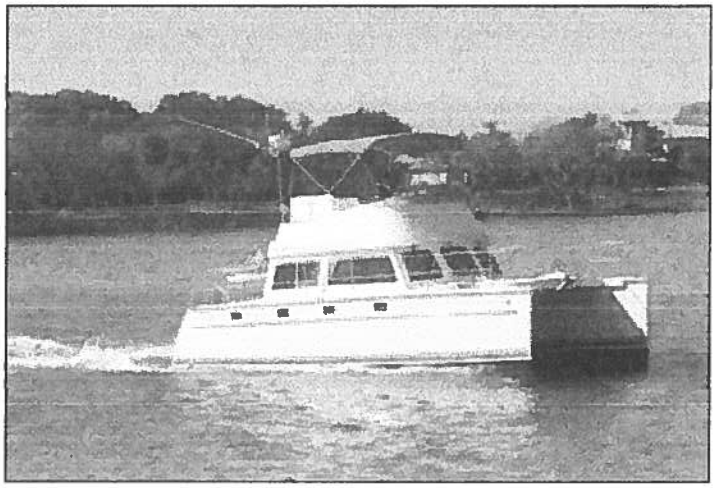
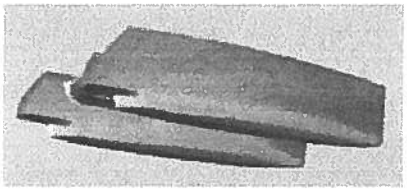
Building the PDQ 34 Powercat

Hull Design



Many variables went into designing the powercat. The simplest way to illustrate our initial design choices would be to imagine a "design triangle" with corners representing **weight capacity**, **seaworthiness**, and **performance**.

- **Weight capacity** includes the ability to accommodate a cargo and float with acceptable freeboard.
- **Seaworthiness** includes comfort, safety, and control.
- **Performance** includes speed and its power (fuel) efficiency.



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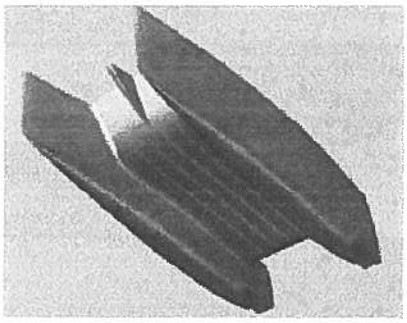

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An imaginary barge is in the capacity corner, a racing hydroplane in the performance corner and a navigation lightship in the seaworthiness corner. *A cruising pleasure vessel, namely the 34 Powercat - would be somewhere more centralized.*

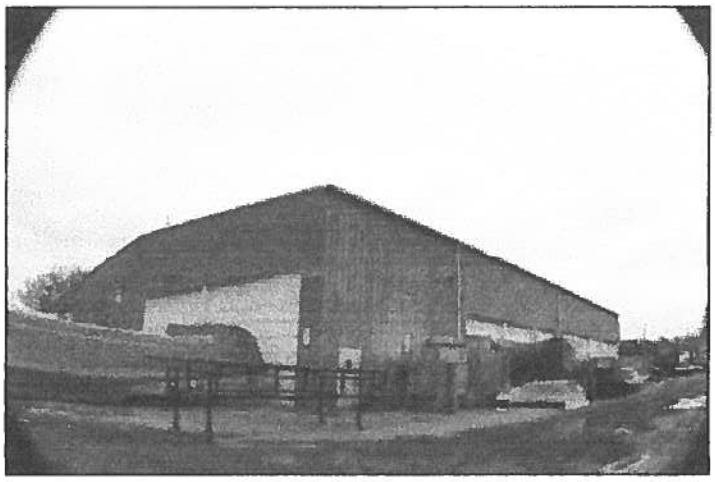
PDQ 34 Powercat hulls: This is a simplification but by keeping our catamaran hulls narrow and deep we can achieve the displacement hull efficiencies and carry them through the wave-making barrier to the speeds we would normally associate with fast planing hulls.

In catamarans, the "bridgedeck" spans the space between the hulls. Aside from its structural duties, it provides an area for accommodation. We try to amalgamate hulls and bridge deck together with large radius fillets (pictured to the left) that handle structural loads well, in addition to gently deflecting higher waves. Four longitudinal ribs down the length of the bridgedeck act to stiffen the structure and scatter the force of any water that makes it up that high.

For more detailed information on power catamaran design at PDQ **click here.**

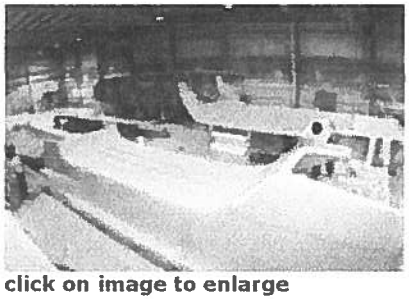
Building the PDQ 34 Powercat

From Design to Development:
our fiberglass shop



We do our molding at a separate facility from our main assembly building, ensuring a clean environment for the molding and spray work.

The plans are transformed into a plug that's constructed of wood, faired and finished. The plug is an exact replica of the finished boat that's used to cast a mold.



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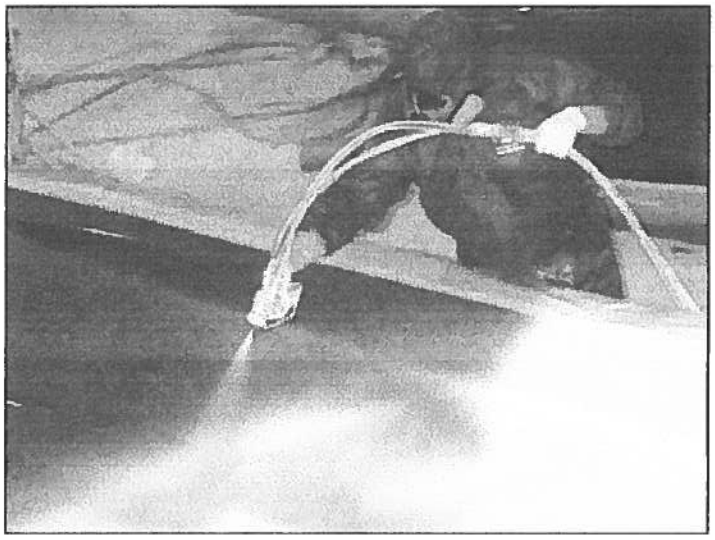
The 34 Powercat hull is comprised of 3 molds - outside left hull, outside right hull, and the inside hulls and bridgedeck. The molds have an orange gel coat finish. By using a dark mold colour, we can ensure an even layer of gel-coat is applied when the required part is layed-up.

The finished mold is buffed, polished, and waxed with bee's wax before the gel-coat is sprayed. Just as with the plug, the better the quality of the mold finish, the better the quality of the exterior on the 34 Powercat.

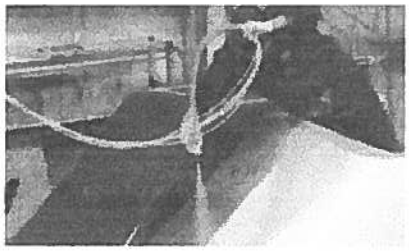
Building the PDQ 34 Powercat

Gel-coat, Coring & Layup



Gel-coat is a high performance marine resin with excellent durability that prevents blistering. This resin is sprayed over the mold to create the first layer. When the 34 Powercat is released from the mold, the gel-coat forms the shiny surface.

After the gel-coat, a 1 oz. omni-directional mat is applied to form the skin coat. The skin coat provides adhesion between the gel coat and the structural layers that follow.



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Once the first layers of fiberglass are applied, bonding putty is evenly spread on the hull and foam core is laid on top. Rope is arranged on top to allow air to be suctioned out from behind a plastic envelope that is applied next. The outer edges of the plastic are then sealed and secured.

When suction is applied to the plastic envelope, 14 lbs/square inch of pressure is applied by the atmosphere, pushing the core firmly against the structural layers. The air travels out through the pinholes in the foam to ensure a secure bond that's free of any air pockets.

This vacuum bagging process assures a 100 percent bond between the structural layers and the core.

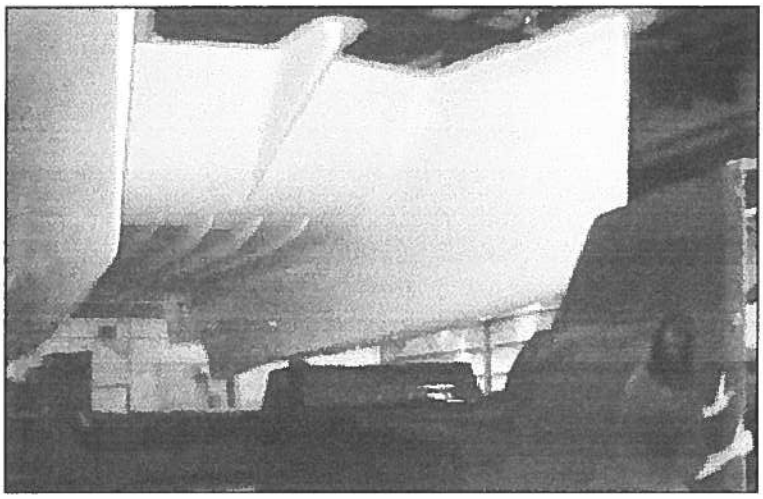
We don't use foam core below the turn of the bilge. Should damage occur below the water line, it is relatively easy to repair. It also facilitates the installation of thruhulls with high integrity.

We use a hand layup method to apply all our fiberglass (no chopper gun used). Hand layup requires less resin and results in a lighter, stronger boat.

The same process is used for our modules - mainly the head, salon and aft cabins. Special attention is required for the fiberglass to adhere smoothly around the sharp corners required for these parts.

Building the PDQ 34 Powercat

Hull Assembly



Once the 3 separate components are cored and glassed, the outside hull molds are aligned with the inner hull and bridgedeck mold section. All are clamped securely down their length.

click on image to enlarge

The structure is first taped and sealed together with gel-coat. Eight layers of biaxial fiberglass are applied to the seam to create a strong, homogeneous hull structure.

The complete hull is now carefully removed from its mold. The clamps are removed and because of the waxed surface, the hull easily slips out of the mold.

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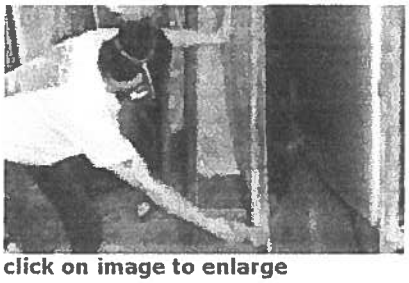
The hull structure is transported to our main building where the inside is sanded and we can begin installing components.



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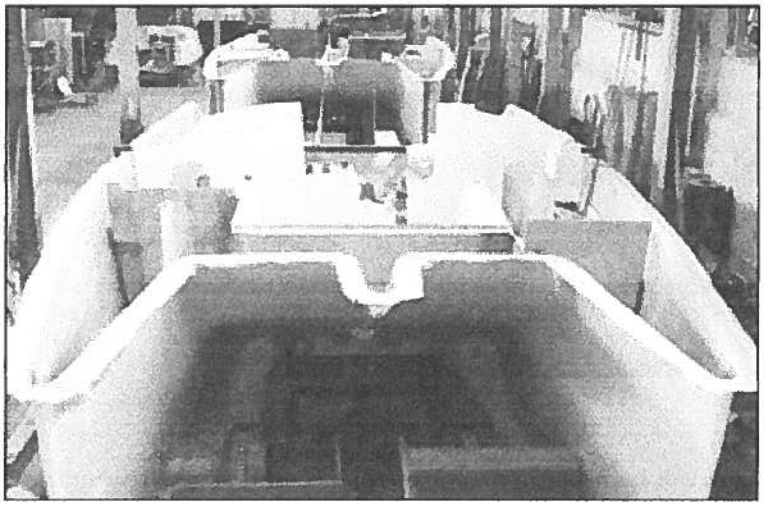
Building the PDQ 34 Powercat

Prework - Bulkheads

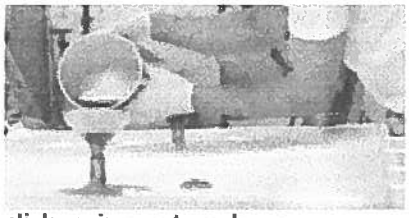
Once the hull is leveled and sanded, we begin to install the fiberglass modules.



There are 4 primary fiberglass modules:

- 1 foreward starboard head
- 1 saloon
- 2 aft cabins - port/starboard

These modules combine together into one unit and give the overall structure added strength.



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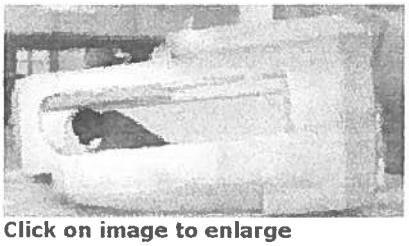

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There are also numerous other structural components used throughout the hull such as the transverse bulkheads, which in combination with the modules, provide structural integrity to the hull.

The 2 aft cabin modules, for example, make a traverse structural joint connecting the bridgedeck to the side of the hull as well as the central portion of the deck. They are also support bulkheads to the companion way area.

The bulkhead material is made of foam core that's layered on both sides with dry structural fiberglass. A plastic sheet is then placed over the assembly, sealed over the perimeter and connected to a suction hose. Resin is then poured through spigots and carefully distributed throughout the part.

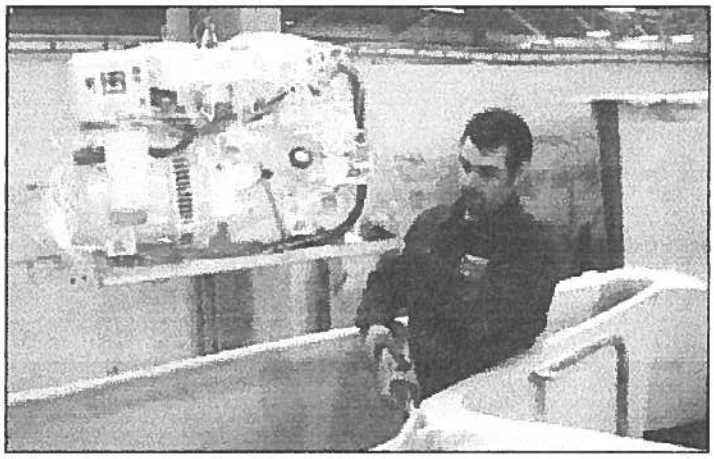
By using the vacuum assisted injection method, we not only use less resin, we're also ensuring that we get rid of any air bubbles that may cause de-lamination down the road.

The materials used, combined with the resin injection process, results in a superior strength bulkhead that's impervious to water.

Building modules gives us greater control and efficiency over the construction process and consistency in the finished product.

Building the PDQ 34 Powercat

Major Components



Before the deck goes on, we install many of the major boat components - the generator, and water/fuel tanks are amongst the first to be installed.

The generator is placed in the large foreward port locker and is easily accessible for future servicing. Combined with the soundproofing insulation, the generator placement is also remote from the sleeping area, ensuring a quiet sleep.

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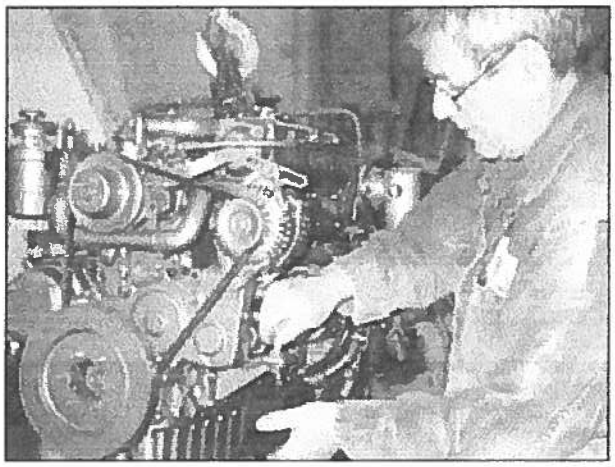
The main fuel tank is located below the wheelhouse floors - an area that is otherwise difficult to use because of accessibility. Similarly, by placing the water and fuel tanks forward of the saloon, we can effectively use an otherwise awkward space.

At this stage, we also install wire harnessing - or bundles of wire. We pre-fabricate our own harnesses and have direct control of what goes into them. This allows us to quickly make any modifications, and keep track of the miles of wire when making connections at the main control panel further down the building process.

We use only marine grade, fine-stranded tinned copper wire. This ABYC (American Boat and Yacht Council) approved wire is both flexible and resists corrosion in salt water. And having our own ABYC certified electrician gives us the assurance that we're working to the highest standards.

Building the PDQ 34 Powercat

Engine Installation



At this stage, the engine is carefully lowered onto the engine bearers. The engine is then pre-aligned to the shaft and its bearings with great accuracy and precession.

We don't use wood in our engine bearers. Instead, we use solid fiberglass moldings with aluminum backing plates carefully glassed in, providing strength and a solid structure to bolt the engine to.

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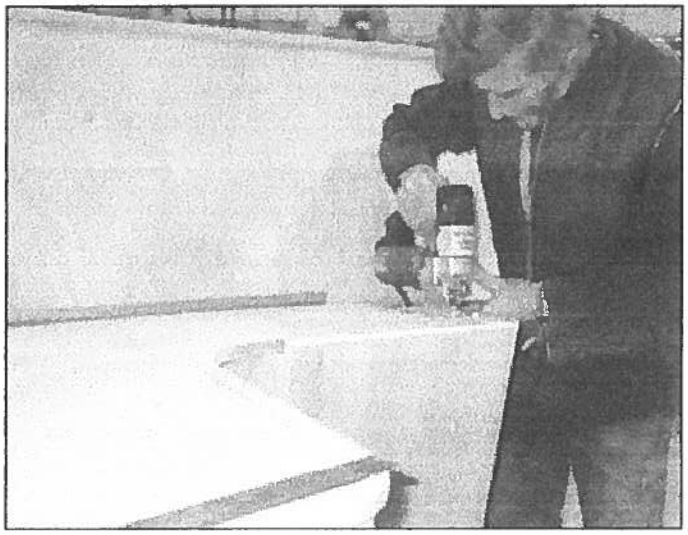
Also, we install flexible couplings and mounts on our engines - which give a vibration cushion and protects the driveline from undue stress.

The twin Yanmar 75 HP turbo-diesels (optional 100 HP also available), combined with hull design properties and propeller selection makes our cruising and economy numbers the envy of the cruising world.

For more detailed technical information on propeller selection, please visit link to our **Technical section**. Link to our **Performance** section for more information on fuel consumption.

Building the PDQ 34 Powercat

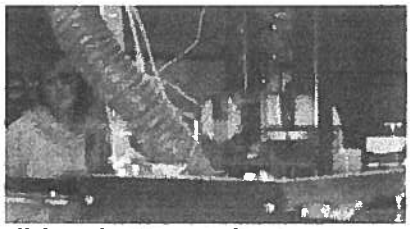
Wood Modules



The same principle of building fiberglass modules extends to building the wood units - the salon settee and the helm module.

We continue to build these 2 modules in wood for aesthetic reasons - the cherry wood detail adds warmth to the exposed surfaces without sacrificing strength and durability.

As with the fiberglass modules, there is greater control of the finished product when constructed on a workbench rather than on the boat.



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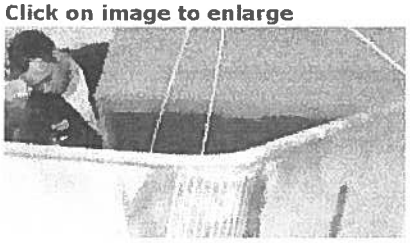

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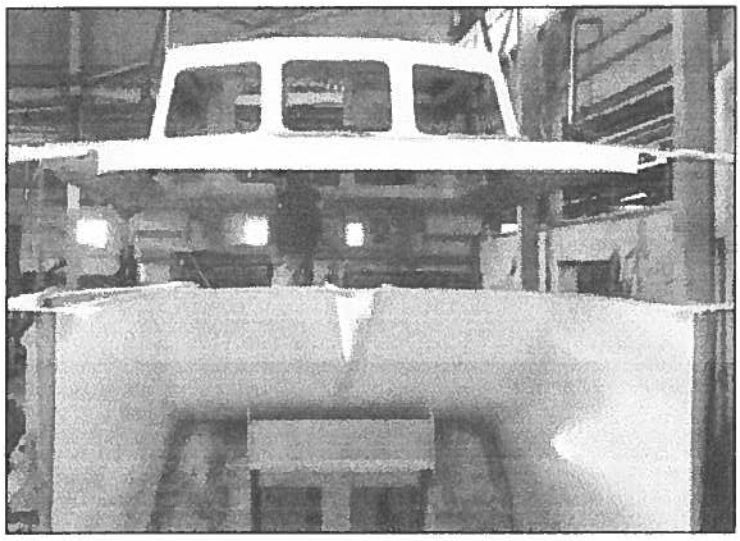
The materials and methods used in our woodshop require special skills. We use unconventional materials like Tricel - a durable and lightweight honeycomb board sandwiched between 2 layers of veneer. Tricel can be shaped and formed to remove sharp angles onboard.

The combination of the materials, the finished shapes and the joinery all contribute to the structural integrity of the modules. Highly engineered and detailed plans guide the construction process to the smallest detail.

Our woodshop quality is never sacrificed to factory production. From the centered patterns, textures and colors grouped to create harmony, to the best and latest in quality hardware fixtures, our attention to detail and our esthetic standards are never compromised.

Building the PDQ 34 Powercat

The Deck



While the major mechanical systems are being installed in the hull, the PDQ 34 deck is prepared for installation.

The first step after the deck is sprayed and layed up in our fiberglass shop is the finishing work of what will be the deckhead of the boat. The deck is built upside down, much like a (very large) jelly mold (see picture below).

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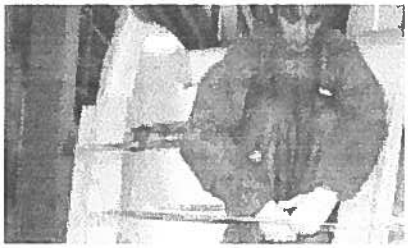

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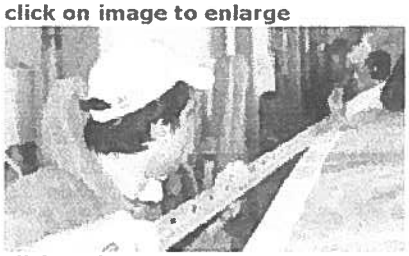

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The deck is removed from the mold and rotated to the upright position. Now it can be sanded and the hatch openings and windows can be trimmed out. This also gives us the opportunity for a close-up inspection of the fiberglass finish. We survey the surface to make sure it is smooth and consistent through out the entire deck.

Once as much as possible of the mechanical systems and structural interior parts are in place, the deck is fitted onto the hull.

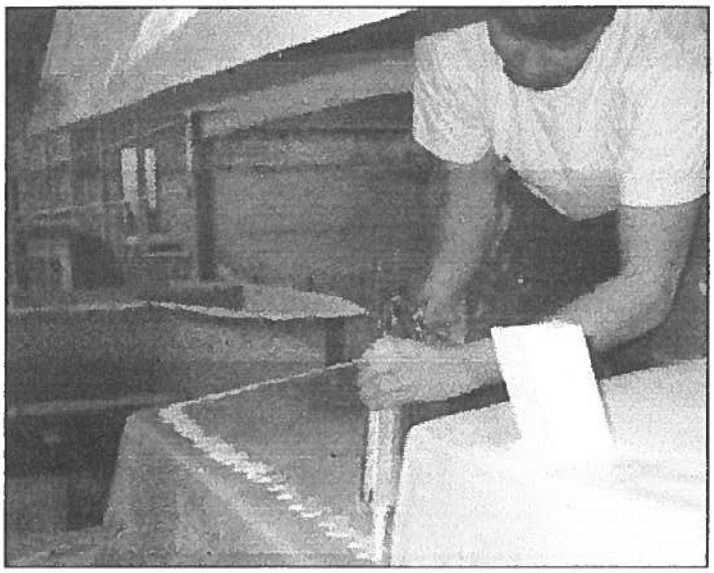
Fitting the deck onto the hull is a major milestone in the Powercat construction. This process involves lowering the deck down into place and trimming the structural bulkheads until the deck is in the correct position and its weight is properly distributed.

Bonding putty is used to secure the deck to the hull. The toe-rail is then secured onto the deck and is part of the structural joint connecting the outside deck flange to the hull.

The external flange hull/deck joint gives you the assurance of added strength at sea as well as hull-scrape protection against the dock. And the resulting 29-inches of unobstructed walkway on the side decks give you easy movement outside the boat.

Building the PDQ 34 Powercat

The Flybridge



Building from the bottom up, the flybridge is the last structure mounted onto the Powercat before it is moved to the final assembly area of our factory.

In the past year, we have created a new mold for the flybridge that incorporates additional seating, extra storage space, and details such as a glove box and cup holders.

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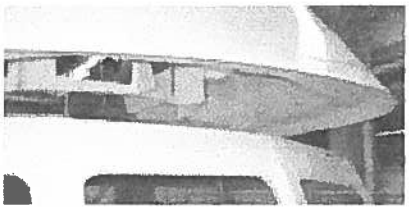

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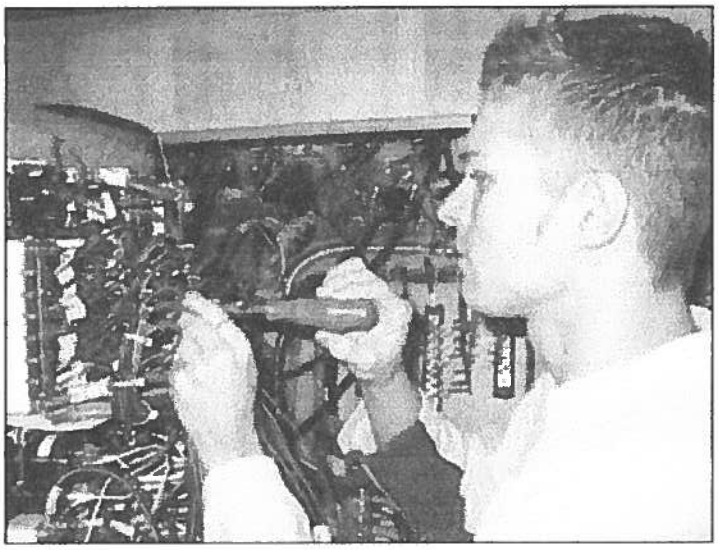
Special attention is required for the layup of the flybridge due to the many sharp corners and angles on the flybridge mold. By using the hand layup method we can access all the grooves and at the same time use less resin. The results in a lighter and stronger structure.

The flybridge is moved to our main factory where it is prepared for fitting on top of the deck. Once suspended, the flybridge can be lowered as many times as necessary to make sure there is a proper fit. The bottom is sanded down until the flybridge sits flush onto the deck.

Adhesive caulking is applied to the deck and the flybridge is lowered and bolted down in several places onto the deck. An eaves trough (pictured above) is glassed into the deck and is used to connect the electrical harness and hydraulic lines from the interior helm to the flybridge.

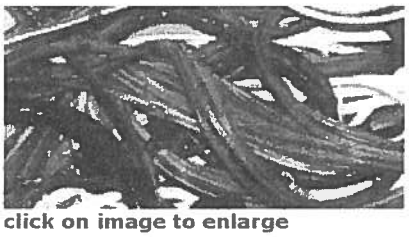
Building the PDQ 34 Powercat

Electrical



The trail of wire leads back to a stock distribution panel. Because we build our own harnesses in-house, the coils of wire are colour coordinated and follow both ABYC and CE standards for accurate and easy identification.

We eliminate as many connections as possible in favor of visibly marked fuses and breakers. Because of their compact nature, we use hydraulic magnetic aircraft circuit breakers.



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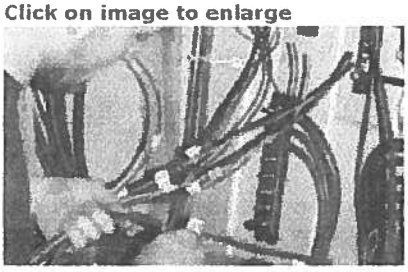

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Dedicated circuits are installed for each unit, such as fresh water pumps, air conditioning, etc. This not only means fewer loads on the breakers, but it also makes the panel both versatile and easy to troubleshoot.

We pay attention to details and make sure all connections below the waterline are double-wall heat shrunk for extra protection. Chafe guard is used to prevent wear and tear from regular vibrations. The wires are also supported every 16 inches so there are no loose wires anywhere on the boat.

Our electrical system is immaculate - all the wires are labeled with numbers that coincide with reference sheets and drawings given to each of our owners. This attention to detail allows us to easily isolate and service any problems down the road.

Building the PDQ 34 Powercat

Steering

A hydraulic steering system is ideal for the 34 Powercat's configuration and the convoluted route the connections have to make.

One of the unique features of the 34 Powercat are the 2 helm stations - an interior helm designed to allow for clear sightlines and a social environment for captain and crew, and a flybridge helm station.

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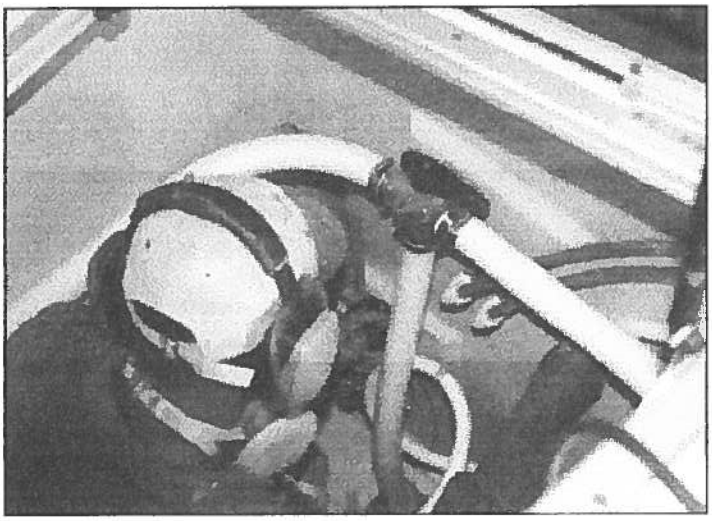
The steering systems consist of two bronze rudders operated with a hydraulic system. Hydraulic rams are fitted to each rudder tiller and they operate in series. Because of the twin rudders, a steering alignment valve is used for future realignment.

It is important to keep the system clean while working on it as there are several small openings in which the hydraulic oil has to travel. All ports are capped before they are hooked up to keep dust and objects from entering the system.

In order to charge the system with oil the first time, a portable, electrically driven pump and reservoir are connected to push air through all the tubes and bleed the system of air.

Building the PDQ 34 Powercat

Plumbing & Air Conditioning



All the preliminary work for the plumbing was installed at the pre-work side. At this stage plumbing fixtures, transom shower hookups, deck wash, waste tank and other connections are made.

Other tradesmen usually work around the plumber. The well designed plans are a road map to all the plumbing work, which means there is little room for error.

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The boat is always plumbed with the customer in mind. Accessibility to joints is a priority, as is keeping connections simple and minimal.

We use push-fit connection joins, which makes assembly and any future servicing simple. This type of connection is also more convenient to use in harder to access areas.

Fresh water is provided under pressure in the galley and in the head. With the circuit breaker on, the pump starts automatically when any tap is opened.

Water is heated by a heat exchanger that draws hot water from the cooling system of the port engine when it is running, and stored in a 6-gallon tank. Alternatively, a 120-volt AC electrical power from the generator set or shore power provides heat.

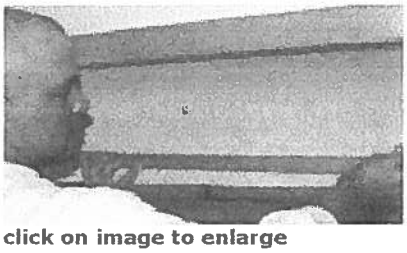
A lot of prep work goes into installing the AC unit. All the vents and drains are positioned properly. The units are water cooled with seacocks, pumps and strainers located under the fridge and in the port engine compartment. These dual air conditioning units are located under the saloon seat and in the aft deck locker.

Building the PDQ 34 Powercat

Final Assembly

At this stage, several teams get onboard to complete the building of the 34 Powercat. From window and liner installers to electricians and plumbers, the builders work in a well-choreographed method to ensure the workflow process is efficient and uninterrupted.

There is still substantial work to be done on the engines, plumbing, steering, and electrical systems, not to mention the finishing details such as wood trim and deck hardware.



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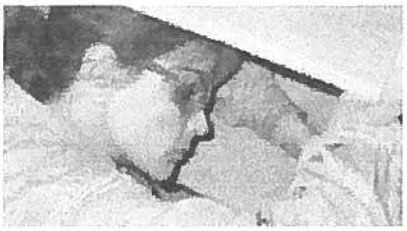

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Most of the work is done simultaneously. As the vinyl lining is being installed, access to the engine compartments in the aft cabins is left open for the easy transfer of tools and ease of movement for builders.

Work in the aft cabins includes plumbing, engine hookups - electrical and mechanical, and hook ups to the water heater. When the majority of this work is completed, the liner in the saloon and the helm area is finished and the windows and the aft wood trim can be installed.

Alternating between cabins to allow for uninterrupted engine work, the meld fabric fairing in cabinets begins. As this work is going on, windows and hatches are installed and work on the steering system on the upper and lower helm stations begins.

Building the PDQ 34 Powercat

Dinghy Davits

Working within existing frameworks of the manufactured product - such as the width and curve of the stainless steel tubing - we try to make our davits elegant and aesthetically appealing.

We don't compromise the way the parts come together, making sure that components can be welded and polished in a practical way.

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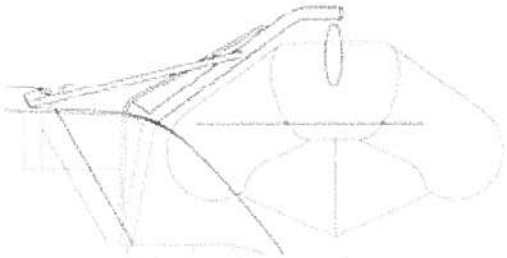


Click on image to open pdf file of dinghy clearance

Another consideration is load bearing. Unlike a crane, the loads don't just come straight down, but more significantly the "resonance loads" or the rhythmic bouncing from wakes and waves on the water, is a major concern.

These side loads are difficult to predict. We can, however, through trial prototypes, anticipate a certain load capacity. By designing the davits in such a way as to keep the dinghy as close to the boat as possible by keeping the lever arms a short distance away from the boat, we see significant improvements in handling loads in all conditions.

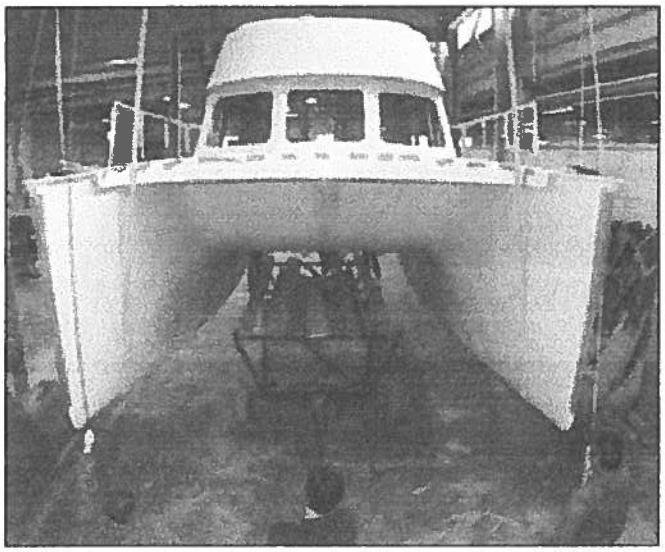
Building the PDQ 34 Powercat

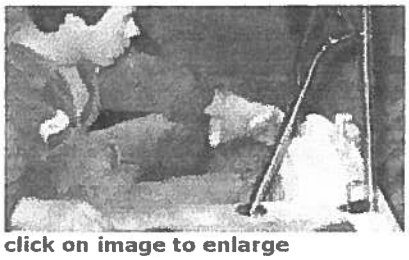
The Mezzanine

The stainless steel rails are mounted onto the hull before the Powercat is moved to the final work area of the factory.

When the majority of the mechanical and electrical systems are installed, the boat is about half way finished. At this point, we move the boat to the finishing side of our plant.

We raise the boat off the pre-work cradle and transport it to the final-assembly area of the factory.





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When we expanded our plant, we took extra care to design the best floor layout for a smooth and logical workflow. We built a raised mezzanine for the efficient fitting out of vessels. This gave us space to store supplies beneath and makes materials and tools more accessible to our builders.

Relying on a simple but accurate technique that was used by the Ancient Greeks, we use a water level to make sure the boat is properly aligned before we commence work. A bucket full of water, 4 hoses, a waterline etched into the hull mold, and a basic understanding of physics allow us to accurately level the boat on jacks.

From installing fixtures and deck hardware to the wood joinery and liner installation, the detail work that defines the PDQ34 for its elegance and superior design begins to take place.

Building the PDQ 34 Powercat

Design

From start to finish, technology is a driving force behind building our boats. The power of this technology is phenomenal in its ability to develop shapes and configurations. With these systems, our designers can quickly and accurately perform weight distribution studies using intricate mathematical models that would otherwise take weeks to complete.

The advantage of having a composite model is that we can accurately see perspective views. This "real life" view gives us the ability to place a hypothetical person in the boat to gather ergonomic data. These ergonomic reference models in turn help us select every item and its placement on board.

When it come time to build, we can create cross sections and render 3D surfaces that can then be machined to shape.

PDQ 34 Powercat Hydrostatics and Stability Analysis

The following charts are used to predict seakeeping behavior and the effect of weight changes on the 34 Powercat. The charts measure the Powercat's behavior when items are moved, added or subtracted, that effect the vessel weight and center of gravity, or when changes are made to the hull form that effect the centers of buoyancy.

In simple terms, the charts predict the point of no return, where the center of gravity moves outboard of the center of buoyancy.

What does this all mean to the stability of the Powercat?

It shows that the 34 Powercat displays an extraordinary level of stability that you would expect in a broad beam catamaran vessel.

The analysis is being presented to meet the requirements for CE regulations for both **Class A** and **Class B** boat design categories.

Class A is an **"Ocean"** category and is defined as a vessel that is *"designed for extended voyages where conditions may exceed wind force 8 (Beaufort scale) and significant wave heights of 4 m and above, and vessels largely self-sufficient."*

Class B is an **"Offshore"** category and is defined as a vessel *"designed for offshore voyages where conditions up to, and including, wind force 8 and significant wave heights up to, and including, 4 m may be experienced."*

(as defined in RSG Guidelines to the Recreational Craft Directive - 94/25/EC)

Please click on folder icon to open an image of the chart.

Note: The charts are derived from the analysis of the submerged hull form (hull form analysis values are computer generated) and the cataloguing of vessel weight studies.

The shape of the hull also determines the center of buoyancy.

Building the PDQ 34 Powercat

Commissioning

The 34 Powercat travels down the road to the Whitby Harbour Marina where it is launched into the water.

It is always exciting and rewarding to see a PDQ 34 Powercat in its natural environment - the water. Once the thruhulls are inspected, the boat is released into the water and commissioning begins.

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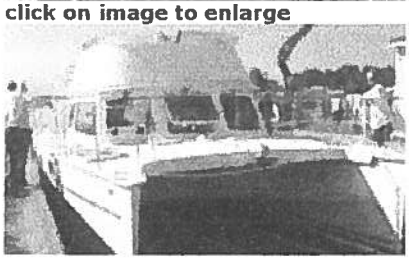

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click on image to enlarge

Our experienced commissioning teams make sure the boat is finely tuned and seaworthy before it leaves our docks. From electronics and mechanics to the upholstery and power washing, our team works hard to fine tune our boats to the smallest detail.

The boat is first fueled up and the fuel transfer pumps and gages are checked. The holding tanks are also filled with water and the plumbing systems are thoroughly inspected.

This is also the first time we run the engines. This allows us to check for any manufacturer defects. The steering calibration is also checked to ensure proper rudder alignment.

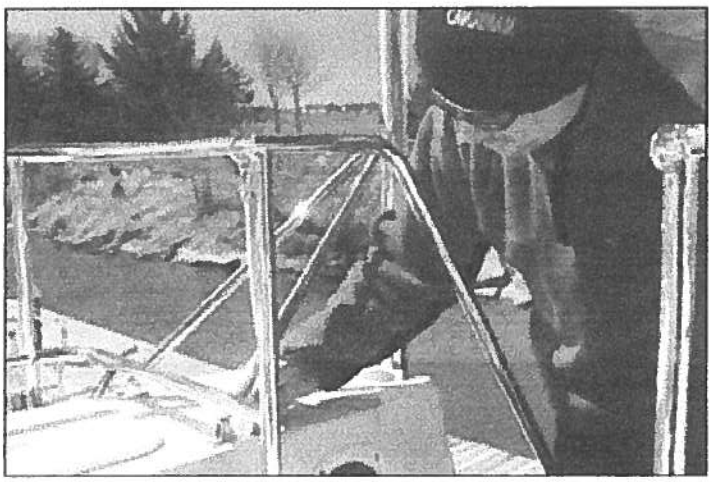
Behind the scenes, our export specialist makes sure all the paperwork is completed and the new owner is properly licensed. The boat leaves the dock only when the customer is 100% satisfied and feels confident about taking ownership of their new boat.

Building the PDQ 34 Powercat

Pre-Commissioning

Through out the whole building process, measures are taken to make sure that a high level of quality workmanship is maintained.

The boat is thoroughly inspected several times before is leaves the plant - when the hull and deck first arrive at the plant, before it is moved to the mezzanine, and before it leaves the plant for commissioning.



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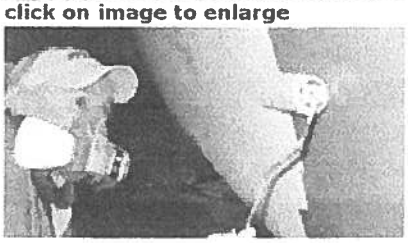

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To prevent scratches and dents, the wood cabinet units are some of the last components to go on the boat. The durable cherry wood veneer immediately adds warmth and richness to the boats atmosphere.

Using a random orbit sander, we sand the hull below the waterline and apply an epoxy barrier coat to protect against osmotic blistering. Two coats of anit-fouling bottom paint are then applied to the smooth surface.

At this stage, the propellers are installed and rudder alignment is inspected once again before transporting the boat to the marina.

For more information on propeller selection, please link to our **Technical** section.

Once the final QC inspection is complete, the boat is ready to be launched.

SALOON:
~seating accommodates up to six people for comfortable dining or lounging
~saloon table can be lowered for extra bunk
~all wood trim is solid cherry
~ample storage under saloon seating
~large area for lounging and navigating in aft section of saloon
~helm seat and wheel to starboard at midpoint of saloon complete with adjustable double bench
~engine control panels mounted above helm, clearing space at inside steering location for large screen chart plotter

GALLEY:
~double burner propane stove
~7.5 cu. ft. Nova Kool 12volt fridge/freezer
~convection microwave oven
~double sink with pressure hot & cold water
~pass through to main saloon
~cutting board sink cover to allow more workspace

UPHOLSTERY:
~saloon, upper saloon and aft cabin dressing seats are upholstered in Factory standard fabric (Sunbrella, Birds Eye Canvas) unless otherwise directed by the owner at time of purchase.

MECHANICAL & ELECTRICAL

STEERING GEAR:
~helm stations located in cabin & on fly bridge
~hydraulic system with equalizer valve
~solid bronze rudder c/w stainless steel shaft
~top bearing and lower bearing on rudder shaft
~bronze tiller arms

ENGINES AND RUNNING GEAR:
~located in aft cabins
~front access for daily checks
~easy access to fuel filters
~twin 75 hp, turbo-charged, Yanmar Diesel motors
~1.25" AQUAMET 19 shafts
~twin single lever motor controls @ both stations
~self bleeding fuel system
~shaft drive complete with Flex couplings
~3 Blade - 16" - Bronze Michigan Wheel Dynajet Propellers
~fully sound insulated engine box
~one group 27 starter battery for each engine
~drip-less shaft seal

FUEL TANKS
~constructed of aluminum
~70 gal forward tank
~114 gal aft tank
~transfer pump (12 V) allows movement between tanks
~individual fuel gauges at helm

PLUMBING:
~pressure on-demand water system feeds hot & cold water to the head, shower and galley
~80 gallon fresh water tank is located in front, forward of the saloon
~hot water provided by engine/shore power
~all thru-hulls are Merkalon and those below waterline are protected with ball valves
~Whale System 15 plumbing used throughout
~automatic bilge pumps

HOLDING TANK:
~FRP 42-gallon tank with Neoprene hose connections
~manual discharge c/w Y-valve

ELECTRICAL

BATTERIES:
~house bank consists of 4 x 6v deep cycle batteries
~house and engine battery systems charged through Heart Pathmaker 100 amp battery combiner
~galvanic isolator

DISTRIBUTION PANEL:
~located at front of lower helm station
~controls all 12volt and 110 volt distribution
~second distribution panel for navigation electronics above helm

12v. CIRCUITS:
~load ammeter
~voltmeter (battery condition)
~23 circuit breakers
~standard 12volt outlets located at Fly bridge Station, lower helm and both aft cabins adjacent to engine compartments

120v. CIRCUITS:
~two 50' x 30 amp power cords
~standard 120v GFI receptacles located in head, galley and main saloon

LIGHTS:
~aft cabins - one incandescent, two reading
~head - one incandescent
~galley - two x 20w. halogens
~galley - one fluorescent
~galley - one 5w. minispot halogen
~saloon - six x 20w. halogens (electr. dmr. cntrld.)
~saloon - two x 5w. halogen reading lights
~stbd hull - two x 20w. halogens electr. dmr. cntrld.)
~upper saloon - three x 20w halogens

THE SPECIFICATIONS LISTED HERE ARE SUBJECT TO CHANGE
(Dated: September 2005)

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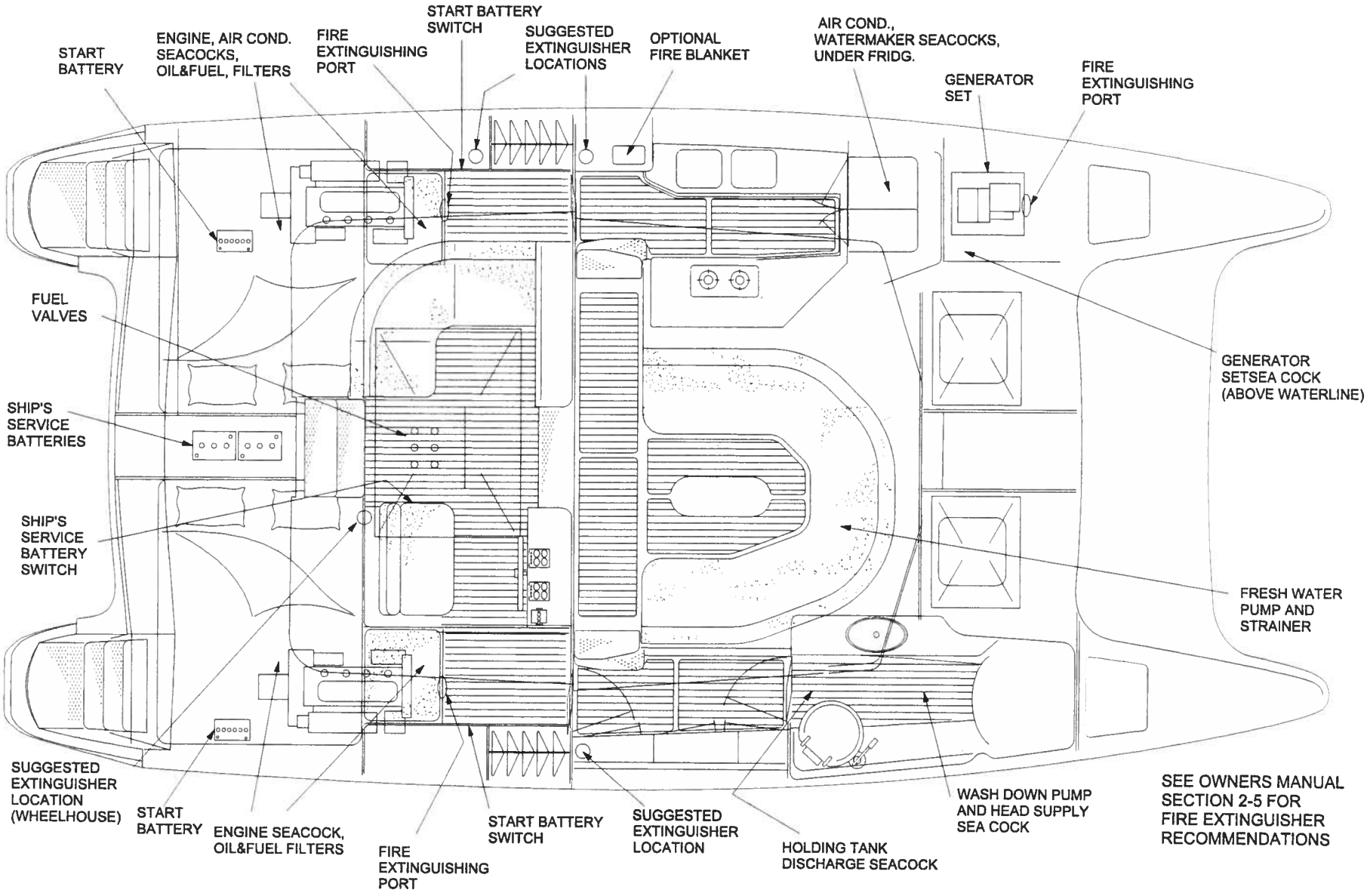

PDQ YACHTS

MV34 SUPPORT, BELOW DECK SERVICE LOCATIONS SP-03-08

REV. 2 AUG. 4 2004