Ferry Class Descriptions

Kennedy, Barberi and *Austen* Classes

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5.0 FERRY CLASS DESCRIPTIONS

5.1 Introduction

NYCDOT currently provides Staten Island Ferry service using three classes of ferryboats, the Kennedy, Barberi, and Austen Classes. Three ferryboats of a fourth class, unnamed as of this writing, are currently (2002) under construction at Marinette Marine Corporation, Marinette, Wisconsin. Delivery of the first of these boats is expected in October 2003. When tested and fully accepted, it is expected that the New Class boats will replace two of the three Kennedy Class boats, which will be permanently withdrawn from service. Basic plans of each ferry class are included in Appendix 'H.'

5.2 Statistics

Kennedy Class:

Year of build: 1965
Shipbuilder: Levingston Shipbuilding Company, Orange, Texas
Names, Builder's Hull Numbers, and Official Numbers

Name	Hull#	Official#
John F. Kennedy	647	298241
American Legion	648	298830
The Governor Herbert H. Lehman	649	298831

Design Capacity
3533 Passengers
44 Automobiles
Type: Welded Steel Double Ended Ferry, Part Aluminum
Propulsion: Diesel Electric (DC), four medium speed Diesel engines driving a single fixed pitch propeller at each end
Fuel: # 2 Diesel
Installed Power: 6560 Brake Horsepower
Maximum Design Speed: 18.3 Miles Per Hour
Service Speed: 17.5 Miles Per Hour
Length Overall: 294'-0"
Breadth Over Guards: 69'-0"
Depth at Side: 20'-7"
Design Draft: 13'-6"
Design Displacement: 2259.5 Long Tons
Design Freeboard: 7'-1"

Barberi Class:

Year of build: 1981
Shipbuilder: Equitable Shipyards, Inc., New Orleans, Louisiana
Names, Builder's Hull Numbers, and Official Numbers

Name	Hull#	Official#
Andrew J. Barberi	1713	629314
Samuel I. Newhouse	1714	629315

Design Capacity
6000 Passengers
Type: Welded Steel Double Ended Ferry
Propulsion: Diesel, four medium speed Diesel engines driving a single cycloidal propeller at each end
Fuel: # 2 Diesel
Installed Power: 7000 Brake Horsepower
Service Speed: 18.5 Miles Per Hour
Length Overall: 310'-0"
Breadth Over Guards: 70'-0"
Depth at Side: 20'-8"
Design Draft: 12'-6"
Design Displacement: 2721.0 Long Tons

Design Freeboard: 8'-2"

Austen Class:

Year of build: 1986
Shipbuilder: Robert E. Derektor Shipyards of Rhode Island, Inc., Warren, RI
Names, Builder's Hull Numbers, and Official Numbers

Name	Hull#	Official#
Alice Austen	N207A	696013
John A. Noble	N207B	696014

Design Capacity
1280 Passengers
Type: Welded Steel Double Ended Ferry
Propulsion: Diesel, two medium speed Diesel engines driving a single cycloidal propeller at each end
Fuel: # 2 Diesel
Installed Power: 2550 Brake Horsepower
Trial Speed: 17.8 Miles Per Hour
Length Overall: 207'-0"
Breadth Over Guards: 41'-10"
Depth at Side: 16'-0"
Design Draft: 8'-3"
Design Displacement: 650 Long Tons
Design Freeboard: 7'-9"

New Class:

Year of build: 2004 (projected delivery of last boat in class)
Shipbuilder: Marinette Marine Corporation, Marinette, Wisconsin
Names, Builder's Hull Numbers, and Official Numbers

Name	Hull#	Official#
TBD # 1	0511	**TBD**
TBD # 2	0512	**TBD**
TBD # 3	0513	**TBD**

Design Capacity
4400 Passengers
30 Automobiles
Type: Welded Steel Double Ended Ferry
Propulsion: Diesel Electric (60 Hz AC), two medium speed Diesel engines driving a single fixed pitch propeller at each end: a third medium speed Diesel engine installed as a standby unit
Fuel: # 2 Diesel
Installed Power: 8595 Brake Horsepower (Operating Power: 5730 Brake Horsepower)
Maximum Design Speed: 18.2 Miles Per Hour
Service Speed: 17.5 Miles Per Hour
Length Overall: 310'-0"
Breadth Over Guards: 70'-0"
Depth at Side: 20'-8"
Design Draft: 13'-6"
Design Displacement: 3200 Long Tons
Design Freeboard: 7'-2" (midships @ side)

5.3 Staffing

Levels of operational staffing for each vessel class are in accordance with union agreements and U.S. Coast Guard directives.

Kennedy Class:

a) Deck Department
- Captain
- Assistant Captain
- Mate
- 6 Deckhands
- Matron

b) Engine Department
- Chief Engineer
- First Assistant Engineer
- 2 Oilers

Barberi Class:

a) Deck Department
- Captain
- Assistant Captain
- 2 Mates
- 7 Deckhands
- Matron

b) Engine Department
- Chief Engineer
- First Assistant Engineer
- 2 Oilers

Austen Class:

a) Deck Department
- Captain
- Assistant Captain
- Mate
- 4 Deckhands
- Matron

b) Engine Department
- Chief Engineer
- 1 Oiler

New Class: (Complement tentative per final direction by U.S. Coast Guard)

a) Deck Department
- Captain
- Assistant Captain
- Mate
- 6 Deckhands
- 2 Matrons

b) Engine Department
- Chief Engineer
- First Assistant Engineer
- 2 Oilers

5.4 Hull & Superstructure Description

Kennedy Class:

The hull is of mild steel construction, all welded. Frame numbers are designated such that frame 0 is located at the transverse midship section. The hull is single-bottom transversely framed between watertight bulkhead (WTT) 62 New York End (NYE) and WTT 62 Staten Island End (SIE), called the "transoms." Ordinary frames are spaced on 24" centers, and web frames are spaced not more than 10' apart. At the ends, a system of heavy cant beams is installed, radiating outward from WTT 62 to the guards. The extension of the cant beams beyond the line of the hull form "fantails," which are plated both below and above, making a strong, rigid structure for absorbing berthing impacts with the slip fenders and landing bridges. The rudder at each end is of the streamlined, semi-balanced, double plate type, constructed on a cast steel frame, and supported on a horn. When underway the "forward" facing rudder is locked on the centerline by a steel pin which is manually lowered from the hull, all steering being accomplished by the "aft" facing rudder. Each wheelhouse only controls the rudder at the opposite end of the vessel.

The hull is divided by ten transverse watertight bulkheads into eleven compartments and is symmetrical about midlength. The main Diesel Generator room, amidships, has four propulsion diesel generator sets in the lower level and an upper level flat at both sides. Locker rooms, washrooms, and a workshop are installed on the port flat (on all Staten Island Ferryboats the NYE is the bow). The Engine Control Room occupies most of the starboard flat.

Forward and aft of the main Diesel Generator room are the motor rooms, WTT 14 to 27. Four propulsion motors and a reduction/ combining gear are installed in the lower level of each motor room, with auxiliary machinery on the upper level.

Next are the fuel compartments forward and aft between WTT 27 and 36, with two Diesel oil storage tanks in the lower level of each. Crew's locker room and washroom are on the upper level flat of the NYE compartment. A cylindrical potable water tank is installed in the compartments between WTT 36 and 46 at each end.

The compartment between WTT 46 and 62 at each end has a ballast tank at the lower level and a watertight tunnel or trunk providing access to the steering gear compartment, which extends from WTT 62 to the end of the hull.

The hull is subdivided so as to allow for the two-compartment standard of flooding mandated by U.S. Coast Guard Regulations. The hull is fitted with a plated in sponson on each side which supports the edges of the main deck and superstructure, and provides reserve buoyancy should the vessel heel to a dangerous angle or suffer flooding.

The superstructure up to the upper deck is welded steel. Above the upper deck, steel is used for casings, stair towers, trunks and coamings for attachment of aluminum. Elsewhere above the upper deck, welded aluminum construction is used for all decks, deck houses, and other attachments.

There are three passenger decks, each with one or more enclosed cabins and limited outside deck areas. There are three vehicle driveways on the main deck, inboard of the longitudinal cabin bulkheads. The two main deck cabins have three person cross seats on the inboard side and longitudinal seats on the outboard side. The men's room is located on the inboard side of the port cabin. There is a stairway at each end of each main deck cabin leading to the upper deck.

Hinged joiner type double doors at the end of the main cabins lead to the quarter decks. Four 12' rescue boats are stowed overhead on the quarter decks, one from each quarter, hung from radial arm davits.

There is a fan room amidships on each side, located on a mezzanine flat between the main and upper decks, over the cabins. The fans in these spaces provide air to all the passenger cabins. Access is via enclosed inclined ladder, accessible from the vehicle driveways.

The upper deck is almost entirely enclosed, with the exception of an open deck at each end which serves as an embarkation area. There are three sets of sliding steel doors at each end of the upper deck cabin to provide access to the open deck.

The seating in the upper deck cabin is mainly transverse, with seats on both sides and across the centerline, separated by 6' aisles. There are also a few outside seats at the ends.

Near each end of the upper deck cabin there is a stairway leading to the bridge deck cabin. Each of these stairs is surrounded by a steel enclosure that is fitted with fire screen doors that can be closed remotely from the wheelhouses. The women's lavatory, lounge and snack bar are located amidships.

The bridge deck cabin extends from the NYE wheelhouse to the SIE wheelhouse and has an open promenade on each side. The interior seating arrangement is similar to the upper deck cabin. The promenade decks are reached by steel sliding doors.

Cabin linings and ceilings are of 1/2" Marinite, faced in some areas with stainless steel, in others with a plastic marine veneer, and in others the linings are simply painted. Interior deck coverings are sheet rubber. Passenger seating is constructed of ¾" Birch on aluminum frames; seat bases are enclosed and serve as life preserver lockers. Cabin heating is accomplished by a low pressure steam system.

Barberi Class:

The hull is steel all welded construction, transversely framed on 30" centers, and subdivided by watertight bulkheads to provide end ballast tanks, voids, propulsion gear rooms, and machinery spaces. The hull is symmetrical about the midships transverse section; frame numbers are designated such that Frame 0 is located at midships.

There are ten watertight compartments. The Engine Room, containing the bulk of all main and auxiliary machinery is located amidships between WTT 12 NYE and WTT 12 SIE. The four main engines, turbo couplings, and their auxiliaries are installed at the bottom of the space which is fitted with a flat on either side accommodating the control room, auxiliary boilers, and auxiliary generators.

Next are voids between WTT 12 and WTT 20 at each end. At the NYE the upper part of this void contains the crew locker rooms, sewage treatment plant, and CO2 bottle room. At the SIE the upper part of the void contains built in Diesel Oil Storage Tanks and Diesel Oil Service Tanks; there is also a Diesel Oil overflow tank that extends to the bottom shell near the center of this space.

The adjacent spaces between WTT 20 and WTT 31 at both ends are voids: in the upper center portion of the NYE there is a built-in potable water tank. Between WTT 31 and WTT 39/40 there is a void at each end; WTT 39/40 is offset to accommodate the propulsion machinery.

The next compartment, between WTT 39/40 and WTT 52 at both ends forms the propulsion gear space; this space contains the pumps, controls, and combining/ reducing gear to drive the cycloidal propellers.

The spaces from WTT 52 to the ends at both ends form ballast tanks; below the ballast tanks at each end there is a fixed, plated steel skeg which protects the cycloidal propellers from impacts with debris as well as improves directional stability and provides structural support of the ends when the vessel is drydocked.

Between WTT 12 and WTT 39/40 at both ends there is a shaft tunnel; each shaft tunnel contains two line shafts and 12 line shaft bearings.

The vessel is designed to meet the two-compartment subdivision standard of the U.S. Coast Guard for passenger vessels and has watertight bulkheads at frames 12, 39/40, and 52, forward and aft. At frames 20 and 31, forward and aft there are partial watertight bulkheads that are interrupted by the shaft tunnels. While the hull is generally single bottomed, there is an inner bottom at the shaft tunnels that is 4'-0" high. Cross flooding ducts in way of the shaft tunnels are provided at frames 22, 31, and 47.

The superstructure is entirely of welded steel.

There are three decks for passenger use and one open deck restricted to use by the crew. Embarkation is at two levels, main deck and upper embarkation level, suited to the terminal facilities. Ramps are provided between bridge deck and upper embarkation level, and stairs are provided between upper embarkation level and saloon deck, and between saloon deck and main deck.

The enclosed portion of the main deck seats 1630 passengers and has an open boarding area at each end protected by the upper embarkation level above. Seating is arranged with

longitudinal seats on centerline and on the outboard sides, with the remaining space occupied by groupings of transverse seats. Four large hinged doors open up the cabin to the boarding space at each end. A toilet for disabled passengers is provided on this deck. Enclosed stairwells forward and aft lead up to the saloon deck.

The saloon deck is completely enclosed and has seating accommodations for 1258 passengers. Seating is arranged similar to the main deck. Men's and Women's toilet facilities are provided at midships on this deck; enclosed stairs lead from the saloon deck to the upper embarkation levels; ramps lead from the upper embarkation levels to the bridge deck.

The bridge deck is divided by two longitudinal bulkheads to provide a convertible promenade area port and starboard of the enclosed center section. During the good weather season the conversion is accomplished by securing the outboard windows in the open position. This deck has longitudinal seating on centerline and on the outboard side of the interior longitudinal bulkheads. The remaining area has groups of transverse seats. The bridge deck seats 784 persons. A snack bar and rest rooms are located in the center of this deck.

The wheelhouses and stack are located on the hurricane deck. The stack provides space for the engine casing and passenger space ventilation fans.

Passenger seating is comprised of individual fiberglass reinforced plastic units supported on aluminum cabinets that serve as life preserver stowage. Cabin decks are faced with sheet rubber. Overheads and bulkheads in passenger cabins are sheathed with Marinite panels; bulkhead sheathing panels in passenger lavatory spaces are faced with ribbed stainless steel from deck to overhead. In the convertible promenade compartments there is no lining of any type; the structural steel, wiring, and piping are exposed and simply painted; decks in these areas and all passenger weather decks are topped with a poured and trowelled composition finish material. Cabin heating is accomplished by a low pressure steam system.

Austen Class:

These vessels, with a maximum passenger capacity of 1280, and significantly lower power requirements and a smaller crew complement, were designed for economical off-peak hour operation. Their small passenger capacity makes them unsuitable for rush hour operation.

The hull is steel all welded construction, longitudinally framed, and subdivided by watertight bulkheads to provide peak tanks, voids, two propulsion gear rooms, and an engine room located amidships. The hull is symmetrical about the midship section; frame numbers are designated such that Frame 0 is located at the after perpendicular. Frame number designations are on 1' centers: actual transverse frames are on 8' centers in the engine room, and generally on 4' centers elsewhere. Partial double bottom tanks in the engine room are provided for fuel storage, and some other small tankage.

There are seven watertight compartments. The engine room, containing the bulk of all main and auxiliary machinery, is located between Frames 76 and 124. The machinery is all mounted at the hold (i.e, tank top) level in the engine room, including the two main engines and their turbo-couplings, the two ship service Diesel generator sets, ship service switchboard, engineer's watch room, and auxiliaries.

The adjacent spaces between Frames 36 and 76, and 124 to 164 are voids. The line shafting passes through each void.

The spaces from Frame 35 to the aft collision bulkhead, and Frame 164 to the forward collision bulkhead are the propulsion gear spaces. Each propulsion gear space includes such major equipment as a flexibly coupled section of line shafting, a single reduction gear mounted on the cycloidal propeller unit, the inboard portion of the cycloidal propeller unit, as well as a cylindrical lube oil storage tank. A fixed skeg at each end is fitted, similar to the Barberi Class.

The superstructure is entirely of welded steel. All passenger decks are nearly fully enclosed with small open embarkation areas at the end of each passenger deck.

There are two decks for passenger use and one open deck restricted to use by the crew. Embarkation is at two levels, main deck and upper embarkation level, suited to the terminal facilities. Ramps are provided between the upper deck and upper embarkation level. A stairway at each end provides communication between the two passenger decks. The main deck cabin is fitted with side ports amidships on each side.

Passenger seating is provided on the two passenger decks by transverse rows of plastic seats mounted on open steel frames. Life preserver stowage is located amidships in steel lockers. There is a rescue boat supported by davits located at each end of the vessel on the open area of the main deck. Crew locker rooms are provided on the upper deck below each wheelhouse. The two wheelhouses and the stack are located on the bridge deck. The stack contains an air inlet plenum and the emergency generator.

All space heating is provided by electrical space heaters using ships service power.

New Class:

Three vessels of this class are currently (fall, 2002) under construction by Marinette Marine Corporation in their facility at Marinette, Wisconsin. The details discussed below are based on the contract design and are subject to change as detail design progresses and construction proceeds.

The vessels are double ended ferries with diesel electric propulsion, suitable for carrying 4400 passengers and 30 automobiles. There are five passenger cabins on four decks; each deck has outdoor passenger areas.

Passenger toilet spaces are provided on the Saloon and Bridge Decks. A snack area is located on the Saloon Deck. Main Deck and Saloon Deck embarkations are similar to previous Staten Island Ferryboats.

A vehicle alleyway with a width of 22 feet is arranged on the main deck between the two main deck passenger cabins. The vehicle alleyway is unobstructed to provide for the transport of overwidth vehicles as required. There is an intermediate deck housing ventilation fans and equipment over each main deck passenger cabin. The Saloon Deck is the principle passenger deck. The Bridge Deck has open promenades having seats arranged along each side of the passenger cabins; crew day rooms are also located on the Bridge Deck. The Hurricane Deck has an enclosed passenger cabin and an open area around the cabin accessible to passengers. Elevator access is provided between all passenger decks. The two wheelhouses, the stack, and the emergency generator room are also located on the Hurricane Deck. The stack contains the uptakes from the machinery and ventilation fan rooms. Cabin heating is accomplished by a low pressure steam system.

The hull and superstructure are constructed entirely of steel. The hull is transversely framed with cant frames at each end; frames below the main deck are on 30" centers and those above the main deck are on 20" centers. Frame numbers are designated such that Frame 0 is at the midships transverse section.

The ferry is subdivided into 14 watertight compartments to meet a two compartment standard of flooding and is single bottomed throughout. The hull is symmetrical about the midship transverse section. The Engine Room extends from WTT 16 NYE to WTT 16 SIE. There is a flat on either side at 10'-0" ABL to accommodate auxiliary machinery; the flat extends completely across the engine room at the NYE to accommodate the control room which is transversely mounted to enhance visibility, a change from previous Staten Island Ferryboats. Next are voids between WTT 16 and WTT 24; the NYE void contains two built-in potable water tanks at the top of the space, while the SIE void contains the Diesel Oil Storage, Service, and Overflow tanks at the bottom of the space. There are partial void spaces extending from WTT 24 to WTT 32, and WTT 32 to WTT 40, built in as wing tanks; in the center of this area there is a propulsion motor room at each end.

Between WTT 40 and WTT 48 there is a ballast tank at both ends: in each ballast tank there is a shaft tunnel at the bottom of the space extending from the propulsion motor room to WTT 48: the shaft tunnel communicates with the propulsion motor room via a watertight door. There is a void space between WTT 48 and WTT 78 at each end. The steering gear rooms are located at each end of the hull from WTT 78 to the ends. The rudders are double plate streamlined section, semi balanced type, supported on horns; each wheelhouse is capable of controlling the angle of both rudders.

5.5 Machinery Description

Kennedy Class:

Each vessel is equipped with two fixed pitch propellers, one at each end. Each propeller is driven through a main reduction/ combining gear by four electric propulsion motors that are flexibly coupled, via disk couplings, to the gear for a total of eight propulsion motors per vessel. The motors are arranged electrically in pairs, with one NYE and one SIE motor connected, making a total of four pairs of motors. The four pairs of motors and the four propulsion generators are all connected in series for propulsion operation. Control is provided such that each propeller rotates as if on a single shaft as regards direction of thrust; power is distributed such that the "pushing" propeller receives 80 – 90 % of the power. Control is achieved through a combination of varying the speed of the main engines and varying the excitation of the separately excited propulsion generators and motors automatically in accordance with a pre-determined program that responds to speed commands from the wheelhouses. Each propulsion generator is driven by a Diesel engine. The system is designed so that a main engine generator set or propulsion motor can be taken off line without any loss of vessel performance. Excitation is obtained from either of two motor generator sets each driven by a 40 horsepower AC motor which is normally supplied by ships service power. Characteristics of the propulsion Diesel generators, motors, and reduction/ combining gears are as follows:

Main Engines
- Model: General Motors EMD 16-567C
- Number per vessel: 4
- BHP (continuous rating): 1640 (each)
- Maximum Rated Speed, rpm: 835
- Idling Speed, rpm: 417
- BMEP (continuous), psi: 87.2
- Type: two cycle, naturally aspirated
- Bore and Stroke: 8.5" x 10"
- Compression Ratio: 16:1
- Starting system: air motor

Propulsion Generators
- Model: General Motors EMD D32G
- Number per vessel: 4
- Output, kW: 1205
- Nominal Voltage (DC): 750
- Type: Separately Excited

Propulsion Motors
- Model: General Motors EMD D32H
- Number per vessel: 8
- Nominal Voltage (DC): 750
- Nominal Amperage: 1607
- Nominal Horsepower: 1525
- Speed, rpm: 835
- Type: Separately Excited

Reduction/ Combining Gears
- Model: Lufkin size OC9014
- Number per vessel: 2
- Ratio: 3.888:1
- Rated Horsepower: 5500
- Type: Parallel Shaft, Single Plane, Single Reduction, Twin Pinion, Double Helical, Four Inputs, Integral Roller Thrust Bearing

A transverse cross section through a typical EMD engine is included in Appendix 'H'.

Barberi Class:

Each vessel is equipped with two cycloidal propellers, one at each end. The cycloidal propellers can provide virtually equal thrust through a horizontal arc of 360 degrees: thus the cycloidal propellers are used to accomplish both propulsion and steering of the vessel. The vessel's control system is such that the magnitude and direction of thrust of each propeller is separately and manually controlled: each of the two wheelhouses can control both propellers. An automatic control system maintains the speed of the main engines at a constant 800 rpm when the vessel is underway and prevents any of the manual commands to the cycloidal propellers from overloading the engines. Manual signals to each propeller are transmitted and amplified by an electro hydraulic system in order to develop the required force to move the internal pitch control mechanism of the propeller.

Each main engine is coupled to a cycloidal propeller through a torsionally flexible (elastomeric) coupling, a disk coupling, a hydraulic coupling, a length of line shafting, and a length of line shafting supported by angularly flexible (dental) couplings. Two main engines drive the NYE propeller, while the other two main engines drive the SIE propeller. Draining a hydraulic coupling permits declutching its associated engine thereby driving its associated cycloidal propeller using a single engine when required. The propellers each have an internal combining and reducing gear/ right angle gear, as the axis of the propeller rotor is vertical.

Main Engines
- Model: General Motors EMD 16-645E6
- Number per vessel: 4
- BHP (continuous rating): 1750 (each)
- Maximum Speed, rpm: 900
- Normal Operating Speed, rpm: 800
- Idling Speed, rpm: 350
- Type: two cycle, naturally aspirated
- Bore and Stroke: 9"x 10"
- Compression Ratio: 16:1
- Starting system: air motor

Hydraulic Couplings
- Model: Voith VTK 1150 TPL
- Type: Drainable
- Number per vessel: 4
- Output, kW: 1286 kW
- Rated Speed, rpm: 800
- Slip in Normal Operation: 2.5%

Cycloidal Propellers
- Model: Voith-Schneider 40G/250
- Number per vessel: 2
- Number of inputs: 2 each
- Number of Blades: 5
- Reduction Gear Ratio: 13.7:1
- Power (each): 3500 Shaft Horse Power

Cross sectional views of a typical Voith Schneider propeller are included in Appendix 'H.'

Austen Class:

Each vessel is equipped with two cycloidal propellers, one at each end. The cycloidal propellers can provide virtually equal thrust through a horizontal arc of 360 degrees: thus the cycloidal propellers are used to accomplish both propulsion and steering of the vessel. The vessel's control system is such that the magnitude and direction of thrust of each propeller is separately and manually controlled: each of the two wheelhouses can control both propellers. An automatic control system maintains the speed of the main engines at a constant 1500 rpm when the vessel is underway. Manual signals to the propellers are transmitted by a combined power assisted hydraulic/ mechanical system and amplified by a hydraulic system in order to develop the required force to move the internal pitch control mechanism of the propeller.

Each main engine is coupled to a cycloidal propeller through a Holset coupling, a hydraulic coupling, a fixed length of line shafting, and a length of line shafting supported by angularly flexible couplings. One main engine drives the NYE propeller, while the other main engine drives the SIE propeller. The propellers each have an integrally mounted parallel shaft reducing gear, and an internal right angle gear, as the axis of the propeller rotor is vertical.

Main Engines
- Model: Caterpillar 3516 TA
- Number per vessel: 2
- BHP (continuous rating): 1275 (each)
- Normal Operating Speed, rpm: 1547
- Type: four cycle, turbocharged, aftercooled
- Bore and Stroke: 6.7" x 7.5"
- Compression Ratio: 13:1
- Starting system: electric motor

Hydraulic Couplings
- Model: Voith 750DT-X
- Type: Constant Fill
- Number per vessel: 2

Reduction Gears
- Model: Voith Type AE 40 FH
- Rated Power: 923 kW
- Ratio: 3.96: 1
- Number per vessel: 2

Cycloidal Propellers
- Model: Voith-Schneider 24 GII/165
- Number per vessel: 2
- Number of inputs: 1 each
- Number of Blades: 5

New Class:

The propulsion system consists of three propulsion diesel generators (one being a standby) supplying electric power to four propulsion electric motors, two mounted mechanically in series at each end, directly connected to a line of shafting and a fixed pitch propeller. One of two ship service diesel generator sets normally supplies power for ship service loads.

Two of the three propulsion diesel generators normally run, generating 3-phase, 60Hz power at 4160 volts, which is conveyed to the main propulsion switchboard. From there power is distributed to four phase shifting transformers, two at each end. The transformers reduce the potential from 4160 to 690 volts as required for the static frequency converter units and the propulsion motors. From there, it is transferred to the four controllers (one for each motor). The four static frequency converters, two on each end, take power from the transformers and supply variable frequency power to the four variable speed, reversible, electric propulsion motors.

Control of speed and direction of propeller rotation is effected by variation of the frequency and phase relationship of the power supply to the propulsion motors in response to commands from the wheelhouses. Control is set up such that each propeller can be operated independently of the other regarding speed and direction from either wheelhouse; this is combined with the ability to independently control each rudder from each wheelhouse to facilitate directional control of the vessel during maneuvering: these arrangements are a change from previous Staten Island Ferry classes. During free running in open water, the control system is programmed to direct 80% of required power to the "pushing" propeller and the remainder to the bow propeller.

Main Engine
- Model: General Motors EMD 16-710G7B
- Number per vessel: 3 (two operating at one time, third is a standby)
- BHP (continuous rating): 3840 (each)
- Speed, rpm: 900 (constant)
- BMEP (continuous), 155 psi
- Type: two cycle, turbocharged
- Bore and Stroke:
- Compression Ratio:
- Starting system: air motor

Propulsion Generators
- Model: TBD
- Number per vessel: 3
- Output, kW: 2865
- Nominal Voltage (AC): 4160, 3phase, 60 Hz

Propulsion Motors
- Model: TBD
- Number per vessel: 4
- Nominal Voltage (AC): 690
- Nominal Amperage: TBD
- Nominal Horsepower: 2500 (each)
- Maximum Speed (RPM): TBD

5.6 Auxiliary Electrical Description

Kennedy Class:

The propulsion power system and the ship service power system are entirely independent of each other, the propulsion power system being 750 volts DC, and the ship service system being 230 volts, AC, 3 wire. Ship service electrical power is furnished by two 275 kW ships service diesel-generator sets at 230 volts, 3 phase, 60 Hz, which are located on the 12'-0" ABL flat in the SIE Propulsion Motor Room. This power is distributed through the ship service switchboard located in the Control Room to distribution panels on each deck, as well as to the emergency switchboard located in the Emergency Generator Room, and to the propulsion control system via the propulsion control panel located in the control room. The ship service Diesel generators may be operated in parallel when necessary. There is a Vital Service Generator and Switchboard, located on the 12'-0" ABL flat in the NYE Propulsion Motor Room: the purpose of this equipment is to supply propulsion control and excitation power in the event of loss of voltage on the ship service system switchboard.

There is a shore supply receptacle located at each end of the vessel designed to receive up to 200 amperes per phase. Similarly, a receptacle is provided at each end to feed up to 200 amperes per phase to a shore facility from the ship service electrical system. Equipment specifications are as follows:

Ship Service Diesel Generator Sets (Number Per Vessel: 2)
- Engine
  - Model: Caterpillar D353
  - BHP (continuous rating): 380 (each)
  - Speed, rpm: 1200 (constant)
  - Type: four cycle, turbocharged
- Generator
  - Model: General Electric AT1
  - Power: 275 kW
  - Potential: 230 volts, 3 phase, 60 Hz
  - Connection: 3 wire
  - Type: Self Excited

Vital Service Diesel Generator Set (Number Per Vessel: 1)
- Engine
  - Model: Caterpillar D333A
  - BHP (continuous rating): 150
  - Speed, rpm: 1800 (constant)
  - Type: four cycle, naturally aspirated
- Generator
  - Model: General Electric SJ
  - Power: 100 kW
  - Potential: 230 volts, 3 phase, 60 Hz
  - Connection: 3 wire
  - Type: Self Excited

Emergency Diesel Generator Set (Number Per Vessel: 1)
- TBD (note: Emergency Diesel Generator Sets on Kennedy Class recently renewed)

Barberi Class:

There are two ship service Diesel generator sets to provide all ship service electrical energy located on the 10'-0" ABL flat in a generator room that is within the engine room. These generator sets supply power to the main switchboard, located in the Control Room, from which the power is transmitted to various panelboards. The ship service diesel generators on the Barberi Class are installed so that they may be operated in parallel when necessary. The ship service electrical system is 230 volts, 3 phase, 60 Hz, alternating current. Transformers are provided to provide 115 volts for lighting and fractional horsepower motors.

There is an emergency Diesel generator set and emergency switchboard located in the emergency generator room on the NYE of the Saloon Deck, port side. This equipment is designed to supply energy to all emergency loads upon loss of voltage from the normal source. Emergency power is supplied at 230 volts, 3 phase, 60 Hz, with dedicated transformation to pick up all 115 volt emergency loads.

In addition there is a 24 volt direct current interior communications power supply system supplied by two storage batteries which are normally kept charged by energy from the emergency switchboard.

There is a shore supply receptacle located at each end of the vessel designed to receive up to 200 amperes per phase. Similarly, a receptacle is provided at each end to feed up to 200 amperes per phase to a shore facility from the ship service electrical system. Equipment specifications are as follows:

Ship Service Diesel Generator Sets (Number Per Vessel: 2)
- Engine
  - Model: Caterpillar 3412
  - BHP (continuous rating): 565 (each)
  - Speed, rpm: 1200 (constant)
  - BMEP (continuous), psi:
  - Type: four cycle, turbocharged

Bore and Stroke:
Starting system: air motor

Generator

Model: Kato, type 19696
Power: 350 kW
Potential: 230 volts, 3 phase, 60 Hz
Connection: 3 wire
Type: Brushless, Self Excited

Emergency Diesel Generator Set (Number Per Vessel: 1)

Engine

Model: Caterpillar 3306
BHP: 200
Speed, rpm: 1800 (constant)
BMEP (continuous), psi:
Type: four cycle, turbocharged
Bore and Stroke:
Compression Ratio:
Starting system: electric motor

Generator

Model: Caterpillar SR-4
Power: 135 kW
Potential: 230 volts, 3 phase, 60 Hz
Connection: 3 wire
Type: Brushless, Self Excited

Austen Class:

There are two ship service Diesel generator sets. providing all ship service electrical energy, located on the tank top level of the engine room, port side. The main switchboard, transformers, and lighting load center are located immediately adjacent to the generators. All features of the auxiliary electrical system are generally similar to the other ferryboat classes. An emergency Diesel generator set, switch board, and associated equipment are located in the dummy stack and provide emergency power when required.

Ship Service Diesel Generator Sets (Number Per Vessel: 1)

Engine

Model: Caterpillar 3406 DT
BHP (continuous rating): 270 horsepower(each)
Speed, rpm: 1800 (constant)
BMEP (continuous), psi:
Type: Four Cycle, Turbocharged
Bore and Stroke:
Starting system: electric motor

Generator

Model: Caterpillar
Power: 185 kW
Potential: 220 volts, 3 phase, 60 Hz
Connection: 3 wire
Type: Brushless, Self Excited

Emergency Diesel Generator Set (Number Per Vessel: 1)

TBD