

FULLY FLOODED hydroEngine®

Typical plant layout

The hydroEngine is delivered to the project site assembled and factory-tested. Commissioning time and cost are reduced as installation into the prepared powerhouse is a simple process. In most gravity-head situations (run-of-river or in-dam), the following guidelines are recommended:

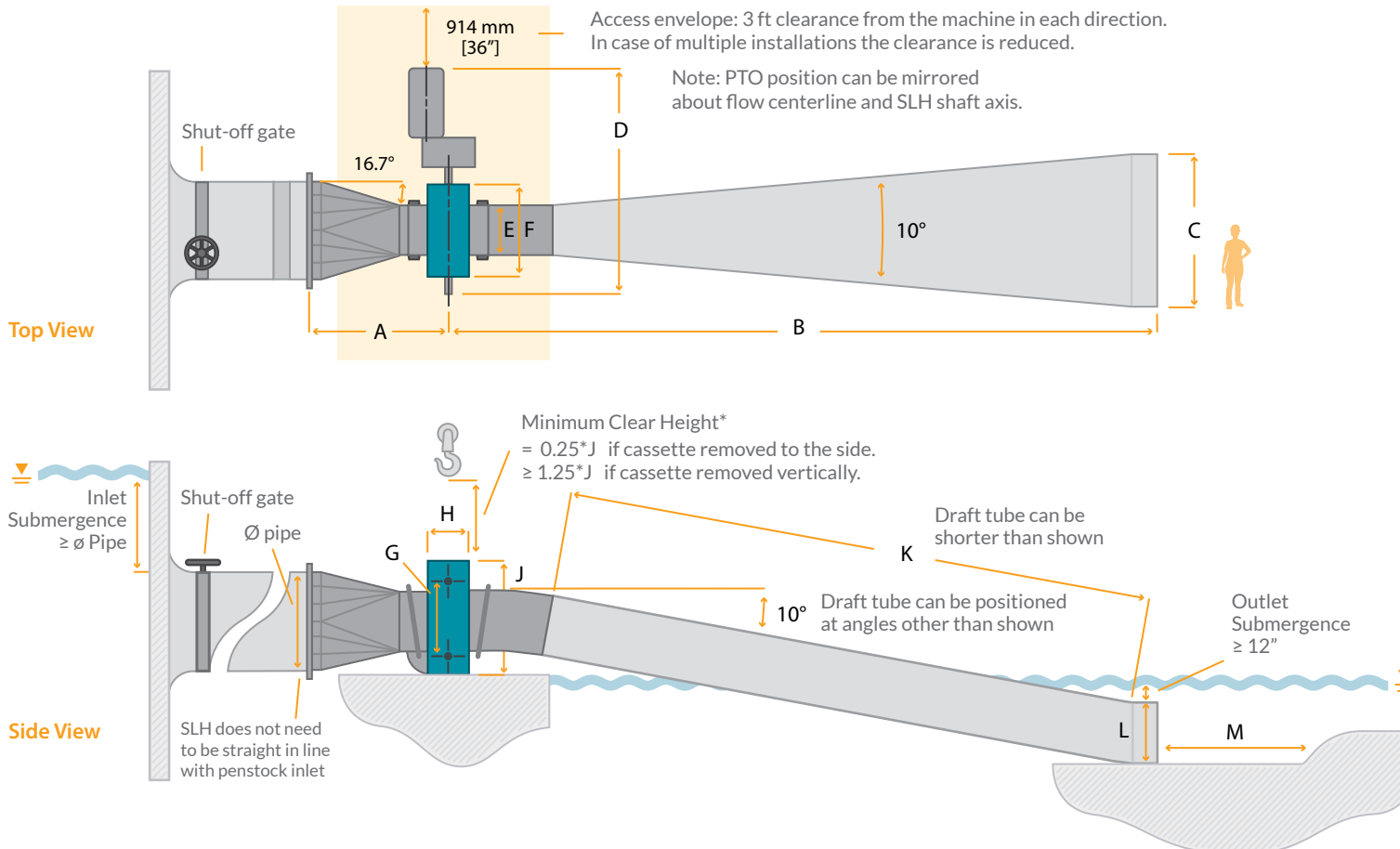
- Top of intake should be submerged below the upper pool in accordance with best practices to avoid formation of air vortices.
- Draft tube outlet must be submerged at all times of expected operation. It is recommended that the upper edge of the draft tube outlet be submerged a minimum of 0.3 m, or 1/4 of the draft tube outlet height.

Ø pipe ranges	FULLY FLOODED		FULLY FLOODED	
	in	mm	in	mm
A	in	84	90	See Table #1
	mm	2,133	2,286	
A	in	53	61	B
	mm	1,349	1,549	C

Table 1

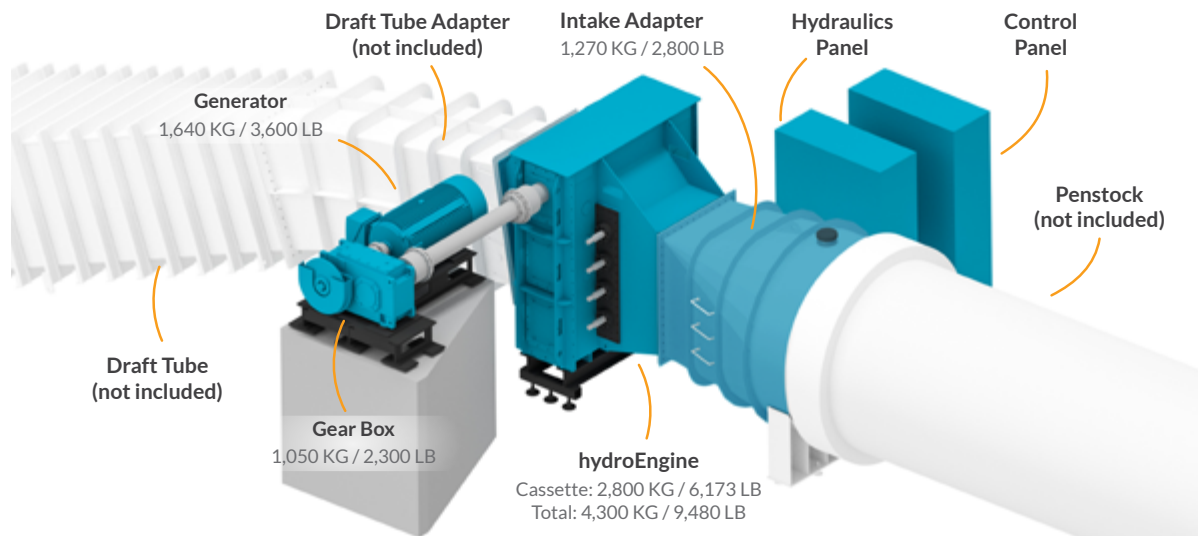
	in	mm
A	See Table #1	
B	617	15,677
C	138	3,494
D	169	4,300
E	43	1,100
F	87	2,200
G	63	1,600
H	49	1,240
J	104	2,650
K	535	13,600
L	52	1,322
M	$\geq (5 \cdot L \cdot E) / (L + E)$	

Table 2



FULLY FLOODED hydroEngine®

Equipment included in the water-to-wire package



ITEMS INCLUDED

Hydro-mechanical equipment

	Base hydroEngine	Water-to-wire Package
hydroEngine	•	•
Intake adapter	•	•
Inlet guide vanes (wicket gates)	•	•
Hydraulic power unit and pressure supply system	•	•
Design guidance for draft tube	•	•
Speed increaser (gearbox or belt drive)		•
Special assembly tools	•	•

Electrical equipment

Generator		•
Power Factor Correction (if required, and as specified, by customer)		•
Generator protection relay (as specified by customer)		•
Grid protection relay (as specified by customer)		•

Instrumentation and control equipment

Unit SCADA control system (hardware and software)	•	•
Integrated Sensors:		
- hydroEngine shaft speed	•	•
- Inlet guidevane control	•	•
- Powertrain health	•	•
- Generator output		•
- Water levels (upper and lower pools)		•

Operating envelope

Natel currently offers two basic configurations: a Fully Flooded model, and a Free Jet model.

The Fully Flooded model is rated to a maximum power of 500kW at 20 feet (6 meters) of net head with 10.1 m³/s.

To optimize profitability, projects should be designed such that installed hydroEngines will operate near their maximum flow capacity, given the available net head.

nethead		FULLY FLOODED			
		flow		power	
m	ft	m ³ /s	ft ³ /s	KW	HP
1.5	5	6.94	245	82	109
2	6.6	8.01	283	125	168
3	9.8	9.81	347	231	309
4	13.1	10.8	381	346	465
5	16.4	11.5	407	462	619
6	19.7	11.4	402	526	705

Table 3

ITEMS NOT INCLUDED

All other related balance of plant designs, hardware, and civil works are not part of Natel's scope of supply, including, but not limited to, the following:

- Intake and bypass gates
- Trash rack or screen
- Power house
- Draft tube or plinth
- Plant wiring
- Transformers and utility interconnection hardware