

## C-3152

## Impeller/Motor/Nominal Sizes

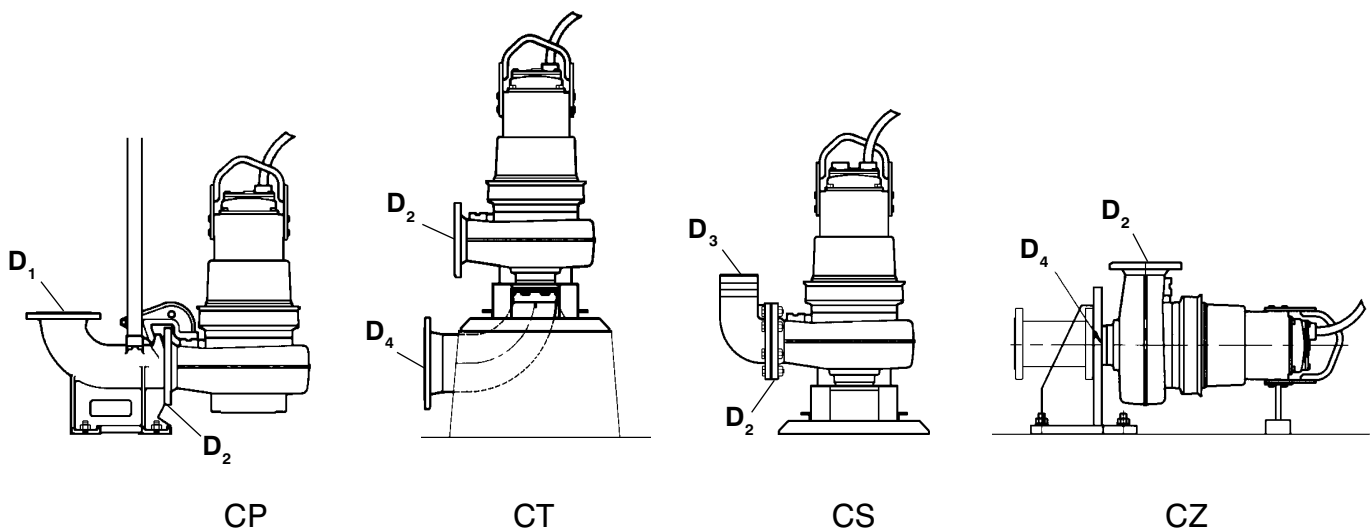
PUMP MODEL	IMPELLER CODE	HP RATING			VAC	RPM	D1	D2	D3	D4
		CP	CT CZ	CS						

3152 3Ø	267 SH 268 SH 269 SH	23.0	23.0	--	200 230/460 575	3520	4"	4"	--	6"
	432 MT 434 MT	20.0	20.0	20.0		1750	6" or 8"	6"	8"	8"
	436 MT	15.0	15.0	15.0			4" or 6"	4" or +6"	--	+6"
	452 HT 454 HT	23.0 20.0	23.0 20.0	-- 20.0		1150	10" or 12"	+10"	10"	*10" 12"
	620 LT 622 LT 624 LT	14.0	14.0	14.0						

\* for CZ configuration + for CT &amp; CZ configurations

3152 3Ø	462 HT	HP	---	HS	200 230/460 575	1750	6"	6"	6"	--
		20.0	--	20.0						

LT= High Volume MT= Standard HT= High Head SH= Super High Head



# CZ-3152

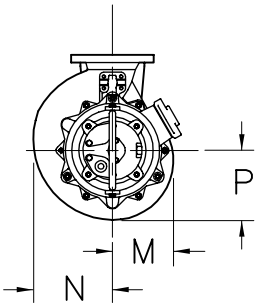
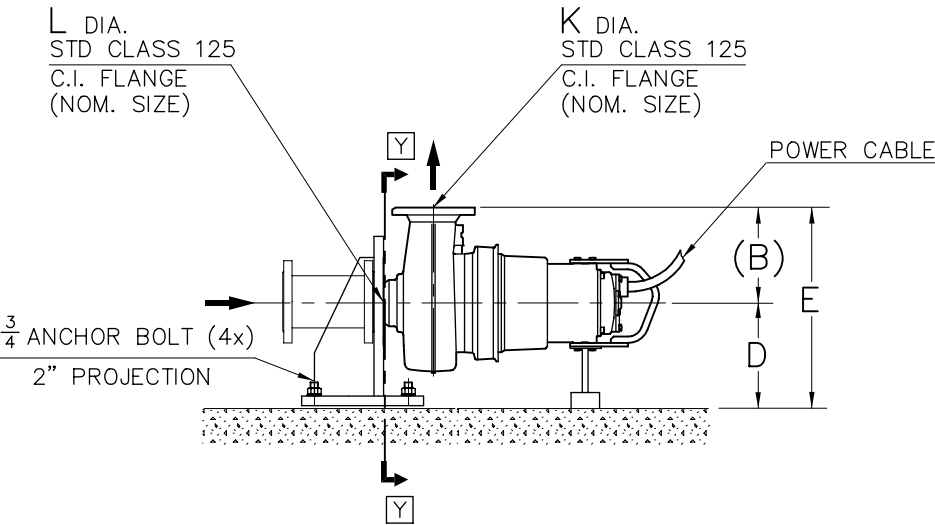
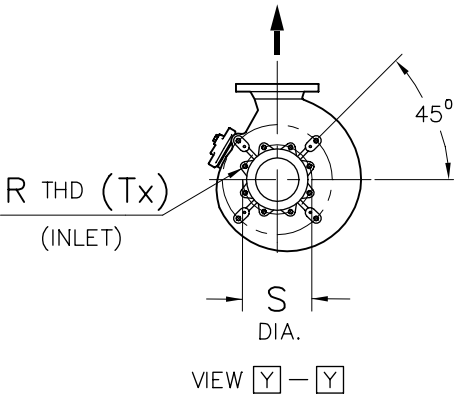
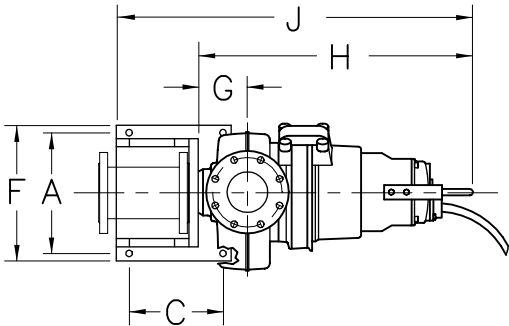
Section 4



## OUTLINE DIMENSIONS

Issued: 3/96

Supersedes:



NOM SIZE (K x L)	VERSION	WEIGHT(LBS)
		PUMP ONLY
6" x 6"	HT	570
10" x 10"	LT	875

ALL DIMENSIONS IN INCHES

NOM SIZE (K x L)	VERSION	DIMENSIONAL CHART																	
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	
6"x 6"	HT	16 <sup>3</sup> / <sub>4</sub>	13	9 <sup>1</sup> / <sub>2</sub>	12	25	19	6 <sup>3</sup> / <sub>4</sub>	37 <sup>1</sup> / <sub>2</sub>	46	6	6	8 <sup>1</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	M16	14 <sup>15</sup> / <sub>16</sub>	8	
10"x 10"	LT	21 <sup>1</sup> / <sub>4</sub>	17 <sup>3</sup> / <sub>4</sub>	13 <sup>1</sup> / <sub>2</sub>	15 <sup>3</sup> / <sub>4</sub>	33 <sup>1</sup> / <sub>2</sub>	24	7 <sup>1</sup> / <sub>4</sub>	40 <sup>3</sup> / <sub>4</sub>	53	10	10	10	14 <sup>3</sup> / <sub>4</sub>	12 <sup>1</sup> / <sub>2</sub>	M20	17 <sup>3</sup> / <sub>4</sub>	12	

# CP-3152

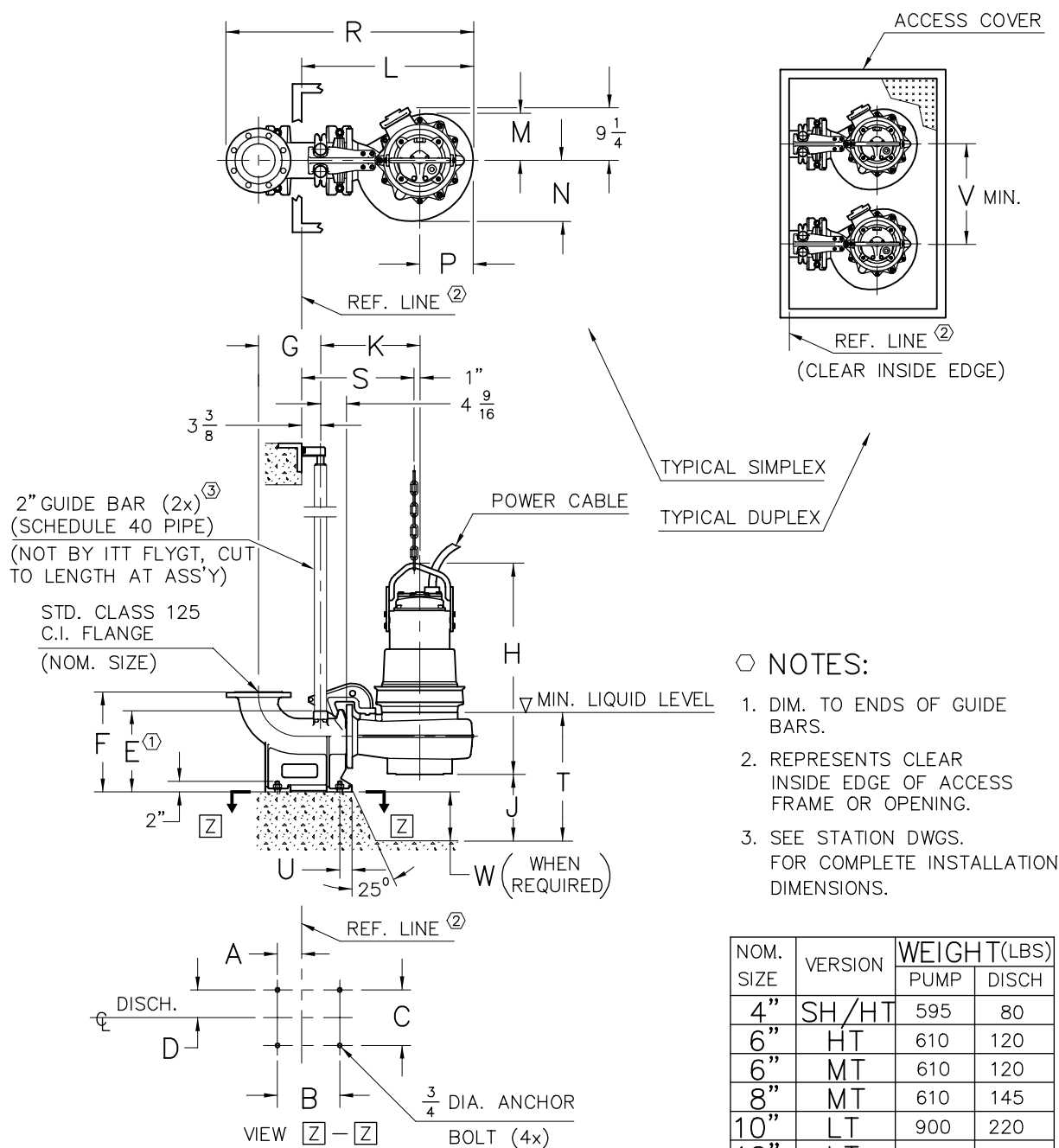
Section 4



## OUTLINE DIMENSIONS

Issued: 3/96

Supersedes: 6/94



ALL DIMENSIONS IN INCHES

NOM. SIZE	VERSION	WEIGHT(LBS)	
		PUMP	DISCH
4"	SH/HT	595	80
6"	HT	610	120
6"	MT	610	120
8"	MT	610	145
10"	LT	900	220
12"	LT	900	455

NOM. SIZE	VERSION	DIMENSIONAL CHART																			
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
4"	SH/HT	2 <sup>3</sup> / <sub>4</sub>	9 <sup>7</sup> / <sub>8</sub>	7 <sup>3</sup> / <sub>4</sub>	3 <sup>7</sup> / <sub>8</sub>	10 <sup>1</sup> / <sub>4</sub>	15 <sup>3</sup> / <sub>4</sub>	10	36	3 <sup>1</sup> / <sub>2</sub>	17 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>2</sub>	8 <sup>1</sup> / <sub>4</sub>	9	8 <sup>3</sup> / <sub>4</sub>	40 <sup>1</sup> / <sub>2</sub>	20	13	2 <sup>3</sup> / <sub>4</sub>	21 <sup>3</sup> / <sub>4</sub>	0
6"	HT	4 <sup>1</sup> / <sub>4</sub>	11	9 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	14 <sup>1</sup> / <sub>2</sub>	17 <sup>3</sup> / <sub>4</sub>	11	36	4 <sup>1</sup> / <sub>2</sub>	17 <sup>1</sup> / <sub>2</sub>	29 <sup>3</sup> / <sub>4</sub>	8 <sup>1</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>2</sub>	9	43 <sup>1</sup> / <sub>4</sub>	20	14	2 <sup>1</sup> / <sub>4</sub>	21 <sup>3</sup> / <sub>4</sub>	0
6"	MT	4 <sup>1</sup> / <sub>4</sub>	11	9 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	14 <sup>1</sup> / <sub>2</sub>	17 <sup>3</sup> / <sub>4</sub>	11	37 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>2</sub>	30 <sup>1</sup> / <sub>2</sub>	8 <sup>1</sup> / <sub>4</sub>	10 <sup>3</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>2</sub>	43 <sup>3</sup> / <sub>4</sub>	20	17	2 <sup>1</sup> / <sub>4</sub>	23 <sup>3</sup> / <sub>4</sub>	3
8"	MT	5 <sup>1</sup> / <sub>2</sub>	11	9 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	16	17 <sup>3</sup> / <sub>4</sub>	12 <sup>1</sup> / <sub>4</sub>	37 <sup>1</sup> / <sub>2</sub>	6	17 <sup>1</sup> / <sub>2</sub>	30 <sup>1</sup> / <sub>2</sub>	8 <sup>1</sup> / <sub>4</sub>	10 <sup>3</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>2</sub>	46	20	17	2 <sup>1</sup> / <sub>4</sub>	23 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>
10"	LT	14 <sup>1</sup> / <sub>8</sub>	19 <sup>3</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	15 <sup>3</sup> / <sub>4</sub>	17 <sup>3</sup> / <sub>4</sub>	14 <sup>1</sup> / <sub>4</sub>	41 <sup>1</sup> / <sub>2</sub>	6 <sup>3</sup> / <sub>4</sub>	22 <sup>1</sup> / <sub>4</sub>	38	10	14 <sup>1</sup> / <sub>2</sub>	12 <sup>1</sup> / <sub>2</sub>	56 <sup>3</sup> / <sub>4</sub>	24 <sup>3</sup> / <sub>4</sub>	22	2 <sup>1</sup> / <sub>4</sub>	29 <sup>1</sup> / <sub>2</sub>	6
12"	LT	9 <sup>5</sup> / <sub>8</sub>	19 <sup>3</sup> / <sub>4</sub>	19 <sup>3</sup> / <sub>4</sub>	9 <sup>7</sup> / <sub>8</sub>	26 <sup>3</sup> / <sub>4</sub>	31 <sup>1</sup> / <sub>2</sub>	17 <sup>1</sup> / <sub>4</sub>	41 <sup>3</sup> / <sub>4</sub>	11 <sup>3</sup> / <sub>4</sub>	22 <sup>1</sup> / <sub>4</sub>	38	10	14 <sup>1</sup> / <sub>2</sub>	12 <sup>1</sup> / <sub>2</sub>	61 <sup>1</sup> / <sub>4</sub>	24 <sup>3</sup> / <sub>4</sub>	27	3	29 <sup>1</sup> / <sub>2</sub>	0

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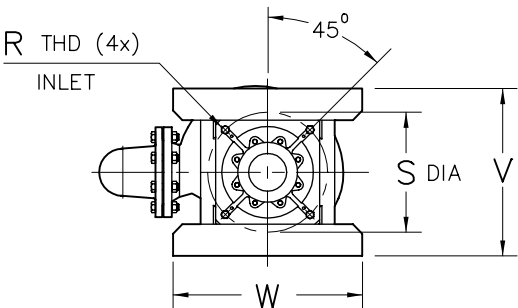
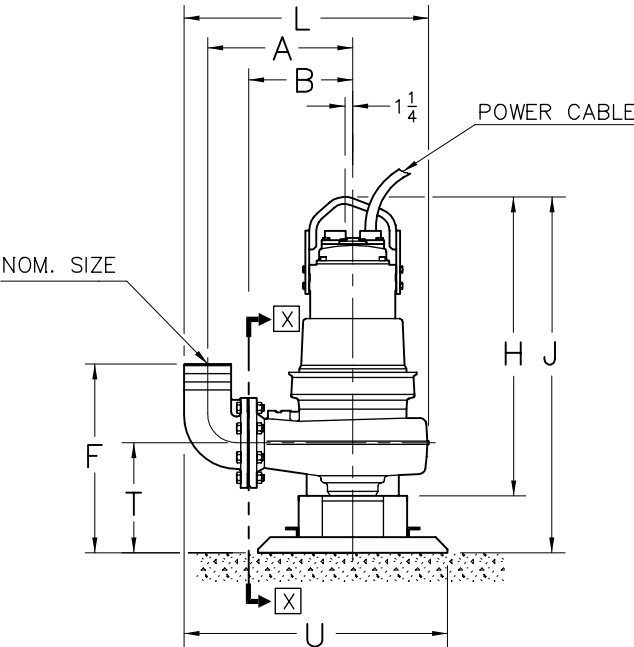
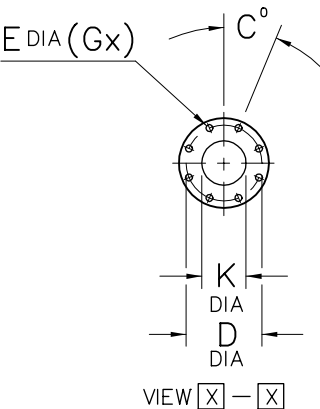
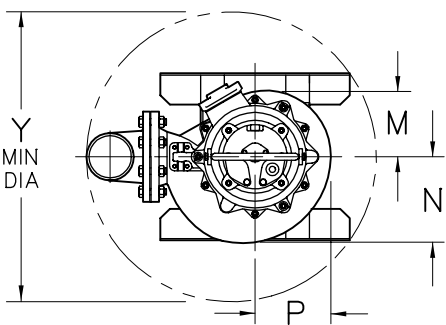
Section 4



OUTLINE DIMENSIONS

Issued: 3/96

Supersedes: 6/94



NOM. SIZE	VERSION	WEIGHT (LBS)
		TOTAL W/STAND
6"	HT	680
6"	MT	715
8"	HT	690
8"	MT	710
10"	LT	980

ALL DIMENSIONS IN INCHES

NOM. SIZE	VERSION	DIMENSIONAL CHART																				
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	Y
6"	HT	18 $\frac{1}{4}$	13	22 $\frac{10}{16}$	9 $\frac{1}{2}$	7 $\frac{7}{8}$	22 $\frac{1}{4}$	8	36	43	5 $\frac{1}{2}$	30	8 $\frac{1}{4}$	9 $\frac{1}{2}$	9	M16	14 $\frac{15}{16}$	12 $\frac{1}{2}$	33	21	23 $\frac{3}{4}$	33
6"	MT	18 $\frac{1}{4}$	13	22 $\frac{10}{16}$	9 $\frac{1}{2}$	7 $\frac{7}{8}$	23 $\frac{3}{4}$	8	37 $\frac{1}{4}$	44 $\frac{1}{2}$	5 $\frac{1}{2}$	30 $\frac{1}{2}$	8 $\frac{1}{4}$	10 $\frac{3}{4}$	9 $\frac{1}{2}$	M16	14 $\frac{15}{16}$	13 $\frac{3}{4}$	33	21	23 $\frac{3}{4}$	33
8"	HT	19 $\frac{1}{4}$	13	22 $\frac{10}{16}$	9 $\frac{1}{2}$	7 $\frac{7}{8}$	26 $\frac{1}{2}$	8	36	43	5 $\frac{1}{2}$	32	8 $\frac{1}{4}$	9 $\frac{1}{2}$	9	M16	14 $\frac{15}{16}$	12 $\frac{1}{2}$	35	21	23 $\frac{3}{4}$	35
8"	MT	18 $\frac{1}{4}$	13	22 $\frac{10}{16}$	9 $\frac{1}{2}$	7 $\frac{7}{8}$	23 $\frac{3}{4}$	8	37 $\frac{1}{4}$	44 $\frac{1}{2}$	5 $\frac{1}{2}$	30 $\frac{1}{2}$	8 $\frac{1}{4}$	10 $\frac{3}{4}$	9 $\frac{1}{2}$	M16	14 $\frac{15}{16}$	13 $\frac{3}{4}$	33	21	23 $\frac{3}{4}$	33
10"	LT	25	17 $\frac{3}{4}$	15 $^0$	13 $\frac{3}{4}$	7 $\frac{7}{8}$	30 $\frac{3}{4}$	12	40 $\frac{1}{2}$	48 $\frac{1}{4}$	10	42 $\frac{1}{2}$	10	14 $\frac{1}{2}$	12 $\frac{1}{2}$	M16	17 $\frac{3}{4}$	15	42	22 $\frac{3}{4}$	23 $\frac{3}{4}$	42

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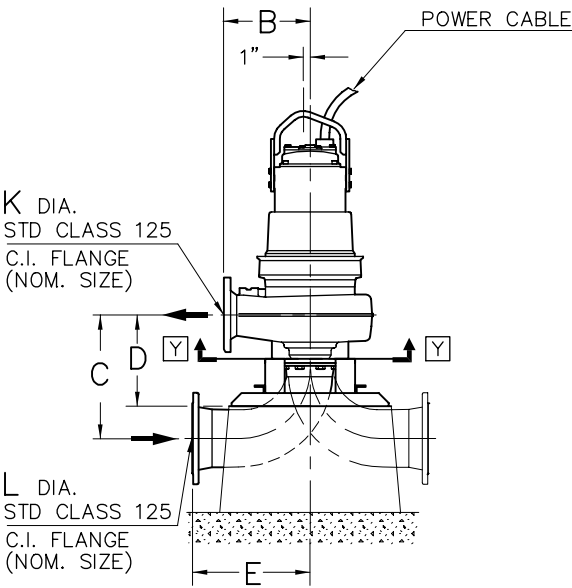
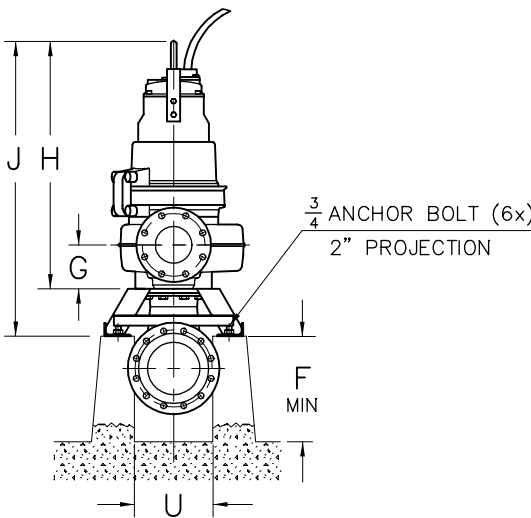
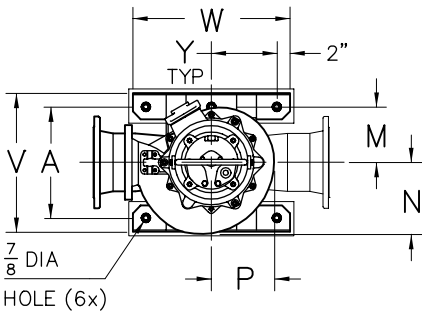
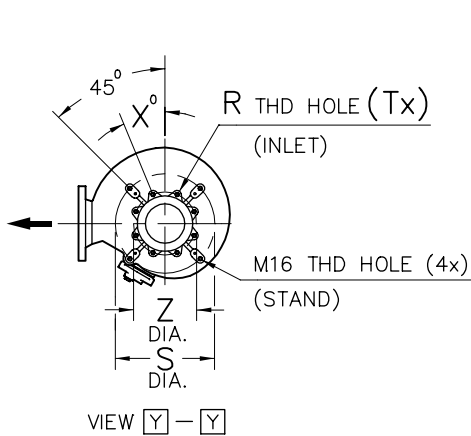
Section 4



OUTLINE DIMENSIONS

Issued: 3/96

Supersedes: 6/94



NOM SIZE (K x L)	VERSION	WEIGHT (LBS)
		TOTAL W/STAND
4" x 6"	SH/HT	670
6" x 6"	HT	680
6" x 8"	MT	730
10" x 12"	LT	1150

ALL DIMENSIONS IN INCHES

NOTE:  
PUMP CAN BE ROTATED ABOUT ITS VERTICAL  
CENTERLINE TO (4x) POSITIONS RELATIVE TO  
THE INLET ELBOW. INCREMENTS ARE 90°.

NOM SIZE (K x L)	VERSION	DIMENSIONAL CHART																			
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
4" x 6"	SH/HT	16 3/4	13	14 1/4	11 1/2	12 3/4	12	4 1/2	36	43	4	6	8 1/4	9 1/4	8 3/4	M16	14 15/16	8	12	21	23 3/4
6" x 6"	HT	16 3/4	13	15	12 1/4	12 3/4	12	5 1/4	36	43	6	6	8 1/4	9 1/2	9	M16	14 15/16	8	12	21	23 3/4
6" x 8"	MT	16 3/4	13	18 3/4	14	17 3/4	15 3/4	6 3/4	37 1/4	44 1/2	6	8	8 1/4	10 3/4	9 1/2	M20	14 15/16	8	12	21	23 3/4
10" x 12"	LT	18 1/2	17 3/4	22	15	15 3/4	19 3/4	7 1/4	40 1/2	48 1/4	10	12	10	14 3/4	12 1/2	M20	17 3/4	12	13 3/4	22 3/4	23 3/4

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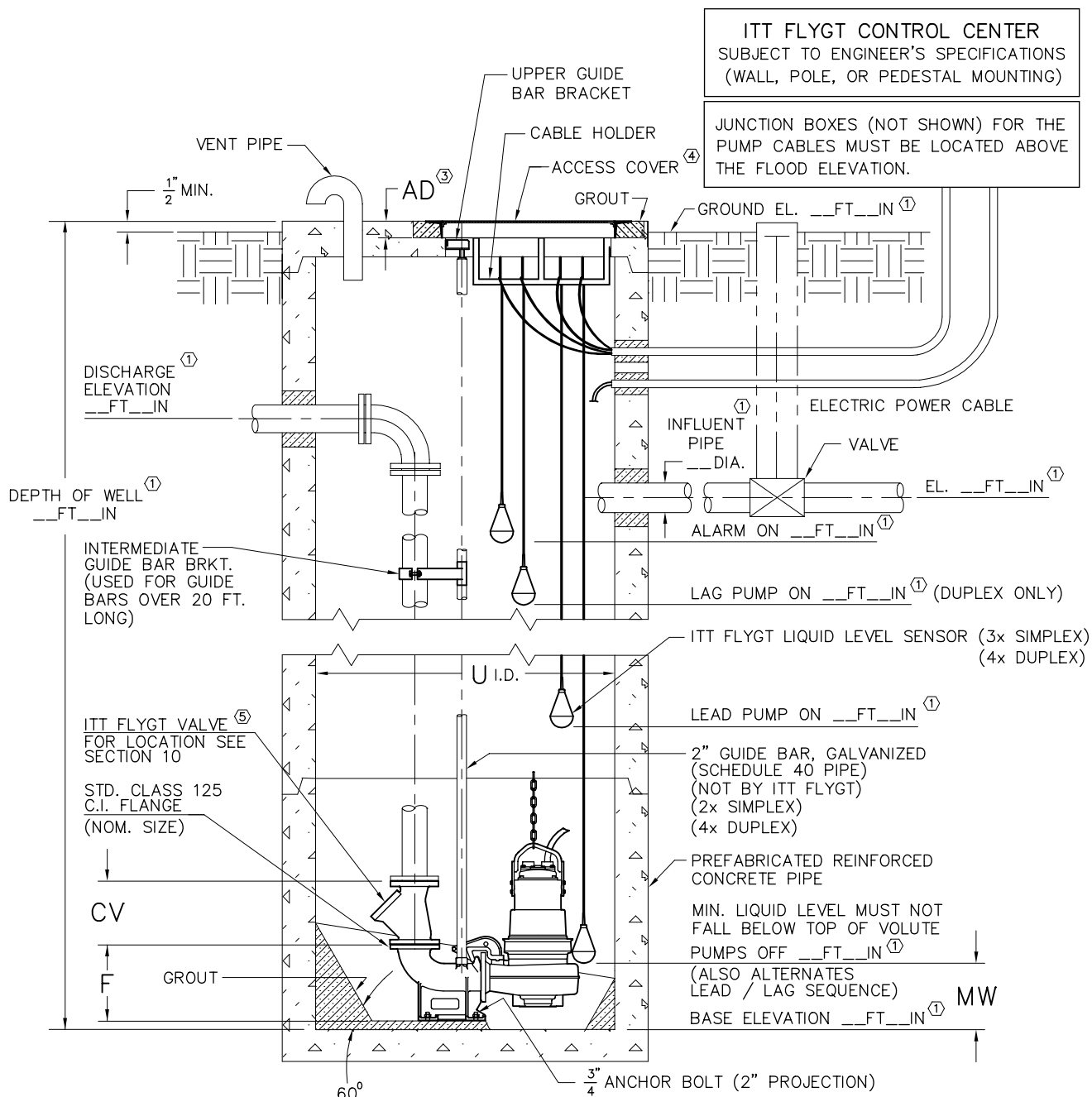
Section 5



Lift Station Dimensions

Issued: 4/96

Supersedes: 6/94



## NOTES:

1. INDICATES INFORMATION TO BE DETERMINED BY OTHERS.
2. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND CENTER LINE OF PUMP AS REF. POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP RELATIVE TO ACCESS FRAME.
3. GROUT OPENING FOR ACCESS FRAME.
4. COVER SHOWN IS FOR STANDARD DUTY ANGLE FRAME. FOR ADDITIONAL DIMENSIONS ON

- STANDARD DUTY TROUGH FRAME, HEAVY DUTY ANGLE FRAME AND HEAVY DUTY TROUGH FRAME, CONSULT ITT FLYGT CORP. ENGINEERING DEPT.
5. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO HIS APPROVAL.
6. FOR INFORMATION SEE SECTION 10.

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Section 5

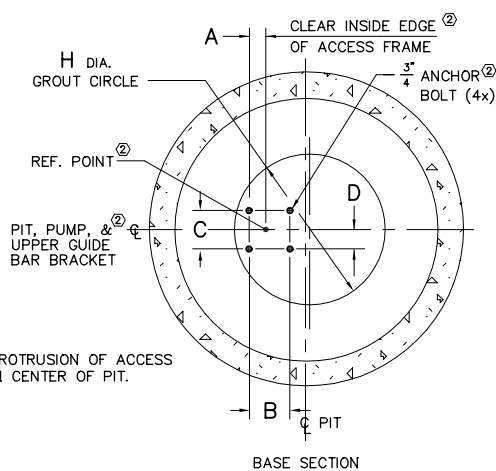
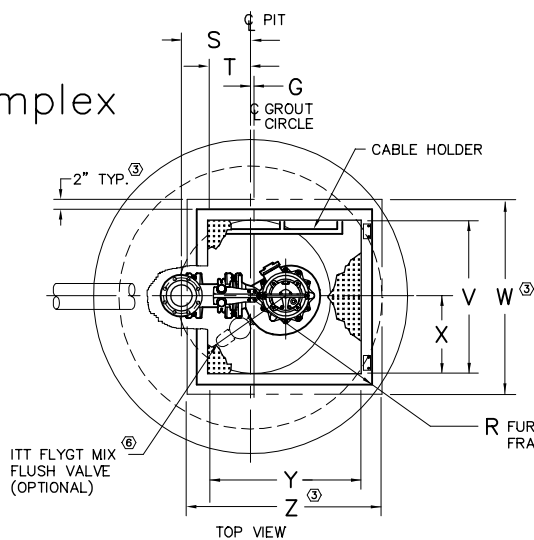


Lift Station Dimensions

Issued: 4/96

Supersedes: 6/94

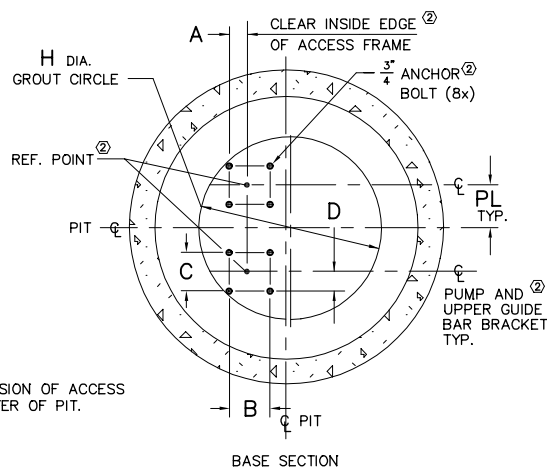
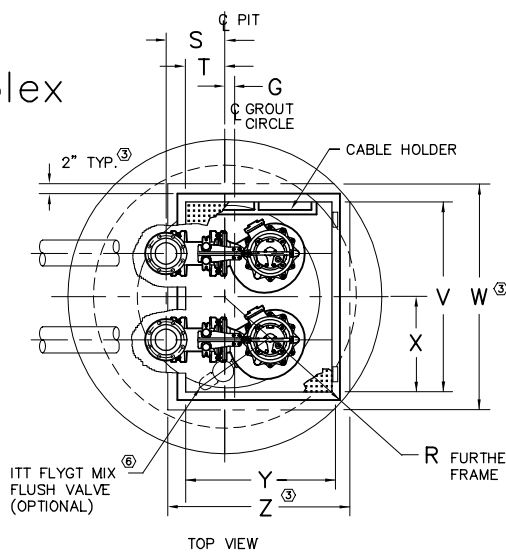
Simplex



ALL DIMENSIONS IN INCHES

NOM. SIZE	VERSION	STATION													COVER						
		A	B	C	D	F	G	H	R	S	T	U	CV	MW	SIZE	V	W	X	Y	Z	AD
4"	SH/HT	2 1/2	9 7/8	7 1/4	3 7/8	15 1/2	1	39	41	18 1/2	12	72	11 1/2	13	FAPS-34 x 49	30	44	16	48	59	3
6"	HT	4 1/4	11	9 1/2	4 3/4	17 1/4	1	42	42	19	11 1/2	72	14	14	FAPS-34 x 49	30	44	15	48	59	3
6"	MT	4 1/4	11	9 1/2	4 3/4	17 1/4	1	42	42	19	11 1/2	72	14	17	FAPS-34 x 49	30	44	16	48	59	3
8"	MT	5 1/2	11	9 1/2	4 3/4	17 1/4	1	46	41	21	12 1/4	72	19 1/2	17	FAPS-34 x 49	30	44	16	48	59	3
10"	LT	14 1/8	19 3/4	9 1/2	4 3/4	17 1/4	1	66	38	30	19 1/4	96	39 3/8	22	FAPS-34 x 49	30	44	18	48	59	3
12"	LT	9 5/8	19 3/4	20 3/4	10 3/8	31 1/2	1	62	41	29	15 1/4	96	47 1/4	27	FAPS-34 x 49	30	44	18	48	59	3

Duplex



ALL DIMENSIONS IN INCHES

NOM. SIZE	VERSION	STATION														COVER						
		A	B	C	D	F	G	H	R	S	T	U	CV	MW	PL	SIZE	V	W	X	Y	Z	AD
4"	SH/HT	2 1/2	9 7/8	7 1/4	3 7/8	15 1/2	1	50	42	15 1/4	8 3/4	72	11 1/2	13	12	FAPS-40 x 49	48	59	25	36	44	3
6"	HT	4 1/4	11	9 1/2	4 3/4	17 1/4	1	50	41	16 1/4	8 3/4	72	14	14	12	FAPS-40 x 49	48	59	25	36	44	3
6"	MT	4 1/4	11	9 1/2	4 3/4	17 1/4	1	50	41	16 1/4	8 3/4	72	14	17	12	FAPS-40 x 49	48	59	25	36	44	3
8"	MT	5 1/2	11	9 1/2	4 3/4	17 1/4	2	54	44	16	7	72	19 1/2	17	12	FAPS-40 x 49	48	59	25	36	44	3
10"	LT	14 1/8	19 3/4	9 1/2	4 3/4	17 1/4	1	78	56	24	13 1/4	96	39 3/8	22	15	FAPD-82 x 49	72	90	36	48	59	3
12"	LT	9 5/8	19 3/4	20 3/4	10 3/8	31 1/2	1	78	57	24	10 1/4	96	47 1/4	27	15	FAPD-82 x 49	72	90	36	48	59	3



# C-3152

## Electrical Data

SECTION

PAGE

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**1**

SUPERSEDES

ISSUED

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### Motor Data

RATED OUTPUT POWER HP (kW)	Ø	VOLTS NOM.	FULL LOAD AMPS	LOCKED ROTOR AMPS	LOCKED ROTOR KVA	LOCKED ROTOR CODE LETTER KVA/HP	RATED INPUT POWER kW	POLES/RPM
14.0 (10.4)	3	200	41	225	78	F	12.4	6/1150
		230	37	196				
		460	18	98				
		575	14	78				
15.0 (11.2)	3	200	46	266	92	G	13.2	4/1750
		230	40	232				
		460	20	116				
		575	16	92				
20.0 (14.9)	3	200	60	363	126	G	17.2	4/1750
		230	52	316				
		460	26	158				
		575	21	126				

PUMP MOTOR HP	EFFICIENCY			POWER FACTOR		
	100% LOAD	75% LOAD	50% LOAD	100% LOAD	75% LOAD	50% LOAD
14.0	84.0	84.0	81.5	0.85	0.81	0.71
15.0	85.0	85.0	84.0	0.83	0.78	0.67
20.0	87.0	87.0	85.5	0.82	0.76	0.65

### Cable Data

HP	VOLTS	MAX. LENGTH FT.	CABLE SIZE/ NOMINAL DIA.	CONDUCTORS (IN ONE CABLE)	PART NUMBER
14.0	200	115	8/3-2-1-GC 28.2mm (1.11")	(3) 8AWG (PWR) (2) 10AWG (CTRL) (1) 8AWG (GND) (1) 10AWG (GC)	00094 21 08
	230	145			
	460	610			
	575	990			
15.0	200	105	8/3-2-1-GC 28.2mm (1.11")	(3) 8AWG (PWR) (2) 10AWG (CTRL) (1) 8AWG (GND) (1) 10AWG (GC)	00094 21 08
	230	135			
	460	560			
	575	880			
20.0	200	130	6/3-2-1-GC 31.0mm (1.22")	(3) 6AWG (PWR) (2) 10AWG (CTRL) (1) 8AWG (GND) (1) 10AWG (GC)	00094 21 09
	230	175			
	460	700			
	575	1110			

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ISSUED	SUPERSEDES	
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Motor Data

RATED OUTPUT POWER HP (kW)	Ø	VOLTS NOM.	FULL LOAD AMPS	LOCKED ROTOR AMPS	LOCKED ROTOR KVA	LOCKED ROTOR CODE LETTER KVA/HP	RATED INPUT POWER kW	POLES/RPM
23.0 (17.2) (4 pole)	3	200	67	363	126	F	19.8	4/1750
		230	58	316				
		460	29	158				
		575	23	126				
23.0 (17.2) (2 pole)	3	200	61	455	159	H	19.6	2/3520
		230	54	400				
		460	27	200				
		575	22	160				

PUMP MOTOR HP	EFFICIENCY			POWER FACTOR		
	100% LOAD	75% LOAD	50% LOAD	100% LOAD	75% LOAD	50% LOAD
23.0 (4 pole)	87.0	87.0	85.5	0.83	0.78	0.67
23.0 (2 pole)	87.5	87.5	86.0	0.92	0.90	0.84

Cable Data

HP	VOLTS	MAX. LENGTH FT.	CABLE SIZE/ NOMINAL DIA.	CONDUCTORS (IN ONE CABLE)	PART NUMBER
23.0 (4 pole)	200	170	4/3-2-1-GC 33.8 mm (1.33")	(3) 4AWG (PWR) (2) 10AWG (CTRL) (1) 6AWG (GND) (1) 10AWG (GC)	00094 21 10
23.0 (4 pole)	230 460 575	145 600 950	6/3-2-1-GC 31.0mm (1.22")	(3) 6AWG (PWR) (2) 10AWG (CTRL) (1) 8AWG (GND) (1) 10AWG (GC)	00094 21 09
23.0 (2 pole)	200	175	4/3-2-1-GC 33.8mm (1.33")	(3) 4AWG (PWR) (2) 10AWG (CTRL) (1) 6AWG (GND) (1) 10AWG (GC)	00094 21 10
23.0 (2 pole)	230 460 575	145 590 900	6/3-2-1-GC 31.0mm (1.22")	(3) 6AWG (PWR) (2) 10AWG (CTRL) (1) 8AWG (GND) (1) 10AWG (GC)	00094 21 09

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### REQUIREMENTS

Furnish and install \_\_\_\_ submersible non-clog wastewater pump(s). Each pump shall be equipped with a \_\_\_\_ HP, submersible electric motor, connected for operation on \_\_\_\_ volts, \_\_\_\_ phase, 60 hertz, \_\_\_\_ wire service, with \_\_\_\_ feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pump shall be supplied with a mating cast iron \_\_\_\_ inch discharge connection and be capable of delivering \_\_\_\_ GPM at \_\_\_\_ TDH. An additional point on the same curve shall be \_\_\_\_ GPM at \_\_\_\_ feet total head. Shut off head shall be \_\_\_\_ feet (minimum). Each pump shall be fitted with \_\_\_\_ feet of \_\_\_\_ lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

### PUMP DESIGN

The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. **Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.** No portion of the pump shall bear directly on the sump floor.

### PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

### COOLING SYSTEM

Each unit shall be provided with an adequately designed cooling system. The water jacket shall encircle the stator housing; thus, providing heat dissipation for the motor regardless of the type of installation. Impeller back vanes shall provide the necessary circulation of the cooling liquid through the water jacket. The cooling media channels and ports shall be non-clogging by virtue of their dimensions. Provisions for external cooling and seal flushing shall also be provided. The cooling system shall provide for continuous pump operation in liquid temperature of up to **104 DEGREES F.** Restrictions below this temperature are not acceptable.

### CABLE ENTRY SEAL

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

### MOTOR

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer O-ring seal. Connection between the cable conductors and stator

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leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. Wire nuts or crimping type connection devices are not acceptable. The motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

#### BEARINGS

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single roller bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. **Single row lower bearings are not acceptable.**

#### MECHANICAL SEAL

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating **tungsten-carbide** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary **tungsten-carbide** seal ring and one positively driven rotating **tungsten-carbide** seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor **depend on direction of rotation for sealing**. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the

impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

**The following seal types shall not be considered acceptable nor equal to the dual independent seal specified:** shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with an lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate dry without damage while pumping under load.**

**Seal lubricant shall be FDA Approved, nontoxic.**

#### PUMP SHAFT

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI type 431 stainless steel.

If a shaft material of lower quality than 431 stainless steel is used, a shaft sleeve of 431 stainless steel is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

#### IMPELLER

The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be keyed to the shaft, retained with an Allen head bolt and shall be capable of passing a minimum \_\_\_\_ inch diameter solid. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

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### WEAR RINGS

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

This pump shall also have a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.

### VOLUTE

Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

### PROTECTION

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

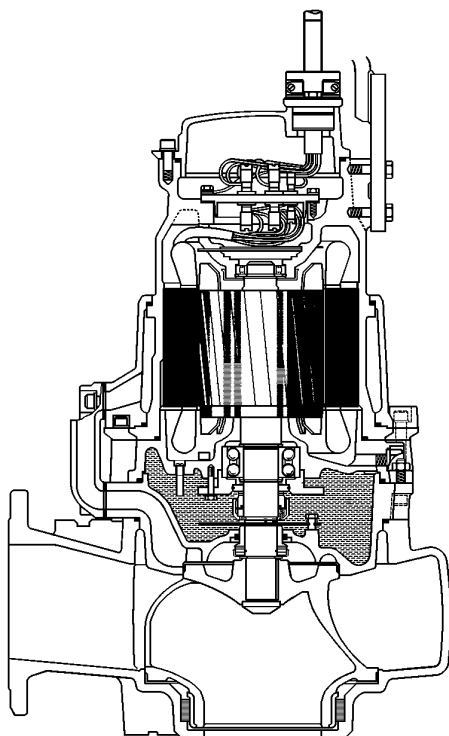
A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**

The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

### MODIFICATIONS

1. Explosion-proof Pumps (X).
2. Warm Liquid Applications (WL).
3. Dry Pit Installations (CT).

Refer to the General Guide Specifications for additional information.



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## GENERAL

The general guide specifications is intended to cover the items applying to all ITT Flygt pumps for this project. Pump specifications follow the general section. Thus; Quality, Technical Support, Testing, and Experience apply to all ITT Flygt pumps for this project.

## SCOPE

The specifications shall govern all work necessary to furnish, install and place into operation the electrical submersible pump(s) required to complete this project. This section includes electric submersible pump(s) to be supplied with motor, close coupled volute, cast iron discharge elbow, guide bar brackets, power cable and accessories. The pumps are available for wet pit (CP), dry pit (CT) and portable (CS) installations.

## QUALITY ASSURANCE

The pump(s) shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of **104 DEGREES F**. Since the high temperature of **104 DEGREES F** is specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below **104 DEGREES F** shall not be acceptable.

The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.

The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

## SUBMITTALS

Submittal data shall be provided to show compliance with these specifications, plans or other specifications that will influence the proper operation of the pump(s).

Standard submittal data for approval must consist of:

- a. Pump Performance Curves.
- b. Pump Outline Drawing.
- c. Station Drawing for Accessories.
- d. Electrical Motor Data.
- e. Control Drawing and Data.

- f. Access Frame Drawing.
- g. Typical Installation Guides.
- h. Technical Manuals.
- i. Parts List.
- j. Printed Warranty.
- k. Manufacturer's Equipment Storage Recommendations.
- l. Manufacturer's Standard Recommended Start-Up Report Form.

Lack of the above requested submittal data is cause for rejection.

## TESTING

Testing performed upon each pump shall include the following inspections:

- a. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
- b. Prior to submergence, each pump shall be run dry to establish correct rotation.
- c. Each pump shall be run submerged in water.
- d. Motor and cable insulation shall be tested for moisture content or insulation defects.

Upon request, a written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the time of shipment.

Each pump (when specified) shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer to determine head vs. capacity and kilowatt draw required. Witness tests shall be available at the factory upon request.

The pump(s) shall be rejected if the above requirements are not satisfied.

## START-UP SERVICE

The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for \_\_\_ 8-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:

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- a. Megger stator and power cables.
- b. Check seal lubrication.
- c. Check for proper rotation.
- d. Check power supply voltage.
- e. Measure motor operating load and no load current.
- f. Check level control operation and sequence.

During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel.

## FACTORY SERVICE

Factory-Approved service facilities with qualified factory-trained mechanics shall be available for prompt emergency and routine service.

## GUARANTEE

In addition to the general guarantee required elsewhere in these specifications, the pump manufacturer shall furnish the Owner with a written warranty to cover the pump(s) and motor(s) against defects in workmanship and material for a period of five (5) years or 10,000 hours of operation under normal use and service. The pump manufacturer will pay the following portion of the cost of **all replacement parts and repair labor** from the date of shipment of the pump unit. Pumps repaired under warranty will be returned to the owner freight prepaid.

Months	0-18	19-39	40-60
Hours	0-3,000	3,000 - 6,500	6,500 - 10,000
Warranty	100%	50%	25%

The warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured.

## EXPERIENCE

The pump manufacturer shall have a minimum of 10,000 heavy-duty submersible wastewater pumps installed and operating for no less than 5 years in the United States.

## MANUFACTURERS

- a. The pump, mechanical seals and motor shall be from the same manufacturer.
- b. The pump, mechanical seals and motor manufacturer shall be ITT Flygt.

## MODIFICATIONS:

### a. EXPLOSION-PROOF PUMPS (X):

The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to **104 DEGREES**

**F.** Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be available, as an option, in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel. **The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion-proof pumps.**

### b. DRY PIT INSTALLATION (CT):

Motor cooling shall be sufficient for continuous operation under full nameplate load in a dry environment. The pump(s) shall be capable of handling pumped media up to **104 DEGREES F.**

**OIL FILLED MOTORS** - Since the complete motor requires total oil immersion for adequate heat dissipation, **oil filled motors shall not be considered for dry pit installations.**

### DRY TYPE - EXTERNAL FAN COOLED

**MOTORS** - When external fan cooling is required, two **SEPARATE** motors are required one for the pump and one for the fan. This results in higher input power, increased operating costs and possible fan motor failure. A submersible pump is used for dry pit installation because of the high possibility of flooding. If the fan motor is operating when submerged, the down thrust developed will damage the fan motor. A pump motor of about **200 HP** **DEPENDS** on the performance of a **3 HP** fan motor. **Thus, air cooled fans shall not be considered for dry pit installations.**

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**c. WARM LIQUID APPLICATIONS (WL):**

Higher temperature units shall be available for pumped media temperatures of 140°F, 160°F and 195°F. Alternative cable, O-rings, seal materials, etc. may be used for the higher temperature applications. On certain pump models and for some higher temperatures, an external source of cooling water may be required.

**d. STAINLESS STEEL PUMPS (SS):**

Complete pump models shall be available in stainless steel. In addition, pump portions including impeller, volute, hydraulic end and motor shall be available in stainless steel. The pump models shall be capable of handling pumped media up to **104 DEGREES F.**

**e. ALUMINUM BRONZE PUMPS (B):**

Complete pump models shall be available in aluminum bronze. For adequate motor cooling, there shall be a water jacket with all aluminum bronze models. The pump models shall be capable of handling pumped media up to **104 DEGREES F.**