DERIVATIONS OF HAULING UNIT COST / AGGREGATES PRODUCTION UNIT COST

Truck Rental (PhP/day)	5,672.00	
Payloader Rental (PhP/day)	6,424.00	
Actual Operating Hours Per Day	6.00	hrs
Rate of Labor (PhP/day)	280.00	
Working Hours Per Day	8.00	hrs
Actual Working Hours Per Day (labor)	7.00	hrs

1	**Screening & Stockpiling Productivity**								
	a)	Mechanical Production of Aggregates							
		Assume Volume of Unprocess Materials, Volume			12.00	cu.m			
		Loader Bucket Capacity			1.50	cu.m			
		Loader Effeciency			83.00%		1.25		
		Fine Aggregates, FA	60%	of unprocessed volume					
		Volume of Fine Aggregates			7.20	cu.m			
		Coarse Aggregates, CA	30%	of unprocessed volume					
		Volume of Coarse Aggregates			3.60	cu.m			
		Waste	10%	of unprocessed volume					
		For Fine Aggregates							
		No. of Cycle [volume / (bucket capacity x efficiency)]					9.64	cycles	
					say		10.00	cycles	
		Approximate Screening Time/Cycle					1.00	minute/cycle	
		Screening Time (# of cycles x screening time/cycle)					10.00	minutes	
		Approximate Time to Stockpile Volume of Screened FA		0.69	min/cu.m		5.00	minutes	
		Total Time Elapsed					15.00	minutes	
		For Coarse Aggregates							
		Waste Volume from Screening of Fine Aggregates					4.80	cu.m	
		No. of Cycle [waste volume / (bucket capacity x efficiency)]					3.86	cycles	
					say		4.00	cycles	
		Approximate Screening Time/Cycle					1.00	minute/cycle	
		Screening Time (# of cycles x screening time/cycle)					4.00	minutes	
		Approximate Time to Stockpile Volume of Screened CA					2.50	minutes	
		Removal of Waste					0.96	minutes	
		Total Time Elapsed					7.46	minutes	
		Combine Time of Production of Aggregates					22.46	minutes	
					say		23.00	minutes	
		Therefore, Hourly Production							
		Fine Aggregates					18.78	cu.m	
		Coarse Aggregates					9.39	cu.m	
		Daily Output of 1 Payloader and 2 Screens from Given Source							
		Fine Aggregates (hourly production x operating time of payloader)					112.70	cu.m	
		Coarse Aggregates (hourly production x operating time of payloader)					56.35	cu.m	
		Fine Aggregates Production Unit Cost (payloader rental / daily output)				*PhP*	*57.00*	*per cu.m*	
		Coarse Aggregates Production Unit Cost (payloader rental / daily output)				*PhP*	*114.01*	*per cu.m*	
	b)	Manual Production of Aggregates/Boulders							
		For Fine Aggregates							
		Approximate Time to Screen & Stockpile 1 cu.m FA					1.00	hrs/cu.m	
		Output of 1 Laborer in cu.m/day (working hours / capacity)					7.00	cu.m/day	
		Fine Aggregates Production Unit Cost (labor rate / daily output)				**PhP**	**40.00**	**per cu.m**	
		For Coarse Aggregates							
		Approximate Time to Remove Waste from the Screening of FA					0.50	hrs	
		Approximate Time to Stockpile 1 cu.m CA					0.33	hrs	
		Total Time Elapsed					0.83	hrs	
		No. of Cycle Per Day (working hours / time spent per cycle)					8.40	cycle	
		Output of 1 Laborer in cu.m/day (# of cycles per day x capacity)					8.40	cu.m/day	
		Coarse Aggregates Production Unit Cost (labor rate / daily output)				**PhP**	**33.33**	**per cu.m**	
		For Boulders							
		Approximate Time to Stockpile 1 cu.m Boulders					7.00	hrs/cu.m	
		Output of 1 Laborer in cu.m/day (working hours / capacity)					1.00	cu.m/day	
		Boulder Production Unit Cost (labor rate / daily output)				*PhP*	*280.00*	*per cu.m*	
2	**Aggregates**								
	a)	*Freight Cost from Source to Job Site*							
		Load Capacity	3.00	cu.m/load					
		Average Hauling Distance					2.00	km	
		Average Speed with Load (mostly above 12% grade dirt road)					5.00	km/hr	
		Average Speed without Load					10.00	km/hr	
		Approximate Loading Time		5.00	mins	or	0.08	hrs	
		Approximate Unloading Time		1.00	mins	or	0.02	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.40	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.20	hrs	
		Time Spent per Cycle (Trip)					0.73	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					10.91	cycle	
		Hauling Cost of Aggregates (truck rental / # of cycles per day)				PhP	519.93	per load	
		Loading Cost of Aggregates (payloader rental / loading time)				PhP	89.22	per load	
		Total Hauling Cost of Aggregates per load				PhP	609.16	per load	
		Hauling Unit Cost of Aggregates per cu.m (total hauling cost / truck capacity)				*PhP*	*203.05*	*per cu.m*	
3	**Boulders**								
	a)	*Freight Cost from Source to Job Site*							
		Load Capacity	3.00	cu.m/load					
		Average Hauling Distance					2.00	km	
		Average Speed with Load (mostly above 12% grade dirt road)					5.00	km/hr	
		Average Speed without Load					10.00	km/hr	
		Approximate Loading Time		30.00	mins	or	0.50	hrs	
		Approximate Unloading Time		10.00	mins	or	0.17	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.40	hrs	

Payloader Rental (operated, PhP/day) = PHP 6,424.00 per day
Payloader Bucket Capacity (bucket volume x 85% efficiency) = 1.28 cu.m per scoop

Volume of unprocessed materials (assumed) = 12.00 cu.m
No. of Payloader CYCLE [assumed volume / payloader capacity] = 10.00 cycle (or trips)
Approximate Screening Time Spent / cycle = 1.00 min / cycle
Time Spent Screening Assumed Volume = = 10.00 min

Fine Aggregates, FA (after screening)
Volume of Fine Aggregates (60% of unprocessed volume) = 7.20 cu.m
Approximate Time Spent to Stockpile FA = 0.69 min / cu.m
Time Spent Stockpiling FA = = 5.00 min

Coarse Aggregates, CA
Volume of Coarse Aggregates (30% of unprocessed volume) = 3.60 cu.m
Waste 10% of unprocessed volume) =

9.6

		Time of Unloaded Trip (hauling distance / speed)					0.20	hrs	
		Time Spent per Cycle (Trip)					1.30	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					6.15	cycle	
		Hauling Cost of Boulders (truck rental / # of cycles per day)				PhP	921.70	per load	
		Loading & Unloading Cost of Boulders [(5 laborer x rate) / (loading+unloading time)]				PhP	122.50	per load	
		Hauling Cost of Boulders per cu.m				*PhP*	*307.23*	*per cu.m*	
		Loading & Unloading Cost of Boulders per cu.m				*PhP*	*40.83*	*per cu.m*	
		Total Hauling Cost of Boulders per cu.m				*PhP*	*348.07*	*per cu.m*	
	b)	*Manual Hauling Cost from Creek/River to Job Site*							
		Capacity of 1 man	0.04	cu.m/load					
		Average Hauling Distance					0.40	km	
		Walking Rate with Load					2.00	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		1.00	mins	or	0.02	hrs	
		Approximate Unloading Time		0.50	mins	or	0.01	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.20	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.11	hrs	
		Time Spent per Cycle (Trip)					0.37	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					18.79	cycle	
		Output of 1 Laborer in cu.m/day (# of cycles x capacity)					0.75	cu.m/day	
		Manual Hauling Unit Cost of Aggregates per cu.m (rate / output per day)				**PhP**	**372.62**	**per cu.m**	
4	**Portland Cement (40kgs/bags)**								
	a)	*Freight Cost from Hardware to End of Road*							
		Load Capacity	200.00	bags/load					
				Dirt Road above 12%			*Pave Road above 12%*		
		Average Hauling Distance		22.00	km		28.00	km	
		Average Speed with Load		5.00	km/hr		10.00	km/hr	
		Average Speed without Load		10.00	km/hr		15.00	km/hr	
		Approximate Loading Time		0.50	min/bag	or	1.67	hrs	
		Approximate Unloading Time		0.50	min/bag	or	1.67	hrs	
		Approximate Slack Time		1.00	min	or	0.02	hrs	
		Time of Loaded Trip (hauling distance / speed)		4.40	hrs		2.80	hrs	
		Time of Unloaded Trip (hauling distance / speed)		2.20	hrs		1.87	hrs	
		Time Spent per Cycle (Trip)					14.62	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					0.55	cycle	
		Hauling Cost of Cement (truck rental / # of cycles per day)				PhP	10,363.22	per load	
		Loading & Unloading Cost of Cement [(5 laborer x rate) / (loading+unloading time)]				PhP	586.25	per load	
		Hauling Cost of Cement per bag				*PhP*	*51.82*	*per bag*	
		Loading & Unloading Cost of Cement per bag				*PhP*	*2.93*	*per bag*	
		Total Hauling Cost of Cement per bag				*PhP*	*54.75*	*per bag*	#####
	b)	*Manual Hauling Cost from End of Road to Bodega*							
		Capacity of 1 man	1.00	bags/load					
		Average Hauling Distance					3.00	km	
		Walking Rate with Load					2.00	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		1.00	mins	or	0.02	hrs	
		Approximate Unloading Time		0.50	mins	or	0.01	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					1.50	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.86	hrs	
		Time Spent per Cycle (Trip)					2.42	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					2.90	cycle	
		Output of 1 Laborer in bags/day (# of cycles x capacity)					2.90	bags/day	
		Manual Hauling Unit Cost of Cement per bag (rate / output per day)				**PhP**	**96.62**	**per bag**	
	c)	*Manual Hauling Cost from Bodega to Job Site*							
		Capacity of 1 Man	1.00	bags/load					
		Average Hauling Distance					0.50	km	
		Walking Rate with Load					2.00	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		1.00	mins	or	0.02	hrs	
		Approximate Unloading Time		0.50	mins	or	0.01	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.25	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.14	hrs	
		Time Spent per Cycle (Trip)					0.45	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					15.51	cycle	
		Output of 1 Laborer in bags/day (# of cycles x capacity)					15.51	bags/day	
		Manual Hauling Unit Cost of Cement per bag (rate / output per day)				*PhP*	*18.05*	*per bag*	
5	**Reinforcing Steel Bars, CWN, Tie Wire**								
	a)	*Freight Cost from Hardware to End of Road*							
		Load Capacity	#####	kgs/load					
				Dirt Road above 12%			*Pave Road above 12%*		
		Average Hauling Distance		22.00	km		28.00	km	
		Average Speed with Load		5.00	km/hr		10.00	km/hr	
		Average Speed without Load		10.00	km/hr		15.00	km/hr	
		Approximate Loading Time		1.00	min/20kg	or	6.67	hrs	
		Approximate Unloading Time		0.50	min/20kg	or	3.33	hrs	
		Approximate Slack Time		1.00	min	or	0.02	hrs	
		Time of Loaded Trip (hauling distance / speed)		4.40	hrs		2.80	hrs	
		Time of Unloaded Trip (hauling distance / speed)		2.20	hrs		1.87	hrs	
		Time Spent per Cycle (Trip)					21.28	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					0.38	cycle	
		Hauling Cost of RSB,CWN (truck rental / # of cycles per day)				PhP	15,089.88	per load	
		Loading & Unloading Cost of RSB,CWN [(# of labor x rate) / (loading+unloading time)]				PhP	1,752.92	per load	
		Hauling Cost of RSB, CWN per kgs				*PhP*	*1.89*	*per kgs*	
		Loading & Unloading Cost of RSB, CWN per kgs				*PhP*	*0.22*	*per kgs*	
		Total Hauling Cost of RSB, CWN per kgs				*PhP*	*2.11*	*per kgs*	
		For GI Pipe (Assume 20kg for 6m length)					**37.72**	**per pcs**	
		For Steel Wire (Assume 25m = 1 kgs)					**0.08**	**per m**	
	b)	*Manual Hauling Cost from End of Road to Bodega*							
		Capacity of 1 man	16.00	kgs/load					
		Average Hauling Distance					3.00	km	
		Walking Rate with Load					2.00	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		1.00	mins	or	0.02	hrs	
		Approximate Unloading Time		0.50	mins	or	0.01	hrs	

		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					1.50	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.86	hrs	
		Time Spent per Cycle (Trip)					2.42	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					2.90	cycle	
		Output of 1 Laborer in kgs/day (# of cycles x capacity)					46.37	kgs/day	
		Manual Hauling Unit Cost of RSB, CWN per kgs (rate / output per day)				**PhP**	**6.04**	**per kgs**	
		For GI Pipe (Assume 20kg for 6m length)					**120.77**	**per pcs**	
		For Steel Wire (Assume 25m = 1 kgs)					**0.24**	**per m**	
	c)	*Manual Hauling Cost from Bodega to Job Site*							
		Capacity of 1 Man	40.00	kgs/load					
		Average Hauling Distance					0.50	km	
		Walking Rate with Load					2.00	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		1.00	mins	or	0.02	hrs	
		Approximate Unloading Time		0.50	mins	or	0.01	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.25	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.14	hrs	
		Time Spent per Cycle (Trip)					0.45	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					15.51	cycle	
		Output of 1 Laborer in kgs/day (# of cycles x capacity)					620.58	kgs/day	
		Manual Hauling Unit Cost of RSB, CWN per kgs (rate / output per day)				*PhP*	*0.45*	*per kgs*	
		For GI Pipe (Assume 20kg for 6m length)					**9.02**	**per pcs**	
		For Steel Wire (Assume 25m = 1 kgs)					**0.02**	**per m**	
6	**Plywood, Tarpaulin**								
	a)	*Freight cost from hardware to end of road*							
		Load Capacity	200.00	pcs/load					
				Dirt Road above 12%			*Pave Road above 12%*		
		Average Hauling Distance		22.00	km		28.00	km	
		Average Speed with Load		5.00	km/hr		10.00	km/hr	
		Average Speed without Load		10.00	km/hr		15.00	km/hr	
		Approximate Loading Time		1.00	min/pcs	or	3.33	hrs	
		Approximate Unloading Time		1.00	min/pcs	or	3.33	hrs	
		Approximate Slack Time		1.00	min	or	0.02	hrs	
		Time of Loaded Trip (hauling distance / speed)		4.40	hrs		2.80	hrs	
		Time of Unloaded Trip (hauling distance / speed)		2.20	hrs		1.87	hrs	
		Time Spent per Cycle (Trip)					17.95	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					0.45	cycle	
		Hauling Cost of RSB,CWN (truck rental / # of cycles per day)				PhP	12,726.55	per load	
		Loading & Unloading Cost of RSB,CWN [(# of labor x rate) / (loading+unloading time)]				PhP	1,169.58	per load	
		Hauling Cost of Plywood per pcs				*PhP*	*63.63*	*per pcs*	
		Loading & Unloading Cost of Plywood per pcs				*PhP*	*5.85*	*per pcs*	
		Total Hauling Cost of Plywood per pcs				*PhP*	*69.48*	*per pcs*	
	b)	*Manual Hauling Cost from End of Road to Bodega*							
	c)	*Manual Hauling Cost from Bodega to Job Site*							
		Capacity of 1 Man	2.00	pcs/load					
		Average Hauling Distance					0.50	km	
		Walking Rate with Load					2.00	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		0.50	mins	or	0.01	hrs	
		Approximate Unloading Time		0.50	mins	or	0.01	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.25	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.14	hrs	
		Time Spent per Cycle (Trip)					0.44	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					15.81	cycle	
		Output of 1 Laborer in pcs/day (# of cycles x capacity)					31.61	pcs/day	
		Manual Hauling Unit Cost of Plywood per pcs (rate / output per day)				*PhP*	*8.86*	*per pcs*	
6	**RC Pipe Culvert**								
	a)	*Freight Cost from Hardware to End of Road*							
		Load Capacity	10.00	pcs/load					
				Dirt Road above 12%			*Pave Road above 12%*		
		Average Hauling Distance		22.00	km		28.00	km	
		Average Speed with Load		5.00	km/hr		10.00	km/hr	
		Average Speed without Load		10.00	km/hr		15.00	km/hr	
		Approximate Loading Time		2.50	min/pcs	or	0.42	hrs	
		Approximate Unloading Time		2.50	min/pcs	or	0.42	hrs	
		Approximate Slack Time		1.00	min	or	0.02	hrs	
		Time of Loaded Trip (hauling distance / speed)		4.40	hrs		2.80	hrs	
		Time of Unloaded Trip (hauling distance / speed)		2.20	hrs		1.87	hrs	
		Time Spent per Cycle (Trip)					12.12	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					0.66	cycle	
		Hauling Cost of RC Pipes (truck rental / # of cycles per day)				PhP	8,590.72	per load	
		Loading & Unloading Cost of RC Pipes [(# of labor x rate) / (loading+unloading time)]				PhP	148.75	per load	
		Hauling Cost of RC Pipes per pcs				*PhP*	*859.07*	*per pcs*	
		Loading & Unloading Cost of RC Pipes per pcs				*PhP*	*14.88*	*per pcs*	
		Total Hauling Cost of RC Pipes per pcs				*PhP*	*873.95*	*per pcs*	
	b)	*Manual Hauling Cost from End of Road to Bodega*							
		Capacity of 1 man	0.25	pcs/load					
		Average Hauling Distance					1.00	km	
		Walking Rate with Load					2.50	km/hr	
		Walking Rate without Load					3.50	km/hr.	
		Approximate Loading Time		2.00	mins	or	0.03	hrs	
		Approximate Unloading Time		2.00	mins	or	0.03	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.40	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.29	hrs	
		Time Spent per Cycle (Trip)					0.79	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					8.91	cycle	
		Output of 1 Laborer in pcs/day (# of cycles x capacity)					2.23	pcs/day	
		Manual Hauling Unit Cost of RC Pipes per pcs (rate / output per day)				**PhP**	**125.71**	**per bag**	
7	**Water**								
	a)	*Freight Cost from Source to Job Site*							
		Load Capacity	3.00	cu.m/load					
		Average Hauling Distance					2.00	km	
		Average Speed with Load (mostly above 12% grade dirt road)					5.00	km/hr	
		Average Speed without Load					10.00	km/hr	

		Approximate Loading Time		15.00	mins	or	0.25	hrs	
		Approximate Unloading Time		15.00	mins	or	0.25	hrs	
		Approximate Slack Time		2.00	mins	or	0.03	hrs	
		Time of Loaded Trip (hauling distance / speed)					0.40	hrs	
		Time of Unloaded Trip (hauling distance / speed)					0.20	hrs	
		Time Spent per Cycle (Trip)					0.88	hrs/cycle	
		No. of Cycle Per Day (working hours / time spent per cycle)					9.06	cycle	
		Hauling Cost of Boulders (truck rental / # of cycles per day)				PhP	626.28	per load	
		Loading & Unloading Cost of Boulders (5 laborer x rate) / (loading + unloading time)				PhP	571.02	per load	
		Hauling Cost of Water per cu.m				*PhP*	*208.76*	*per cu.m*	
		Loading & Unloading Cost of Water per cu.m				*PhP*	*190.34*	*per cu.m*	
		Total Hauling Cost of Water per cu.m				*PhP*	*399.10*	*per cu.m*	