

## Suggested Specifications Short Coupled, Open Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping product at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Product temperature of	_____ °F
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing, permanently grease lubricated and provided with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(*optional*) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(*optional*) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet and/ or sized to avoid critical speeds by a safe operational margin. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in bearing retainers of ASTM A743 CF8 stainless steel. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(*optional*) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be of ASTM A48 Class 30 cast iron, ASTM A536 Grade 65-45-12 ductile iron, or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. As required to reduce internal friction losses, a radius or three-piece mitered type elbow shall be used for a smooth transition. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. If the discharge head is to be mounted on a booster can, the base diameter and bolt pattern shall match a 150 Class ANSI flange.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Short Coupled, Open Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping product at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Product temperature of	_____ °
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing, permanently grease lubricated and provided with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(optional) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet and/ or sized to avoid critical speeds by a safe operational margin. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in bearing retainers of ASTM A743 CF8 stainless steel. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft. The discharge flange shall be a 150 Class ANSI raised face flange. The discharge size shall be the same as the column pipe.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**MOTOR STAND:** The motor stand shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The motor stand shall be for below ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. The motor stand shall permit a two-piece head shaft to be coupled above the stuffing box. The base of the motor stand shall be circular and fully finished on bottom.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Booster Can Mounted Open Lineshaft Pump With Underground Suction

Pump shall be designed for pumping product at:	Rated capacity of _____ (GPM)	
	Total dynamic head of _____ (TDH)	
	Minimum bowl efficiency of _____ %	
	Product temperature of _____ °F	
	Specific gravity of _____	
	Running Speed of _____ (RPM)	

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing, permanently grease lubricated and provided with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(optional) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet and/ or sized to avoid critical speeds by a safe operational margin. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in bearing retainers of ASTM A743 CF8 stainless steel. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be of ASTM A48 Class 30 cast iron, ASTM A536 Grade 65-45-12 ductile iron, or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. As required to reduce internal friction losses, a radius or three-piece mitered type elbow shall be used for a smooth transition. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. If the discharge head is to be mounted on a booster can, the base diameter and bolt pattern shall match a 150 Class ANSI flange.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**BOOSTER CAN:** The booster can shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate steel. The booster can shall have a 150 Class ANSI raised face flanged inlet. The head-mounting flange shall match the discharge head base 150 Class ANSI diameter and bolt pattern. The booster can shall be sized per Hydraulic Institute Pump Intake Design standards.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Booster Can Mounted Open Lineshaft Pump With Underground Suction

Pump shall be designed for pumping water at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Water temperature of	_____ °F
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing, permanently grease lubricated and provided with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(optional) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/ -.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet and/ or sized to avoid critical speeds by a safe operational margin. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in bearing retainers of ASTM A743 CF8 stainless steel. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/ -.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. The suction flange shall be a 150 Class ANSI raised face flange. The suction size shall be sized per Hydraulic Institute Pump Intake Design standards. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. The base diameter and bolt pattern shall match a 150 Class ANSI flange.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**BOOSTER CAN:** The booster can shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate steel. The head-mounting flange shall match the discharge head base 150 Class ANSI diameter and bolt pattern. The booster can shall be sized per Hydraulic Institute Pump Intake Design standards.

## Suggested Specifications Deep Set, Open Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping water at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Water temperature of	_____ °F
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing, permanently grease lubricated and provided with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(optional) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The pipe weight shall be consistent with industry standard pump column pipe and appropriately sized for the intended service. The column pipe shall be connected by "J" Type straight butt style threaded couplings. The ends of each column pipe shall be machined parallel and threaded so that the ends butt. Intermediate sections of column shall not exceed 10 feet. Top and bottom column pipe sections shall not exceed 5 feet. Drop-in bearing retainers of ASTM A743 CF8 stainless steel shall be used at the end of each column section. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 20 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. The suction flange shall be a 150 Class ANSI raised face flange. The suction size shall be sized per Hydraulic Institute Pump Intake Design standards. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. The base diameter and bolt pattern shall match a 150 Class ANSI flange.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Deep Set, Open Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping water at:	Rated capacity of	_____	(GPM)
	Total dynamic head of	_____	(TDH)
	Minimum bowl efficiency of	_____	%
	Water temperature of	_____	°F
	Specific gravity of	_____	
	Running Speed of	_____	(RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The discharge case shall be fitted with an ASTM B505 89835 bronze bearing extending into the top bowl. A tube adaptor shall provide a means of connecting the shaft enclosing tube to the bowl assembly by use of an ASTM B505 C93200 bronze tube bearing. Drain ports are to be provided with a sufficient area and shape to permit the escape of water that passes through the pump bowl bearings. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing, permanently grease lubricated, and provided with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(optional) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts up to 2-3/16" nominal diameter, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining, and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134, to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The pipe weight shall be consistent with industry standard pump column pipe and appropriately sized for the intended service. The column pipe shall be connected by "J" Type straight butt style threaded couplings. The ends of each column pipe shall be machined parallel and threaded so that the ends butt. Intermediate sections of column shall not exceed 20 feet. Top and bottom column pipe sections shall not exceed 5 feet.

The shaft enclosing tubes shall be of schedule 80 ASTM A53 Grade B carbon steel. The tube ends shall be bored and internally threaded, and faced parallel so that the ends butt and accurately align. The tube lengths shall be interchangeable not to exceed 60". The top section of tube shall be designed for applying proper tension to the enclosing tube assembly. The enclosing tubing shall be of such overall assembled length to properly match the length of the column pipe and allow for proper tensioning.

The bearings within the shaft enclosing tubes shall be of ASTM B505 C93200 bronze. The bearings serve as couplings for the shaft enclosing tubes, and shall be used at each enclosing tube end to maintain alignment of the line-shaft and to prevent excessive vibration. The bearings shall be machined and externally threaded to accurately align and securely affix the enclosing tube sections. The bearing bore shall be machined and grooved to provide proper lubrication.

The line-shafts shall be of ASTM A108 Grade 1045 carbon steel for oil lubricated application, and shall be of ASTM A582 Grade 416 HT stainless steel for water flush application. The line-shaft shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading per 10 foot section. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel for oil lubricated applications and from ASTM A276 Grade 304 stainless steel for water flush applications. The intermediate line-shaft sections shall be interchangeable and shall not exceed 20 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be of ASTM A48 Class 30 cast iron, ASTM A536 Grade 65-45-12 ductile iron, or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. As required to reduce internal friction losses, a radius or three-piece mitered type elbow shall be used for a smooth transition. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. The stuffing box shall consist of a tension box of ASTM A536 Grade 65-45-12 ductile iron, designed to maintain proper tension of the shaft enclosing tubes. For oil lubricated applications, a dust cover of ASTM A48 Class 30 cast iron will be used above the tension box that will provide a threaded port for attaching means of supplying drip oil to the enclosing tubes. For water flush applications, a packing box of ASTM A48 Class 30 cast iron or ASTM A36 HR carbon steel will seal the enclosing tubes and provide a threaded port for flush water injection.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Submersible Pump With Above Ground Discharge

Pump shall be designed for pumping water at:

Rated capacity of	_____ (GPM)
Total dynamic head of	_____ (TDH)
Minimum bowl efficiency of	_____ %
Water temperature of	_____ °F
Specific gravity of	_____
Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The suction inlet area shall be equal to at least 5 times the impeller eye area, and thoroughly covered by stainless steel screen. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(*optional*) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The motor bracket shall be of ASTM A536 Grade 65-45-12 ductile iron or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(*optional*) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/ -.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards. The coupling connecting the motor to the pump bowl shall be of ASTM A276 Grade 316 stainless steel, keyed or splined to the pump shaft of sufficient size and strength to withstand the maximum torque generated by the motor.

**SUBMERSIBLE MOTOR:** The motor shall be of the vertical, submersible, induction type, designed for continuous duty, underwater operation with 3 phase, 60 Hz, 230v, 460v or 2300 volt alternating current power. The motor shall be designed with normal starting torque and low starting current. The motor shall have a 1.15 service factor. The motor shall not be loaded in excess of its nameplate rating at design and not be loaded in excess of 115% of its nameplate rating at any condition from zero flow to maximum capacity of the pump. The motor shall be oil or water-filled and shall incorporate a mechanical seal to restrict foreign matter from entering the motor. The thrust bearing shall be of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust and shall be an integral part of the driver. The bearing shall be of such size that the average life rating is based on 5 years continuous operation. The motor leads shall be protected where it passes the bowl assembly to prevent damage from contact with the well casing.

**SUBMERSIBLE CABLE:** The cable shall be comprised of separate conductors within a single neoprene exterior jacket. Each conductor shall be insulated by synthetic rubber or plastic insulation specifically for continuous immersion in water. Minimum size of cable shall be per NEC ampacity requirements.

**DISCHARGE PIPING:** The discharge pipe shall be of ASTM A53 Grade B carbon steel. The discharge pipe shall be furnished in 20' random length sections threaded with ANSI B1.20.1 standard taper threads and connected with matching threaded couplings. The pipe weight shall be consistent with industry standard pump discharge pipe and sized such that the intended service fluid velocity in the pipe is no less than 4 ft/sec. and no more than 10 ft/sec.

**DISCHARGE HEAD:** The discharge head shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall consist of a long radius elbow and be for above ground discharge with sufficient strength and rigidity to carry the suspended weight of the attached column and pump/ motor assembly. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall have an integral base and lifting lugs of sufficient strength to lift the entire head, discharge pipe, and pump/ motor assembly safely for installation and servicing operations. The base of the discharge head shall be circular and finished on bottom for proper mounting. A threaded connection shall be provided in the head base for a terminal box. The base shall also be provided with threaded openings for a well vent and a water level indicator.

## Suggested Specifications Booster Can Mounted Submersible Pump

Pump shall be designed for pumping product at:

Rated capacity of	_____ (GPM)
Total dynamic head of	_____ (TDH)
Minimum bowl efficiency of	_____ %
Product temperature of	_____ °F
Specific gravity of	_____
Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls, suction, and discharge cases shall be of close grained ASTM A48 Class 30 cast iron or ASTM A536 Grade 65-45-12 ductile iron as required for pressure handling capability, cast and machined without defect. The top bowl shall be fitted with an ASTM B505 C89835 bronze bearing. The intermediate bowls shall be fitted with fluted neoprene and/ or ASTM B505 C89835 bronze bearings. The suction case shall be fitted with an ASTM B505 C89835 bronze bearing with an ASTM B505 C89835 bronze sand collar to protect the suction case bearing from abrasives. The suction inlet area shall be equal to at least 5 times the impeller eye area, and thoroughly covered by stainless steel screen. The impellers shall be made of ASTM B148 C95500 Ni. Al. bronze, cast and machined without defect, statically balanced, and filed for optimum performance, [(optional) and shall be fitted with replaceable ASTM B148 C95500 Ni. Al. bronze wear rings] having minimum practical clearance to the mating cylindrical surface of the intermediate bowls and suction case. The impellers shall be securely fastened to the bowl-shaft with tapered collets of ASTM A519 Grade 1018 carbon steel for bowl-shafts 2-3/16" nominal diameter and smaller, and with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The water passages of pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and over shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The motor bracket shall be of ASTM A536 Grade 65-45-12 ductile iron or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards. The coupling connecting the motor to the pump bowl shall be of ASTM A276 Grade 316 stainless steel, keyed or splined to the pump shaft of sufficient size and strength to withstand the maximum torque generated by the motor.

**SUBMERSIBLE MOTOR:** The motor shall be of the vertical, submersible, induction type, designed for continuous duty, underwater operation with 3 phase, 60 Hz, 230v, 460v or 2300 volt alternating current power. The motor shall be designed with normal starting torque and low starting current. The motor shall have a 1.15 service factor. The motor shall not be loaded in excess of its nameplate rating at design and not be loaded in excess of 115% of its nameplate rating at any condition from zero flow to maximum capacity of the pump. The motor shall be oil or water-filled and shall incorporate a mechanical seal to restrict foreign matter from entering the motor. The thrust bearing shall be of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust and shall be an integral part of the driver. The bearing shall be of such size that the average life rating is based on 5 years continuous operation. The motor leads shall be protected where it passes the bowl assembly to prevent damage from contact with the well casing.

**SUBMERSIBLE CABLE:** The cable shall be comprised of separate conductors within a single neoprene exterior jacket. Each conductor shall be insulated by synthetic rubber or plastic insulation specifically for continuous immersion in water. Minimum size of cable shall be per NEC ampacity requirements.

**DISCHARGE PIPING:** The discharge pipe shall be of ASTM A53 Grade B carbon steel. The discharge pipe shall be furnished in 20' random length sections threaded with ANSI B1.20.1 standard taper threads and connected with matching threaded couplings. The pipe weight shall be consistent with industry standard pump discharge pipe and sized such that the intended service fluid velocity in the pipe is no less than 4 ft/sec. and no more than 10 ft/sec.

**DISCHARGE HEAD:** The discharge head shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall consist of a long radius elbow and be for above ground discharge with sufficient strength and rigidity to carry the suspended weight of the attached column and pump/ motor assembly. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall have an integral base and lifting lugs of sufficient strength to lift the entire head, discharge pipe, and pump/ motor assembly safely for installation and servicing operations. The base of the discharge head shall be circular and finished on bottom for proper mounting. A threaded connection shall be provided in the head base for a terminal box. The base shall also be provided with threaded openings for a well vent and a water level indicator.

**BOOSTER CAN:** The booster can shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate steel. The booster can shall have a 150 Class ANSI raised face flanged inlet. The head-mounting flange shall match the discharge head base 150 Class ANSI diameter and bolt pattern. The booster can shall be sized per Hydraulic Institute Pump Intake Design standards.



## Suggested Specifications Mixed Flow, Open Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping product at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Product temperature of	_____ °F
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls and suction bell shall be of close grained ASTM A48 Class 30 cast iron, cast and machined without defect. The bowls shall be fitted with ASTM B505 C93200 bronze bearings. The suction bell shall be fitted with an ASTM B505 C93200 bronze bearing, permanently grease lubricated, and provided with an ASTM B584 C89836 sand collar to protect the suction bell bearing from abrasives. The impellers shall be made of ASTM B584 C89836 bronze, cast and machined without defect, statically balanced, and filed for optimum performance. The impellers shall be securely fastened to the bowl-shaft with keyed connections. The water passages of pump bowls shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet and/ or sized to avoid critical speeds by a safe operational margin. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in bearing retainers of ASTM A743 CF8 stainless steel. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be of ASTM A48 Class 30 cast iron, ASTM A536 Grade 65-45-12 ductile iron, or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. As required to reduce internal friction losses, a radius or three-piece mitered type elbow shall be used for a smooth transition. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. If the discharge head is to be mounted on a booster can, the base diameter and bolt pattern shall match a 150 Class ANSI flange.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Mixed Flow, Open Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping product at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Product temperature of	_____ °F
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls and suction bell shall be of close grained ASTM A48 Class 30 cast iron, cast and machined without defect. The bowls shall be fitted with ASTM B505 C93200 bronze bearings. The suction bell shall be fitted with an ASTM B505 C93200 bronze bearing, permanently grease lubricated, and provided with an ASTM B584 C89836 sand collar to protect the suction bell bearing from abrasives. The impellers shall be made of ASTM B584 C89836 bronze, cast and machined without defect, statically balanced, and filed for optimum performance. The impellers shall be securely fastened to the bowl-shaft with keyed connections. The water passages of pump bowls shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet and/ or sized to avoid critical speeds by a safe operational margin. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in bearing retainers of ASTM A743 CF8 stainless steel. The line-shaft bearings shall be field replaceable neoprene, securely held in place. The neoprene bearings shall have internal grooves to allow for product lubrication of the shaft. The discharge flange shall be a 150 Class ANSI raised face flange. The discharge size shall be the same as the column pipe.

The line-shafts shall be of ASTM A582 Grade 416 HT stainless steel [(optional) with hard chrome plating, having a Brinell hardness of no less than 500. The line-shaft shall have no less than .007" hard chrome per side], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards and/ or sized to avoid critical speeds by a safe operational margin. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel or ASTM A276 Grade 304 stainless steel. The intermediate line-shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**MOTOR STAND:** The motor stand shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The motor stand shall be for below ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. The motor stand shall permit a two-piece head shaft to be coupled above the stuffing box. The base of the motor stand shall be circular and fully finished on bottom.

**PACKED TYPE STUFFING BOX:** The stuffing box shall be of ASTM A48 Class 30 cast iron. The packing box shall have a deep bore with a minimum of five rings of packing and a lantern ring capable of handling 450 PSI and 210° F temperature. Connections for grease inlet and pressure relief shall be provided. The one piece packing gland shall be of ASTM B584 C89833 bronze and secured in place with stainless steel studs and brass nuts. A stuffing box bearing of ASTM B505 89835 bronze shall be provided directly below the packing for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**MECHANICAL SEAL ASSEMBLY:** The seal housing shall be of ASTM A48 Class 30 cast iron. The housing shall have a 1/8" NPT orifice for seal circulation or lubrication. The design of the mechanical seal system shall provide for easy and visually verifiable pump lateral adjustments. Setting shall not require the disassembly of any portion of the factory preset seal assembly. For pressures up to 600 PSI, a Chesterton 155 shall be used. The rotating face shall be tungsten carbide and the stationary face shall be carbon. All metal seal parts shall be 316 stainless steel. A seal housing bearing of ASTM B505 89835 bronze shall be provided directly below the mechanical seal for stability. A neoprene o-ring shall be used to seal the packing box to the discharge head.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Mixed Flow, Enclosed Lineshaft Pump With Above Ground Discharge

Pump shall be designed for pumping water at:

Rated capacity of	_____ (GPM)
Total dynamic head of	_____ (TDH)
Minimum bowl efficiency of	_____ %
Water temperature of	_____ °F
Specific gravity of	_____
Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls and suction bell shall be of close grained ASTM A48 Class 30 cast iron, cast and machined without defect. A tube adaptor shall provide a means of connecting the shaft enclosing tube to the bowl assembly by use of an ASTM B505 C93200 bronze tube bearing. Drain ports are to be provided with a sufficient area and shape to permit the escape of water that passes through the pump bowl bearings. The bowls shall be fitted with ASTM B505 C93200 bronze bearings. The suction bell shall be fitted with an ASTM B505 C93200 bronze bearing, permanently grease lubricated, and provided with an ASTM B584 C89836 bronze sand collar to protect the suction bell bearing from abrasives. Impeller shall be made of ASTM B584 C89836 bronze, cast and machined without defect, statically balanced, and filed for optimum performance. The impellers shall be securely fastened to the bowl-shaft with keyed connections. The water passages of pump bowls shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be of ASTM A582 Grade 416 HT stainless steel [*optional with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side*], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in centering spiders of ASTM A743 CF8 stainless steel.

The shaft enclosing tubes shall be of schedule 80 ASTM A53 Grade B carbon steel. The tube ends shall be bored and internally threaded, and faced parallel so that the ends butt and accurately align. The tube lengths shall be interchangeable not to exceed 60". The top section of tube shall be designed for applying proper tension to the enclosing tube assembly. The enclosing tubing shall be of such overall assembled length to properly match the length of the column pipe and allow for proper tensioning.

The bearings within the shaft enclosing tubes shall be of ASTM B505 C93200 bronze. The bearings serve as couplings for the shaft enclosing tubes, and shall be used at each enclosing tube end to maintain alignment of the line-shaft and to prevent excessive vibration. The bearings shall be machined and externally threaded to accurately align and securely affix the enclosing tube sections. The bearing bore shall be machined and grooved to provide proper lubrication.

The line-shafts shall be of ASTM A108 Grade 1045 carbon steel for oil lubricated application, and shall be of ASTM A582 Grade 416 HT stainless steel for water flush application. The line-shaft shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading per 10 foot section. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel for oil lubricated applications and from ASTM A276 Grade 304 stainless steel for water flush applications. The intermediate line-shaft sections shall be interchangeable and shall not exceed 20 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**DISCHARGE HEAD:** The discharge head shall be of ASTM A48 Class 30 cast iron, ASTM A536 Grade 65-45-12 ductile iron, or fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The discharge head shall be for above ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. As required to reduce internal friction losses, a radius or three-piece mitered type elbow shall be used for a smooth transition. The discharge flange shall be faced and drilled to match 150 Class ANSI flange bolt pattern. The discharge size shall be the same as the column pipe. The discharge head shall permit a two-piece head-shaft to be coupled above the stuffing box. The base of the discharge head shall be circular and fully finished on bottom. The stuffing box shall consist of a tension box of ASTM A536 Grade 65-45-12 ductile iron, designed to maintain proper tension of the shaft enclosing tubes. For oil lubricated applications, a dust cover of ASTM A48 Class 30 cast iron will be used above the tension box that will provide a threaded port for attaching means of supplying drip oil to the enclosing tubes. For water flush applications, a packing box of ASTM A48 Class 30 cast iron or ASTM A36 HR carbon steel will seal the enclosing tubes and provide a threaded port for flush water injection.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.

## Suggested Specifications Mixed Flow, Enclosed Lineshaft Pump With Underground Discharge

Pump shall be designed for pumping product at:	Rated capacity of	_____ (GPM)
	Total dynamic head of	_____ (TDH)
	Minimum bowl efficiency of	_____ %
	Product temperature of	_____ °F
	Specific gravity of	_____
	Running Speed of	_____ (RPM)

**BOWL ASSEMBLY:** The pump bowls and suction bell shall be of close grained ASTM A48 Class 30 cast iron, cast and machined without defect. A tube adaptor shall provide a means of connecting the shaft enclosing tube to the bowl assembly by use of an ASTM B505 C93200 bronze tube bearing. Drain ports are to be provided with a sufficient area and shape to permit the escape of water that passes through the pump bowl bearings. The bowls shall be fitted with ASTM B505 C93200 bronze bearings. The suction bell shall be fitted with an ASTM B505 C93200 bronze bearing, permanently grease lubricated, and provided with an ASTM B584 C89836 bronze sand collar to protect the suction bell bearing from abrasives. Impeller shall be made of ASTM B584 C89836 bronze, cast and machined without defect, statically balanced, and filed for optimum performance. The impellers shall be securely fastened to the bowl-shaft with keyed connections. The water passages of pump bowls shall have ScotchKote™ Fusion-Bonded Epoxy 134 to provide optimum performance. The bowl-shaft shall be of ASTM A582 Grade 416 HT stainless steel [*optional with hard chrome plating, having a Brinell hardness of no less than 500. The bowl-shaft shall have no less than .007" hard chrome per side*], shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .0005" total indicator reading per foot of length. The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards.

**COLUMN ASSEMBLY:** The column pipe shall be of ASTM A53 Grade B carbon steel. The column pipe shall be flanged having interchangeable sections, not exceeding 10 feet. The column flanges shall be of ASTM A36 HR steel and conform to ANSI specifications. The flanged pipe ends shall have a female register accurately machined for drop-in centering spiders of ASTM A743 CF8 stainless steel. The discharge flange shall be a 150 Class ANSI raised face flange. The discharge size shall be the same as the column pipe.

The shaft enclosing tubes shall be of schedule 80 ASTM A53 Grade B carbon steel. The tube ends shall be bored and internally threaded, and faced parallel so that the ends butt and accurately align. The tube lengths shall be interchangeable not to exceed 60". The top section of tube shall be designed for applying proper tension to the enclosing tube assembly. The enclosing tubing shall be of such overall assembled length to properly match the length of the column pipe and allow for proper tensioning.

The bearings within the shaft enclosing tubes shall be of ASTM B505 C93200 bronze. The bearings serve as couplings for the shaft enclosing tubes, and shall be used at each enclosing tube end to maintain alignment of the line-shaft and to prevent excessive vibration. The bearings shall be machined and externally threaded to accurately align and securely affix the enclosing tube sections. The bearing bore shall be machined and grooved to provide proper lubrication.

The line-shafts shall be of ASTM A108 Grade 1045 carbon steel for oil lubricated application, and shall be of ASTM A582 Grade 416 HT stainless steel for water flush application. The line-shaft shall have pump shaft quality dimensional tolerances of +.000"/-.002", and shall be straightened within .005" total indicator reading per 10 foot section. The line-shafts shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump shaft standards. The shaft threads shall be lathe cut and shall be left hand to prevent loosening during pump operation. The shaft couplings shall be threaded from ASTM A108 Grade 1018 CR carbon steel for oil lubricated applications and from ASTM A276 Grade 304 stainless steel for water flush applications. The intermediate line-shaft sections shall be interchangeable and shall not exceed 20 feet in length. The butting ends of the line-shafts shall be machined square to axis of the shaft and shall be recessed to insure proper alignment.

**MOTOR STAND:** The motor stand shall be fabricated of ASTM A53 Grade B carbon steel pipe and ASTM A36 HR carbon steel plate. The motor stand shall be for below ground discharge with sufficient strength and rigidity to support the attached vertical motor or driver and carry the suspended weight of the attached column and bowl assembly. The motor stand shall permit a two-piece head shaft to be coupled above the stuffing box. The base of the motor stand shall be circular and fully finished on bottom. The stuffing box shall consist of a tension box of ASTM A536 Grade 65-45-12 ductile iron, designed to maintain proper tension of the shaft enclosing tubes. For oil lubricated applications, a dust cover of ASTM A48 Class 30 cast iron will be used above the tension box that will provide a threaded port for attaching means of supplying drip oil to the enclosing tubes. For water flush applications, a packing box of ASTM A48 Class 30 cast iron or ASTM A36 HR carbon steel will seal the enclosing tubes and provide a threaded port for flush water injection.

**FOUNDATION PLATE:** The foundation plate shall be of ASTM A36 HR carbon steel. The foundation plate shall be square with radius corners, equal to or greater than the size of the base of the discharge head. The foundation plate shall be uniformly faced on one side, with four drilled holes provided, one at each corner to accommodate anchor bolts.

**MOTOR COUPLING:** The Motor Coupling, when driven with a solid shaft motor, shall be a flanged adjustable three-piece or spacer type four-piece rigid coupling. The coupling shall be of steel, designed to transmit the required torque and horsepower of the attached pump and other rotating elements. The lower half of the coupling shall be keyed to the head-shaft. The upper half shall have a radial key to support down thrust and an axial key to transmit torque. A threaded adjusting nut shall be located between the lower coupling half and the spacer or upper coupling half. The coupling shall be designed to prevent movement due to up thrust, and held concentric by means of machined registers.