



BKB PUMPS & TANKS PTY LTD

SPECIFICATION FOR *INSTAPACK* SKID MOUNTED HOT WATER SYSTEM

SYSTEM OVERVIEW

The *Instapack* Hot Water System is designed for installation in applications where hot water could be required at set times of the day with the demand relatively constant during those periods. For the remainder of the day the demand is low and can be accommodated by a smaller heating capacity.

This system is perfectly suited to Sporting Complexes, Caravan Parks, Military Camps etc where users will expect an instantaneous supply up to the maximum simultaneous demand over a relatively short period (e.g. morning showers) but otherwise the system would remain idle for long periods. Heat losses through storage tanks may lead to lower system efficiency.

This demand profile is best achieved utilizing a continuous flow system, where the size of the package is selected to meet the highest calculated user demand at the desired set temperature i.e. all outlets operating simultaneously. The number and type of outlets are counted and the maximum instantaneous flow is calculated based on normal flow rates through such fittings. From this calculation, BKB will determine the number of heaters required to achieve this performance. A flow and return system is only necessary if the heaters are positioned far away from the outlets, such the heat losses through the reticulation need to be addressed. The system is still demand responsive and any lower flow demands are accommodated by the initiating only such heaters as may be required to deliver the required quantity of hot water at the set temperature.

The system will respond to two parameters:-

- 1) The preset temperature of the system- as demand increases, so more heaters will be initiated to maintain the pre-set temperature.
- 2) Flow demand – as more outlet points are utilized, the flow will increase to satisfy this demand up to the maximum system flow rate required to satisfy the calculated instantaneous demand.

System pressure is maintained by using primary pumps from cold water circuit feeding the package. These pumps can be selected to boost the pressure to the desired level at the output locations.

The *Instapack* system offers users a low cost solution, because it is based on a modular design.

- Heater Module
- Pumping Module
- Control module

Each module can be optimized to meet the specific requirements of any installation, eliminating oversizing of any particular module, but offering the flexibility to meet operating conditions at the lowest capital cost and with minimum space requirements.



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1) Heater Module

The **Instapack** uses multiple gas heaters as the primary heat source. The Rinnai Infinity HD 200 instantaneous gas fired heater is at the heart of the Heater Module. The total number of heaters installed will cater for the maximum instantaneous demand. These heaters (or banks of heaters) are mounted on a rigid frame and assembled to cold and hot water manifolds, so that there are single point connections to the BKB package. Manifolds are insulated to minimize heat losses in pipework. When necessary, the lead heater maintains the temperature of the “flow and return” line to prevent any dead-spots in the piping to outlets, ensuring a rapid response to the anticipated demand.

Each heater bank is connected to a solenoid valve which is operated by the programmable controller within the control panel. As demand for hot water increases, so more heater banks are brought on line, until the system is operating at the peak instantaneous level. This ensures that the system optimizes the number of heaters in use at any one time and improves overall gas consumption.

Because the Rinnai Infinity heaters are well known in the market, the maintenance and service of the heater module can be undertaken simply and economically by appropriately trained tradesmen.

2) Pumping Modules

a) The primary pump – This pump is sized to boost the mains pressure to the required level at activate the heaters in sequence. As the flow rate increases, so the heat load will increase and more heaters are initiated to keep pace with demand. In most cases, this boosting can be achieved with a constant speed pump, which responds to the flow demand at any point in time. These will be of the Grundfos CR type in all SS 304 construction. BKB recommends a duty/standby combination for reliability and ease of maintenance. However, for the peak demand situations, when all 4 heater banks are called into operation, both primary pumps will operate in parallel to boost the pumping capacity and maintain adequate flows and pressures at the multiple outlet points.

In certain installations with a complex reticulation system, these fixed speed primary pumps can be replaced by pumps with variable speed drive responding to demand for hot water, thereby increasing the range of flow variation that can be accommodated.

b) The flow and return circuit (if fitted) – This maintains the temperature in the reticulation pipework at a preset level to ensure a rapid supply of hot water to any outlet that is opened. This line is a continuous loop and therefore is not subject to static head, irrespective of the number of storeys of the building. The pump must overcome friction losses in the pipework at a flow rate sufficient to maintain the required set temperature in the flow and return loop. For this reason, small hot water pumps of Grundfos UPS all bronze construction are ideal and very cost effective. BKB recommends the use of a duty/standby combination, With the load being shared between the two pumps on a timed basis. When the flow & return line is at the required temperature, the pumps are switched off to reduce power consumption. Either pump can be removed for service and maintenance as required, while the hot water system remains in operation. By sizing each of these two pumping systems correctly, it is possible to significantly reduce the capital cost of the pumping module, while simplifying maintenance and fault finding in the event of operating problems.



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3) Control Module

The two parameters of principal interest to users are:-

- Water temperature - controlled by the temperature sensor in the heater system
- Water flow rate at outlets – controlled by the primary pump capacity

As a result, the control system should be capable of monitoring these parameters and adjusting the performance of heater and pumping modules to match the output up to the maximum instantaneous demand of the system.

Since most packaged hot water systems are designed to operate automatically and adjust to system demand, users of the system expect that hot water can be provided when required and at the desired temperature. This places high emphasis for reliability on the control system. All control equipment shall be suitable for operation in ambient temperatures up to 50 degC and 95% relative humidity.

Our standard control panel incorporates all the necessary switchgear for proper functioning of the system, including acceptance of signals from temperature sensors, flow sensors, which monitor overall system performance. The panel will also include alarm and fault signals for both the heaters and pumps to alert maintenance staff that the system has experienced a problem.

The panel will include the following:-

- Main isolator switch
- Indicator lamps to show flow & return pump is operational
- Indicator lamp to show primary pump is operational
- Pump selector switch for primary pump (MANUAL/OFF/AUTO) with associated relays
- Pump selector switch for flow & return pump (MANUAL/OFF/AUTO) with associated relays
- Low temperature alarm warning light
- Audible “fault “ alarm
- Volt free contacts to Building Management System

Optional features

- System alarm warning bell
- Pump hours run meters
- Record of total flow

Electrical Panel

- The control panel shall be fabricated from 2 mm thick mild steel with exterior quality powder coating applied to properly prepared surfaces
- A minimum of IP 54 protection shall be provided
- The switchboard shall have DIN rail terminals located in the bottom half of the panel
- All control wiring shall be in multi-stranded multi-cored cables at least 1 mm sq. All wiring shall be numbered to conform to the “as-built” wiring diagrams
- The control panel power supply shall be 240 volt, single phase, 50 Hz and shall be suitably protected from unauthorized access. Control voltage will be 24 v supplied from a transformer.



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- All electrical work will be installed to AS 3000 and comply with regional power authority requirements.

Our design keeps the system at a level of complexity that meets these requirements, yet can be serviced and maintained by appropriately trained tradesmen who work in this industry. Even in the event of system faults, there will be an expectation that standby capability is built-in and that the package can be quickly and easily brought back into full service.

6) Electrical Specification

All electrical installations shall comply with the relevant Australian standards which include but not limited to:-

- AS 1202 – AC motor starters (up to 1000 V)
- AS 1431 – Low voltage switchgear, control gear and control circuit devices
- AS 1675 – Current transformers. Measurement and protection
- AS 1930 – Circuit breakers for distribution circuits
- AS 1930 – Degree of protection of electrical equipment
- AS 2184 – Moulded case circuit breakers
- AS 3000 – SAA wiring rules
- AS3008 – Cables for alternating current
- AS 3190 – Current operated earth leakage devices
- AS 3439 – Low voltage switchgear and control assemblies
- AS 1345 – Rules for the identification of piping conduits and ducts
- AS 1319 – Rules for the design & use of safety signs for the occupational environment

7) General Requirements

- The complete skid shall be designed to be lifted by 4 lifting lugs for ease of site installation
- The control panel shall be located in a position to protect the equipment from the elements and direct sunlight
- The complete package shall be subject to function testing at the manufacturers works. Function testing may be witnessed by a client representative if required
- The manufacturer shall have a QA system in accordance with AS 9000 – 2000, and provide full QA documentation on the finished packaged hot water system

8) Documentation

BKB Pumps & Tanks will provide the following:-

- Package GA and foundation plan within 2 weeks of order
- Quality Plan outlining all test and inspection activities during manufacture
- Signed ITP by manufacturer's inspection staff.
- “As built” general arrangement drawing
- “As built” P&ID
- “As built” wiring diagram
- Detailed Installation & Operating Instructions for the plant



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