



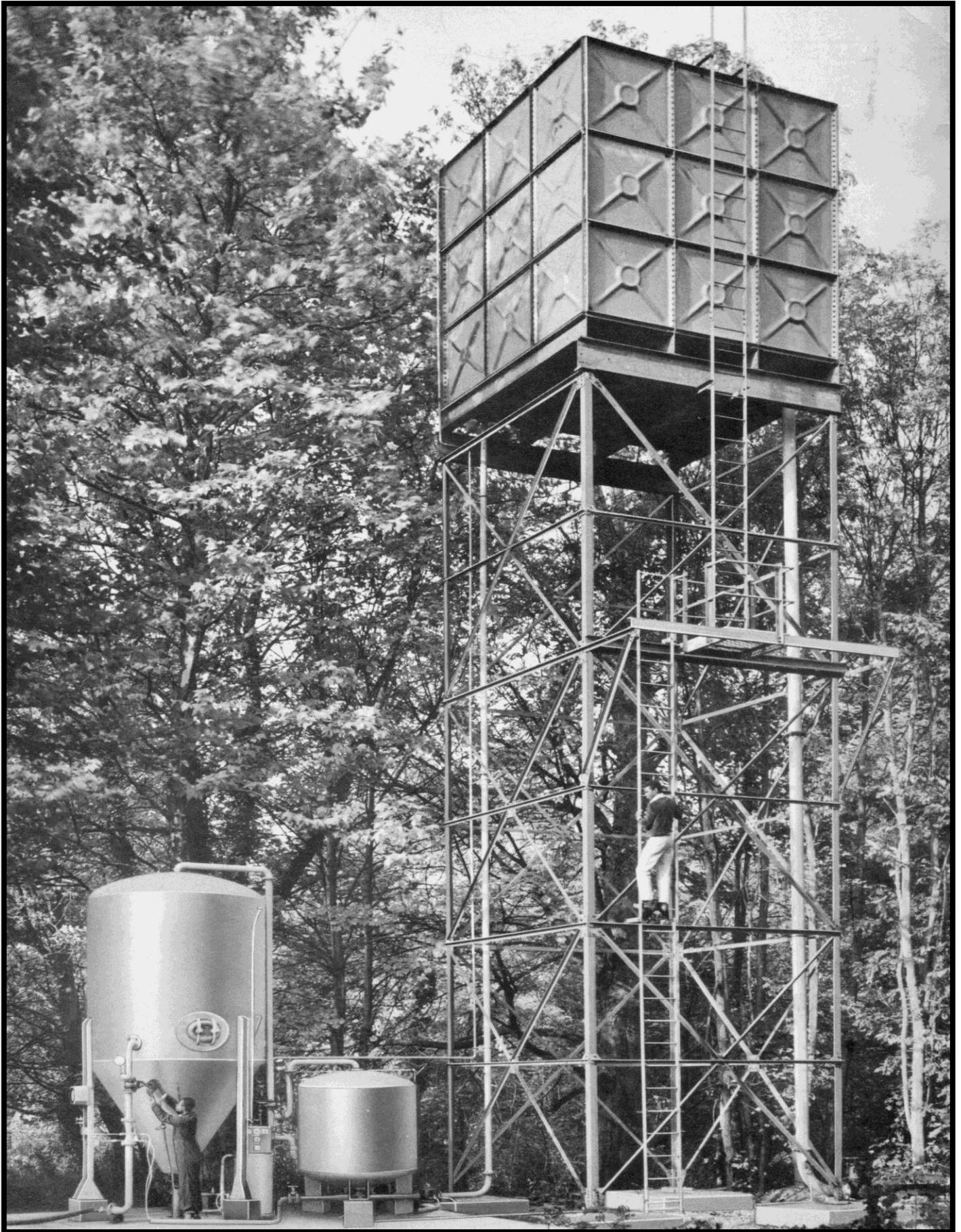
WATER-MAN RANGE OF PACKED AUTO WASH TREATMENT PLANTS FOR RURAL WATER SUPPLIES



PCI AFRICA

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Introduction

The PCI Water-Man range has been developed to meet an increasing demand for a prefabricated treatment plant for Community and Institutional water supplies, especially in rural areas, which can be easily and quickly installed, eliminates as far as possible civil engineering work, is capable of being operated by unskilled personnel and requires the minimum of attendance and maintenance.

The PCI Water-Man equipment is completely prefabricated before dispatch and requires only concrete footings on which to place the equipment bolting up and charging with filter media and chemicals to be ready for operation.

The plant may require no outside source of power such as electricity or diesel for its functioning if all the equipment is hydraulically operated using the head of water available at the plant.

WATER - MAN

The Water-Man range provides equipment for any one of combination of the following treatment processes.

- (1) Chemical Pretreatment such as coagulation, pre-chlorination etc.
- (2) Clarification to reduce the turbidity or colour content.
- (3) Filtration to remove all suspended matter.
- (4) Chemical Post Treatment such as pH correction, sterilization etc.

In addition the Water-Man range provides equipment for storage of the treated water and washwater for filters. Pumping plant can be offered to suit the particular hydraulic conditions at site.

The final specification for any one individual plant will depend on the quantity and nature of the water to be treated and the quality of the effluent required. For example spring water with only low turbidity may need only filtration followed by chlorination whereas river water may need coagulation, clarification, filtration, pH correction and chlorination.

The Water-Man range is available in the following sizes:-

Model W.1000 up to

1000 Imp. gals/hour-
4500 litres/hour – 1200 U.S.
gals/hour

Model W.2000 up to

2000 Imp. gals/hour-
9000 litres/hour – 2400 U.S.
gals/hour

Model W.3000 up to

3000 Imp. gals/hour-
13500 litres/hour – 3600 U.S.
gals/hour

Model W.4000 up to

4000 Imp. gals/hour-
18000 litres/hour – 4800 U.S.
gals/hour

Model W.5000 up to

5000 Imp. gals/hour-
22500 litres/hour – 6000 U.S.
gals/hour

It is assumed that where the flow requirements are greater than 5000gals/hour (22500 litres/hour, 6000 U.S. gals/hour) consideration would be given to the installation of a plant with permanent staff.

However, to suit special requirements, equipment working in parallel can be supplied but this will require certain modifications to the standard equipment.

The principal features of the Water-man range are:

- Automatic proportioning Chemidosers.
- Vertical flow sludge blanket clarification tanks.
- Automatic wash Bi-filters.
- Elevated pressed steel storage tanks with built-in wash compartments.
- All steel piping.
- All treatment equipment for use under pressure.
- All equipment for mounting in open.

Full details of the Water-Man are given on later pages.

CLARIFICATION TANK

The Clarification Tank is of the vertical flow, sludge blanket, conical bottom type developed originally by The Candy Filter Company Limited. The PCI Water-man range utilizes a pressure type version of this unit.

DESCRIPTION

The tank is circular in plan with the upper portion having vertical sides and the lower portion in the form of an inverted cone with the sides at an angle of 60. to the horizontal. The size of the tank is governed by the vertical upward velocity of the water, which, in turn, is influenced by the water, which, in turn, is influenced by the character of the water. The retention period, as such, is immaterial.

The tank sizes listed in the data tables are based on water of average quality.

The incoming water is delivered near the bottom of the conical portion by a vertical inlet pipe. The velocity of discharge, combined with a change in direction of flow, creates and maintains a condition of agitation ideal for initial flocculation, which is completed within the sludge blanket.

The water rises at a steadily decreasing velocity through suspended particles, which are allowed to accumulate in the tank. The "sludge blanket" is composed of relatively large particles, which are capable of maintaining their position against the upward velocity of the water because they have been in the tank for a period during which their size has grown due to contact with other particles of coagulated matter moving upward with the water. Sedimentation of these smaller particles may be said to take place on the surface of the larger stationary particle in the sludge blanket. Particles, which are too heavy to be carried in the sludge blanket fall to the bottom of the cone and are discharge periodically.

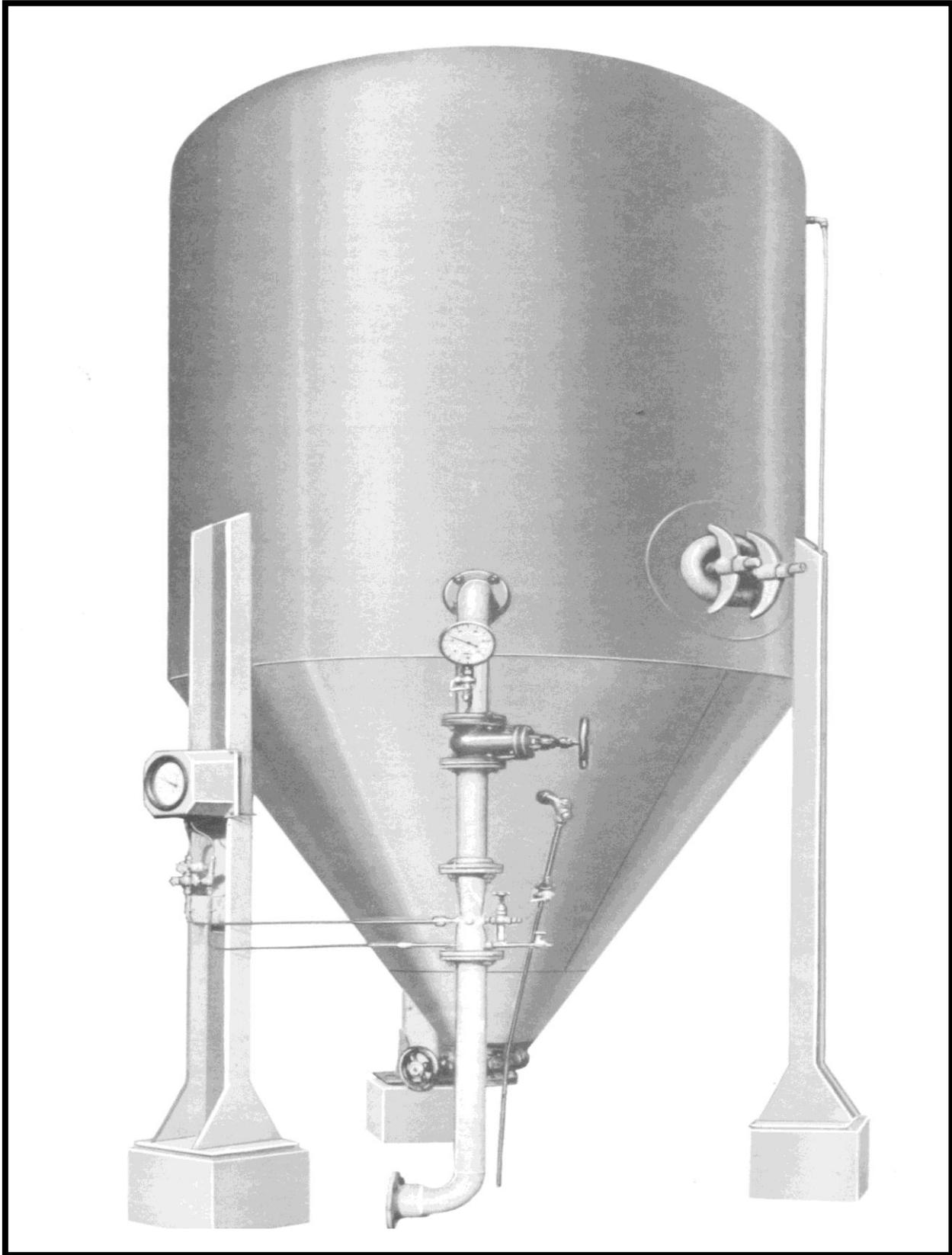
The water emerging from the sludge blanket passes up through the straight portion of the tank and is drawn off around a baffle plate through an outlet pipe in the domed portion of the top of the tank.

The accumulated sludge in the bottom of the cone of the tank is drawn off periodically, at a frequency determined by the characteristics of the water, and is discharged into a sump to flow away by gravity to a convenient area. In addition to the main de-sludging arrangements, a 12" diameter open top inverted cone is suspended within the tank from which a continuous bleed of sludge is drawn from the sludge blanket zone. This allows the blanket to be maintained at its optimum level.

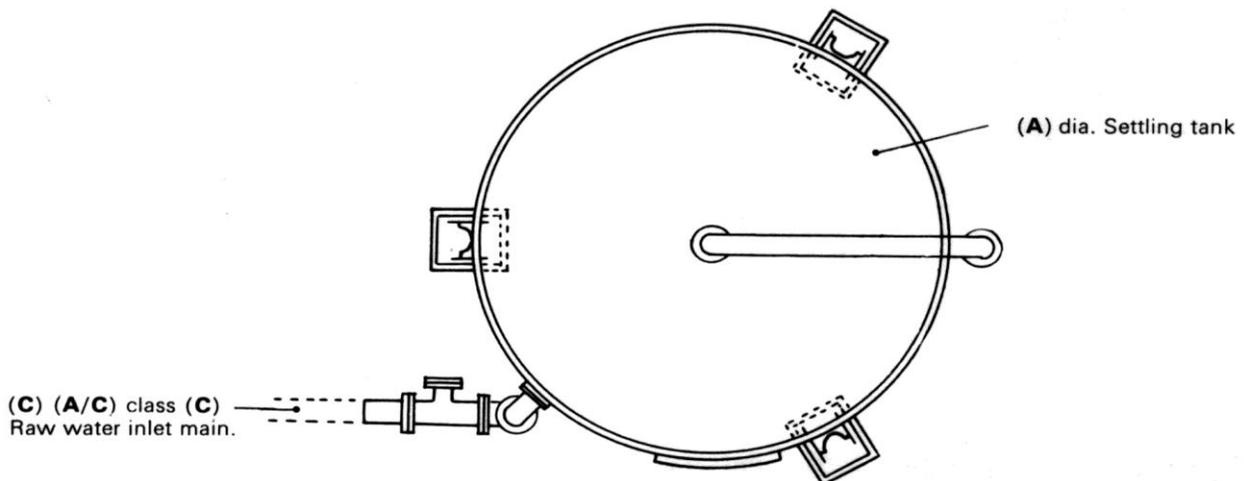
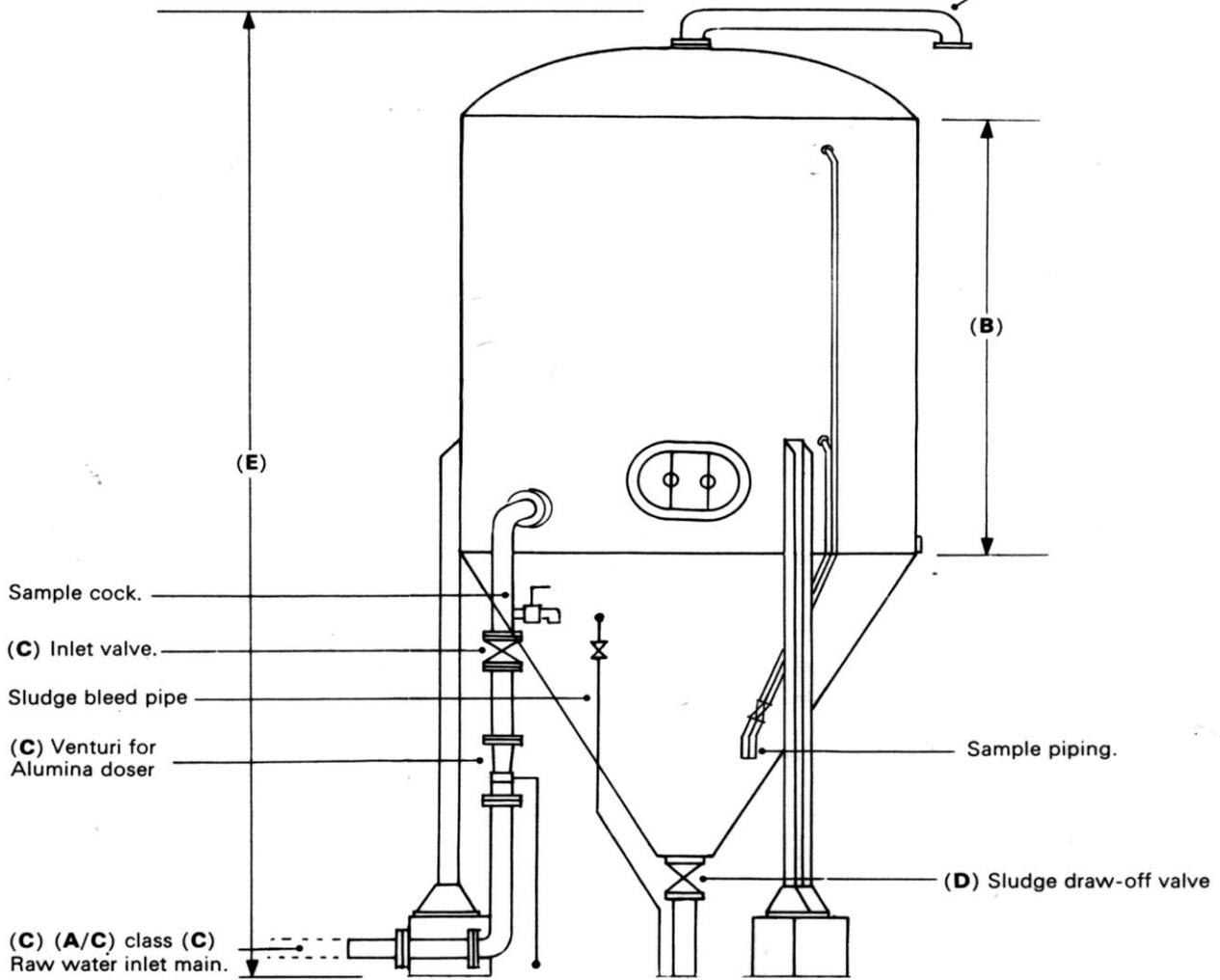
SPECIFICATION

- 2.01 One (A) dia. x (B) deep on straight welded mild steel pressure vessel, designed for a maximum working pressure of 25 p.s.i.g. and tested hydraulically to 50 p.s.i. before dispatch, complete with internal baffle plate bolted over outlet. Pads for (C) inlet, (C) outlet and (D) sludge draw-off. McNeil type manhole in side, three prefabricated steel supporting legs with flanges for placing on concrete bases, bosses to two sampling cocks and one sludge bleed. Tank painted internally with two coats of Epoxy applied cold and externally with one coat red primer.
- 2.02 One class © steel inlet main from point shown on our drawing to tank and within tank.
- 2.03 One short-range (D) steel sludge draw-off pipe.
- 2.04 One range (C) settled water main to filter.
- 2.05 One range sludge bleed pipe.
- 2.06 One 300mmdia. sludge mild steel bleed cone and piping inside tank.
- 2.07 One (C) sluice valve with cast iron handwheel for inlet.
- 2.08 One (D) sluice valve with cast iron handwheel for sludge draw-off.
- 2.09 Two 12mm sampling cocks.
- 2.10 One 20mm sludge bleed valve.
- 2.11 One sampling cock in raw water inlet main.

CLARIFICATION TANK



(C) Settled water main to filter.



AUTOWASH FILTER

The filter unit supplied with the Water-man range is the PCI autowash pressure type Bi-filter. Basically this is a normal pressure filter containing graded sand and pebbles with an upper layer of graded filter anthracite where appropriate, the purpose of which is to ensure that, in the event of an inferior water passing from the clarification tank due to incorrect operation of the plant, filtration in depth is obtained and excessively fast build up of head loss is avoided.

The valve control system provides automatic washing of the filter bed without the need for shutting down the raw water pumps or gravity supply or for the plant operator to be present. The filter washes itself at a predetermined loss of head thus ensuring that the bed is kept in first class condition.

The normal filtration rate is approximately 5m/hour.

Access to the filter bed is through a manhole in the top dome.

METHOD OF OPERATION (TYPICAL ONLY)

The filter is a circular steel pressure vessel in which the filter bed of sand and anthracite is supported on a steel plate floor fitted with polypropylene draw-off and upwash nozzles.

During normal operation the unfiltered water is delivered to the top of the filter passing through the inlet butterfly valve. The unfiltered water passes down through the bed of the filter and is drawn off through the filter floor and piped directly into the washwater chamber of the overhead tank. A differential pressure operated valve connected to the upstream and downstream of the filter remains closed during the normal filter operation.

When the head loss across the filter rises to a predetermined figure, due to the build up of accumulated dirt in the filter bed, the differential pressure valve opens and allows a small flow of water from the washwater chamber to pass down into the inlet and washout valve float tank.

There is an outlet valve from this tank, which remains open all the time, but the flow of water from the washwater tank is greater than the discharge rate from the tank and the floats in the tanks rise, partially closing the inlet valve and opening the washout valve automatically. Water now flows back from the washwater chamber up through the filter bed and out through the washout pipe into the drain sump and away to waste. When all the water in the washwater chamber has been used up for washing, no further water flows into the inlet and washout valve float tank. This now empties allowing the floats to fall, which closes the washout valve and fully opens the inlet valve. Unfiltered water now passes into the top of the filter shell through the bed and up into the overhead tank. The differential pressure across the pressure operated valve falls to minimum conditions and the valve closes preventing any further supply of water from the washwater chamber to the float tank. Normal filtering is now resumed.

The length of washing is determined by the amount of washwater in the washwater chamber in the elevated tank, which is sized to suit different filter sizes.

A degree of slow starting of the filter is obtained by adjustment of the discharge valve from the float tank.

As will be seen, the method of washing the filter is extremely simple and does not require the attendance or the assistance of a plant operator.

SPECIFICATION (TYPICAL ONLY)

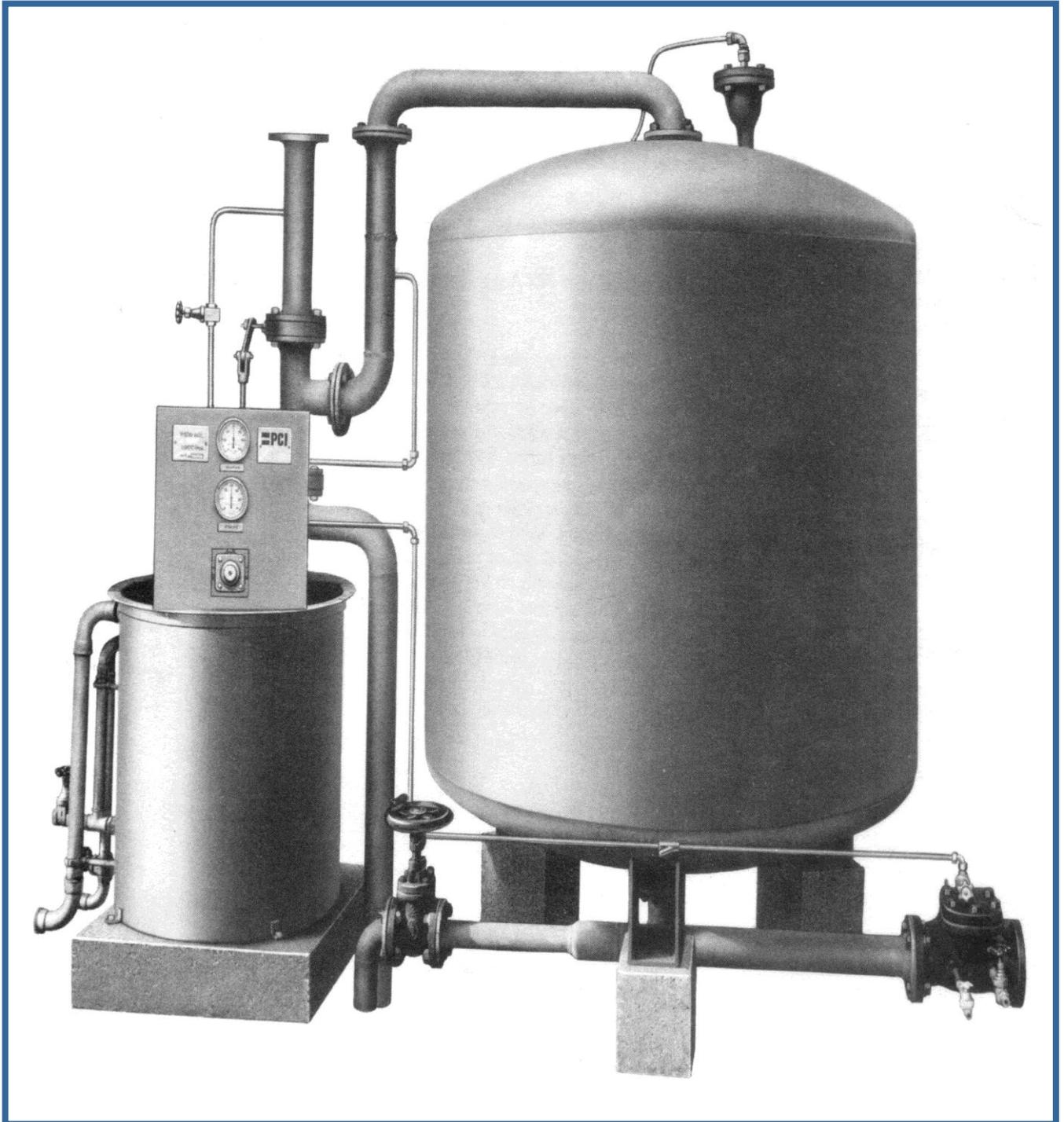
Filter

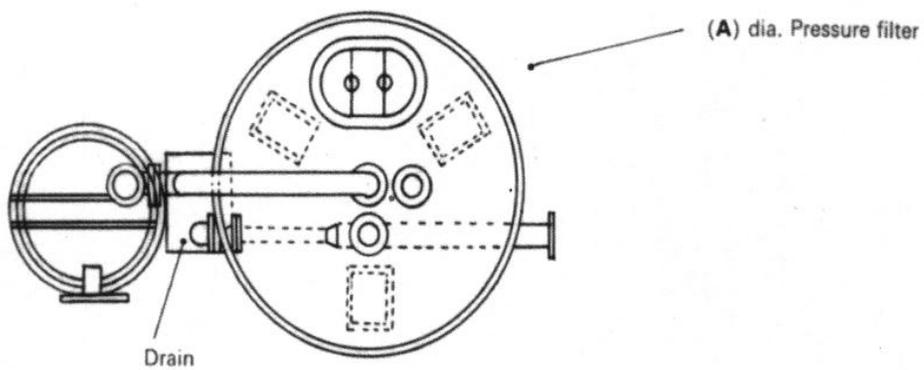
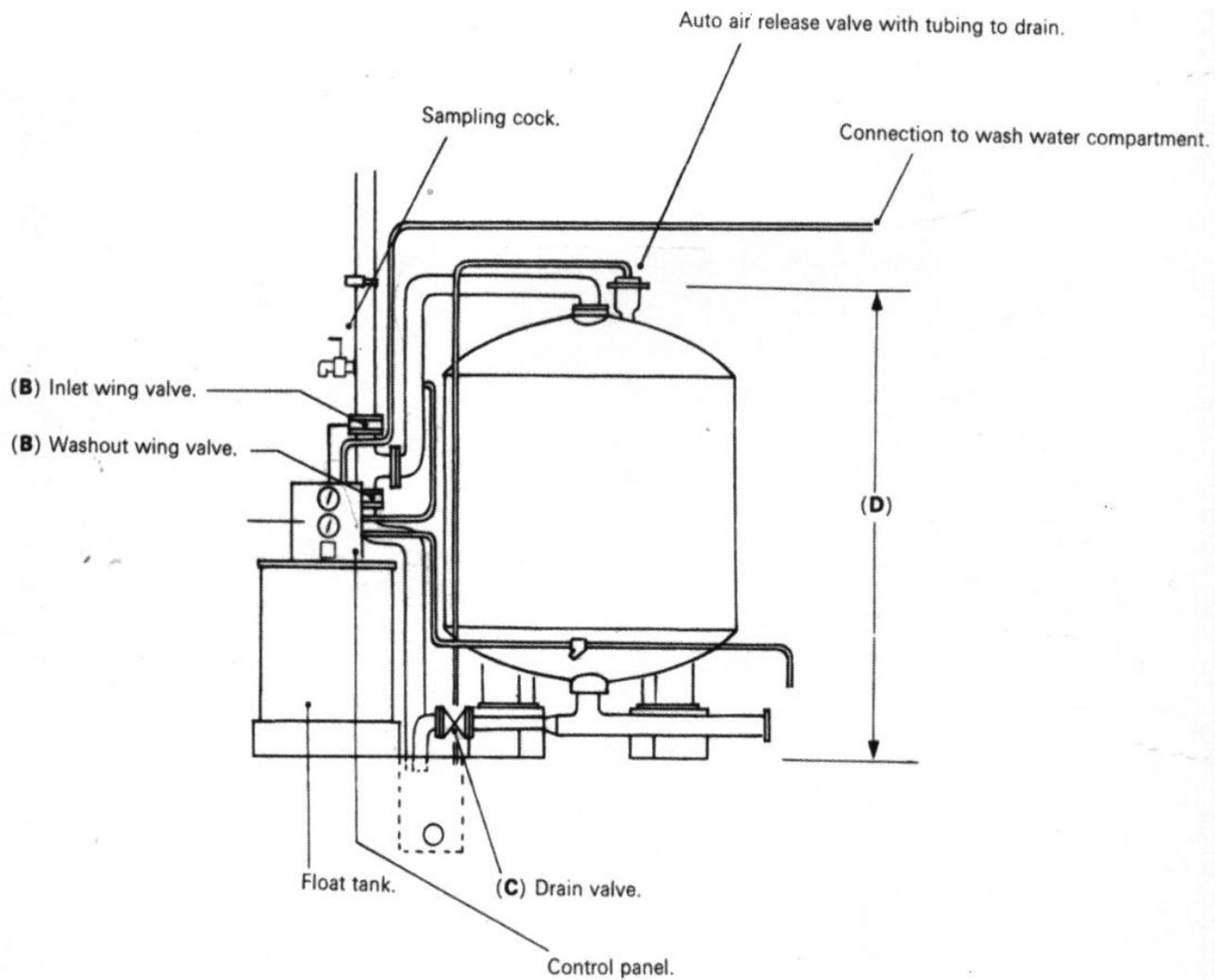
Equipment for one PCI Autowash Bifilter, comprising:-

- 3.01 One mild steel electrically welded filter shell (A) dia. x 12m deep on cylinder with nozzle plate welded in and reinforced with tie bars; steel supporting feet; McNeil type manhole covers in top dome; faced pads for inlet and outlet connections; shell designed for a maximum working pressure of 25 p.s.i. and tested hydraulically to 50 p.s.i. before dispatch, shell painted internally with cold epoxy externally with red primer. All necessary PCI polypropylene floor nozzles fitted into nozzle plate before dispatch.
- 3.02 Two sampling cocks in settled water inlet and filtered water outlet mains.
- 3.03 One control panel with connections to unfiltered and filtered water mains. Float tank and 30m of piping to washwater compartment.
- 3.04 One mild steel float tanks with drain valve and pipework.
- 3.05 One (B) inlet wing valve with extension spindle to linkage to float, complete with float gear.
- 3.06 One (B) washout wing valve with extension spindle to linkage to float, complete with float gear.
- 3.07 One (C) drain valve with cast iron handwheel. Hattersley Fig. 549
- 3.08 One 25mm automatic air release valve, with tubing and fittings to drain.
- 3.09 The necessary (B) flanged steel terminal pipework and fittings as shown on drawing for inlet, outlet, upwash, washout and (C) drain.
- 3.10 All graded sand and anthracite for filter bed, supplied in polythene lined jute bags, comprising:-
150mm depth 6 to 14 mesh coarse sand
400mm depth 14 to 30 mesh sand
230mm depth No. 2 grade anthracite

Total depth: 780mm

AUTOWASH FILTER





ELEVATED STORAGE TANK

The elevated storage tank is a standard unit on a steel tower with access stairway and having a flat steel cover with two manholes and two mosquito-proof vents. A steel plate compartment is provided within the main tank for storing washwater as referred to earlier. The filtered water enters the bottom of this compartment and passes over the top of it into the main tank, from which it flows into the distribution mains through an outlet at the bottom. When the filter is washing itself, it will be drawing from the washwater compartment only and the water in the remainder of the tank will not be affected. An overflow is provided near the top of the tank.

Any size of tank can be supplied but our data sheets show tanks holding about 55-6 hours treatment plant output capacity. It should be noted that the minimum elevation of the bottom of the storage tank above treatment plant floor level is 7,5m and the maximum height 15m.

SPECIFICATION

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| <p>(a) Pressed steel sectional tank – nominal capacity – (A) gallons (B) x (C) x (D) deep including washwater compartment.</p> <p>(b) Fabricated steel tower – height – (E)</p> <p>5.01 One pressed steel Sectional Cold Water Storage Tank (B) x (C) x (D) deep, net capacity (F) imperial gallons, without freeboard, having division forming a corner compartment (G) x (H) x (I) deep, constructed of standard plates complete with the requisite bolts, nuts, washers, stays, cleats and plastic jointing material, fitted with mild steel flat cover constructed from sheets 12 gauge thick suitably supported having two 500dia. manholes with bolted lids and two 100dia. mosquito-proof ventilators. Tank would also have two (J) dia. and one (K) dia. pads fixed in convenient positions to accommodate pipework and two mild steel internal ladders. Materials painted with epoxy or galvanized.</p> | <p>5.02 One mild steel structure to support the underside of tank (L) x (L) x (E) ft. above ground level, complete with the necessary holding down bolts, with mild steel cat ladder from ground to top of tank with safety hoops.</p> <p>5.03 One range (J) steel filtered water main to underside of washwater compartment of tank.</p> <p>5.04 One range (K) steel main from underside of main compartment of tank to ground level terminating with flanged bend.</p> <p>5.05 One short range (J) overflow pipe</p> <p>5.06 One (J) flap valve on overflow pipe</p> |
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DATA

WATER-MAN MODEL	W.1000	W.2000	W.3000	W.4000	W.5000
A	7,500	10,250	15,000	20,000	33,500
B	3.6m	3.6m	3.6m	5.0m	6.1m
C	3.6m	3.6m	5.0m	5.0m	5.0m
D	2.4m	3.6m	3.6m	3.6m	5.0m
E	9m	9m	9m	9m	9m
F	31m ³	46m ³	64m ³	90m ³	152m ³
G	1.2m	1.2m	1.2m	1.2m	1.2m
H	1.2m	1.2m	1.2m	1.2m	1.2m
I	915mm	2.1m	3.4m	3.4m	4.6mm
J	75mm	75mm	100mm	150mm	150mm
K	75mm	150mm	150mm	100mm	200mm
L	3.7m	3.7m	3.7m	3.7m	3.7m

ELEVATED STORAGE TANK

