATE* (L/H) | WORKING PRESSURE RANGE (BAR) | WATER PASSAGES DIMENSIONS WIDTH-DEPTH-LENGTH (MM) | FILTRATION AREA (MM²) | CONSTANT K | EXPONENT* X | SHUT OFF PRESSURE (BAR) | BASE CODE COLOR** | CAP COLOR CODE |
|---|---|---|---|---|---|---|---|---|
| 0.5 | 0.7 – 4.0 | 0.54 x 0.60 x 35 | 1.8 | 0.5 | 0 | 0.12 | Mustard | Black |
| 1.2 | 0.7 – 4.0 | 0.67 x 0.77 x 35 | 2.0 | 1.2 | 0 | 0.12 | Brown | Black |
| 2.0 | 0.7 – 4.0 | 0.98 x 0.79 x 35 | 2.0 | 2.0 | 0 | 0.12 | Red | Black |
| 3.0 | 0.7 – 4.0 | 1.03 x 1.07 x 35 | 2.0 | 3.0 | 0 | 0.12 | Blue | Black |
| 4.0 | 0.7 – 4.0 | 1.32 x 0.92 x 35 | 2.0 | 4.0 | 0 | 0.12 | Gray | Black |
| 8.0 | 0.7 – 4.0 | 1.60 x 1.08 x 35 | 2.0 | 8.0 | 0 | 0.12 | Green | Black |
| 12.0 | 0.7 – 4.0 | 1.60 x 1.08 x 17 | 2.0 | 12.0 | 0 | 0.12 | Fuchsia | Black |
| 15.0 | 0.7 – 4.0 | 1.60 x 1.08 x 17 | 2.0 | 15.0 | 0 | 0.12 | Black | Black |

*Within working pressure range **PCJ-LCNL is distinguished by the rings around the barb water inlet connector

## PCJ-HCNL drippers

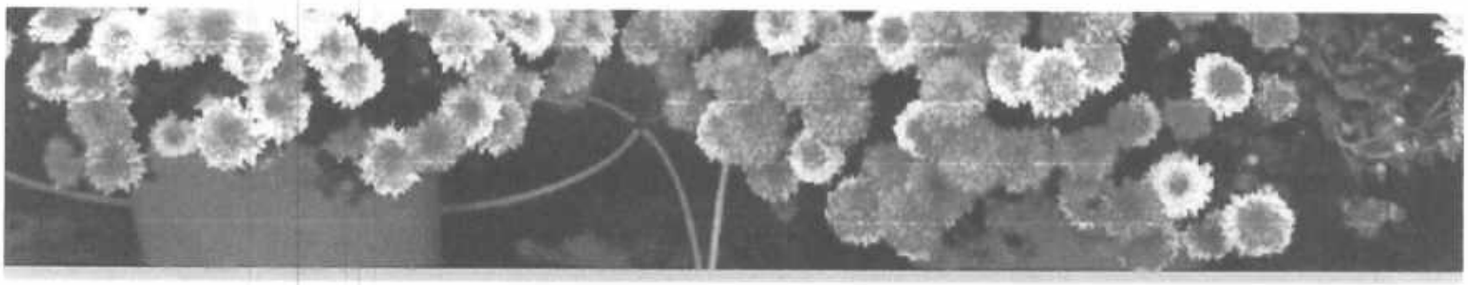
| FLOW RATE* (L/H) | WORKING PRESSURE RANGE (BAR) | WATER PASSAGES DIMENSIONS WIDTH-DEPTH-LENGTH (MM) | FILTRATION AREA (MM²) | CONSTANT K | EXPONENT* X | SHUT OFF PRESSURE (BAR) | BASE CODE COLOR | CAP COLOR CODE |
|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.5 – 4.0 | 0.54 x 0.60 x 35 | 1.8 | 0.5 | 0 | 0.18 | Light yellow | Black |
| 1.2 | 1.5 – 4.0 | 0.67 x 0.77 x 35 | 2.0 | 1.2 | 0 | 0.18 | Light brown | Black |
| 2.0 | 1.5 – 4.0 | 0.98 x 0.79 x 35 | 2.0 | 2.0 | 0 | 0.18 | Pink | Black |
| 3.0 | 1.5 – 4.0 | 1.03 x 1.07 x 35 | 2.0 | 3.0 | 0 | 0.18 | Light blue | Black |
| 4.0 | 1.5 – 4.0 | 1.32 x 0.92 x 35 | 2.0 | 4.0 | 0 | 0.18 | Light gray | Black |

*Within working pressure range

PCJ DRIPPER NIPPLE MODEL

PCJ DRIPPER 4 MM BARB MODEL

PCJ DRIPPER 3 MM BARB MODEL



# SPIDERS

## PRE-ASSEMBLED COMPONENTS

### APPLICATIONS

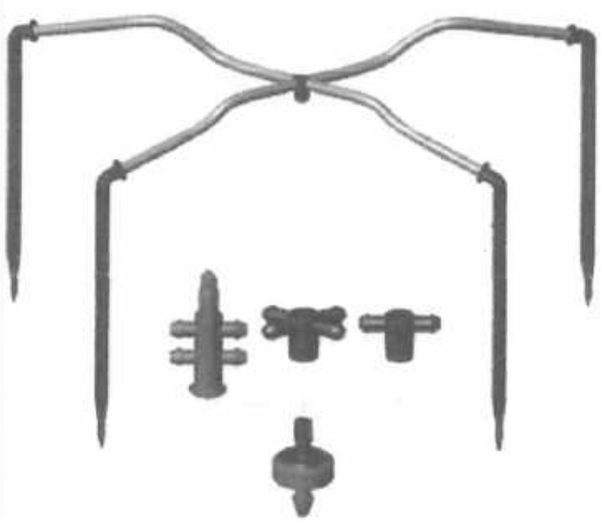
- Greenhouses and nurseries irrigation.
- Ornamental plants.

### SPECIFICATIONS

- Recommended working pressure must match the pressures specified for all Spiders components.
- Wherever there is more than one irrigation point it is recommended to use the Spiders with Arrow drippers as an end product in order unify the flow of each of the points.
- Wherever the Spiders serves a single irrigation point, the Netafim™ spike can be used.
- It is highly recommended not to design flows below 0.5 l/h per each irrigation point, namely, if a 2 l/h "mother" dripper is used, no more than 4 irrigation points should be designed. If 1.2 l/h "mother" dripper is used, no more than 2 irrigation points should be designed. This applies to all other flow models.
- The other side of the sheet details descriptions and assembly method of the Spiders different models.

### BENEFITS

- All-in-one stand assembly reduce labor time and cost.
- Innovative assembly technologies improve assembly efficiency and reduce costs.
- Reliability, the products are installed under strict supervision of experts.
- All Spiders components were designed and produced under the same quality standards identifying all the Netafim™ products.
- Environmentally friendly, the Spiders tubes are made of softened PE not emitting the chemical agents normally used for softening similar tubes made of other raw materials.



## Components available for your choice of assemblage

End line product | Micro-tube | Spiders start component | Micro-tube | End line product


### START PRODUCT

1. Flat mainfold x 4 outlets
2. Flat mainfold x 4 outlets w/nipple
3. Flat mainfold x 2 outlets
4. Flat mainfold elbow, one outlet
5. Upright mainfold x 4 outlets
6. Upright mainfold x 8 outlets
7. "T" 5 mm connector
8. Adapter to integral dripper
9. PCJ or any other on-line dripper
10. W/o start product

### END LINE PRODUCT

- A Straight arrow dripper
- B Straight w/splitter arrow dripper
- C Straight w/plug arrow dripper
- D Angled short arrow dripper
- E Angled long arrow dripper
- F Spike

### MICRO-TUBE

SSPE micro-tube 3*5 mm, 80 cm lenght, black
SSPE micro-tube 3*5 mm, 40 cm lenght, gray
SSPE micro-tube 3*5 mm , 60 cm lenght, gray
SSPE micro-tube 3*5 mm, 80 cm lenght, gray
SPE micro-tube 3*5 mm, 40 cm lenght, black
SPE micro-tube 3*5 mm, 60 cm lenght, black
SPE micro-tube 3*5 mm, 80 cm lenght, black

*please, add any required lenght by writing

SPE = Soft Polyethylene
SSPE = Super Soft Polyethylene

The draws are non-uniformly scaled. They are for illustration purposes only.

# NETAFIM™ BLANK DRIPPERLINES

## DRIPPERLESS DRIPPERLINES (WITHOUT DRIPPERS INSIDE)

### APPLICATIONS

For use in agricultural drip, micro-sprinkler, landscape and mining irrigation systems.

### FEATURES AND BENEFITS

- All pipes are manufactured with UV and oxidation protection making them durable to solar radiation without significant damage for at least 50 years.
- Microorganisms or fungi do not attack PE pipes, either internally or externally.
- PE pipes are resistant to saline water, acid or alkaline solutions (excluding highly concentrated solutions) and to most substances employed in agricultural applications.
- Available in standard coil lengths.
- Made with the finest available low/medium density polyethylene resin, especially formulated to resist cracking and kinking, and to ensure long-term reliability.
- Precision manufacturing to ensure the uniformity of internal diameter and wall thickness.

### SPECIFICATIONS

- PE pipes (100% PE, totally recyclable).
- Inside diameters and wall thicknesses according to the Netafim™ dripperline product basket can be used as a risers, connectors or distribution pipes.
- Can be used as distribution pipes for micro-sprinkler irrigation systems.

## BLANK DRIPPERLINES (COLORED BLACK)

**Catalog number 19950 - (any of below 6 digits)**

| MODEL | 100 (M) | 200 (M) | 300 (M) | 400 (M) |
|---|---|---|---|---|
| 12010 | 000830 | 000945 | | 000840 |
| 16010 | 001400 | 001410 | 001415 | 001420 |
| 16012 | 001000 | | 001100 | 001200 |
| 17012 | 004600 | 004700 | 004800 | 004900 |
| 20010 | 008500 | 008600 | 008700 | N/A |
| 20012 | 008150 | 008300 | 008400 | N/A |
| 23009 | | | | 009500 |
| 23010 | | | 009520 | N/A |

Missing catalog numbers available upon request

## BLANK DRIPPERLINES (COLORED BROWN)

**Catalog number 19950 - (any of below 6 digits)**

| MODEL | 25 (M) | 50 (M) | 100 (M) | 200 (M) | 500 (M) |
|---|---|---|---|---|---|
| 16010 | 003200 | 003300 | 003400 | 003500 | 003600 |
| 16012 | 002700 | 002720 | 002740 | | |
| 17012 | | 006700 | 006800 | 006900 | |

Missing catalog numbers available upon request

## BLANK DRIPPERLINES (COLORED DARK BROWN)

**Catalog number 19950 - (any of below 6 digits)**

| MODEL | 25 (M) | 50 (M) | 100 (M) |
|---|---|---|---|
| 12010 | 000910 | 000920 | 000930 |
| 16012 | 003100 | 003120 | |

Missing catalog numbers available upon request

## BLANK DRIPPERLINES (COLORED VIOLET)

**Catalog number 19950 - (any of below 6 digits)**

| MODEL | 200 M | 300 (M) | 400 (M) |
|---|---|---|---|
| 16010 | 003970 | | |
| 17012 | | | 007500 |
| 20012 | | 009300 | |

Missing catalog numbers available upon request

## BLANK DRIPPERLINES (COLORED LIGHT GRAY)

**Catalog number 19950 - (any of below 6 digits)**

| MODEL | 300 (M) | 400 (M) | 500 (M) |
|---|---|---|---|
| 16010 | | | 003700 |
| 16012 | | 001260 | N/A |
| 17012 | | 004400 | N/A |
| 20012 | 009310 | N/A | N/A |

Missing catalog numbers available upon request

TEFEN
FLOW & DOSING TECHNOLOGIES

| | |
|---|---|
| Product Code: | 28040100000 |
| Name: | MixRite TF5 |
| Flow Rate Range: | 20-5000 l/h [0.088 to 22 gpm] |
| Thread Size: | 1" |
| Dosage Rate: | 0.1% - 1% |
| ON OFF System: | No [Air Release] |
| Connection Type: | Threaded |
| Material: | PP+FG |
| Colour: | Grey |
| Thread Type: | BSP |
| Min Injection Per Hour: | 0.02 l/h [0.005 gph] |
| Max Injection Per Hour: | 50 l/h [13.2 gph] |
| Water Pressure: | 1 - 8 bar [14.7 to 120 psi] |
| Min Pressure Loss: | 1 bar Bar |
| Max Pressure Loss: | 8 bar Bar |
| With Legs: | Optional |
| Foot Valve: | Optional |
| Air Release: | Yes |

## 16 MM BARB CONNECTORS

| Pipe inside Ø (mm) | Wall thickness (mm) | (mil) | To fit Netafim™ dripperlines |
|---|---|---|---|
| 14.2 | 0.9 | 35 | 16009 |
| | 1.0 | 39 | 16010 |
| | 1.2 | 47 | 16012 |

**Coupling barb 16 x 16**

| | |
|---|---|
| 1 unit | 32500-010700 |
| 50 units/bag | 32500-010720 |
| 100 units/bag | 32500-010730 |

**Elbow barb 16 x 16**

| | |
|---|---|
| 1 unit | 32500-012500 |
| 50 units/bag | 32500-012520 |
| 100 units/bag | 32500-012530 |

**Straight barb 16 MTH ½"**

| | |
|---|---|
| 1 unit | 32500-010900 |
| 50 units/bag | 32500-010920 |
| 100 units/bag | |

**Elbow barb 16 MTH ½"**

| | |
|---|---|
| 1 unit | 32500-012700 |
| 50 units/bag | 32500-012720 |
| 100 units/bag | 32500-012730 |

**"T" barb 16 x 2 MTH ½"**

| | |
|---|---|
| 1 unit | 32500-011600 |
| 50 units/bag | 32500-011620 |
| 100 units/bag | |

**Straight barb 16 MTH ¾"**

| | |
|---|---|
| 1 unit | 32500-011000 |
| 50 units/bag | 32500-011020 |
| 100 units/bag | 32500-011030 |

**Elbow barb 16 MTH ¾"**

| | |
|---|---|
| 1 unit | 32500-012800 |
| 50 units/bag | 32500-012820 |
| 100 units/bag | 32500-012830 |

**"T" barb 16 x 16 x 16**

| | |
|---|---|
| 1 unit | 32500-011300 |
| 50 units/bag | 32500-011320 |
| 100 units/bag | 32500-011330 |

**"8" line end 16**

| | |
|---|---|
| 1 unit | 32500-013000 |
| 50 units/bag | 32500-013020 |
| 100 units/bag | 32500-013030 |

**"Y" barb 16 x 2 MTH ¾"**

| | |
|---|---|
| 1 unit | 32500-011200 |
| 50 units/bag | 32500-011220 |
| 100 units/bag | 32500-011230 |

**"W" barb16 x 3 MTH ¾"**

| | |
|---|---|
| 1 unit | 32500-012400 |
| 50 units/bag | 32500-012425 |
| 100 units/bag | 32500-012430 |

**"T" barb 16 x 2 FTH ¾"**

| | |
|---|---|
| 1 unit | 32500-011700 |
| 50 units/bag | 32500-011720 |
| 100 units/bag | |

**Barb 16 x 3 FTH ¾"**

| | |
|---|---|
| 1 unit | 32500-011900 |
| 50 units/bag | 32500-011920 |
| 100 units/bag | |

**Barb 16 x 4 FTH ¾"**

| | |
|---|---|
| 1 unit | 32500-012100 |
| 50 units/bag | 32500-012120 |
| 100 units/bag | |

## POLYETHYLENE PIPES, TUBES AND MICRO-TUBES

### APPLICATIONS

For use in agricultural irrigation systems, water delivery systems, sprinkler and micro-sprinkler stands, assembly dripper sets and automation application.

### SPECIFICATIONS

- Standard irrigation pipes, produced according to Israeli Standard SI 8779 that fits the International Standard ISO 8779.
- Tubes and Micro-tubes 3*5, 4*6.5, 6*8 and 9*12 mm, produced according to Netafim™ quality standards for drippers, sprinkler and micro-sprinkler stands.
- Micro-tubes 8 mm, produced according to Netafim™ quality standards for hydraulic command and automation systems.

### FEATURES AND BENEFITS

- All pipes are manufactured with UV and oxidation protection, making them durable to solar radiation without significant damage

for many years.

- Microorganisms or fungi do not attack PE pipes, either internally or externally.
- PE pipes are resistant to saline water, acid or alkaline solutions (excluding highly concentrated solutions) and to most substances

employed in agricultural applications.

- Available in standard coil lengths, large diameter reels or pipe rods, to meet specific requirements.
- Made with quality low or medium density polyethylene resin, especially formulated to resist cracking and kinking, and to ensure

long-term reliability.

- Precision manufacturing to ensure the uniformity of internal diameter and wall thickness.

### MARKING

Each pipe can be identified by its external diameter and by its class (2.5, 4, 5 or 6 bar).