RIGGING

- Loads should be well secured
- Slings should be adequate to the task
- Slings should be un-kinked and load balanced and secured
- No sudden stops
- No obstructions while lifting or traveling
- No loose items on load or crane before lift
- Bumping into runway stops is prohibited
- Hoist line must be vertical prior to the lift (remove slack in the hoist slowly)
- No crane load should pass overhead of personnel, clear the area before making the lift
- No one is to ride the crane without permission

The most important job of any crane operation is rigging of the load. Poor rigging may result in personnel injury, property damage, or other serious hazards. Rigging is the most time consuming of any crane operation and represents the single most hazardous potential of crane operation. In a multi-sling operation, each leg must be of the same length and must contribute equally to load distribution. Nylon slings are susceptible to damage by sharp corners on the item to be rigged. Caution must be taken to ensure that slings are not damaged by sharp corners or by excessive loading. Rigging requires years of practice to perfect. If in doubt about the security of your rigging, ask for help. Rigging should be checked by lifting the load a few inches off the ground to ensure that no swing develops and that the load is completely secure. Remember it is important to take the time to accomplish this task correctly. Not doing so may result in catastrophic consequences. One of the most important things to check before lifting a load is to look for loose items, such as screws or tools, which may have been used to secure the load. Such items can become projectiles during a lift. This is the reason why crane operators or especially tag line operators should wear hard hats when operating the crane and why it is essential to make sure the path of the crane does not pass over the head of any individual.

Spreader bars must be used when lifting the B30. Slings are to be attached at the lifting lugs located at the Four Inside Corners of the B30.

Overall Weight	34, 200 Lbs
- Weight Trough	3,650
- Weight Shaft	4,634
- Weight Hood	3,900
- Miscellaneous	22,000

Overall Dimensions	311 Inch Long x 143 Inch Wide x 186 Inch High

(Refer to the General Arrangement Drawing for exact dimensions)

The following handling and installation instructions are intended to help customers install the RBC properly and efficiently.

Handling and installation instructions are only recommendations. They do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Improper handling or installation, which results in damage or tank failure, is the sole responsibility of the purchaser. Failure by the customer to comply with the handling or installation instructions will void the tank warranty. Unknown situations or conditions are also the burden of the purchaser.

The presence of SEPROTECH SYSTEMS personnel or an authorized representative at the installation site does not relieve the purchaser of their responsibilities.

DO NOT fully assemble RBC prior to lifting. First install the tank, and then assemble the shaft and other components onto installed tank.

INSPECTION

At the time of delivery, the customer shall be responsible for inspecting the tank for damage during transit. Both the inside and the outside of the tank must be inspected. If damage has occurred it should be noted on the delivery receipt prior to signing acceptance, whether it be a SEPROTECH SYSTEMS truck of common carrier. If a SEPROTECH SYSTEMS truck makes delivery, the factory should be immediately contacted prior to unloading or acceptance. The customer accepts all future responsibility for a damaged tank if the procedures set forth are not followed.

Minor damage can be repaired at the delivery site.

SEPROTECH SYSTEMS tanks are designed to withstand normal handling. Note the following handling precautions:

1. NEVER roll or slide a RBC. Lift the tank using a crane or other approved method.
2. Operators of hoist equipment should follow proper rigging procedures at all times. NEVER allow RBC to swing out of control.
3. Do not drop or allow hard impact from tools, spreader bars, etc.
4. Avoid the use of equipment inside the tank that could scratch or damage the inner corrosion barrier.
5. NEVER use cables or chains around tank.
6. NEVER lift tank by using fittings. Use designated lifting lugs.
7. If RBC is being stored prior to installation, be sure to lay on padded surface and tie down securely.

Seprotech
Water. Pure and Simple

DESIGN BRIEF
SHANCO NUNAVUT - RETRO-FIT
*Note that since this is a retro-fit that has not been tested in the field, effluent values are target values.

1. HYDRAULIC DESIGN: (AVERAGE DAILY FLOW)

1	unit at	14	m3/day =	14	m3/day = Q
	Peak Flow	41			
	design based on a	24	hour day.		

2. INFLUENT PARAMETERS:

BOD (biochemical oxygen demand) =	491	mg/l
SS (suspended solids) =	491	mg/l
TKN =	70	mg/l
Phosphorus =	n/a	mg/l

Ontario Application?	n	y/n
Designated Model?	y	y/n
What Model?	B30	MODIFIED with extra media
In concrete tank?	Full Steel	

3. TREATED EFFLUENT QUALITY:

BOD (biochemical oxygen demand) =	20	mg/l	
SS (suspended solids) =	20	mg/l	
NH3-N =	2	mg/l	this effluent concentration is expected after the retro-fit
Phosphorus =	n/a	mg/l	

4. R.B.C. SURFACE AREA REQUIRED (AO):

a) Removal in Primary Settling Tank (P.S.T.)

Primary BOD Removal =	10%			(Ref.1)
Primary Tank. Eff. BOD =	490.9090909	mg/l x	90%	
to RBC =	441.8181818	mg/l		

b) RBC BOD Loading.

Applied Load =	441.8181818	mg/l	14	m3/day
	5.96	kg BOD/day		

c) Area required to reduce BOD to 20 mg/l (AO)

Applied Load =	5.96	kg BOD/day		5.96	kg BOD/ day
For	20	mg/l*	use	1.95	kg/day/100 m2
	306	m2			

(*in a nitrification application, reduce BOD to 30 mg/l, the nitrification process completes the BOD reduction)

TABLE #1
BOD REMOVAL RATES
Seprotech Curve

Req. effl.	lbs/day/1000 ft2	kg/day/100 m2
5	1.25	0.61
10	2.65	1.29
15	2.00	0.98
20	2.65	1.29
25	3.35	1.64
30	4.00	1.95
35	4.60	2.25
40	5.15	2.52
50	6.00	2.92
60	7.15	3.52
70	8.28	4.05
80	9.40	4.59
90	10.53	5.13
	USE	1.95

* For effluent strengths less than 20 mg/l, filtration is required. Filtration removes the sloughed biomass 50% of which is BOD. Therefore, to obtain effluent strengths of 5 and 10 mg/l BOD use the loading rates for 10 and 20 mg/l respectively with filtration.

No temperature correction required
Refs. 13,14,&15

d) NH3-N to be removed
(Assume Organic Nitrogen is converted to Ammonia NH3)

Removed to	5	mg/l	=		70	less	5	times	13,500	litres/day
=	0.88	kg/day	=		1.93	lb/day				
Area Required to reduce NH3-N to	5	mg/l								
=	0.88	kg/day		over	0.147	kg NH3-N/day/100 m2		(Ref. 12)		
=	597	m2	=							
Residual NH3-N to be removed below 5 mg/l =	5	mg/l	less		2	mg/l	times	13,500	litres/day	
=	0.041	kg/day								
Area Required to reduce NH3-N to	0									
=	0.041	kg/day		over	0.089	kg NH3-N/day/100 m2		(Ref. 12)		
=	46	m2	=							
Total Nitrification Area Required =	642	m2	=			(Ref. 12)				

e) Total Surface Media Required

Total Surface Media Required = 948 m2

f) Staging

Hydraulic Loading	0.13	L/d/m2
B.O.D.post primary	5.96	kg BOD/day
Media req'd(B.O.D)	306	m2
Media req'd(nitrfct'n)	642	m2
Total req'd	948	m2
Min req'd to prevent 1st st. overload	192	m2
Min req'd to prevent 2nd st. overload	71	m2

TABLE # 2 - Brenner

Req'd NH3-N concentration (mg/l)	Removal Rate (kg/day/ 100m2)
1	0.037
1.5	0.061
2	0.089
2.5	0.110
3	0.123
3.5	0.135
4	0.147
4.5	0.147
5	0.147

No temperature correction required
Refs. 13,14,&15

Media Distribution After Retro-fit

	ACTUAL AREA (m2)
First Stage	205
Second Stage	140
Third Stage	784
Fourth Stage	0
TOTAL	1,129

Minimum First Stage Media Area

Maximum loading to prevent first stage overload =	3.1	kg/day/100 m2
=	5.96	kg of post primary BOD/day divided by max. loading times 100 m2
=	192	m2

BOD remaining for 2nd Stage =	2.21	kg/day
Minimum Media 2nd Stage =	71.38	m2

5. PRIMARY SETTLING TANK (P.S.T.) (per RBC unit):

a) Primary Settling Tank Influent Flows (per RBC unit)

Average Daily Flow =	**13,500**	**litres/day**				
Recycle at	507%	%	=	68472	litres/day	The actual volume per bucket may change in the field depending on how much wastewater each bucket picks up
Total Average Flow =	81,972	litres/day				
Peak Daily Flow =	40,500	litres/day				
Peak Flow including Recycle =	108,972	litres/day				

b) Loading Rates

Average Overflow Rate =	16,000	Litres/day/m2	max from	(Ref.5)
Peak Overflow Rate =	24,000	Litres/day/m2 (rounded)		(Ref.7)
Detention Time =	4	hours	use 4 hrs	(Ref.6)

c) Surface Area Required

i) by Average Overflow Rate = Total Average Flow divided by Average Overflow Rate
= 5.12 m2
ii) by Peak Flow Rate = Peak Flow divided by Peak Overflow Rate
= 4.54 m2
Therefore, use 5.12 m2 to compare with actual area of P.S.T.

P. S. T. Surface Area for Model B30 3.35 m x 4.19 m = 14.0 m2

Safety factor of: 2.74 times supplied.
Therefore **Surface Area Acceptable**

d) Volume Required = Q x Detention Time / 24 hrs / day
= 2.3 m3
P.S.T. Tank Capacity for this B30 is 27 m3
(after allowance for sludge) 12.0 **safety factor**
Therefore **Volume Acceptable**

6. FINAL SETTLING TANK (F.S.T.):

a) Loading Rates

Average Overflow Rate =	24000	Litres/day/m2	[Ref. 10]
Peak Overflow Rate =	44822	Litres/day/m2	[Ref. 10]
Detention Time =	3	hours	

b) Surface Area Required

i) by Average Overflow Rate = Average Flow divided by Average Overflow Rate
= 0.56 m2
ii) by Peak Flow Rate = Peak Flow divided by Peak Overflow Rate
= 0.30 m2
Therefore, use 0.56 m2 to compare with actual area of F.S.T.

F. S. T. Surface Area for Model B30 3.35 m x 1.0 m = **3** m2

Safety factor of 5.75 times supplied.
Therefore **Surface Area Acceptable**

c) Volume Required = Q x Detention Time / 1000 / 24 hrs / day
= 1.7 m3 =
F.S.T. Tank Capacity for this B30 is 4.0 m3
(after allowance for sludge) **2.4** safety factor
Therefore **Volume Acceptable**

7. SLUDGE CALCULATIONS:

Assumptions Used for Calculation of Sludge Accumulation

1. Inlet TSS:	491	mg/l
2. Outlet TSS:	20	mg/l
3. Inlet BOD5:	491	mg/l
4. Outlet BOD5:	20	mg/l
5. Average Daily Flow:	34	m3/day
6. Proportion of inlet BOD5 soluble:	70%	
7. Total incoming solids	16.57	kg/d
8. Inert portion of solids (30%)	4.97	kg/d
9. Assuming Aerobic digester removal efficiency, 50%.	5.80	kg/d
10. BOD removed in secondary treatment	14.24	kg/d
11. Sludge produce due to BOD removal	4.27	kg/d
12. Aerobic digester removal efficiency 50%.	2.14	kg/d
13. Total sludge produced per day	12.90	kg/d

Information Pertaining to the ROTORDISK Used in Calculation of Sludge Accumulation

1. All sludge accumulates in the PST (sludge settled in the FST is pumped back to the PST).

2. PST Surface Area:	14.0	m2
3. PST Volume:	27.0	m3
4. PST Sludge Storage Capacity:	13.5	m3
TOTAL Mass of sludge produced that accumulates in the PST:	**12.9**	**kg/day**
Volume of Wet Sludge produced Daily:	0.2581	m3/day
Depth of Wet Sludge produced Daily:	0.0184	m/day
Frequency of Pump-Outs:	52	days

SUMMARY OF REFERENCES

Ref.1
excerpt from "Design of Municipal Wastewater Treatment Plants Volume 1", Chapters 1-12, WEF Manual of Practice No. 8, ASCE Manual and Report on Engineering Practice No. 76, p. 475, which states, " Sedimentation with coagulation may remove 60 to 90% of the TSS, 40 to 70% of BOD5, 30 to 60% of COD, 70 to 90% of the Phosphorus, and 80 to 90% of the bacteria loadings. In comparison, sedimentation without coagulation, may remove only 40 to 70% of the TSS, 25 to 40% of the BOD5, 5 to 10% of the Phosphorus loadings, and 50 to 60% of the bacteria loadings."

Ref.2
excerpt from "Manual of Policy, Procedures and Guidelines for Private Sewage Disposal Systems, Ontario Regulation 374/81 under part VII of the Environmental Protection Act", May 1982, ISBN 0-7743-7303-2, section 12.7.1, which states, "if it is a system operating on the rotating biological disc or similar principle involving contact of the biomass with air, provide a disc area so that the daily loading of sewage will not be in excess of 1.25 kg of BOD5 per 100 sq.m. of disc area, or a hydraulic loading in excess of 45 l/sq.m. of disc area".

Ref.3
excerpt from "Pilot Plant Studies of Rotating Biological Contactors treating municipal Wastewater", by: K.L. Murphy and R.W. Wilson, International Environmental Consultants Ltd., Toronto Ontario, prepared for Central Mortgage and Housing Corporation, Ottawa, Ontario.

Ref.4
excerpt from "Design of Municipal Wastewater Treatment Plants Volume 1", Chapters 1-12, WEF Manual of Practice No. 8, ASCE Manual and Report on Engineering Practice No. 76, p. 776, which states, "...whenever the first stage loading limit exceeded 3.1 kg BOD5/100 sq.m.day(6.4 lbs. BOD5/d/1000 sq.ft.), the system was associated with the presence of sulfur-oxidizing organisms".

Ref.5
excerpt from "EPA Process Design Manual, On-site Wastewater Treatment and Disposal Systems", Oct 1980, EPA 625/1-80-012, section 6.4.2.4.e., p.149, which states, "...average flow design values normally range from 200 to 400 gpd/sq.ft.(8 to 16 cu.m./d/sq.m.)".

Ref.6
excerpt from " O&M of Trickling Filters, RBC's, and Related Processes, Manual of Practice OM-10, 1988, Water Pollution Control Federation, p. 105, which states, " Weir overflow rates typically range from 125 to 250 cu.m./m.d (10,000 to 20,000 USgpd/ft.)...The wastewater detention time in a settling basin is normally between 1 to 3 hours, but has been as high as 10 hours with excellent results". [use 4 hours]

Ref.7
excerpt from "EPA Process Design Manual, Wastewater Treatment Facilities for Sewered Small Communities", Oct 1977, EPA-625/1-77-009, section 6.4.2., which states, " the peak overflow rate may be 2,500 to 3,000 USgpd/sq.ft. (100 to 120 cu.m./sq.m.d) for primary clarifiers followed by biological treatment processess".
" Clarifiers handling chemical flocs, such as aluminum or iron coagulants, should be designed for peak overflow rates no longer than 600 and 800 USgpd/sq.ft.(24 and 32 cu.m./sq.m.d)".

Ref.8
excerpt from "Design of Municipal Wastewater Treatment Plants Volume 1", Chapters 1-12, WEF Manual of Practice No. 8, ASCE Manual and Report on Engineering Practice No. 76, p. 484, which states, " TSS removal efficiencies in primary sedimentation tanks usually range between 50 and 65%. Many designers assume a removal efficiency of 60% for