Vessel Arrival & Departure Plan

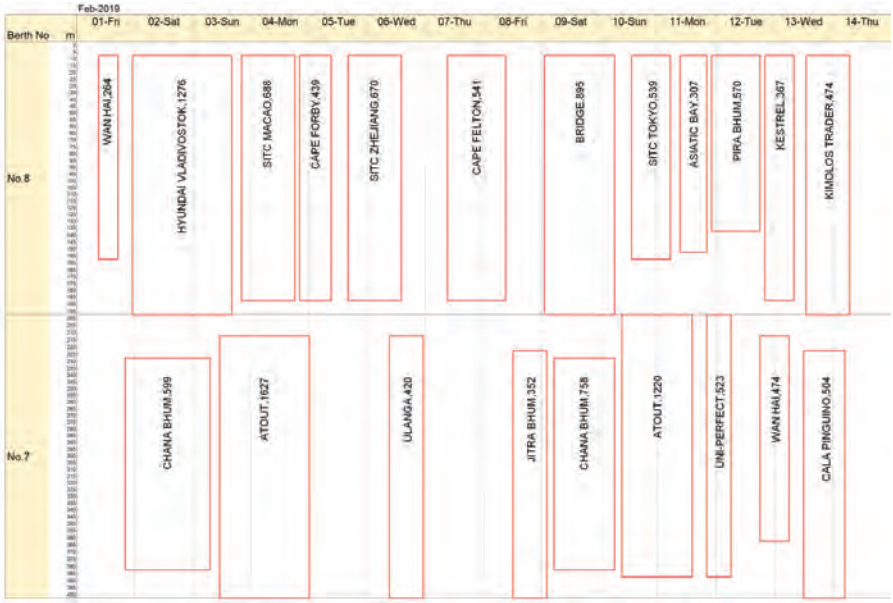
- PAS makes the Vessel Arrival & Departure Plan. c

Total Dish 3092 / Total Load 2700				ការរៀបចំផែនការចូល និងចេញដំណើរបស់នាវាសំរាប់អាទិត្យទី 11 PLANNING ARRIVAL AND DEPARTURE OF VESSELS FOR WEEK 11 to 17/03/2019							Weekly Gross Productivity #REF! Boxes/h
Nº	Liner	Berthing	Vessel's name/Voy	Pilot station	Berthing	Start Op.tion	End Op.tion	Dish	Load	Total	Remarks
1	NYS	7	CHIANG TUN 1909	Mon, 11/03/19 12:00	Mon, 11/03/19 14:01	Mon, 11/03/19 14:31	Mon, 11/03/19 18:41	32	66	98	(Departured)
2	WAH	8	WANHAI 105-232	Tue, 12/03/19 16:00	Tue, 12/03/19 17:03	Tue, 12/03/19 17:33	Wed, 13/03/19 4:23	326	92	418	(Departured)
3	SITC	8	SITC JAKARTA 1906	Tue, 12/03/19 19:30	Tue, 12/03/19 21:05	Tue, 12/03/19 21:35	Wed, 13/03/19 21:38	282	461	743	(Departured)
4	MCC	7	MIA SCHULTE 910	Wed, 13/03/19 8:30	Wed, 13/03/19 12:01	Wed, 13/03/19 12:31	Thu, 14/03/19 3:13	435	23	458	(Departured)
5	COSCO	8	SINO. KAOHSIUNG 029	Thu, 14/03/19 22:30	Fri, 15/03/19 0:04	Fri, 15/03/19 0:34	Fri, 15/03/19 18:33	299	183	482	(Departured)
6	RCL	7	RATHA BHUM 682	Thu, 14/03/19 20:00	Thu, 14/03/19 22:49	Thu, 14/03/19 23:19	Fri, 15/03/19 12:02	263	167	430	(Departured)
7	RCL	7	CHANA BHUM 700	Fri, 15/03/19 20:00	Fri, 15/03/19 20:55	Fri, 15/03/19 21:25	Sat, 16/03/19 23:30	348	447	795	(Departured)
8	MCC	8	B TRADER 910	Fri, 15/03/19 20:00	Fri, 15/03/19 22:29	Fri, 15/03/19 22:59	Sun, 17/03/19 6:30	406	509	915	(Departured)
9	EML	7	BRIDGE 0067	Sun, 17/03/19 0:00	Sun, 17/03/19 4:00	Sun, 17/03/19 4:30	Mon, 18/03/19 13:00	701	752	1453	(Departured)
10	SITC	8	SITC BANGKOK 1906	Sun, 17/03/19 9:00						0	
11	WAH	7	WANHAI 105-232	Sun, 17/03/19 23:00						0	

Based on the above data, we produce the actual berth window and calculate waiting time for berthing as follows:

Berth Window (Actual; from Feb.1 to 14)

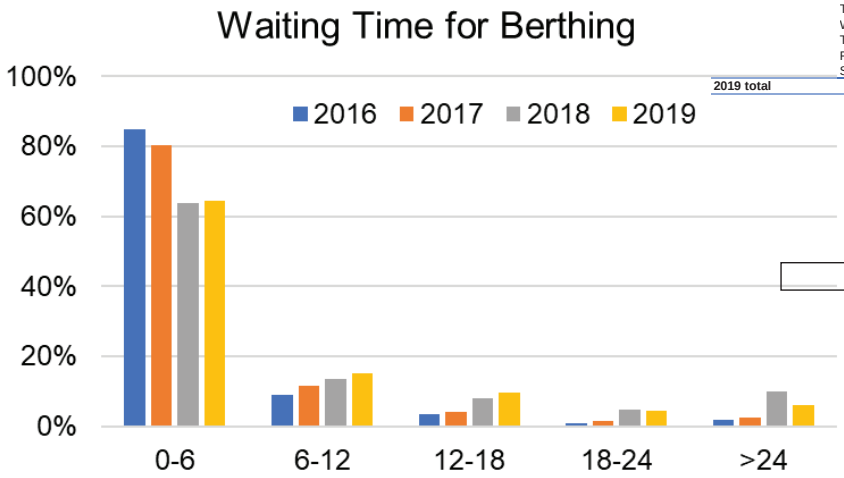
- Berth window has been already narrow to receive additional weekly shipping services.
- 800,000 TEU could be realized when receiving additionally 2 weekly services with 1,500 boxes handling. (1,500 x 1.6 TEU/box 52 weeks x 2 services = 250,000 TEU/year)



Waiting Time for Berthing

- Waiting time for berthing is going to increase year by year.

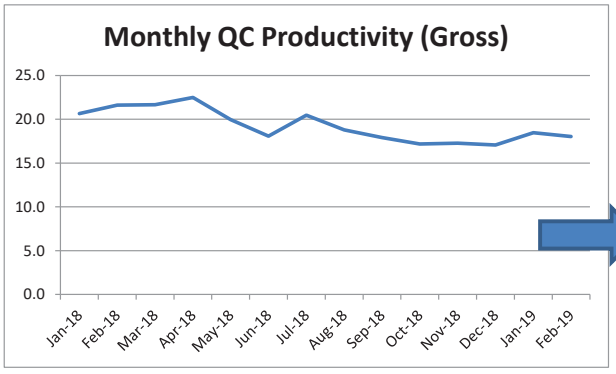
# of Vessels		Wa												
Pilot station (ETA)	Day of the Week	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	>12	Total
⊟2016	Sun	19	20	4	5	2	3	3	7	3	3	1	3	16	89
	Mon	43	43	4	2	1	1		1	2	4	1		2	104
	Tue	25	23	5	2		1	1	1	1	1	1		4	65
	Wed	14	15	2										1	32
	Thu	48	67	12	4		2		1		2			1	137
	Fri	55	56	9	8	3	1	7	3	1		1		2	146
	Sat	13	35	10	3	2	1		5	2	4	2	2	11	90
2016 total		**217**	**259**	**46**	**24**	**8**	**9**	**11**	**18**	**9**	**14**	**6**	**5**	**37**	**663**
⊟2017	Sun	3	17	7	6	3	1	4	5	2	4	1		13	66
	Mon	9	24	12	6	7	3	2	1		1	2		13	80
	Tue	7	31	8	1	2	1	3	2		1		1	4	61
	Wed	3	21	13	3	3		1	2			1	1	1	49
	Thu	12	31	8	4		1			1			1		58
	Fri	16	59	26	7	2	1	2	3	3		1	2	4	126
	Sat	8	25	13	6	5	6		6	1	2	1	3	8	84
2017 total		**58**	**208**	**87**	**33**	**22**	**13**	**12**	**19**	**7**	**8**	**6**	**8**	**43**	**524**
⊟2018	Sun	1	5	7	4	9	5	1	1	2		2	6	29	72
	Mon	7	14	9	9	5		2	2	3	3	2	4	34	94
	Tue	3	20	20	6	2	1	3	5	4	2	2		28	96
	Wed	3	18	15	15		2	2	2	1	4	1	1	6	70
	Thu	3	13	14	8	3	3	1	1					9	55
	Fri	9	42	23	13	11	3	4	1	3	1	1		8	119
	Sat	2	7	5	9	5	5	3	2	2	2	1		11	54
2018 total		**28**	**119**	**93**	**64**	**35**	**19**	**16**	**14**	**15**	**12**	**9**	**11**	**125**	**560**
⊟2019	Sun		3	1	3			2		1	3	1		6	20
	Mon	1	2	3	2	1	1	1	1					4	16
	Tue		6	2	2	2					1	1		1	15
	Wed		1	3	5	2			1	2			1	1	16
	Thu	1	3	3	2				1					2	12
	Fri	1	7	8	3									4	23
	Sat			1	2	2		1						5	11
2019 total		**3**	**22**	**21**	**19**	**7**	**1**	**4**	**3**	**3**	**4**	**2**	**1**	**23**	**113**

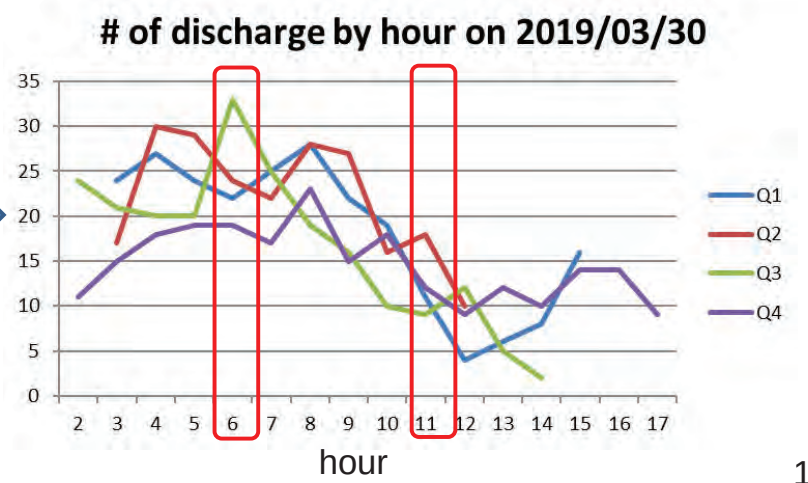


- *Considering international standard, "Turn around time" of a vessel (from arrival to the port to departure) should be at least less than 2 days.*
- *Berth window should be created to receive new shipping services.*

Quayside Productivity (Shore Handling)

- QC gross productivity used to be nearly 25 box/hr but is now less than 20 box/hr
  - Original:
    25/hr/QC x 16hr/day x 4QC x 365 x 1.6TEU/unit = 934,400 TEU/year
  - Current:
    17/hr/QC x 16hr/day x 4QC x 365 x 1.6TEU/unit = 635,400 TEU/year





QC Operation on Last Saturday of March (March 30)

- Observation (AM 6:00): QC net productivity kept within 2 minutes per move.

QC Operation on Last Saturday of March (March 30)

- Observation (AM 6:30): QC was going to wait internal trailers.

Yard Operation on Last Saturday of March (March 30)

- Observation (AM 11:30): External trailers began to enter the marshalling yard, which generates severe congestion in the yard.

Video from a drone

Outputs in PDM

- Output 1
  - Capacity to formulate corporate strategic (mainly CT) of PAS will be enhanced.
- Output 2
  - CTMS operation capacity will be enhanced.
- Output 3
  - Entry/exit control and traffic flow management on port premises (including CT, rail yard and multi-purpose terminal) will be implemented.
- Output 4
  - Incoming/outgoing traffic congestion will be mitigated at gate as well as outside of Sihanoukville Port premises.
- Output 5
  - Vessel arrival/departure procedure will be improved via Port EDI.

Key Performance Indicator (KPI) in Each Output

Output Field	Objectively Verifiable Indicato (as per the PDM)	KPI (Key Performance Indicator)
Output 2 (1)	Dwelling time of import containers will be shortened.	Import Container Dwell Time
Output 2 (2)	Dwelling time of export containers will be shortened.	Export Container Dwell Time
Output 2 (3)	Berthing time of vessels will be reduced	Berth Productivity
Output 2 (4)	Turn around time of trailers will be reduced	Turn Around Time of Trailers
Output 3	Vehicles and motorcycles other than container trailers will not enter the container terminal	Number of Vehicles other than Container Trailers
Output 4 (1)	Waiting trailers in front of the terminal gate will be reduced	Number of Waiting Trailers
Output 4 (2)	Trailers passing the gate will be increased	Number of Trailers Passing Gate

KPI should be monitored continuously by team and PAS. (PDCA)

Activities for Output 1

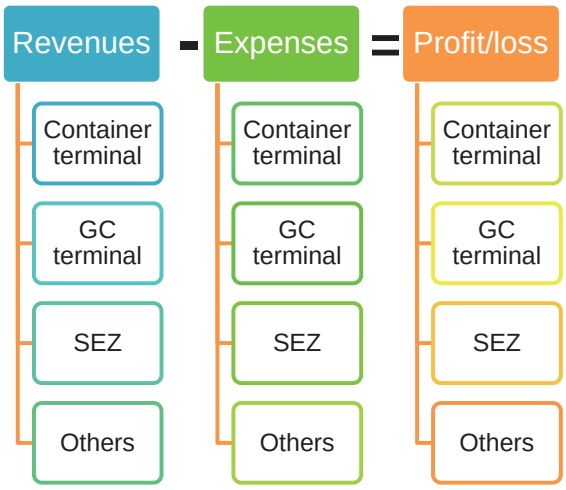
Implementation of Managerial Accounting

- Business sector (segment) -wise profit/loss becomes visible in a managerial accounting.

Financial Accounting

Financial accounting shows invoice-wise amounts only

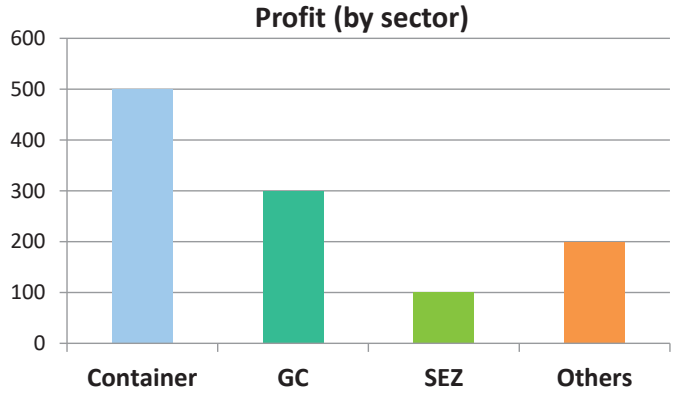
Managerial Accounting



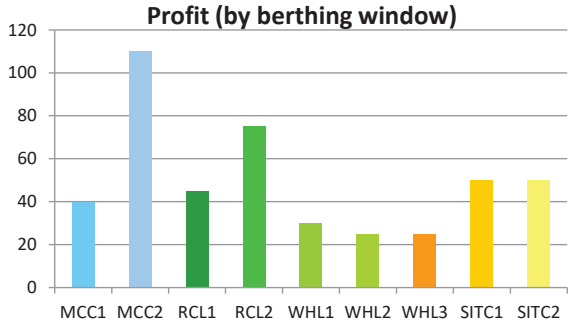
Managerial accounting shows business sector (segment) -wise amounts

Implementation of Managerial Accounting

- Management can evaluate business sector-wise profitability and berthing window-wise as well.

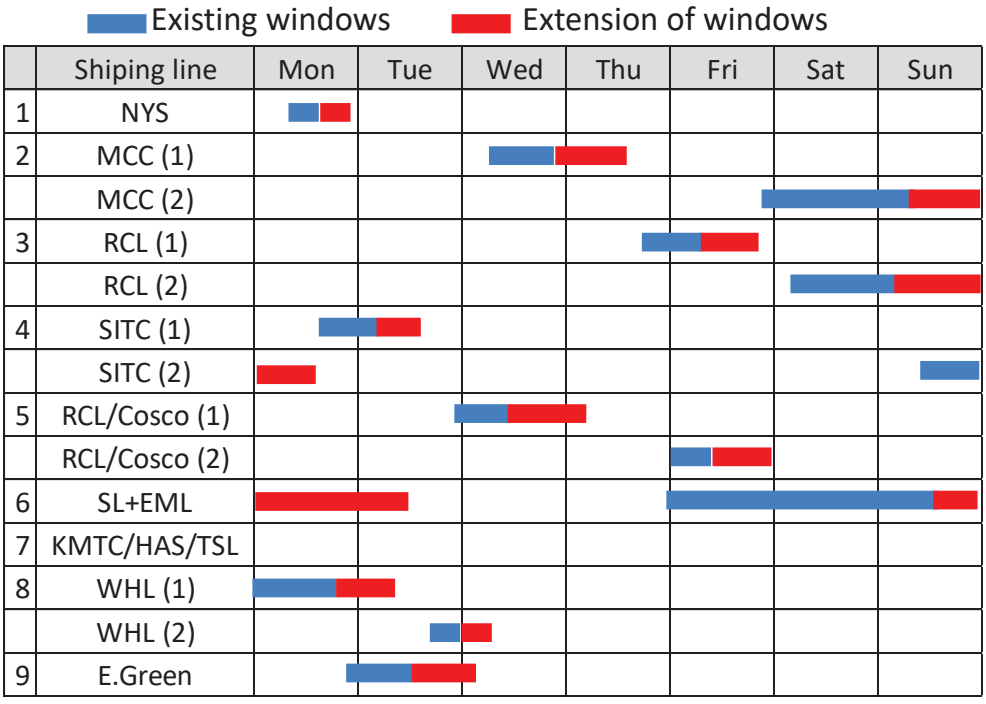


Management can evaluate business sector (segment) - wise profitability.



Implementation of Managerial Accounting

- Simulation based on the future berth window gives us a question: how to complete loading/unloading in time ?



Increase in throughput

Extension of berthing windows

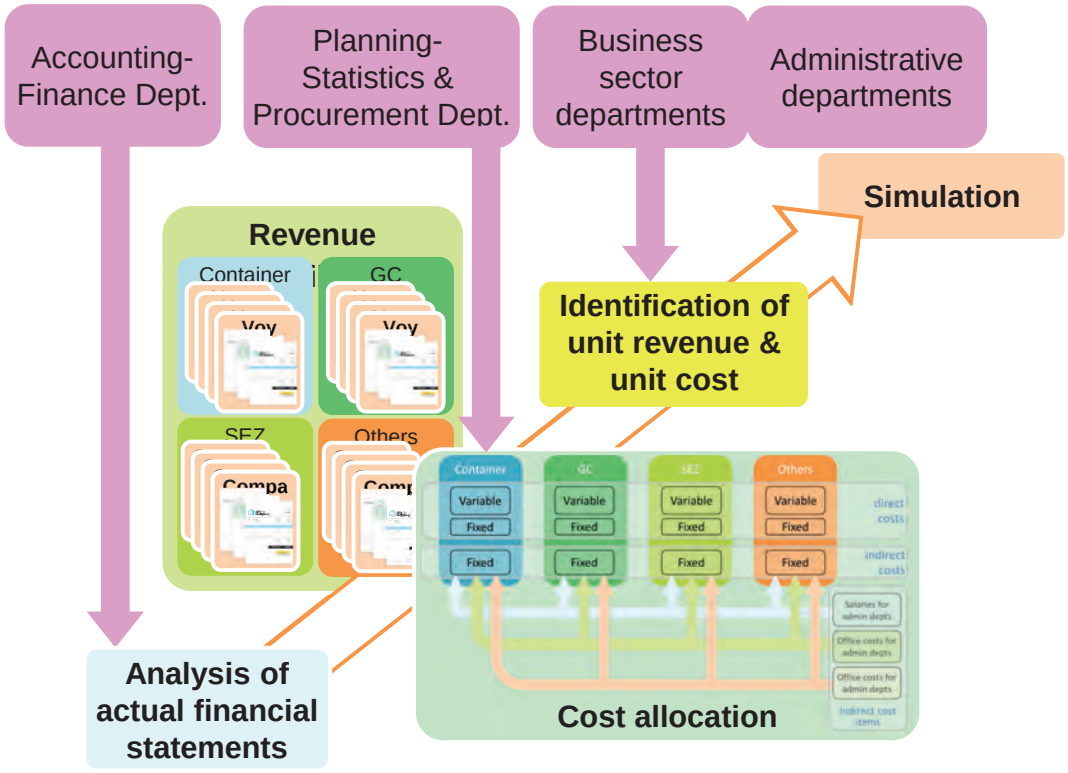
Strategies

- Induce to off-peak
- Price incentives
- Berth expansion
- Additional equipment
- Improve efficiency

Activities for Output 1

Implementation of Managerial Accounting

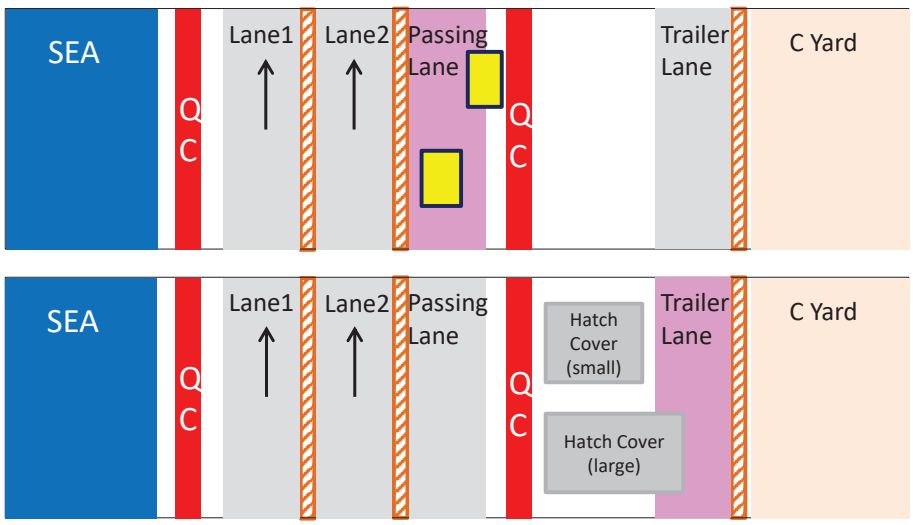
- Your kind cooperation is vital to realize managerial accounting.

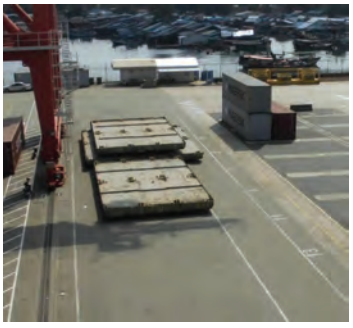


Activities for Output 2

Trailers Flow in the Yard

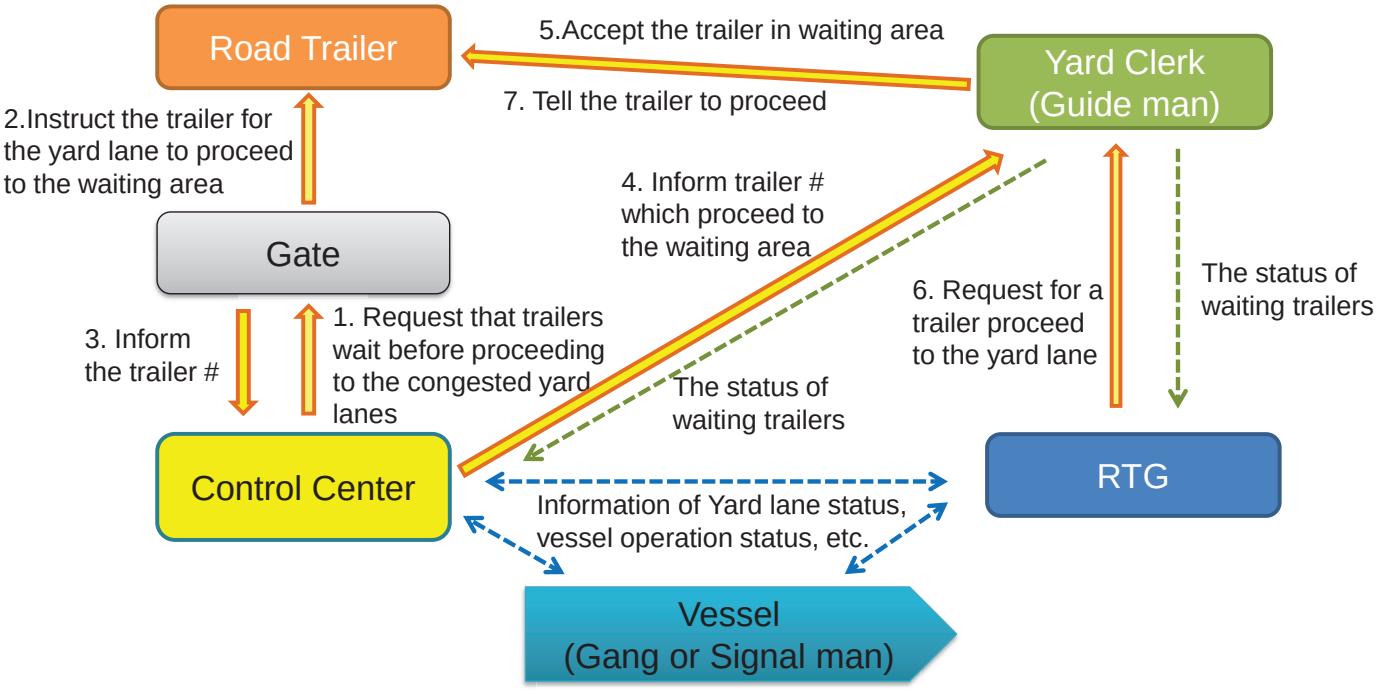
- A passing lane under QC does not function due to the existence of cabin, gear box, container, etc.
  - The passing lane should be always cleared.
- The Trailer lane outside QC is not always available.





Trailers Flow in the Yard

- Recommendation:
  - Implement a system to control outside trailers entering C Yard to avoid congestion inside lanes (reduce number of trailers entering inside the lane).



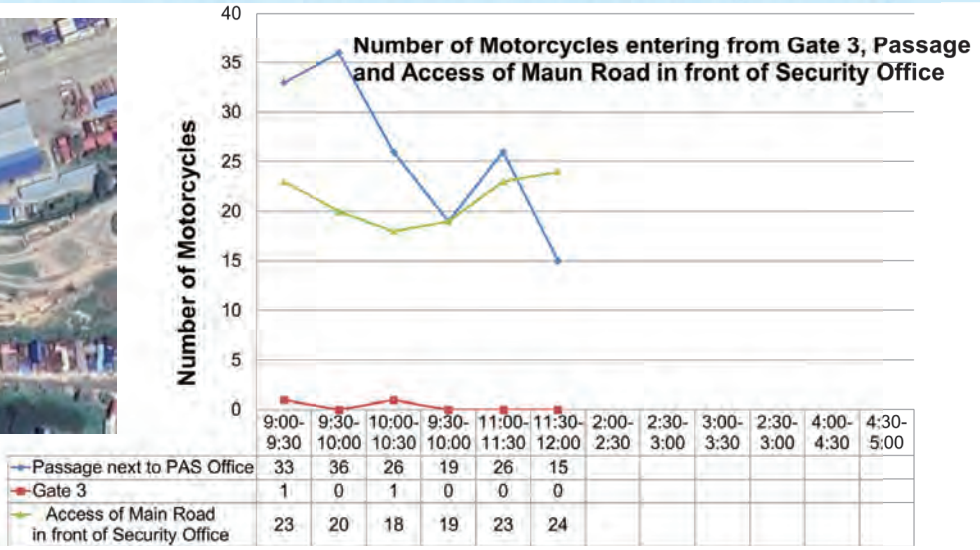
Improvements

- The lashing/unlashing tool is improved.
- The instruction boards for wear was renewed. (However, lashers do not yet have the proper wear.)
- Motorcycles selling several goods have disappeared from the yard.

- Parking area for a motor cycles has been prepared. (Gang boss still rides a motor cycle at the quayside)

Activities for Output 3

A Guideline for Entry and Exit Control (Draft)



	9:00-9:30	9:30-10:00	10:00-10:30	9:30-10:00	11:00-11:30	11:30-12:00	2:00-2:30	2:30-3:00	3:00-3:30	2:30-3:00	4:00-4:30	4:30-5:00
Passage next to PAS Office	33	36	26	19	26	15						
Gate 3	1	0	1	0	0	0						
Access of Main Road in front of Security Office	23	20	18	19	23	24						

	Entry/Exit to the Port			Access roads
Target vehicle	**Gate 3**	**Passage next to PAS Office**	**Gate 2**	**Access roads in the Port/Terminal**
Motorcycles	Prohibited	Prohibited/ Other Solutions?	Allowed	Only authorized access roads shall be used
Cars	Prohibited	Prohibited/ Other Solutions?	Allowed	Only authorized access roads shall be used
Employee's Cars	Prohibited	Allowed	Allowed	Only authorized access roads shall be used

Activities for Output 3

List of Cargo Handling Equipment

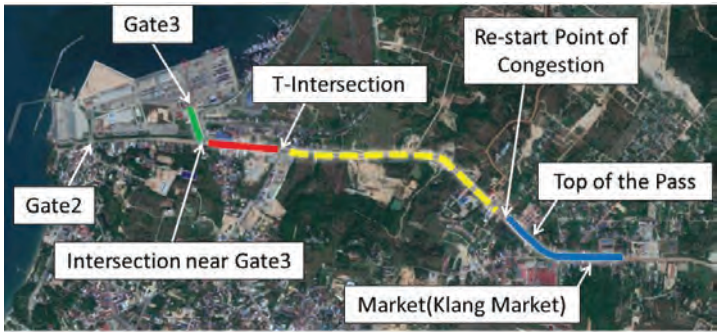
	No. of CHE	Appellative	Fabricator	Rated Load for Container (Hatch-cover)	Start of Operation (Year)	Status of Utilization
QC	No. 1	401	MES	30.5Ton (35.5Ton)	2008	In-service
	No. 2	402	MES	30.5Ton (35.5Ton)	2008	In-service
	No. 3	403	MES		2017	In-service
	No. 4	404	ZPMC		2017	In-service
RTG	No. 1	201	HYUNDAI	40LT	1999	In-service (Hardly used: Speed is very slow)
	No. 2	202	HYUNDAI	40LT	1999	In-service (Hardly used: Speed is very slow)
	No. 3	203	MES	35LT	2009	In-service
	No. 4	204	MES	(Ditto)	2009	In-service
	No. 5	205	MES	(Ditto)	2009	In-service
	No. 6	206	MES	(Ditto)	2009	In-service
	No. 7	207	MES	35LT	2009	In-service
	No. 8	208	MES	35LT	2017	In-service
	No. 9	209	MES	35LT	2017	In-service
	No. 10	210	MES	35LT	2017	In-service
	No. 11	211	MES	35LT	2017	In-service
	No. 12	212	MES	35LT	2017	In-service
	No. 13	213	ZPMC		2017	In service GPS TAS is no good. WB=Approx. 8m
	No. 14	214	ZPMC		2017	In service GPS TAS is no good. WB=Approx. 8m.
	No. 15	215	ZPMC		2017	In service GPA TAS is no good.
	No. 16	216	ZPMC		2017	In service GPA TAS is no good.
Reach Stacker	No. 1	101	PPM	45	1994	In-service
	No. 2	102	PPM	45	1994	In-service
	No. 3	103	TREX	45	1997	In-service
	No. 4	104	TEC	45	1997	In-service
	No. 5	105	(Removal)	-	--	Not used (Removal)
	No. 6	106	(Removal)	45	2003	Not used (Removal)
	No. 7	107	(Removal)	45	2003	Not used (Removal)
	No. 8	108	Kalmar	7.5	2004	In-service
	No. 9	109	Kalmar	45	2007	In-service
	No. 10	110	Kalmar	45	2007	In-service
Fork-Lift	FL	76	KOMATSU	25	1969	In-service
Yard Chassis Total: 22 units	10 units	17 to 26	MITSUBISHI	30	1997	In-service
	8 units	27 to 34	NISSAN	35	2008	In-service
	8 units	35 to 42	ISUZU	?	2016	In-service

Status need to be carefully examined.

26 units of Yard-Tractors (Tractor-Head) are available on April 6, 2019.
But, 10 units of Yard-Tractors (Tractor-Head) are not available under repairing on April 6, 2019.

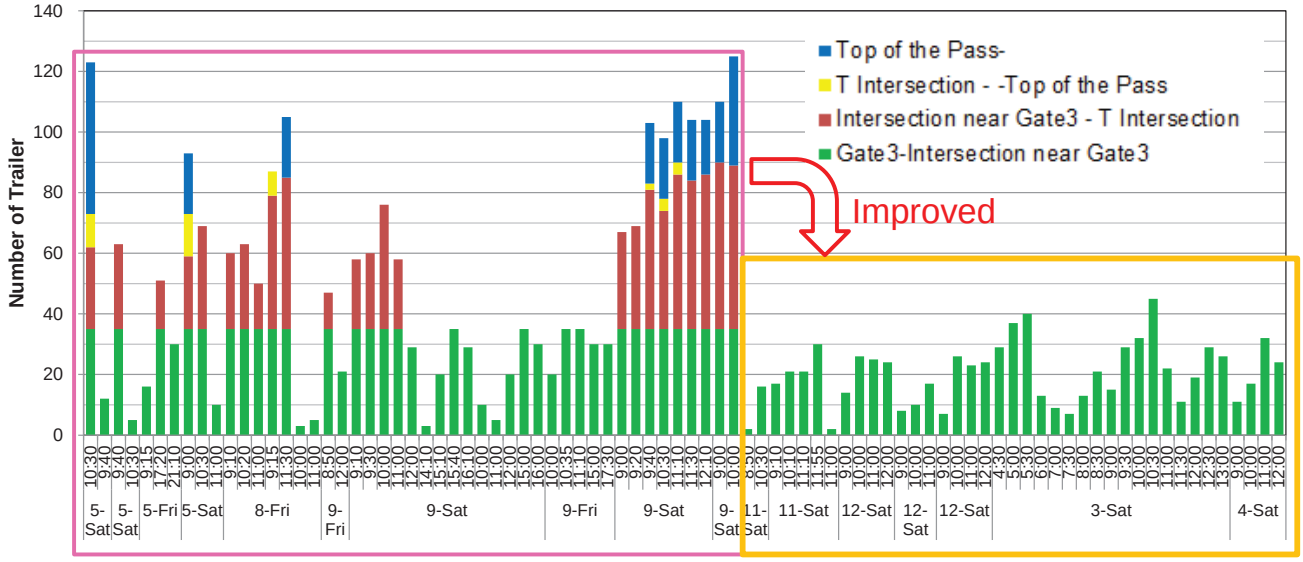
Activities for Output 4

Traffic Situation at the Gate 3



2019/3/30 (Sat) # of trailers

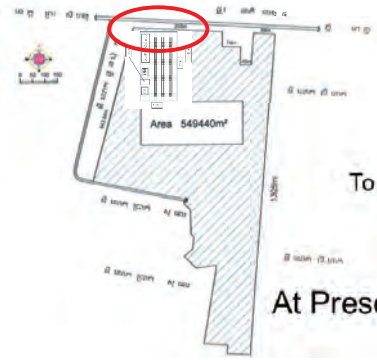
	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	TOTAL
6:00-700	15	13	9	12	12	4	65
7:00-8:00	13	16	11	23	12	0	75
8:00-9:00	14	16	16	21	20	12	99
9:00-10:00	17	14	21	19	16	18	105
10:00-11:00	12	17	21	25	21	31	**127**
11:00-12:00	13	16	15	21	18	28	111
12:00-13:00	17	15	13	22	19	20	106
Total	101	107	106	143	118	113	688
Ave (minutes)	14.4	15.3	15.1	20.4	16.9	16.1	98.3

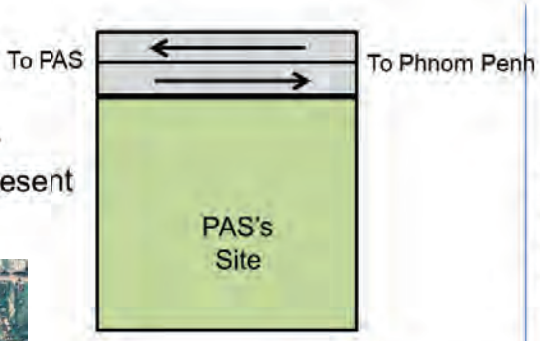


** Figure in the left side of the day is month.*

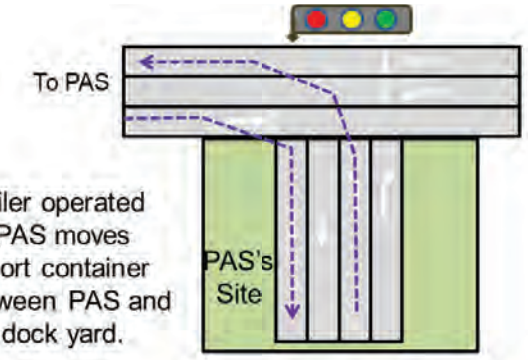
Activities for Output 4

Utilization of ICD/Off-dock Yard

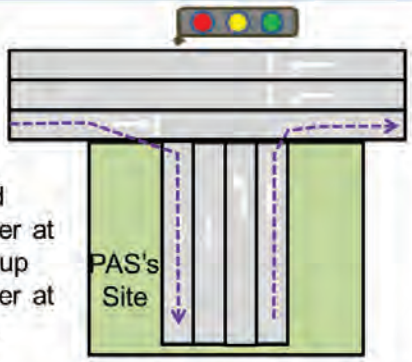




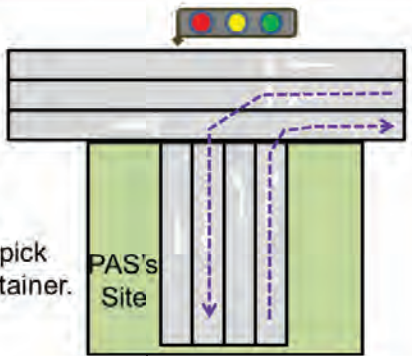
At Present



Trailer operated by PAS moves import container between PAS and Off dock yard.



Trailers unload export container at PAS and pick up import container at Off dock yard.



Trailers from Phnom Penh pick up import container.

Proposal on the revision of Project Design Matrix -1

1-6. Support to formulate Standard Operation Procedures (SOP) for selected departments of PAS as well as support the assessment of organization including job specifications.	*Added: Based on the request from PAS.*
2-6. Support to formulate Standard Operation Procedures (SOP) in each cargo handling department.	*Added: Based on the request from PAS.*

	Objectively Verifiable Indicators
1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.	1. Corporate strategy will be submitted to the shareholders/Investors
	1.2 Decision making procedure and approval standard is authorized.

Proposal on the revision of Project Design Matrix -2

~~2-5. Propose data sharing method between CTMS and inquiry system (by telephone, fax and/or e-mail) for availability status of carry-in/carry-out containers (to be developed in 4.1).~~	*Deleted: It is not realistic to introduce container status inquiry system based on the observation at the site as well as opinions of PAS and truck companies.*

cf. Replaced Activity 4.1 (see slide 36)

~~3-5. Implement pilot operation of container handling at multi-purpose terminal based on the container operation plan to be developed in 3-2 and develop roadmap to full-scale operation..~~ 3-5. Implement pilot operation of empty container stacking yards and develop roadmap to full-scale operation.	*Replaced: It would be difficult for the multi-purpose terminal to deal with containers. Instead, operation of empty container stacking yards will be focused on in the context of entry/exit control as well as traffic flow management in port premises.*

Proposal on the revision of Project Design Matrix -3

~~4-1. Preliminarily design inquiry system (by telephone, fax and/or e-mail) for availability status of carry-in/carry-out containers.~~ 4-1. Support to design a system which publishes the operating status of the container terminal using Web system.	*Replaced: It is not realistic to introduce container status inquiry system based on the observation at the site as well as opinions of PAS and truck companies. Instead, a system which publishes the operating status of the container terminal using the Web system. is proposed which would be effective for elimination of the traffic congestion outside of SHV port.*
~~4-2. Implement pilot operation of inquiry system (by telephone, fax and/or e-mail) for availability status of carry-in/carry-out containers and develop roadmap to full-scale operation. (in case that PAS will introduce the system at its own expense.)~~ 4-2. Implement pilot operation of the above system and develop roadmap to full-scale operation.	

Proposal on the revision of Project Design Matrix -4

4-3. Preliminarily design off-dock yard as pre-screening system of improper document trailers (IDTs) with evacuation space based on the analysis (to be conducted in 2-1).	*Added: Countermeasures to cope with the increase of container handling which could reach 800,000 TEUs when the new container terminal enters operation, should be added as one of the activities of Output 4.*
4-4. Implement pilot operation of pre-screening system of improper document trailers (IDTs) together with evacuation space based on the preliminary design (to be achieved in 4-3) and develop roadmap to full-scale operation. (in case that PAS will introduce the system at its own expense.)	
4-5. Propose countermeasures to cope with the increase of container handling up to 800,000 TEU, and support its implementation.	

Proposal on the revision of Project Design Matrix -5

Target Groups:	(Direct Beneficiary) Staff members of Sihanoukville Autonomous Port (PAS), Ministry of Public Works and Transport (MPWT, including Kampuchea Shipping Agency and Brokers (KAMSAB))

5-1. Assist Port EDI taskforce (PAS, PPAP, MPWT including KAMSAB) to appropriately introduce and operate Port EDI for vessel arrival/departure procedure.	

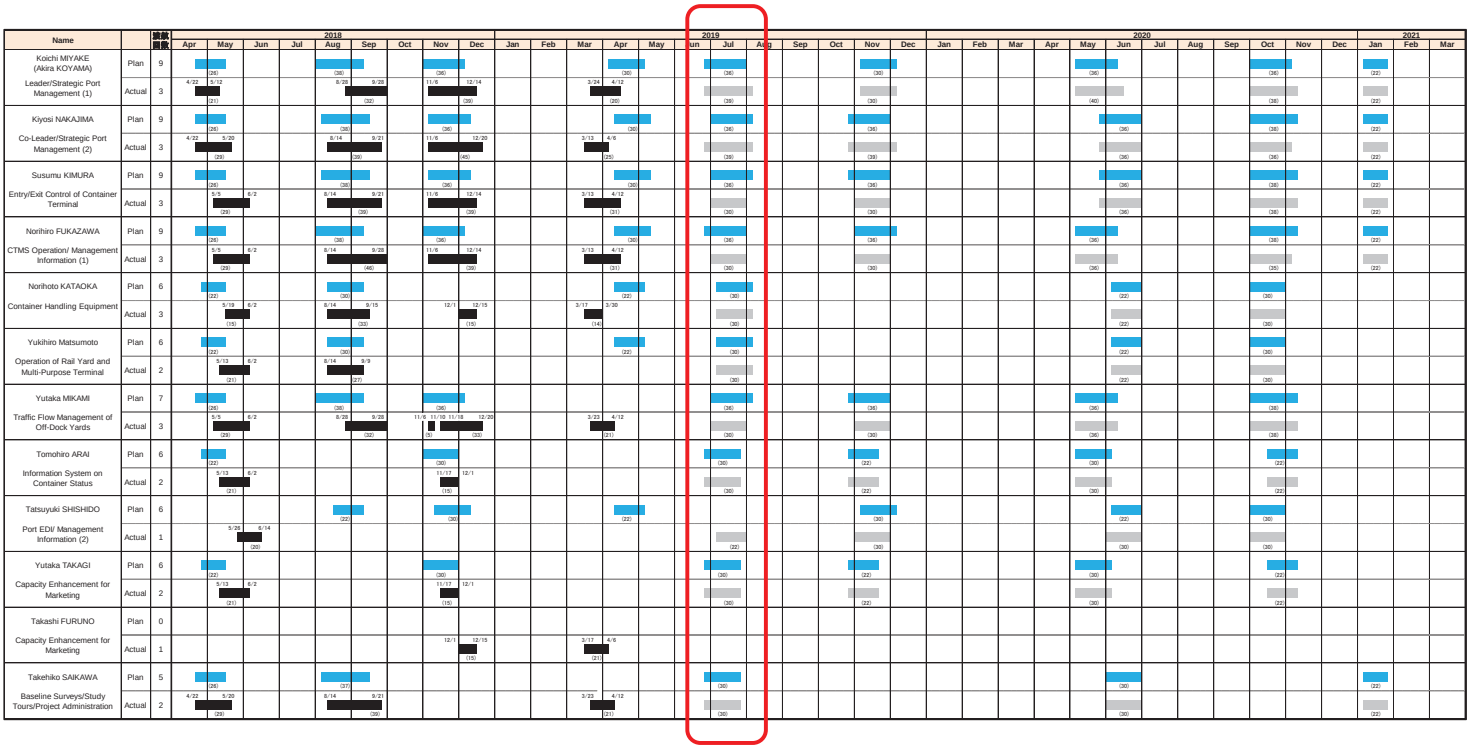
Study Tour to Japan

- Purpose:
  - To enhance the understanding of participants on advanced management and operations of Japanese CT centering on site visits.
  - Participants will observe CT operation as well as traffic control systems in the Japanese port.
  - Discussions will also be held whether such systems would be effective at Sihanoukville Port.
- Period (Duration): Around 2 weeks in September 2019
- Number of trainees: Maximum 10 persons (one (1) executive should be included as a team leader)
- Schedule (tentative):

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						Day 1 Arrival
Day 2 Orientation, Lectures	Day 3 Lectures	Day 4 Yokohama	Day 5 Kobe	Day 6 Kobe	Day 7	Day 8
Day 9 Kobe	Day 10 Hanshin	Day 11 Hakata	Day 12 Moving day	Day 13 Discussion, Presentation	Day 14 Return to Cambodia	

Schedule of the next (5th) dispatch (Tentative)

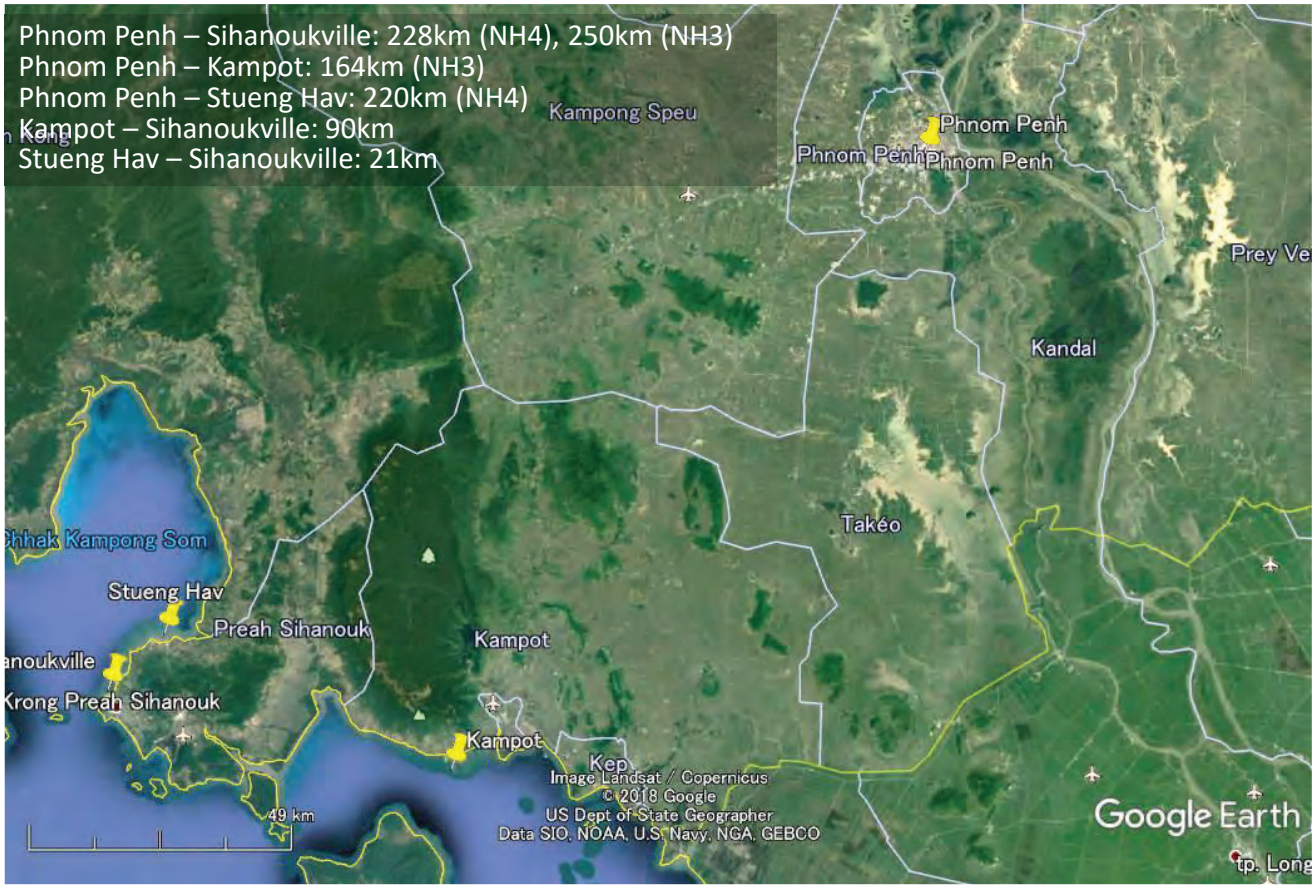
- From the end of June to the beginning of August



Other Topics

~ SEZ Development neighboring SV ~

SEZ Development neighboring SV (1)

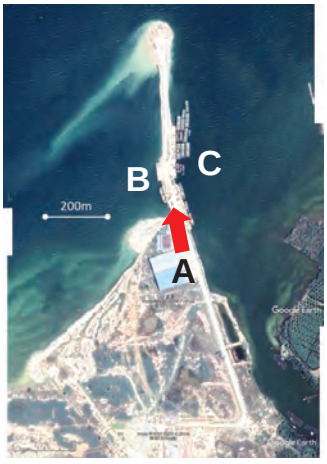


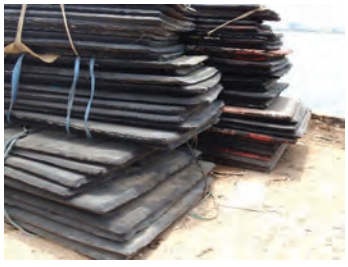
SEZ Development neighboring SV (2)

Comparison with the same scale

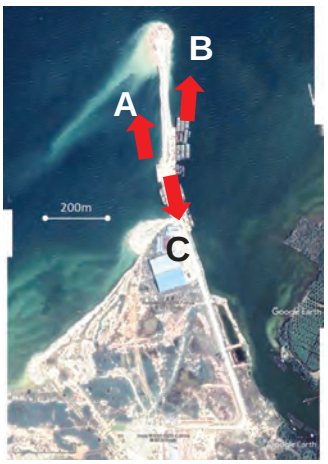
Steung Hav SEZ

Current Status of Steung Hav





Current Status of Steung Hav Development



អរគុណអ្នកខ្លាំងណាស់។
Arigatou Gozaimashita.

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Attachment 2

The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port

~ Phase 2 ~

4th Joint Coordination Committee

December 23, 2019

OCDI

(The Overseas Coastal Area Development Institute of Japan)

Work Schedule of 6th Dispatch

- SHV from November 13 to December 25, 2019

			November																			December																									
			12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
			Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu
1	Koichi MIYAKE (km)	Leader/Strategic Port Management																									←																				→
2	Kiyoshi NAKASHIMA (kn)	Co-Leader/Strategic Port Management /Support for Evaluation of Organization (1)	←																													→														
3	Norihiro FUKAZAWA (nf)	CTMS Operation/Management Information /Support for Evaluation of Organization (2)	←																													→														
4	Susumu KIMURA (sk)	Entry/Exit Control of Container Terminal /Support for Evaluation of Organization (3)	←																													→														
5	Norihiko KATAOKA(nk)	Container Handling Equipment																←																→												
6	Takashi FURUNO (tf)	Capacity Enhancement for Marketing /Operation of Rail Yard and Multi-Purpose Terminal	←																													→														
7	Yutaka MIKAMI (my)	Traffic Flow Management of Off-Dock Yards															←																														→
8	Shigehisa HOROGOME(sh)	Traffic Flow Management of Off-Dock Yards /Support for Evaluation of Organization (4)	←																													→														
9	Tatsuyuki SHISHIDO (ts)	Port EDI System/Management Information																														←															→
10	Takehiko SAIKAWA (ts)	Baseline Surveys/Study Tours/Project Administration	←																	→																											
						PIU																																					JCC			
					← Activities at Sihanoukville (workshops/follow-up surveys etc.)																																						→		

Contents

- Key Performance Indicators (KPIs)
- Progress of the Project
- Revision of Project Design Matrix (PDM)
- Schedule of the next (7th) dispatch

Key Performance Indicators (KPIs)

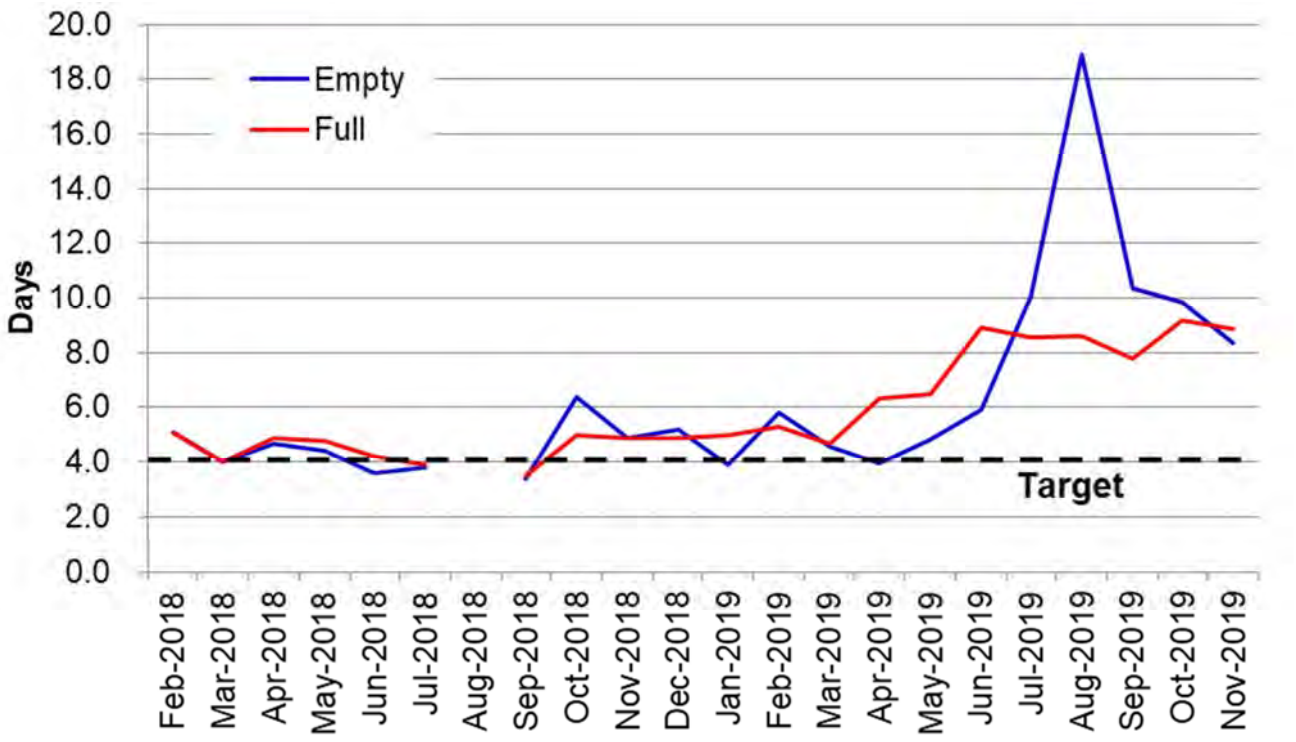
Key Performance Indicators (KPIs)

Attachment 2

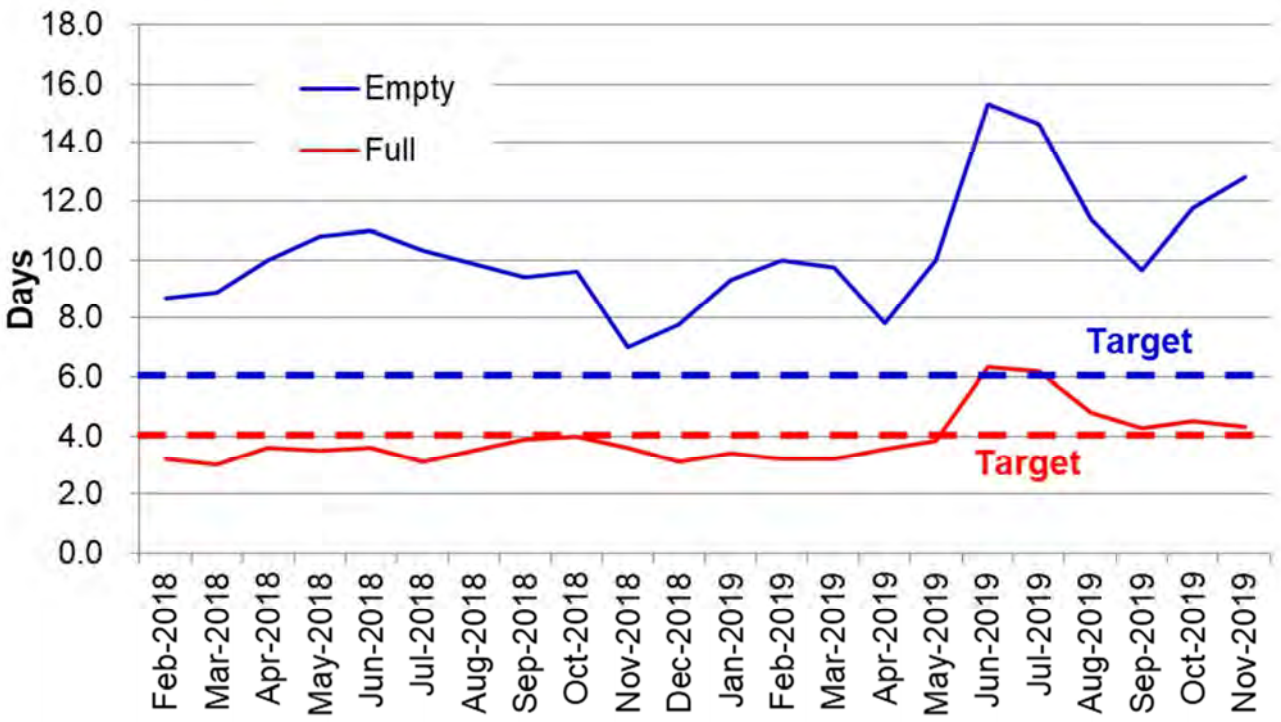
Output Field	Objectively Verifiable Indicato (as per the PDM)	KPI (Key Performance Indicator)
Output 2 (1)	Dwelling time of import containers will be shortened.	Import Container Dwell Time
Output 2 (2)	Dwelling time of export containers will be shortened.	Export Container Dwell Time
Output 2 (3)	Berthing time of vessels will be reduced	Berth Productivity
Output 2 (4)	Turn around time of trailers will be reduced	Turn Around Time of Trailers
Output 3	Vehicles and motorcycles other than container trailers will not enter the container terminal	Number of Vehicles other than Container Trailers
Output 4 (1)	Waiting trailers in front of the terminal gate will be reduced	Number of Waiting Trailers
Output 4 (2)	Trailers passing the gate will be increased	Number of Trailers Passing Gate

KPI should be monitored continuously by team and PAS. (PDCA)

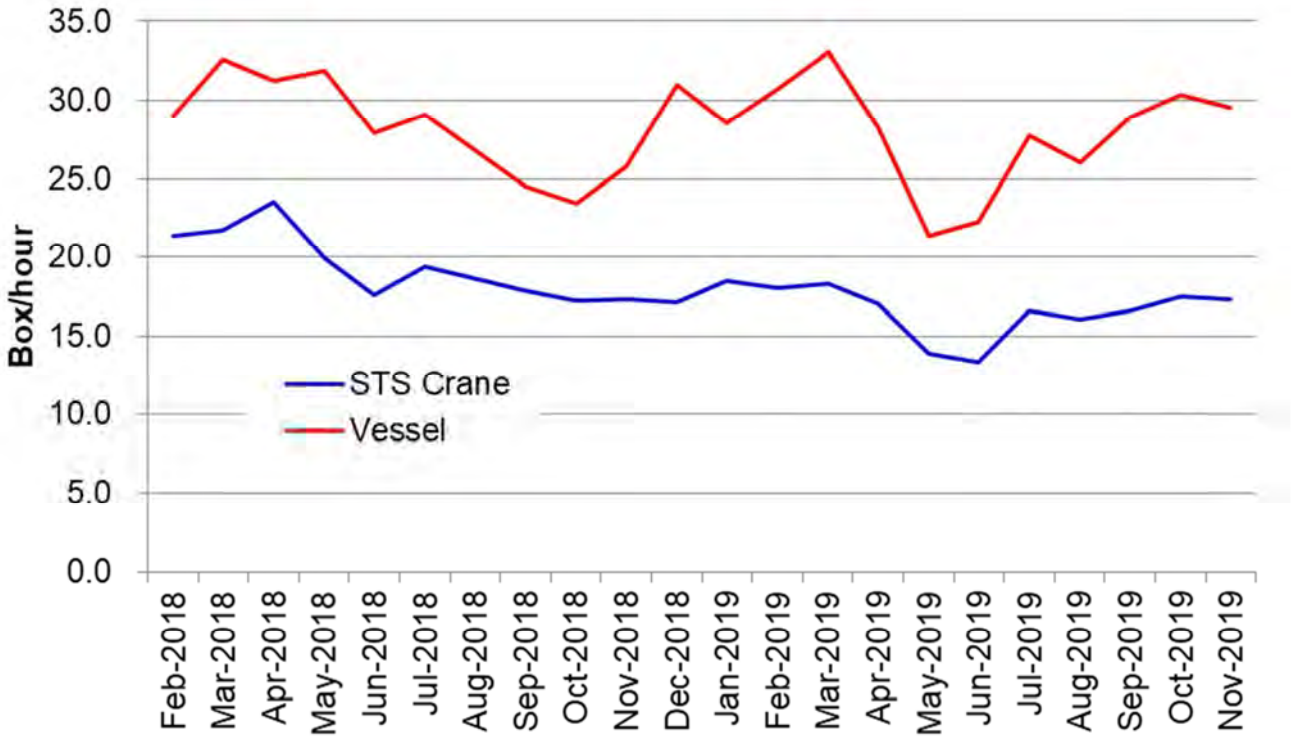
Import Dwell Time



Export Dwell Time

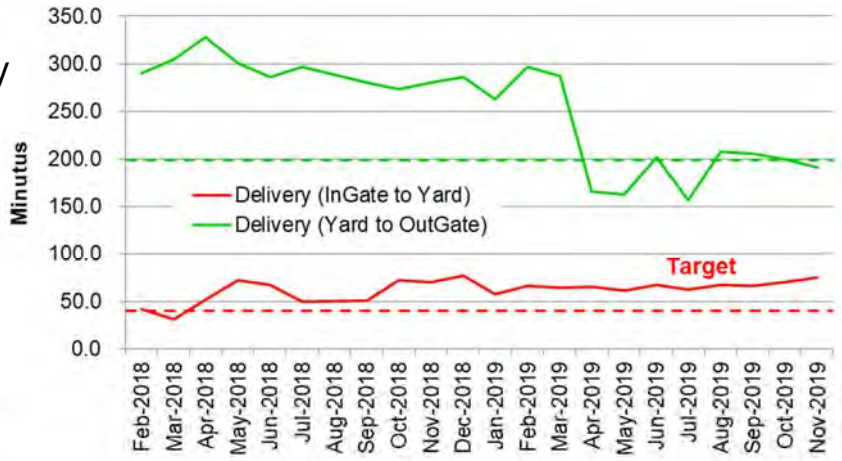


Berth Productivity

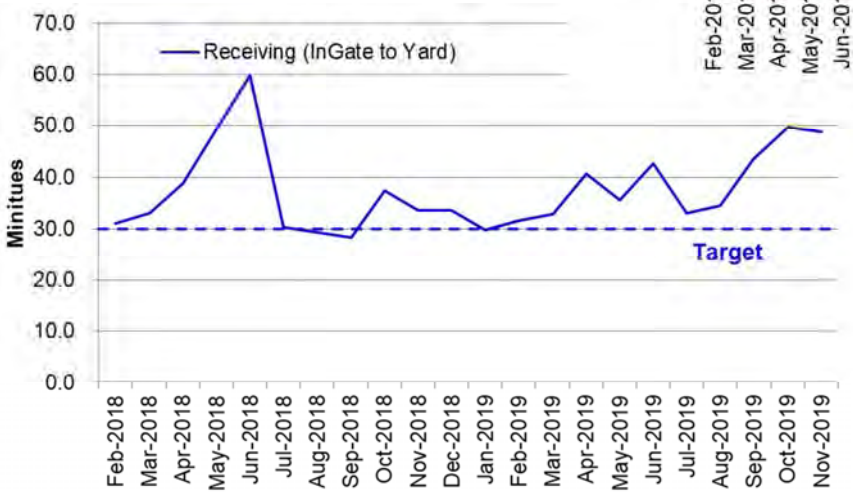


Truck Turnaround Time

Delivery



Receiving



Traffic of Motorcycles Entering CT Operation Area

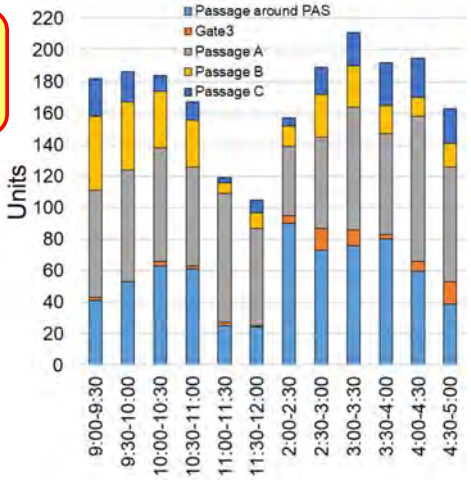
Traffic Volume (9 am to noon & 2 pm to 5 pm)

Type of Vehicle	Place of Entry	2019/7/4	2019/11/22
Motorcycle	Passage around PAS	169	685
	Gate3	12	62
	Passage A	237	827
	Passage B	117	284
	Passage C	121	192
	Total	**656**	**2,050**
Car	Passage around PAS	67	76
	Gate3	5	6
	Passage A	57	51
	Passage B	29	13
	Passage C	27	27
	Total	**185**	**173**

June 4, 2019

Worse than before!

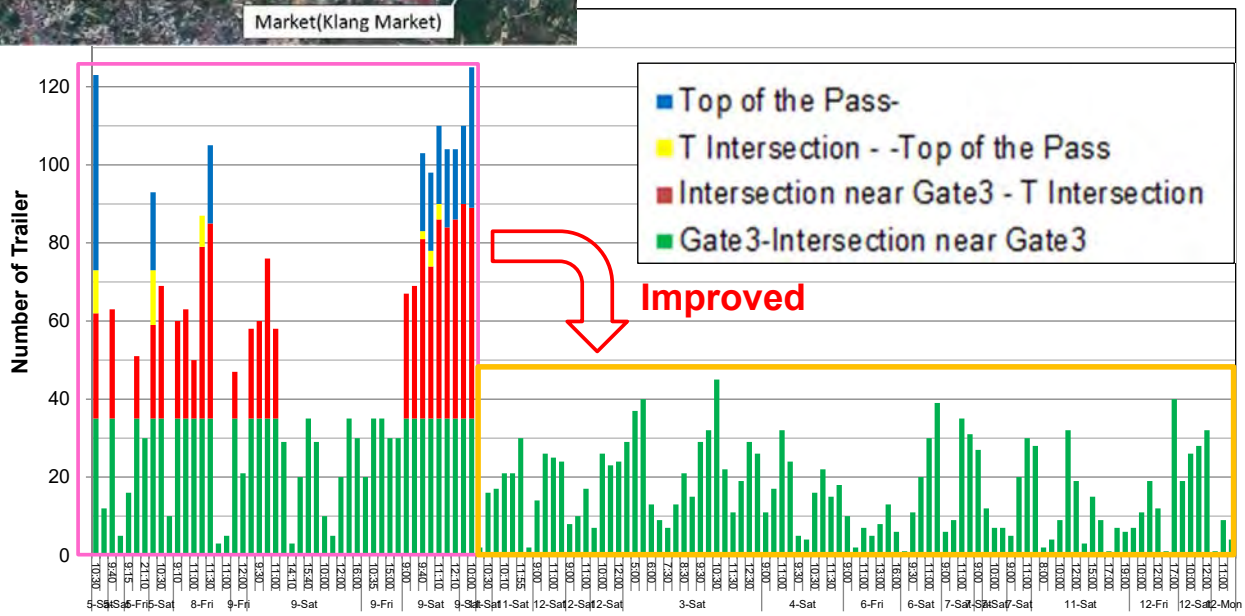
Nov 22, 2019



Traffic Situation at the Gate 3

After October in 2018

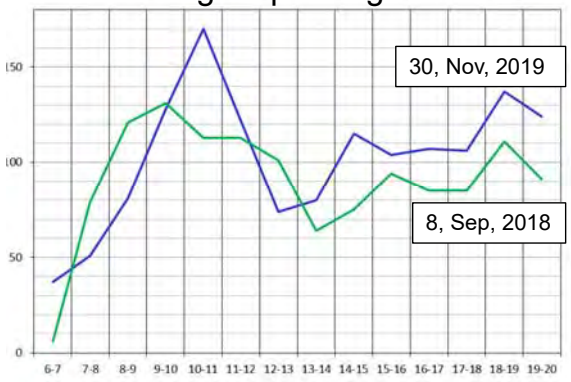
- All 6 lanes begin to operation at 6:00
- Gate clerks, Gate checkers and Gate guides make traffic flow smoothly
- As Fines, the trailers have incomplete documents allowed to load the cargo until 12:00pm



** Figure in the left side of the day is month.*

Traffic Situation at the Gate 3

Number of gate passing in/out trailers



	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	TOTAL
30 Nov 2019	**37**	**51**	**81**	**128**	**170**	**122**	**74**	**80**	**115**	**104**	**107**	**106**	**137**	**124**	**1,436**
A+B:Gate IN	24	50	79	120	156	104	55	70	79	75	76	61	86	50	1,085
A: From Phnom Penh	23	32	61	73	86	57	25	35	32	37	48	39	63	37	648
B: From Sihanoukville	1	18	18	47	70	47	30	35	47	38	28	22	23	13	437
Z: From PAS	13	1	2	8	14	18	19	10	36	29	31	45	51	74	351
8 Sep 2018	**6**	**79**	**121**	**131**	**113**	**113**	**101**	**64**	**75**	**94**	**85**	**85**	**111**	**91**	**1,269**
A+B:Gate IN	4	76	117	121	87	77	78	53	60	67	52	35	44	36	907
A: From Phnom Penh	1	70	96	103	77	69	33	35	34	47	44	32	39	33	713
B: From Sihanoukville	3	6	21	18	10	8	45	18	26	20	8	3	5	3	194
Z: From PAS	2	3	4	10	26	36	23	11	15	27	33	50	67	55	362

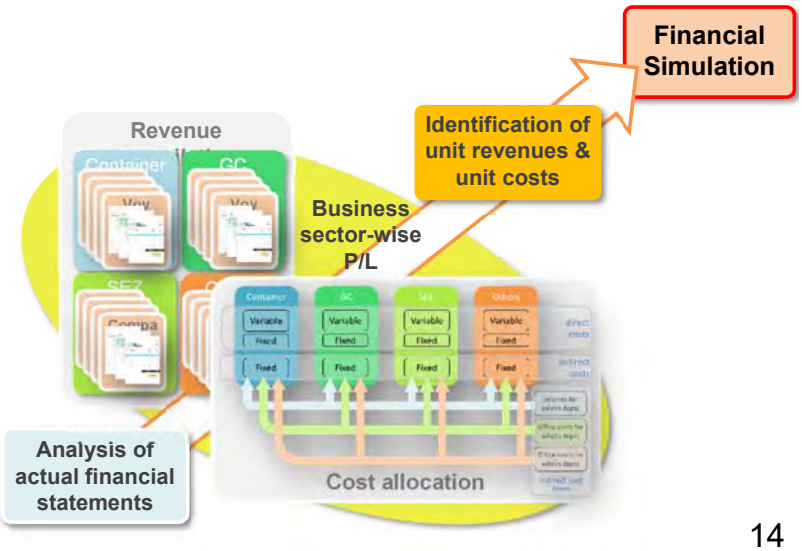
56% increased

Progress of the Project

Activities for Output 1

5 year management plan

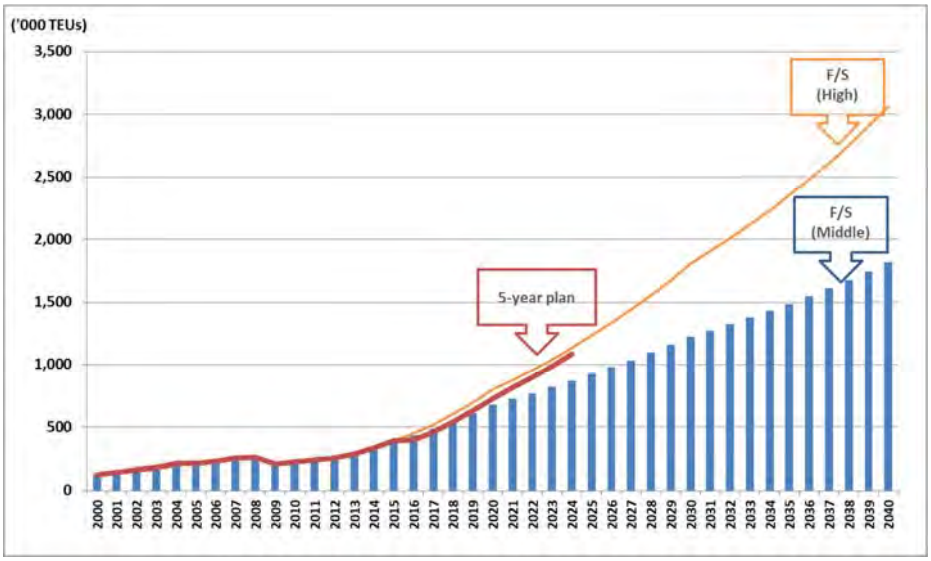
- Following the achievements up to the previous dispatch (Stage 1 - business sector-wise profit & loss statement, and Stage 2 - unit revenues/unit costs), the Team worked on a financial simulation for the years from 2019 to 2023 (Stage 3)
- The Team has completed the 6th step (formulation of 5-year investment plan and calculation of depreciation for each year) out of the total 12 steps of the Stage 3 works, while the Team has not yet reached the final goal of the Step 3 works (that is, business sector-wise profit & loss statements for 2019 to 2023) .
- For the financial simulation, the Team proposed
  - To draw a weekly berth plan for each year from 2019 to 2023 corresponding to the predicted container throughputs, and based on this,
  - To calculate the working hours of shore side equipment such as quay cranes and harbor mobile cranes, then
  - To calculate the operating expenses through multiplying the working hours by the costs per hour of the equipment.



Forecast of cargo traffics (Container)

Assumed increase rates		
	2020	+15%
	2021	+12%
	2022	+10%
	2023	+10%

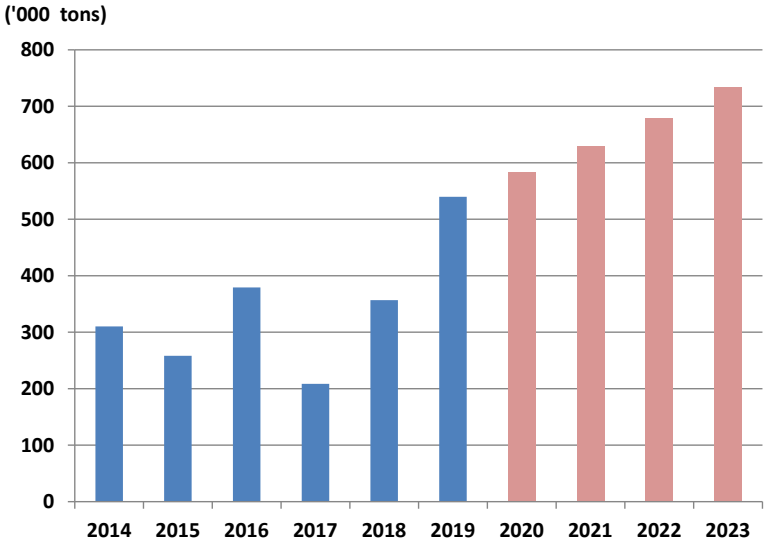
Year	F/S-Mid	F/S-High	5-year plan	
2000	130,435	130,435	130,435	
2001	145,292	145,292	145,292	11.4%
2002	166,638	166,638	166,638	14.7%
2003	181,286	181,286	181,286	8.8%
2004	213,916	213,916	213,916	18.0%
2005	211,141	211,141	211,141	-1.3%
2006	231,036	231,036	231,036	9.4%
2007	253,271	253,271	253,271	9.6%
2008	258,775	258,775	258,775	2.2%
2009	207,861	207,861	207,861	-19.7%
2010	222,928	222,928	222,928	7.2%
2011	237,941	237,941	237,941	6.7%
2012	255,378	255,378	255,378	7.3%
2013	286,450	286,450	286,450	12.2%
2014	333,904	333,904	333,904	16.6%
2015	391,819	391,819	391,819	17.3%
2016	437,736	452,363	400,187	2.1%
2017	489,035	522,263	459,839	14.9%
2018	546,345	602,963	541,288	17.7%
2019	610,371	696,133	633,099	17.0%
2020	681,900	803,700	**728,064**	**15.0%**
2021	725,138	876,034	**815,432**	**12.0%**
2022	771,117	954,878	**896,975**	**10.0%**
2023	820,012	1,040,819	**986,672**	**10.0%**



Forecast of cargo traffics (General Cargoes)

Assumed increase rates		
	2020	+8%
	2021	+8%
	2022	+8%
	2023	+8%

	5-year plan ('000 tons)	Increase rate
2014	310	
2015	258	-16.8%
2016	379	46.9%
2017	209	-45.0%
2018	357	71.0%
2019	540	51.3%
2020	583	8.0%
2021	630	8.0%
2022	680	8.0%
2023	734	8.0%

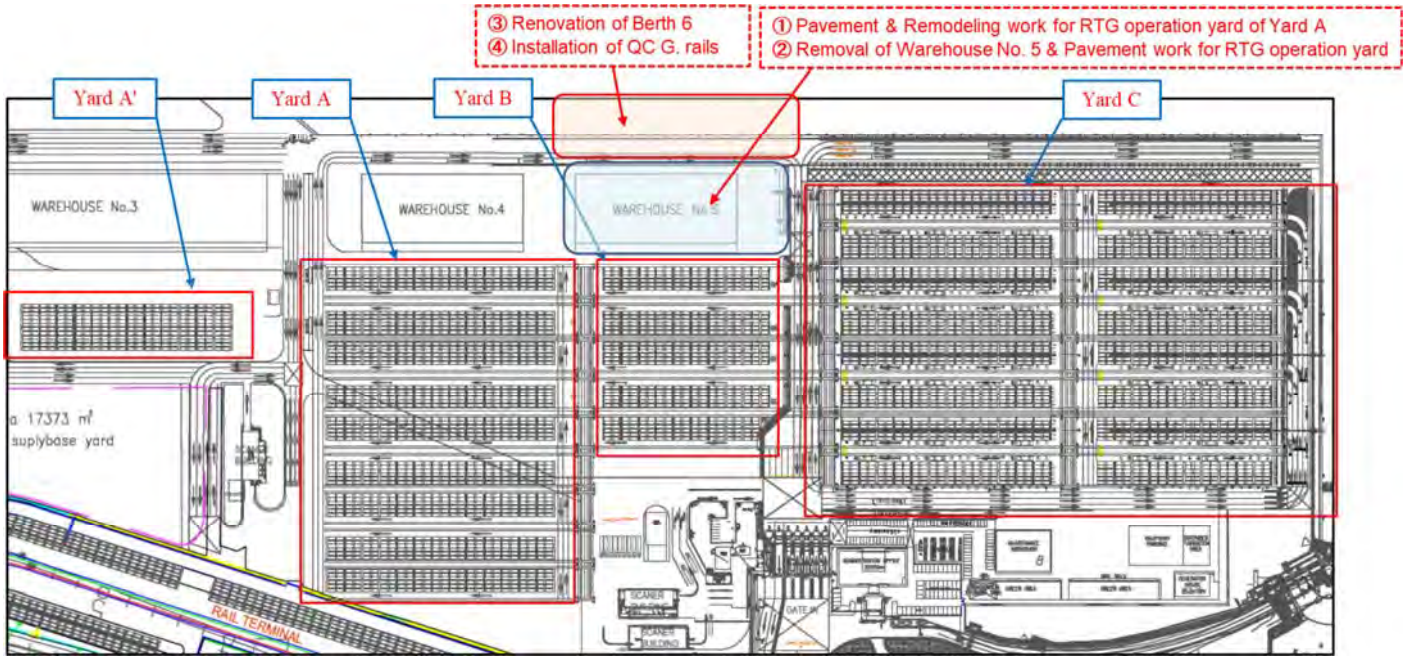


Examination of Yard Capacity

Reference: Crane Capacity

box/hour/crane	TEU/box	days	hour	Use Ratio	Units	TEU
20	1.6	365	24	80%	4	897,024
20	1.6	365	24	80%	5	1,121,280
20	1.6	365	24	80%	6	1,345,536

Layout at the time of 2023



Examination of Yard Capacity

Dwelling Days

	Present		Target
Im. Laden	8.0	95%	4.0
Im. Empty	8.0	5%	4.0
Ex. Laden	4.0	65%	4.0
Ex. Empty	10.0	35%	6.0
Laden Ave,	6.4		4.0

Calculation of Workable Capacity

Present

Yard	C	B	A	D	A'	T	S1	S2	F
Handling Method	RTG	RTG	RS	RS	RS	RS	RS	RS	RS
Type of Containers	Laden	Laden	Laden	Ex. Empty	Laden	Laden	Ex. Empty	Ex. Empty	Ex. Empty
Ground Slots (TEUs)	2,112	682	500	1,099	558	80	728	728	400
Tiers	3.5	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0
Storage Capacity (Maximum)	7,392	2,387	2,000	3,847	2,232	320	2,912	2,912	1,600
Effective Utilization Ratio of Yard	75%	75%	75%	75%	75%	75%	75%	75%	75%
Workable Maximum Capacity	5,544	1,790	1,500	2,885	1,674	240	2,184	2,184	1,200
Peak Ratio (of annual handling amount)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Sustainable Maximum Capacity	3,960	1,279	1,071	2,061	1,196	171	1,560	1,560	857
Average Dwell time of a Container (days)	6.4	6.4	6.4	10.0	6.4	6.4	10.0	10.0	10.0
Workable Capacity	226,729	73,215	61,345	75,213	68,461	9,815	56,940	56,940	31,286

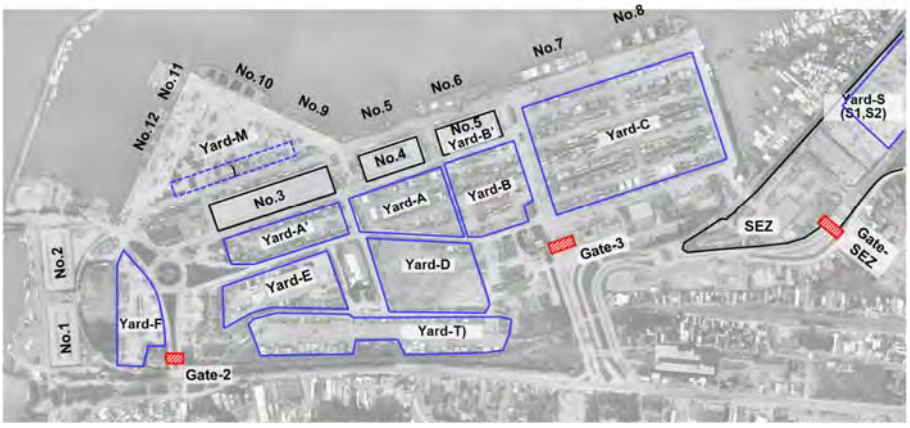
Target

Yard	C	B	A	D	A'	T	S1	S2	F
Handling Method	RTG	RTG	RS	RS	RS	RS	RS	RS	RS
Type of Containers	Laden	Laden	Laden	Ex. Empty	Laden	Laden	Ex. Empty	Ex. Empty	Ex. Empty
Ground Slots (TEUs)	2,112	682	500	1,099	558	80	728	728	400
Tiers	3.5	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0
Storage Capacity (Maximum)	7,392	2,387	2,000	3,847	2,232	320	2,912	2,912	1,600
Effective Utilization Ratio of Yard	75%	75%	75%	75%	75%	75%	75%	75%	75%
Workable Maximum Capacity	5,544	1,790	1,500	2,885	1,674	240	2,184	2,184	1,200
Peak Ratio (of annual handling amount)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Sustainable Maximum Capacity	3,960	1,279	1,071	2,061	1,196	171	1,560	1,560	857
Average Dwell time of a Container (days)	4.0	4.0	4.0	6.0	4.0	4.0	6.0	6.0	6.0
Workable Capacity	361,350	116,686	97,768	125,355	109,109	15,643	94,900	94,900	52,143

Examination of Yard Capacity

Assumed Development Schedule

Yard	Handling Method	Type of Containers	2020		2021		2022		2023		2024	
			Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec
C	RTG	Laden	1	1	1	1	1	1	1	1	1	1
B	RTG	Laden	1	1	1	1	1	1	1	1	1	1
B'	RTG	Laden					1	1	1	1	1	1
A	RS	Laden	1	1	1	1						
D	RS	Ex. Empty	1	1								
D	RTG	Laden			1	1						
A+D	RTG	Laden					1	1	1	1	1	1
A'	RS	Laden	1	1	1	1	1	1	1	1	1	1
T	RS	Laden	1	1	1	1	1	1	1	1	1	1
S1	RS	Ex. Empty		1	1	1	1	1	1	1	1	1
S2	RS	Ex. Empty				1	1	1	1	1	1	1



Examination of Yard Capacity

Big difference according to dwelling days !

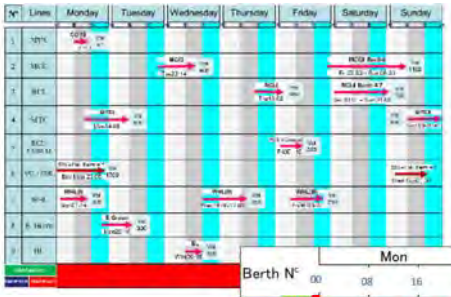
Dwelling days = Present

	2019	2020		2021		2022		2023		2024	
	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec
Workable Maximum CY Capacity	514,777	514,777	571,717	585,500	642,440	667,514	667,514	667,514	667,514	667,514	667,514
Laden	439,564	439,564	439,564	528,560	528,560	553,634	553,634	553,634	553,634	553,634	553,634
	NO!		NO!		NO!		NO!		NO!		NO!
Ex. Empty	75,213	75,213	132,153	56,940	113,880	113,880	113,880	113,880	113,880	113,880	113,880
	NO!		OK!		NO!		NO!		NO!		NO!
Annual Container Handling Volu	632,000		728,000		815,000		897,000		987,000		1,066,000
95% Im. Laden	300,200		345,800		387,125		426,075		468,825		506,350
5% Im. Empty	15,800		18,200		20,375		22,425		24,675		26,650
65% Ex. Laden	205,400		236,600		264,875		291,525		320,775		346,450
35% Ex. Empty	110,600		127,400		142,625		156,975		172,725		186,550

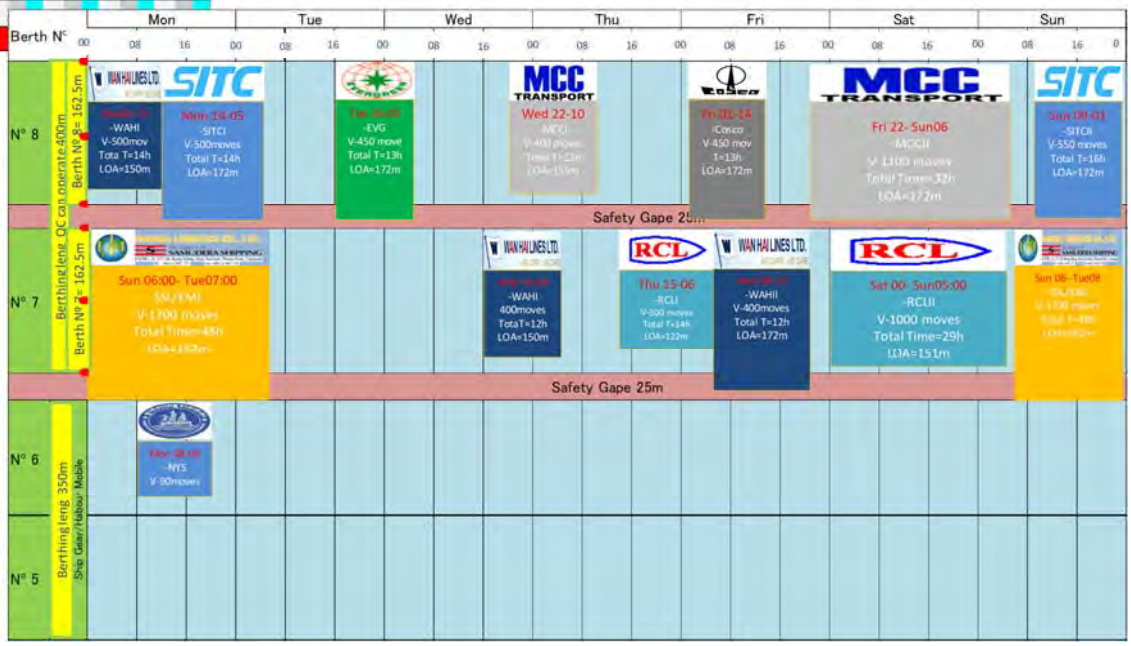
Dwelling days = Target

	2019	2020		2021		2022		2023		2024	
	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec	Jan - Jun	Jul - Dec
Workable Maximum CY Capacity	825,910	825,910	920,810	937,292	1,032,192	1,072,155	1,072,155	1,072,155	1,072,155	1,072,155	1,072,155
Laden	700,556	700,556	700,556	842,392	842,392	882,355	882,355	882,355	882,355	882,355	882,355
	OK!		OK!		OK!		OK!		OK!		OK!
Ex. Empty	125,355	125,355	220,255	94,900	189,800	189,800	189,800	189,800	189,800	189,800	189,800
	OK!		OK!		OK!		OK!		OK!		OK!
Annual Container Handling Volu	632,000		728,000		815,000		897,000		987,000		1,066,000
95% Im. Laden	300,200		345,800		387,125		426,075		468,825		506,350
5% Im. Empty	15,800		18,200		20,375		22,425		24,675		26,650
65% Ex. Laden	205,400		236,600		264,875		291,525		320,775		346,450
35% Ex. Empty	110,600		127,400		142,625		156,975		172,725		186,550

Berth Window Planning

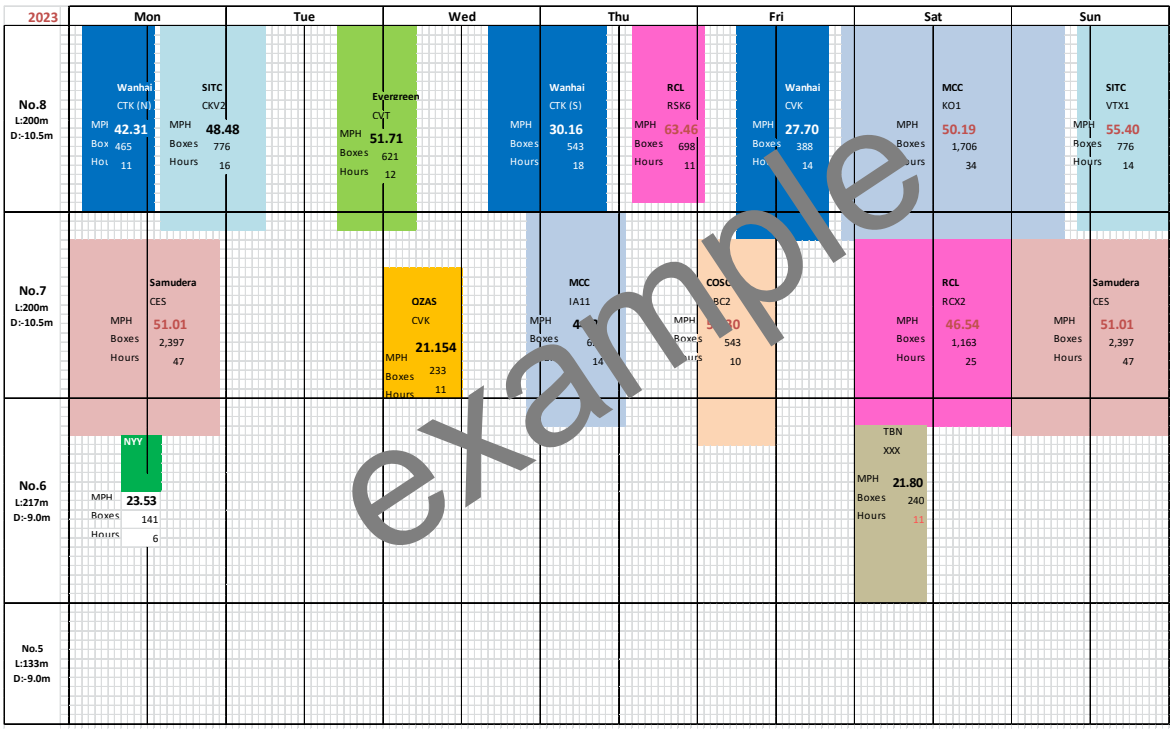


- For the drawing of berth plan, the Team proposed a new bi-axial format (berth length axis & time axis) that makes the berth occupancy and operational efficiency to be grasped at a glance.



Allocation of berthing windows in 2023

- Vessel operation with 3 QCs becomes a common practice
- Enlargement of vessel sizes
- Additional shipping line (TBN) can be induced at weekend



Activities for Output 1

Records of Meetings with Customers by Business Department

- Accompanied by PAS marketing staff, the Team visited customers such as cargo owners, freight forwarders and shipping line agents in Sihanoukville as well as the shipping lines in Phnom Penh to interview their voices as port users with regard to current SHV Port operation, and to sound them any possibility to obtain their cooperation to alleviate the weekend congestion.

Interview Records

Date	Company	Category	Place	Visiting Members (Business Dept. & JICA)
25-Nov	CMA-CGM	Shipping agency	SHV	Mr. Khin Vy, Mr. Mao Samon, Furuno
25-Nov	SITC	Shipping agency	SHV	Mr. Khin Vy, Mr. Mao Samon, Furuno
26-Nov	Teng Lay	Forwarder	SHV	Mr. Khin Vy, Furuno
2-Dec	SITC	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno
2-Dec	CMA-CGM	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno
2-Dec	COSCO	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno
2-Dec	OOCL	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno
3-Dec	Straight Int'l	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno
3-Dec	RCL	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno
4-Dec	Maersk	Shipping agency	Phnom Penh	Mr. Khin Vy, Mr. Mao Samon, Furuno

Activities for Output 1

Leveling of Container Receiving Date (Export Laden Container)

- There are several factors behind the weekend congestion, such as the timing of confirmation on the slot allocation of feeder vessels, connection schedule from feeders to mainlines at hub ports, and the timing of quality inspections at garment factories etc. The Team also found that Maersk Line and Wan Hai Line are rather cooperative to the alleviation of congestion
  - Major commodity is GARMENT
  - In order to secure the transshipment connection to the Mother vessels, Shipping Lines intend to maintain the current position at Sihanouk Ville as below:

Line	Destination	Sihanouk Ville Position	CY Close
SITC	Japan	Sun 09:00 - 24:00	Sat
WAN HAI	Japan (via HKG)	Mon 01:00 - 14:00	Sun
RCL	Singapore	Sat 01:00 - Sun 01:00	Fri
SAMUDERA	Singapore	Sun 01:00 - Mon 23:00	Sat
MAERSK	Tanjung Pelepas	Fri 22:00 - Sun 08:00	Thu

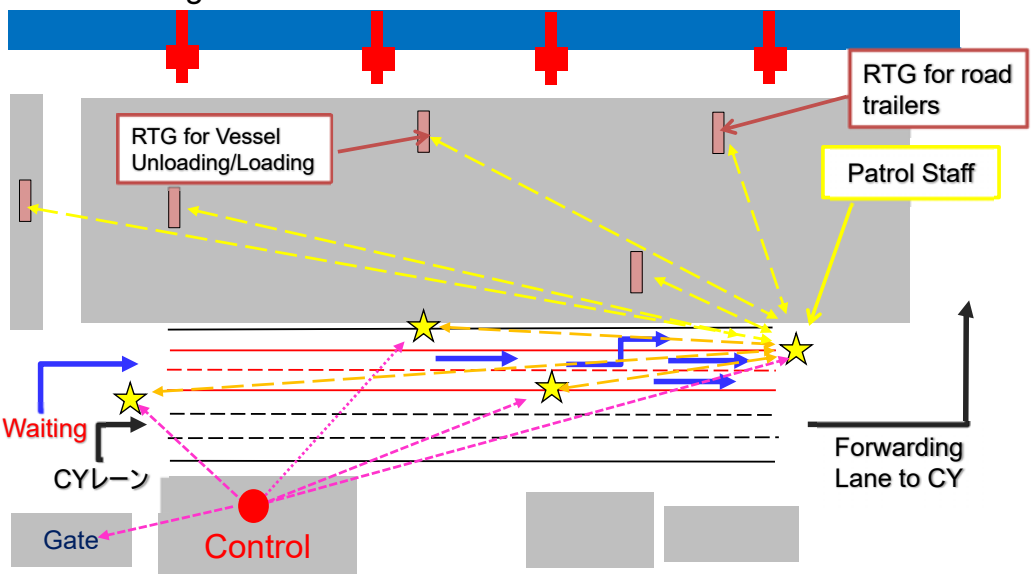
  - Inspection by the third parties to be nominated by buyers is performed on Thursday and Wednesday, and the cargoes are stuffed into container after the inspection. This means that the laden containers are returned to CY after Friday. → Manufacturers prefer the delivery of their cargoes on weekends.

Stacking Area of OOG Container

- Issues
  - Danger to handle cargo on the main traffic flow
  - It may stop the traffic of trailers (it may also affect gate flow)
- Proposal
  - Relocate OOG stacking area
    - For safety: Away from the access road
    - For efficient operation: Cranes, workers, and tools are located near
  - Utilize the current OOG area as trailer waiting area for controlling incoming trailers in yard lanes of RTG area

Coordination among Control, RTG and Patrol

1. A controller share the information of vessel operation RTGs among gate clerks and patrollers over the radio.
2. A gate clerk communicates with patrollers when road trailers come to the gate.
3. A gate clerk gives an instruction to drivers to wait at the designated area.
4. A patroller give an announcement to RTGs whether they are ready for a road trailer or not.
5. When ready, a patroller let the road trailer to go to the RTG lane.
6. A patroller shall not let the road trailer to go to the RTG lane until receiving go-sign from RTG to avoid the congestion in RTG lanes.



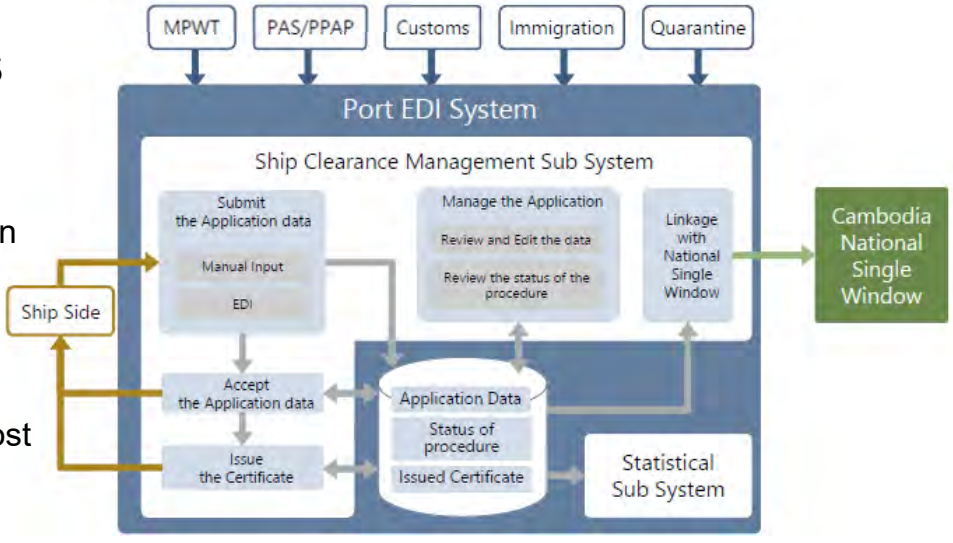
Entry and Exit Control

- To prohibit customs-broker's motorcycles from entering the container operation
  - It is necessary to complete necessary procedures for discharge/receipt of containers before road-trailers reach the Gate 3.
  - Motorcycles, cars and persons should be prohibited from crossing over the safety zone in front of the Gate 3. It is the passing zone only for road-trailers to export and import containers and yard-trailers.
  - Sign board should be installed at both the entrance and exit of each passage to the container operation area.

Location of "Access guard clerk"

Port EDI

- Discussions in W/S are summarized as follows:
  - Necessity of connection with Customs System
  - Relation to National Single Window.
  - Who and how share cost for maintenance of the system
  - Manifest data in the Port EDI
  - Necessity for access to the system by smartphones
  - Port statistics used by Port EDI data



Indicator (Quantities) based on the grant-aid project	Base Line (2018)	Target*
Duration of the ship **clearance committee** (minutes)	30 minutes	0
The utilization rate of the Port EDI System for ship clearance procedures for port entry/departure	0	100%
Indicator (Qualitative)	Situation at the end of the project	
Modernization of port administration	Progress through project implementation	
Simplify the business procedures		
Adopt the international standard procedures		

** Prospects for achieving the target three (3) years after completion of the Port EDI Development Project*

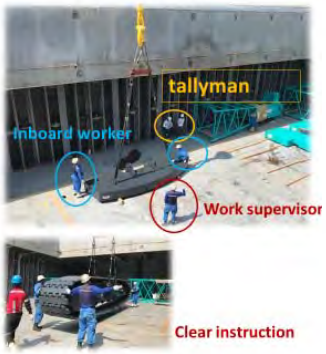
General Cargo Handling

- Improve cargo storage
- Appropriate wear of safety equipment
- Keep organized workspace
- Improvement lifting work
- Supervisor
- Improve cargo work efficiency
- Sand and gravel on berth

Necessity of Supervisors

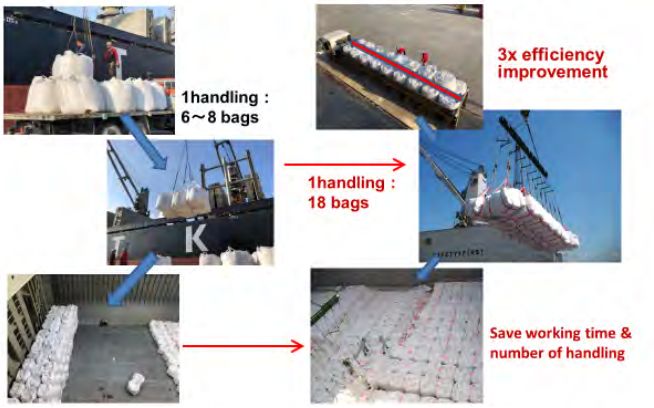
- Current situation

- Standard situation in JAPAN



Improvement cargo work efficiency (Sugar)

- Current operation
- Improved operation



Revision of PDM

Outputs in PDM

- Output 1
  - Capacity to formulate corporate strategic (mainly CT) of PAS will be enhanced.
- Output 2
  - CTMS operation capacity will be enhanced.
- Output 3
  - Entry/exit control and traffic flow management on port premises (including CT, rail yard and multi-purpose terminal) will be implemented.
- Output 4
  - Incoming/outgoing traffic congestion will be mitigated at gate as well as outside of Sihanoukville Port premises.
- Output 5
  - Vessel arrival/departure procedure will be improved via Port EDI.

Revision of Project Design Matrix

Project Design Matrix (PDM)

Project Title: Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

Period of Project: April 2018 to September 2021 (42 months in total)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification
Outputs		
1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.	1.1 Corporate strategy will be submitted to the shareholders/Investors	1.1 Report submitted to the shareholder meeting
	1.2 Decision making procedure and approval standard is authorized.	1.2 Monitoring Survey (Authorized document, etc)
	1.3 A medium/long-term facility investment plan for container terminals is formulated.	1.3 A medium/long-term facility investment plan for container terminals

Activities
Activities for Output 1
1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.
1.7 Support the formulation of a facility investment plan for medium/long-term.

⇨ Development Timeframe

Formulation of Development Timeframe

- Timeframe of facility development shall be a good document to share information and to build common understanding among staff as well as related authorities
- The Team propose that PAS should update such kind of timeframe.

Development Timeframe up to 2024 (Draft)

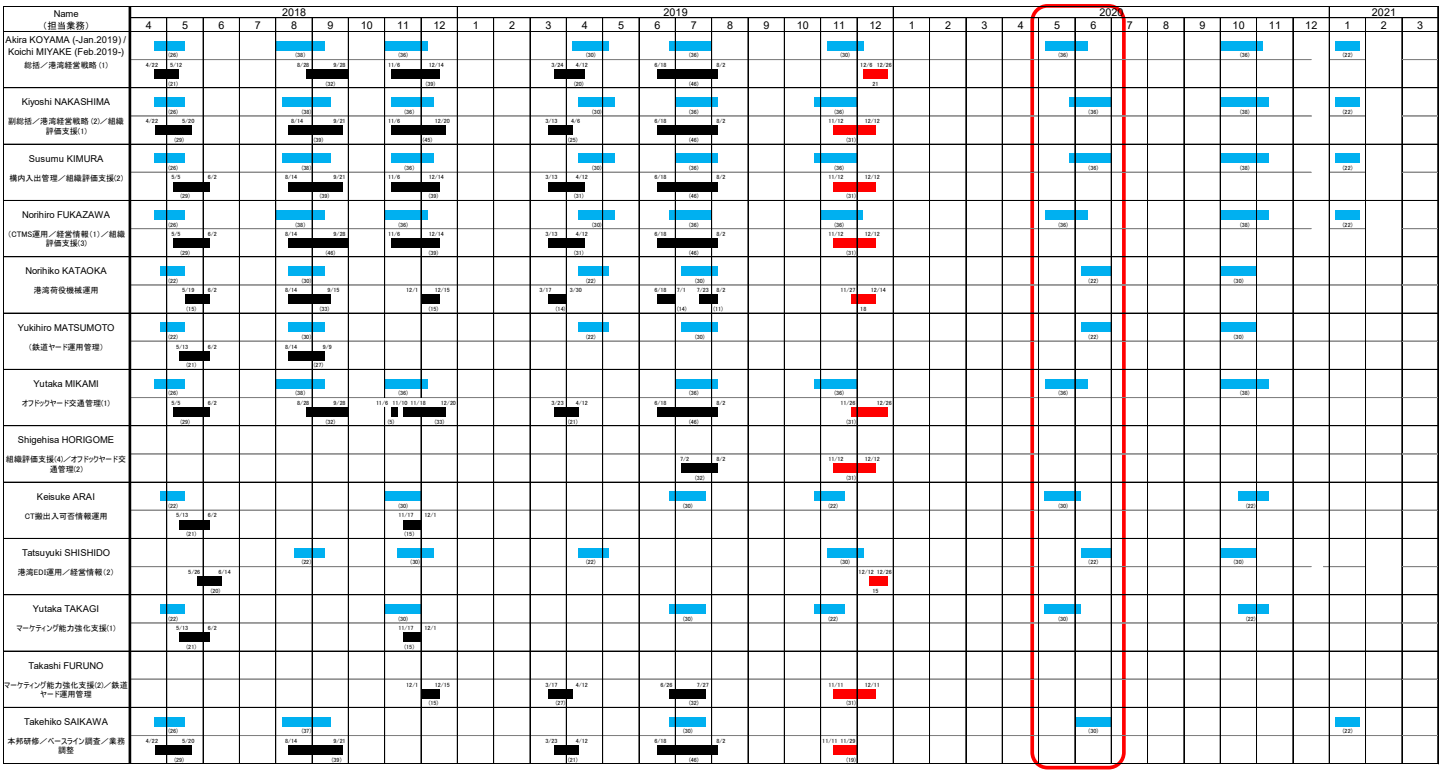
: Preparation for construction work / Procurement
: Development / Construction
: Operation for container handling
: Operation for GC handling
Fiscal Year (1Q:Jan-Mar, 2Q:Apr-Jun, 3Q: Jul-Sep, 4Q: Oct-De

Facility		TEU Gs, Units, etc.	Description	Finance/ Scheme
Quay No.6			Extension of QC Rail	JICA Yen Loan
Yard including outside	Yard C (9.2ha)	2,100	for Laden C	
	Yard B (2.3ha)	680	for Laden C (4 lanes→5 lanes)	
	Yard A (1.7ha)	500	for Empty C (RS) → RTG yard	PAS Finance
	Yard D (2.8ha)	700	for Empty C (RS) → RTG yard (concrete pavement)	PAS Finance
	Yard A' (1.3ha)	320	for Empty C (RS) → for General Cargo	PAS Finance
	Yard E (1.5ha)	—	for General Cargo → for Container (RS) (E ⇔ F)	
	Yard F (1.5ha)	400	for Empty C & Long dwelling C (RS) → for General Cargo	
	Yard B' (No.5 WH) (0.7ha)	270	for Laden C (RTG yard)	PAS Finance
	Yard-T (Rail terminal) (0.7ha/3.2ha)	160	for Long Dwelling C (RS)	
	Multi-purpose Terminal (0.7ha, 0.3ha)	300	Temporary use for container storage (RS)	
	Yard S (4ha) (SEZ area)	1,000	for Empty C (RS)	PAS Finance
	PAS Property at 25km away from SHV		TBD	PAS Finance
Handling Equipment	QC # of operable QCs	4→5→6	Installation of additional QCs	PAS Finance
	RTG # of operable RTGs	14→16→18 →22	Installation of additional RTGs	PAS Finance
	RS/Top Lifter	9→TBD	Installation of reach stackers/top lifters	PAS Finance
	HMC	2→3→4	Installation of Habor Mobile Crane	PAS Finance
	Yard-Trailer	30→TBD	Installation of additional yard-trailers	PAS Finance
Truck Waiting Area (behind Yard-C)			Secure designated areas	
New Container Terminal			DD, tender and construction	JICA Yen Loan
Technical Cooperation Project (Phase-2)			Improve management and operation of the terminal	JICA Grant

Schedule of the next (7th) dispatch

Schedule of the next (7th) dispatch (Tentative)

- From the end of April to June 2020



Simultaneous mooring by two cruise vessels (December 22, 2019)

អរគុណអ្នកខ្លាំងណាស់។

Arigato Gozaimashita.

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The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port (Phase 2)

5th Joint Coordination Committee

Progress and Achievement of the Project

Contents

- Outline of the Project
- Activity and Achievement of the Project
- Remaining Issues

December 20, 2021

OCDI

(The Overseas Coastal Area Development Institute of Japan)

Outline of the Project

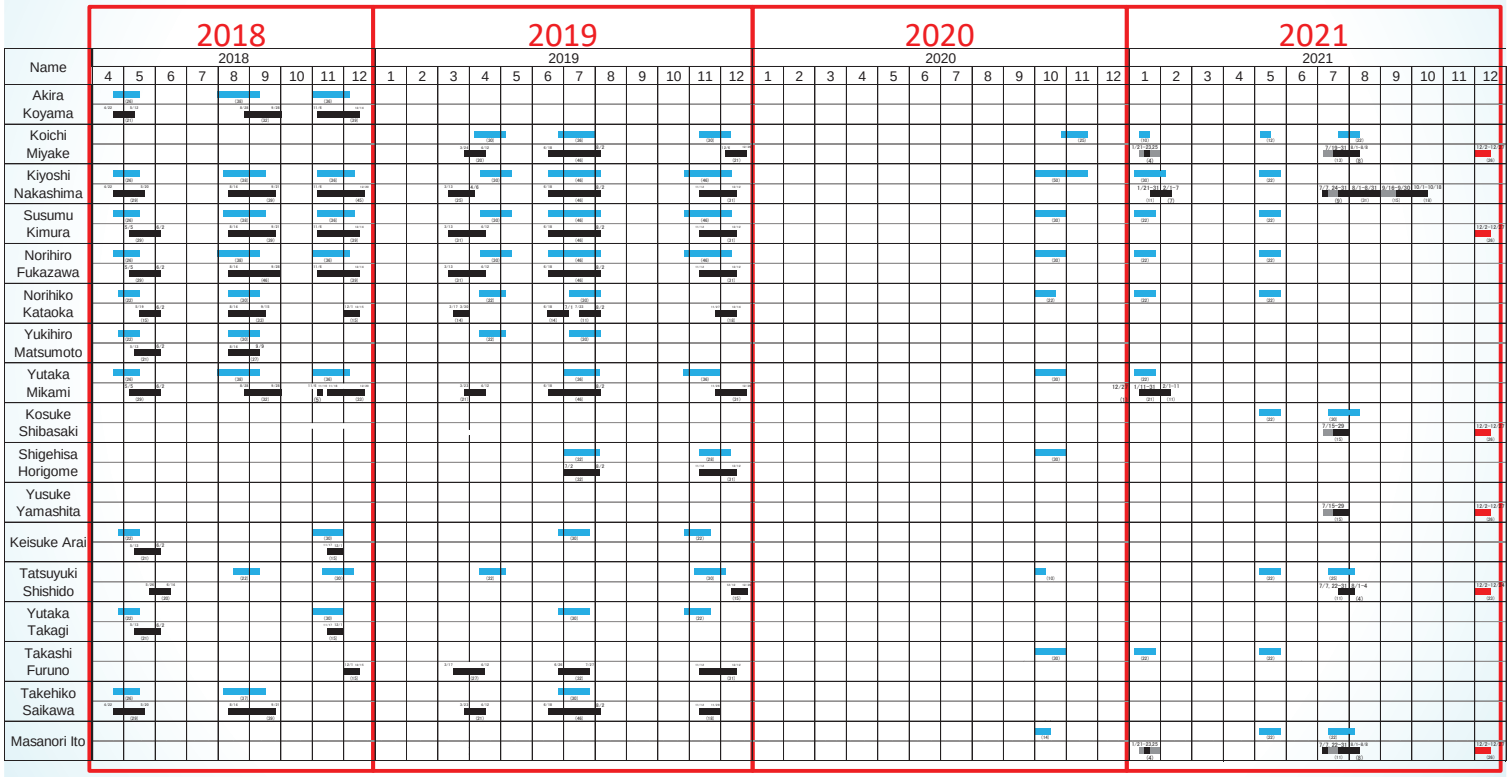
Project Design Matrix (PDM)

- Implementing Organization:
  - Sihanoukville Autonomous Port (PAS)
- Target Groups:
  - (Direct Beneficiary) Staff members of Sihanoukville Autonomous Port (PAS), Ministry of Public Works and Transport (MPWT)
  - (Indirect Beneficiary) Users of the Port of Sihanoukville
- Period of Project
  - April 2018 to January 2022 (46 months in total)

The total number of experts dispatched: 17 experts

Dispatch Record of the Experts

- Activities in 2020 were limited due to COVID19.

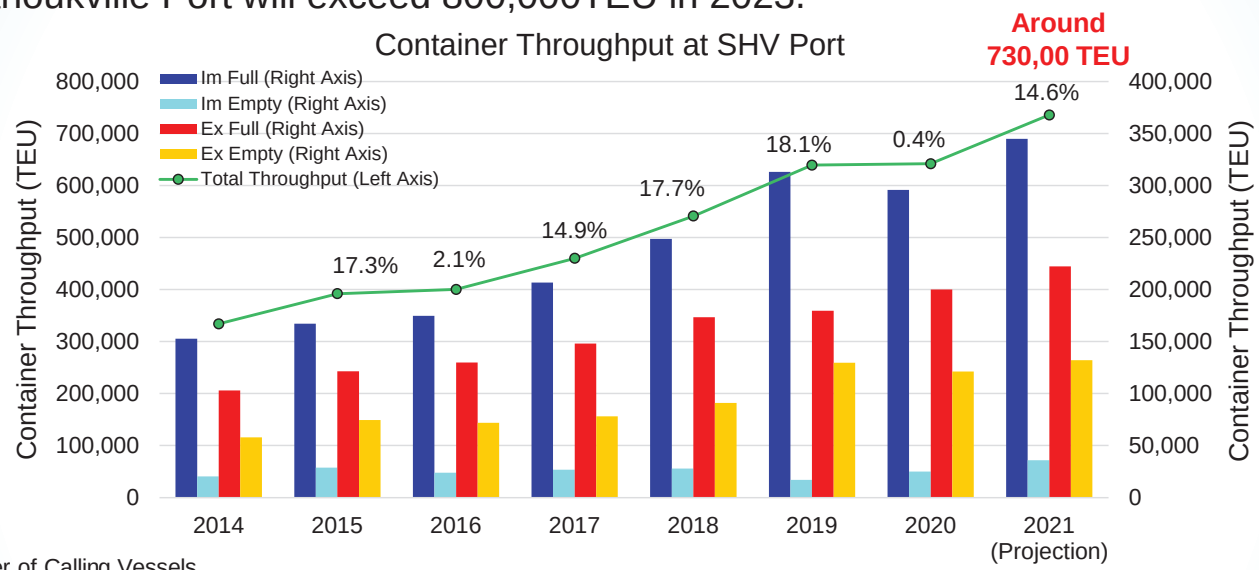


PDM (Overall Goal and Project Purpose)

Narrative Summary	Objectively Verifiable Indicators
Overall Goal	
Modernized Corporate strategy (mainly Container Terminal of PAS will contribute to trade promotion in Cambodia.	Annual container throughput of Sihanoukville Port will exceed 800,000TEU in 2023.
Project Purpose	
Capacity of business operation (mainly CT) of corporatized PAS will be enhanced.	Capacity of business operation (mainly CT) of corporatized PAS will be enhanced.

Trend of Container Throughput (1)

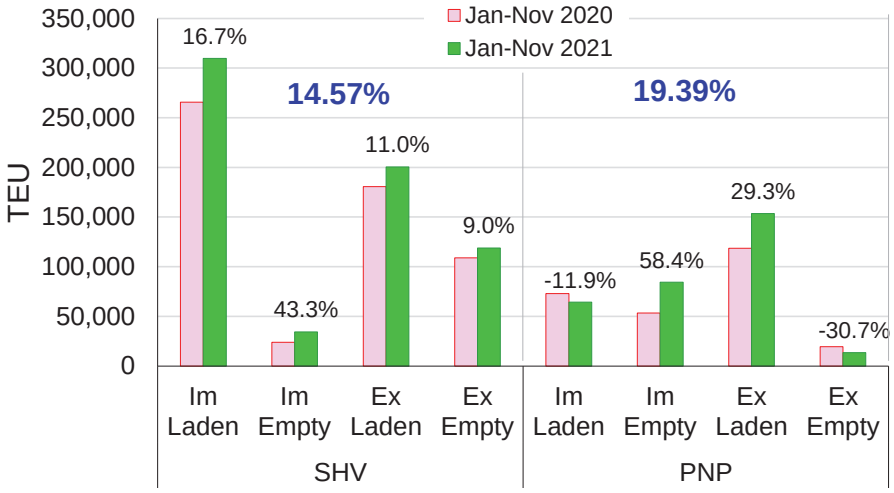
Verifiable Indicators for Overall Goal: Annual container throughput of Sihanoukville Port will exceed 800,000TEU in 2023.

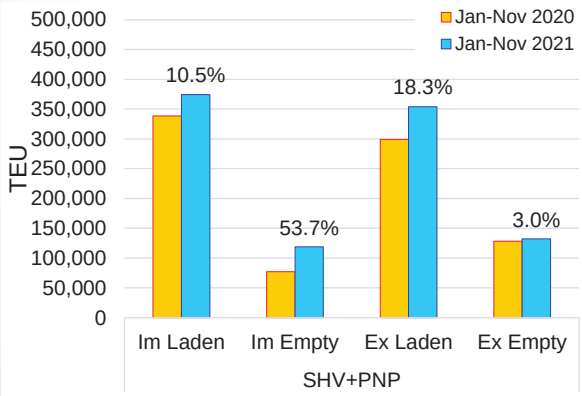


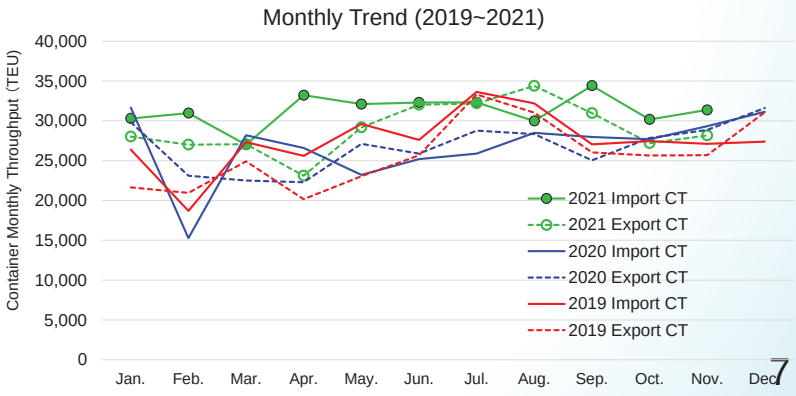
Number of Calling Vessels

Item		2016	2017	2018	2019	2020	Jan-Nov 2020	Jan-Nov 2021	2021/2020
Calling Vessels	Units	985	844	869	991	995	904	887	-1.88%
Container	Units	667	531	581	621	670	611	599	-1.96%
Conventional	Units	283	283	251	322	307	275	288	4.73%
Passenger	Units	35	30	37	48	18	18	0	-
Calls/day (excluding Tanker)		2.7	2.3	2.4	2.7	2.7	3.0	2.9	-1.6%
TEU/call (for Container Vessel)		600	866	932	1,029	958	948	1,108	16.87%
	box/call	372	527	557	617	572	566	657	16.06%

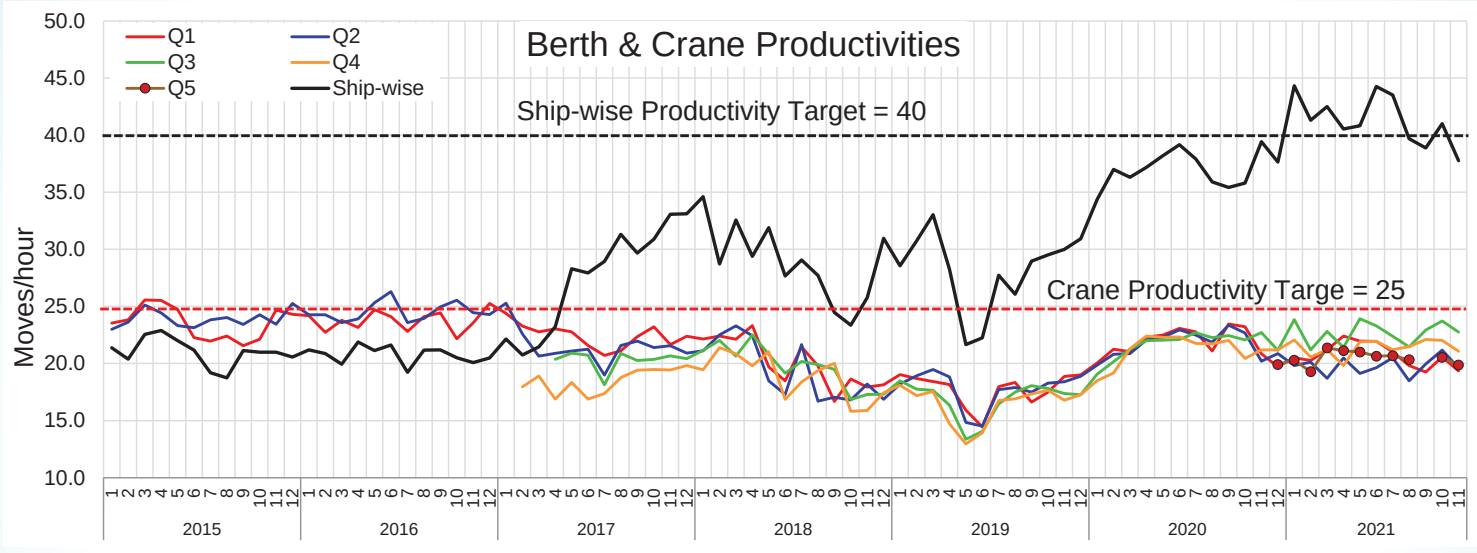
Trend of Container Throughput (2)

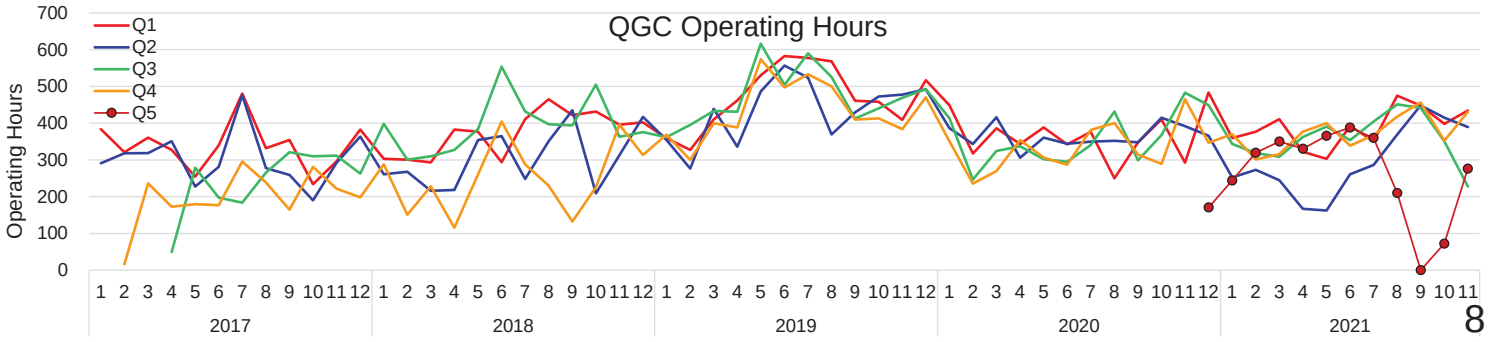




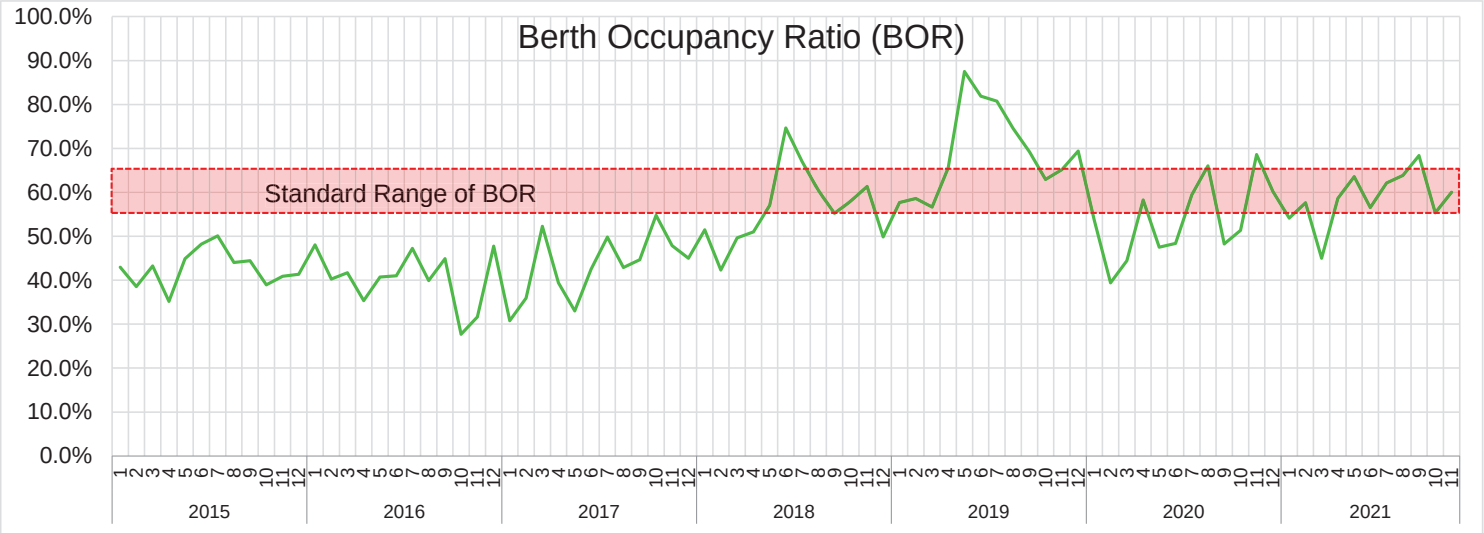


Crane and Ship-wise Productivity



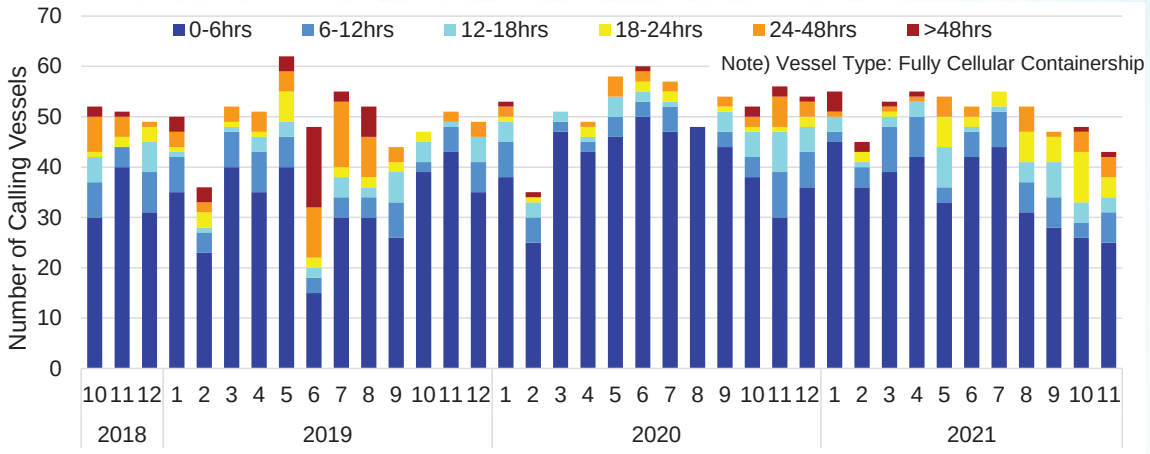


Berth Occupancy Ratio (BOR)

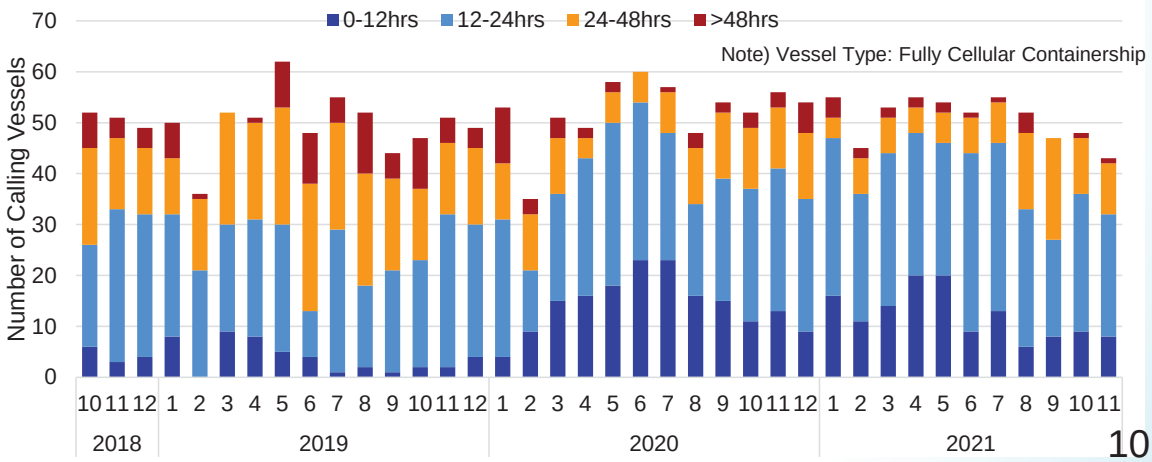


Port Performance (from AIS Data from Oct. 2018 ~ Nov. 2021)

Waiting time at the anchorage



Staying time at SHV port



Source: AIS Data (Oct. 2018 ~ Nov. 2021)

Outputs Planned in the PDM

Outputs	
1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.	1.1 Corporate strategy will be submitted to the shareholders/Investors 1.2 Decision making procedure and approval standard is authorized. 1.3 A medium/long-term facility investment plan for container terminals is formulated.
2. CTMS operation capacity will be enhanced.	2.1 Dwelling time of import containers will be shortened. 2.2 Dwelling time of export containers will be shortened. 2.3 Berthing / Time of vessels will be reduced.
3. Entry and exit control and traffic flow management in port premises (including CT, rail yard and multi-purpose terminal) will be consistently implemented.	3.1 Vehicles and motorcycles other than container trailers will not enter CT. 3.2 Turn Around Time of Trailers will be reduced.
4. Incoming/outgoing traffic flow congestion will be mitigated at gate as well as outside of Sihanoukville Port premises.	4.1 Waiting trailers in front of the terminal gate will be reduced. 4.2 Gate processing time will be reduced.
5. Vessel arrival/departure procedure will be improved via. Port EDI.	5.1 Vessel arrival/departure procedure will be electronically processed by Port EDI. 5.2 Calling vessel statistics will be prepared through Port EDI.

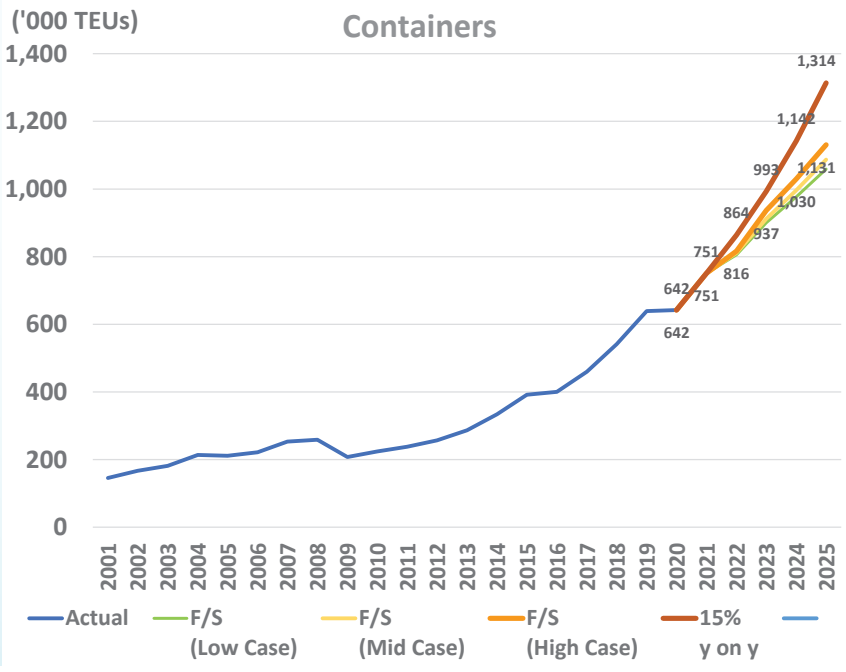
Key Performance Indicators (KPIs)

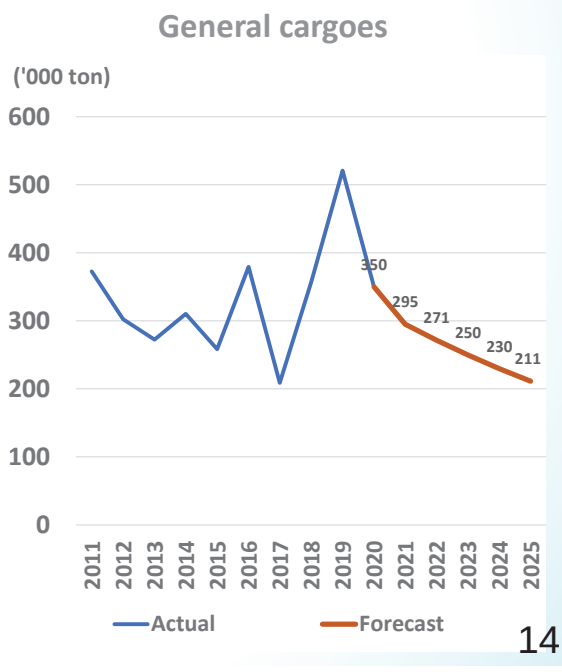
Output Field	Objectively Verifiable Indicator (as per the PDM)	KPI	Baseline (Dec 2018)	Target
Output 2 (1)	Dwelling time of import containers will be shortened.	Import Container Dwell Time	Full: 4.5 days Empty: 4.2 days	Full: 4 days Empty: 4 days
Output 2 (2)	Dwelling time of export containers will be shortened.	Export Container Dwell Time	Full: 3.4 days Empty: 10.0 days	Full: 4 days Empty: 6 days
Output 2 (3)	Berthing time of vessels will be reduced	Berth Productivity	QGC: 20.2 moves/hr Vessel: 30.1 moves/hr	QGC: 25 Vessel: 40
Output 2 (4)	Turn around time of trailers will be reduced	Turn Around Time of Trailers	Receiving: 41.4 min Delivery-A: 53.6 min Delivery-B: 300.7 min	Rec: 30 min Del-A: 40 min Del-B: 200 min
Output 3	Vehicles and motorcycles other than container trailers will not enter the container terminal	Number of Vehicles other than Container Trailers	Gate-3: 274 units Passage: 519 units	None (all from Gate-2)
Output 4 (1)	Waiting trailers in front of the terminal gate will be reduced	Number of Waiting Trailers	123 trailers	60 trailers
Output 4 (2)	Trailers passing the gate will be increased	Number of Trailers Passing Gate	80 trailers/hr	104 trailers/hr

Activities and Achievements (Output-1)

Formulation of 5-Year Management Plan

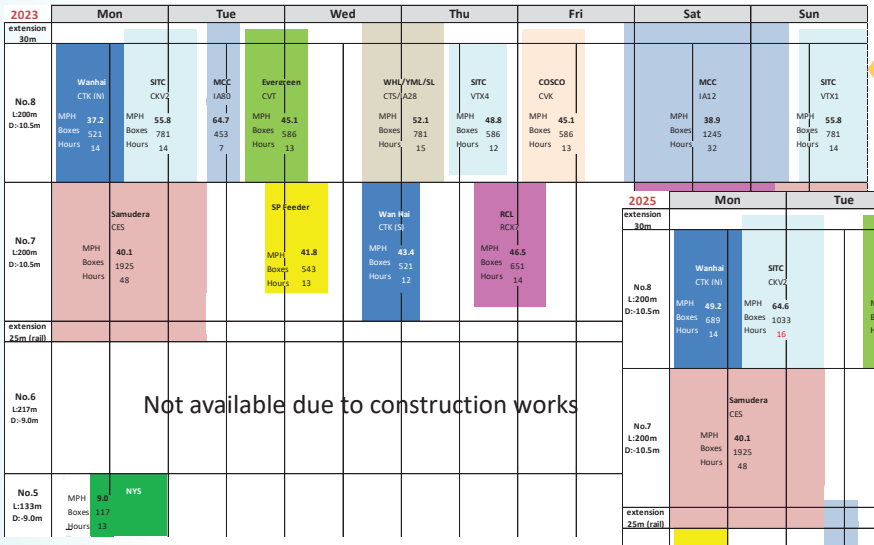
- Demand forecast for 5 years (2021-2025)
  - For containers: 2 extreme cases were assumed to prepare for the capacity crunch.
    - 1) High case of the F/S for NCT 2/3
    - 2) 15% year-on-year through 5 years
  - For general cargoes: downward trend was assumed (-8% year-on-year through 5 years), due to the reduction of construction works.





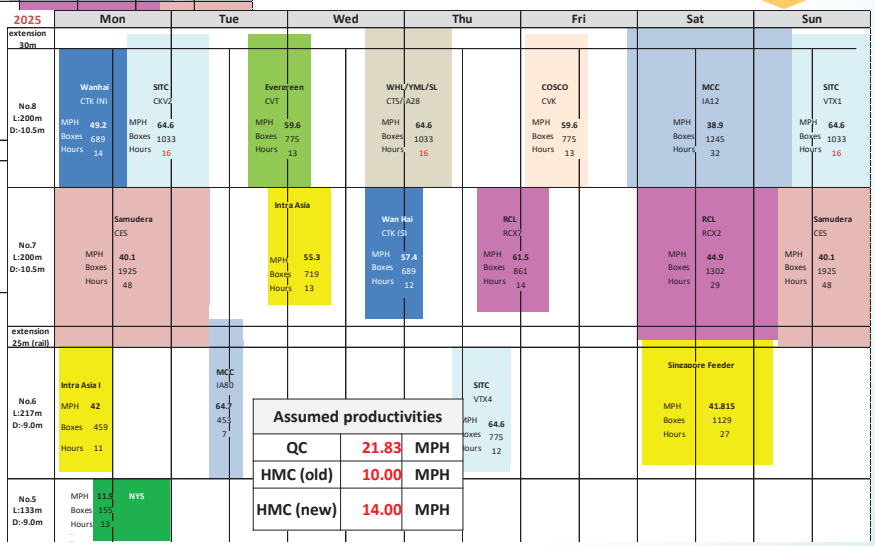
Formulation of 5-Year Management Plan

- Simulation of berth allocation
  - Result of the simulation shows that the berth windows can be managed even with the extreme demand forecasts subject to the conditions as follows:
    - Average productivity of QC is maintained at 21.83 MPH (gross basis) through 5 years
    - #6 berth is available from 2024 with extended QC rail



Berth windows for 2023 in 15% yoy case (most difficult year)

Berth windows for 2025 in 15% yoy case



Other assumptions (15% yoy case) :

- LOA of every vessel increases by 20m in 2022
- LOA of SITC (Mon) & MCC (Tue) further increase by 10m in 2024
- 3 new services are accepted at vacant windows

Assumed productivities		
QC	21.83	MPH
HMC (old)	10.00	MPH
HMC (new)	14.00	MPH

Formulation of 5-Year Management Plan

- Simulation of yard capacity
  - Result of the simulation shows that the yard capacity can be managed until 2025 even with the extreme demand forecasts subject to the following conditions:
    - Average dwell times of containers (empty & laden) are reduced year by year (as per the red font below)
    - Sufficient number of reach stackers & yard trailers are purchased (as per the green font below)

F/S high case : yard in use

				G.S.	2021	2022	2023	2024	2025
Ondock ground slots (TEUs)	Yard C (9.2ha)	laden	RTG	2,112	2,112	2,112	2,112	2,112	2,112
	Yard B (2.3ha)	laden	RTG	800	800	800	800	800	800
	Yard A (1.7ha)	laden	RTG	450	450	450	450	450	450
	Yard D (2.8ha)	laden	RTG	600	600	600	600	600	600
	Yard-T (Rail Tmnl.)	laden	RS	80	80	80	80	80	80
	Yard A' (1.3ha)	laden	RS	450	250	300	450	450	450
	Yard F (1.5ha)	laden	RS	400	210	350	400	400	400
	Yard B' (0.7ha)	laden	RTG	220				220	220
	Yard E (1.5ha)	laden	RS	350				150	350
	Multi-purpose Tmnl.	laden	RS	330		120	200	200	330
Offdock G.S. (TEUs)	Yard S1 (4ha)	empty	RS	1,100	1,100	1,100	1,100	1,100	1,100
	Yard S2 (4ha)	empty	RS	1,100		45	400	510	730
Total ground slots (TEUs)					5,602	5,957	6,592	7,072	7,622
Annual handling capacity ('000 TEUs)					**751**	**816**	**937**	**1,030**	**1,131**
Assumed dwell time	Laden (days)				5.00	5.00	5.00	5.00	5.00
	Empty (days)				8.00	**7.50**	**6.50**	**6.00**	**5.50**
Nos of cargo handling equipment (units)	QC				5	5	5	6	6
	MHC				1	1	3	3	3
	RTG				16	16	21	21	21
	Reach stacker				15	**17**	**22**	**28**	**30**
	Yard trailer				38	**42**	**47**	**51**	**56**

15% y on y : yard in use

				G.S.	2021	2022	2023	2024	2025
Ondock ground slots (TEUs)	Yard C (9.2ha)	laden	RTG	2,112	2,112	2,112	2,112	2,112	2,112
	Yard B (2.3ha)	laden	RTG	800	800	800	800	800	800
	Yard A (1.7ha)	laden	RTG	450	450	450	450	450	450
	Yard D (2.8ha)	laden	RTG	600	600	600	600	600	600
	Yard-T (Rail Tmnl.)	laden	RS	80	80	80	80	80	80
	Yard A' (1.3ha)	laden	RS	450	250	300	450	450	450
	Yard F (1.5ha)	laden	RS	400	210	350	400	400	400
	Yard B' (0.7ha)	laden	RTG	220				220	220
	Yard E (1.5ha)	laden	RS	350			200	350	350
	Multi-purpose Tmnl.	laden	RS	330		200	200	330	330
Offdock G.S. (TEUs)	Yard S1 (4ha)	empty	RS	1,100	1,100	1,100	1,100	1,100	1,100
	Yard S2 (4ha)	empty	RS	1,100		200	445	605	825
Total ground slots (TEUs)					5,602	6,192	6,837	7,497	7,717
Annual handling capacity ('000 TEUs)					**751**	**864**	**994**	**1,143**	**1,314**
Assumed dwell time	Laden (days)				5.00	5.00	5.00	5.00	**4.45**
	Empty (days)				8.00	**7.00**	**6.00**	**5.00**	**4.45**
Nos of cargo handling equipment (units)	QC				5	5	5	6	6
	MHC				1	1	3	3	3
	RTG				16	16	21	21	21
	Reach stacker				15	**18**	**22**	**30**	**35**
	Yard trailers				38	**44**	**47**	**53**	**62**

Formulation of 5-Year Management Plan

- Investment plan
  - To maintain the productivity and yard capacity, an additional investment for civil works & cargo handling equipment is required, which will increase depreciation burden and pull down operating profit.
  - Total investment amount for 5 years:
    - USD 48 million in F/S high case
    - USD 52 million in 15% yoy case

F/S high case

		Investment item	Cost ('000 USD)	2021	2022	2023	2024	2025
Civil works	1	Expansion of RTG system to Yard B & Yard A	5,790					
	2	Extension of QC rail on Berth #6, WH#5 demolition & Yard B' pavement	3,502					
	3	25m rail extension	100					
	4	Installation of new bollard ahead of Berth #8	579					
	5	Yard A' (1.3ha)	848					
	6	Yard E (1.5ha)	978					
	7	Yard F (1.5ha)	978					
S. Total			12,775					
CHE	1	5 RTGs	7,500					
	2	2 MHCs	9,000					
	3	6th QC	7,000					
	4	RS (2 uts)	1,000					
	5	RS (5 uts)	2,500					
	6	RS (6 uts)	3,000					
	7	RS (2 uts)	1,000					
	8	Yard trailers (22 uts)	4,400					
S. Total			35,400					
Total			48,175					

15% yoy case

		Investment item	Cost ('000 USD)	2021	2022	2023	2024	2025
Civil works	1	Expansion of RTG system to Yard B & Yard A	5,790					
	2	Extension of QC rail on Berth #6, WH#5 demolition & Yard B' pavement	3,502					
	3	25m rail extension	100					
	4	Installation of new bollard ahead of Berth #8	579					
	5	Yard A' (1.3ha)	848					
	6	Yard E (1.5ha)	978					
	7	Yard F (1.5ha)	978					
S. Total			12,775					
CHE	1	5 RTGs	7,500					
	2	2 MHCs	9,000					
	3	6th QC	7,000					
	4	RS (3 uts)	1,500					
	5	RS (4 uts)	2,000					
	6	RS (8 uts)	4,000					
	7	RS (5 uts)	2,500					
	8	Yard trailers (28 uts)	5,600					
S. Total			39,100					
Total			51,875					

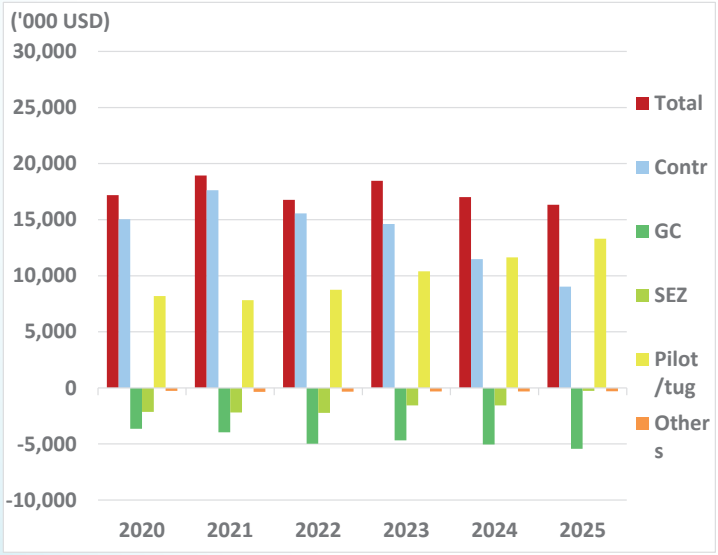
: years in use

Formulation of 5-Year Management Plan

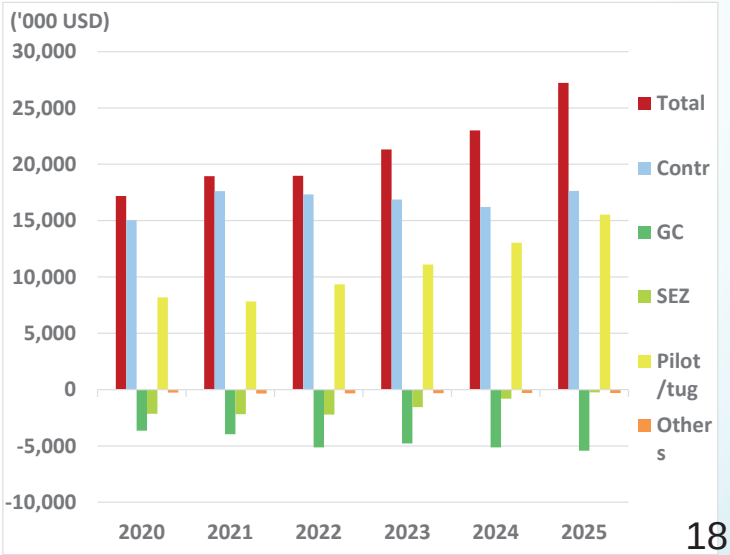
- Operating profit by business sector
  - Due to the depreciation burden, profit of container sector is declining in the F/S high case, while it remains almost flat in the 15% yoy case.
  - Revenues of navigation charges are all included in “Pilot/tug” sector.
  - Rental income of SEZ is estimated on the assumption that 1 new tenant will be added on a 3 ha plot in 2023 and another will be added on a 2.36 ha in 2025

Operating profit by business sector

F/S high case



15% yoy case

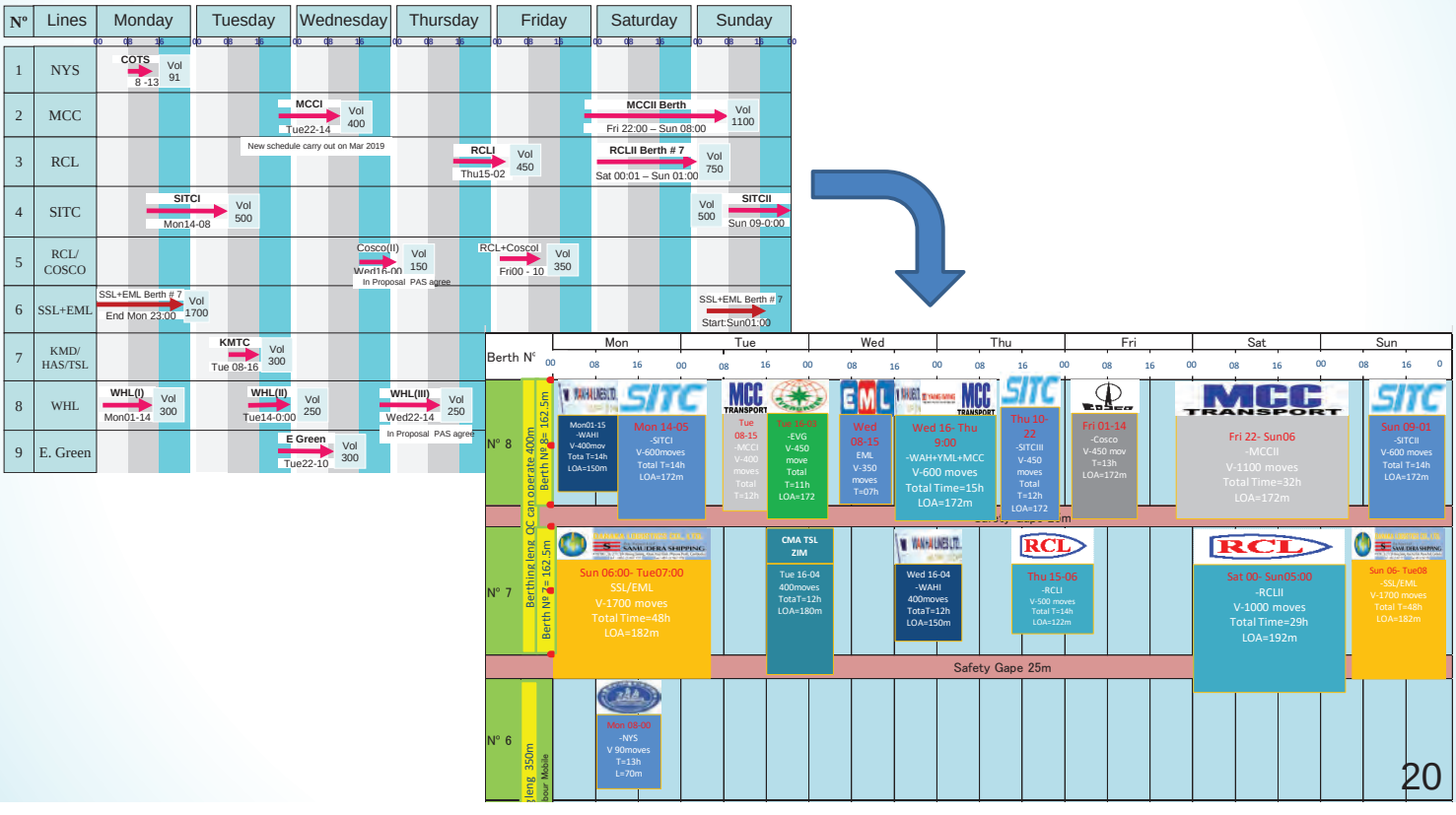


Formulation of 5-Year Management Plan

- Characteristics of this 5-year plan
  - The 5-year plan prepared this time focuses on crisis management in terms of operating the container terminal until 2025 with a limited capacity.
  - It is necessary for JCC to understand that this 5-year plan was prepared more for the purpose of internal use rather than entertaining/attracting shareholders/investors.
- Internal approval on 5-year plan
  - We will ask JCC to recommend whether or not this 5-year plan should be approved by the BOD. In case of yes, the appropriate time of BOD meeting must be determined.
- Publicity of 5-year plan
  - "Objectively verifiable indicators" of PDM shows that "Corporate strategy will be submitted to the shareholders/Investors".
  - However, Cambodian Security Exchange (CSX) strictly controls what contents be shared with shareholders /investors.
  - We will ask JCC to recommend whether or not this 5-year plan should be published with CSX's approval. In case of yes, it should be determined when and how it will be published.

Berth Window Management

- PAS has been shifted to "Berth Window Management" from "Shipping Schedule Management".



Timeframe Management for Facility Development

- A document such as the one below on facility development is useful for sharing information and building a common understanding among staff as well as related authorities.

Development Timeframe up to 2025 (Draft)

: Preparation Work
: Development / Construction
: Operation for Container Handling
: Operation for GC handling

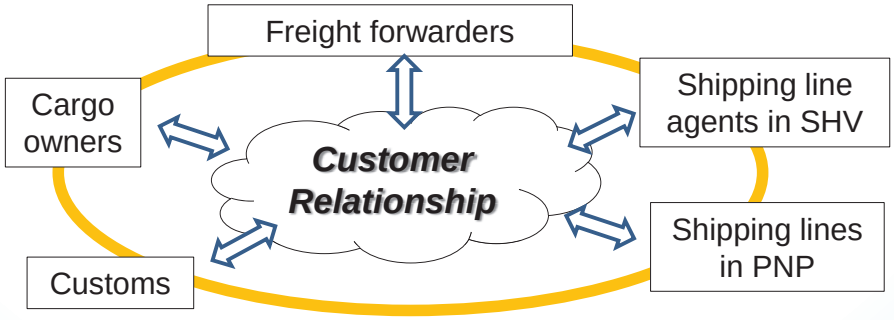
20/Dec/2021

Facility		Ground Slots/Units	Description	Remarks
Quay No.6			Extension of QC Rail	JICA Yen Loan
Quay No.5 / Multi-Purpose Berth				
Yard including outside	Yard C (7.7ha)	2,300	for Laden C (RTG)	
	Yard B (2.6ha)	800	for Laden C (RTG)	
	Yard A (2.8ha)	450	for Laden C (RS) ⇒ RTG yard	Pavement Improvement PAS Finance
	Yard D (1.8ha)	600	for Laden C (RTG)	
	Yard A' (1.6ha)	450	for Laden C (RS) ⇒ RTG Yard	
	Yard E (1.8ha)	-	for General Cargo	
	Yard F (1.5ha)	400 ⇒ 0	for Long-stay C (RS) ⇒ for General Cargo	
	Yard B' (No.5 W/H) (0.7ha)	220	for Laden C (RTG yard)	PAS Finance
	Yard-T (Rail terminal)	80	for Railway / Long-stay C (RS)	
	Yard in Multi-purpose Terminal	-	for General Cargo / Long-stay C (RS)	
	Yard S (SEZ) (4ha-->6ha)	1,100	for Empty C (RS)	(PAS Finance) Cross-mixing pavement
Handling Equipment	QC # of operable QCs	4⇒5⇒6	Installation of additional QCs	PAS Finance
	RTG # of operable RTGs	14⇒16⇒20	Installation of additional RTGs	PAS Finance
	MHC (Mobile Harbor Crane)	2⇒4	1 unit is out of order.	Grant Aid
	Reach Stacker	19		PAS Finance
	Yard-Trailer	34⇒38		PAS Finance
Vessels	Tug Boat	6	3200HP(1), 1900HP(1), 1600HP(2), 800HP(2)	PAS Finance
New Container Terminal 1		Civil	1 berth (350m)	JICA Yen Loan
		Equipment	3 QCs, 9 RTGs, 16 Yard-trailors, 2 RSs	JICA Yen Loan
New Container Terminal 2 & 3		Civil	NCT2: 1 berth (400m) NCT3: 1 berth (430m)	JICA Yen Loan
		Equipment	NCT2: 3 QCs, 10 ARTGs, 17 Yard-trailors, 2 RSs NCT3: 3 QCs, 10 ARTGs, 17 Yard-trailors, 2 RSs	
Technical Cooperation Project			Improve management and operation of the Container Terminal	JICA Grant

Please see a separate paper.

Marketing (Enhancement of Customer Relationship)

- Good public/customer relations will assist PAS to more effectively manage and operate the port. In this project, the Team, accompanied by PAS marketing staff, visited customers such as cargo owners, freight forwarders and shipping line agents in Sihanoukville as well as the shipping lines in Phnom Penh to obtain their opinions on current SHV Port operation.
- After the COVID-19 pandemic, we have conducted the similar activities remotely and held discussions with the Business Dept. of PAS from time to time.
- Opinions and information acquired in the above activities are valuable and helpful to evaluate the current situation of the port and to consider the way forward to improve the port performance.
- Therefore, the Business Dept. should such the opinions of users among other Departments and report to the management of PAS from time to time.



Feedback from the Port Users

- Almost no berth waiting has been observed these days.
- Crane productivity has been relatively good, but the number of handling equipment is sometimes inadequate during the ship-side operation due to maintenance and/or repair works. These information should be shared among shipping lines/agencies.
- The congestion in the yard has been within the acceptable range, but shipping lines pointed out the following issues.
  - The area of container yard should be expanded to cope with the cargo increase in the future.
  - Reefer yard will not be sufficient for reefer containers which are expected to grow in the future.
  - Import customs clearance sometimes takes time, which can lead to congestion in the yard. There are also some cases in which export container are not loaded to a scheduled vessel, which generates additional procedure in the Customs and PAS. Good coordination among shippers, Customs and PAS is a key for efficient operation of the yard and the gate.

Activities and Achievements (Output-2)

Activities

- Objective : CTMS operation capacity will be enhanced.
- Activities and deliverables

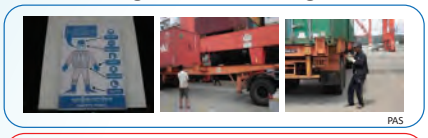
	Major Activity	Deliverables
2-1	● Examine the reception procedure at Gate and prepare the operation flow ● Examine the traffic flow and propose its improvement at the workshop	● Operation flow for Gate reception procedure ● List of required documents for the reception procedure
2-2	● Observe the container handling operation at site or by using drone ● Propose countermeasures at the workshop	● Countermeasures for issues concerning container handling efficiency and safety
2-3	● Propose improvement of Control Centre at the workshop. ● Follow-up the change in the instruction flow conducted by PAS	
2-4	● Prepare software to general various information from CTMS such as KPI, etc.・	● Extended CTMS Usage manual
2-5	● Support to formulate SOP	● SOP for CTOD and GCOD

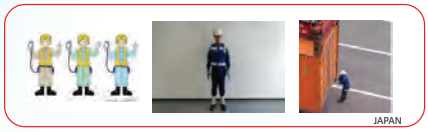
Proposal and discussion at the workshop

Visit	Title	Proposals
2	● Issues Concerning Container Handling Operation in Vessel Operation	● Lashing Team / Tools for Lasing ● Empty container Handling ● Mobile Harbor Crane ● Maintenance of handling Equipment
	● SOP for the Lashing Team and Traffic Flow of Trailers inside the Port	● Operational Procedure for Lashing Team ● Traffic Flow for Yard Trailers/Hauliers Trailers
3	● Comparison of Productivity between Gate and Yard (RTG) using CTMS data (7/2 – 7/8)	● Findings by the statistical data for Gate in Moves and container moves in RTG area
	● The role of Control Center and the current issues	● Improvement of Control Centre
	● Issues concerning Vessel Operation and SOP for RTG Operators	● Several issues in Vessel operation ● Operational Procedure for RTG operator
4	● Observation of Container Handling at Site Issues and Countermeasures	● Vessel operation (Kobe vs Shihanoukville) ● Traffic control during the congestion in the yard ● Traffic flow at the quay, hatch cover operation, etc.
5	● Follow up of baseline survey and the simulation on weekly container handling based on the berth schedule	● Simulation of container movements in the yard based on the planned berth schedule using Excel
6	● Follow up of baseline survey / SOP for Container Terminal Operation Dept. (Vessel related operation)	● Discharging of OOG containers
	● Observation of General Cargo Operation and Terminal at Site Issue and Countermeasures	● Improve cargo storage, safety wears, organized workspace, improve lifting work, deployment of supervisor for the work, improve cargo handling efficiency, sand/gravel, etc.

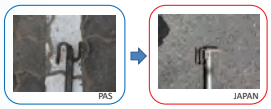
Issues/Measures presented at the Workshop (1/2)

Working Ware for Lashing Team





Lashing Lock/Unlock Bar



Lashing lock/unlock tool has to be improved for easy and secure operation

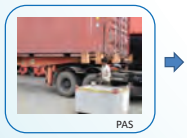
Shape of Trailers which lowers the productivity

A : Single Side Guide　B : Single Side Guide　C : Dual Side Guide

Trailer Type should be unified to B

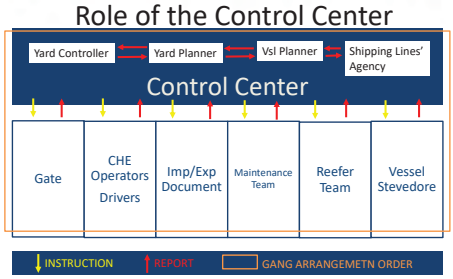
Attach / Remove Stacking Cones

At Least 2 lashers / gang must be assigned for stacking cone handlings
1 man -> 57sec
2 man -> 12sec



Preparatory work is required for efficiency and safety

Role of the Control Center



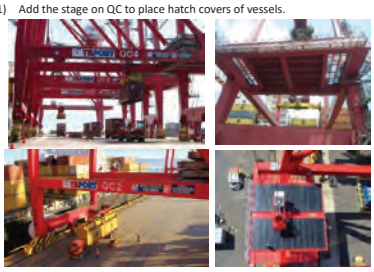
Mobile Harbor Carne

Heave Line (Control Line) has to be implemented to stabilize the movement. It will reduce the container handling time by at least 10 second for each move.

The Stage on QC to place Hatch Covers

Recommendation:

1) Add the stage on QC to place hatch covers of vessels.



Signaling for the Lashing Team

(6) Basis of Signaling

a. Call : Raise your hand
b. Location: Indicate by pointing
c. Hoisting : Raise your hand and rotate your arm
d. Lowering: Extend your hand and gradually lower and raise it as required
e. Stop: Raise your hand and make a fist
f. Emergency Stop: Raise both hands and flap your arms

(7) Rules in Signaling

a. If the signal man is absent, a substitute will be assigned.
b. Multiple signal men are prohibited in order to avoid confusion.

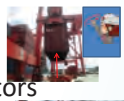
SOP for the Lashing Team

(8) Signaling for Remove / Attach Stackers (continued)

d. Send a signal for hoisting up to a side guide of a chassis after attaching stackers by 2 workers

e. Stop hosting after a spreader reaches the side guide of a chassis

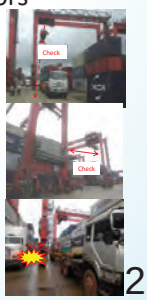
f. Send a signal for hoisting after confirming the spreader is separated from a chassis completely.



SOP for RTG Operators

(6) Travelling

a. Followings must be confirmed before start travelling
   - The pervious operator has got off RTG
   - The spreader is lifted up at the right position
b. An operator must confirm RTG is travelling straight by looking ahead to the travel path.
c. An operator must confirm there is no obstacle or any vehicles on the access path.
d. An operator must confirm the position of other RTG visually and by the voice radio If any RTG is working in the same lane.
e. Trailer path side should be more carefully watched as the trailer door may be open.



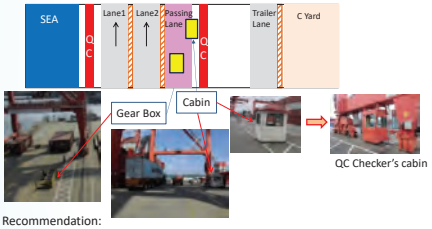
Issues/Measures presented at the Workshop (2/2)

Traffic Flow Between Berths and CY

★Short cut (Yellow line) should be prohibited

Minimize the moves crossing RTG run way for improving the efficiency and safety

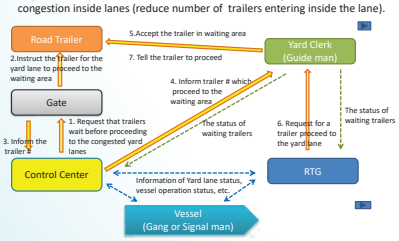
Traffic Flow of Trailers in the Yard



Recommendation:
The passing lane should be always cleared.
1) The quayside cabin should be removed -> Use a QC checker's cabin instead
2) The gear box, containers, etc. should not be stowed on the lane

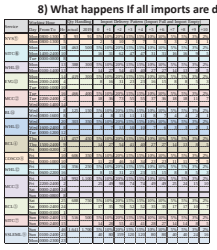
Traffic Flow Control inside the Yard Lane

Recommendation:
2) Implement a system to control outside trailers entering C Yard to avoid congestion inside lanes (reduce number of trailers entering inside the lane).



Simulation based on Berth Schedule

8) What happens if all imports are delivered in 10 days after vessel discharge?



Average Import Dell Time = 4.87 days

Import Delivery Pattern (Import Full and Import Empty)										
0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Moves	Export Rec	141	164	219	372	518	425	162	2,001
	Import Del	563	630	596	549	402	490	544	3,774
	E_mpty Rec	254	282	223	187	130	134	128	1,338
	Unload	682	153	454	270	447	774	1,074	3,854
	Load	1,112	144	186	267	341	722	565	3,337
Inventory	Import	3,201	2,738	2,667	2,440	2,612	2,927	3,488	
	Export	376	599	812	1,135	1,303	1,383	1,311	
	Empty	1,223	1,302	1,345	1,314	1,403	1,210	1,066	

- The simulation is conducted just by changing the import delivery pattern

Discharging of OOG Containers

Attachment used in Kobe Terminal.
Less vibration, up to 2 meters over height.

Keep it on chassis while unused.
It can be carried by the trailer

Lock/unlock is done by the rope.
The hydraulic type is also available

How about getting this type of attachment for OOG containers ?

Stacking Area of OOG Container

- Issues
  - Danger to handle cargo on the main traffic flow
  - It may stop the traffic of trailers (it may also affect gate flow)
- Proposal
  - Relocate OOG stacking area
    - For safety: Away from the access road
    - For efficient operation: Cranes, workers, and tools are located near
  - Utilize the current OOG area as trailer waiting area for controlling incoming trailers in yard lanes of RTG area

- Improve cargo storage -

Storage condition

Unstable

Damage on the yard

※ Good example

Maintain storage condition

Using wedges

No damaging is efficient continuous operation.

- Improvement lifting work -

Risk falling

No rubber equipment

Pipe Lifting work in Japan

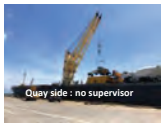
Risk slipping & falling

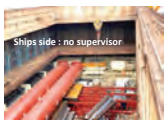
Heave line

Easy to operate & efficient

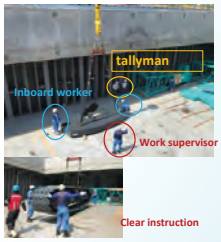
- Supervisors -

Current situation





Standard situation in JAPAN

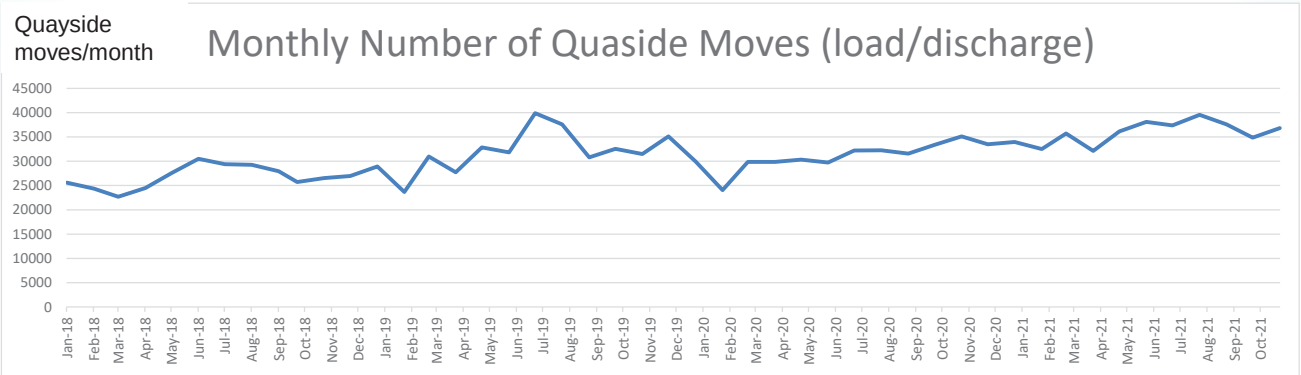


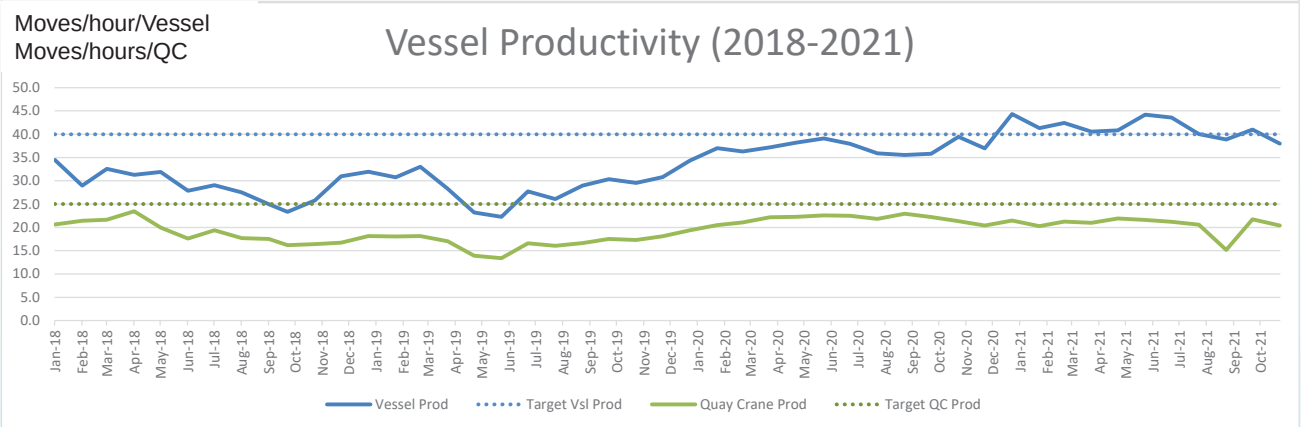
Major Achievements

Activities	Major Achievements
2-1 Examine and analyse causes of congestion at gate, traffic flow inside/outside CT.	● The operation flow and the documents required for the reception procedure of the Terminal gate are clarified ● They were documented and utilized for examining the traffic congestion issues.
2-2 Analyse operational conditions of CT by making full use of CTMS	● Several measures to improve the container handling efficiency and safety were proposed and discussed. ● They are documented in one of the deliverables.
2-3 Develop staff-enhancement plan of PAS to make full use of CTMS	● The **Operation Steering Group** among related dept. is established in PAS organization to manage the **Control Centre** for container handling operation in the yard.
2-4 Implement on-the-job-training to make full use of CTMS	● Extended usage of CTMS was documented to show how to get the data for getting KPI, etc.
2-5 Support to formulate Standard Operation Procedures (SOP) in each cargo handling department	● Standard Operation Procedures were documented ✓ Container Terminal Operation Department ✓ General Cargo Operation Department

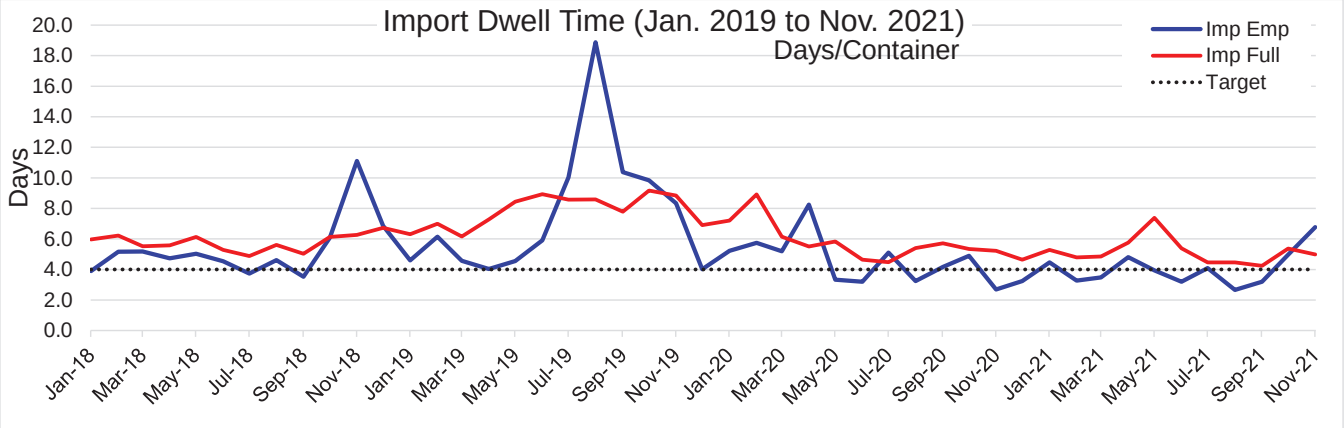
Transition of KPI Values from 2018 to 2021

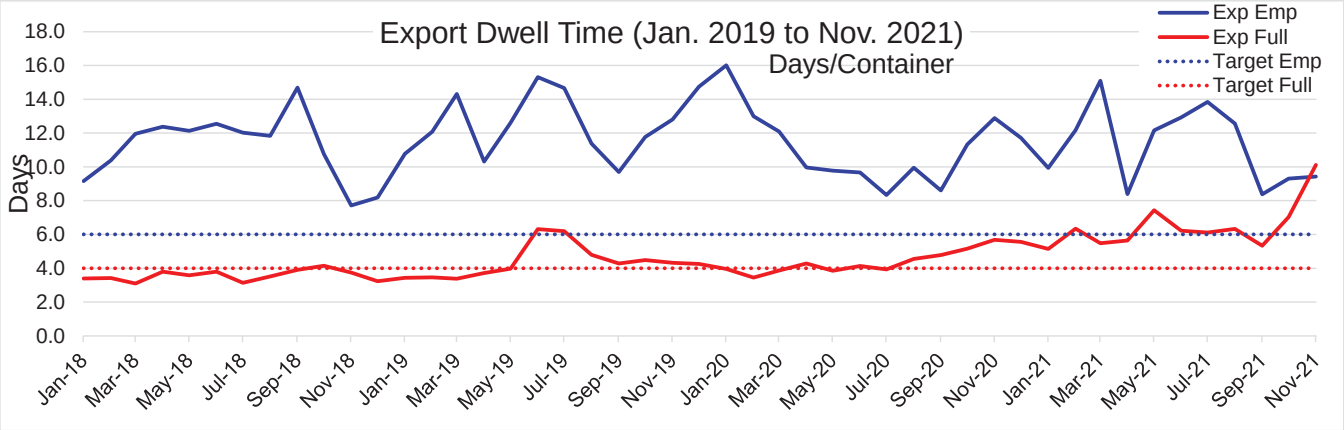
- KPI value has been improved or stable even though the annual throughput has increased since 2018 thanks to the effort by PAS in coordination with the Team



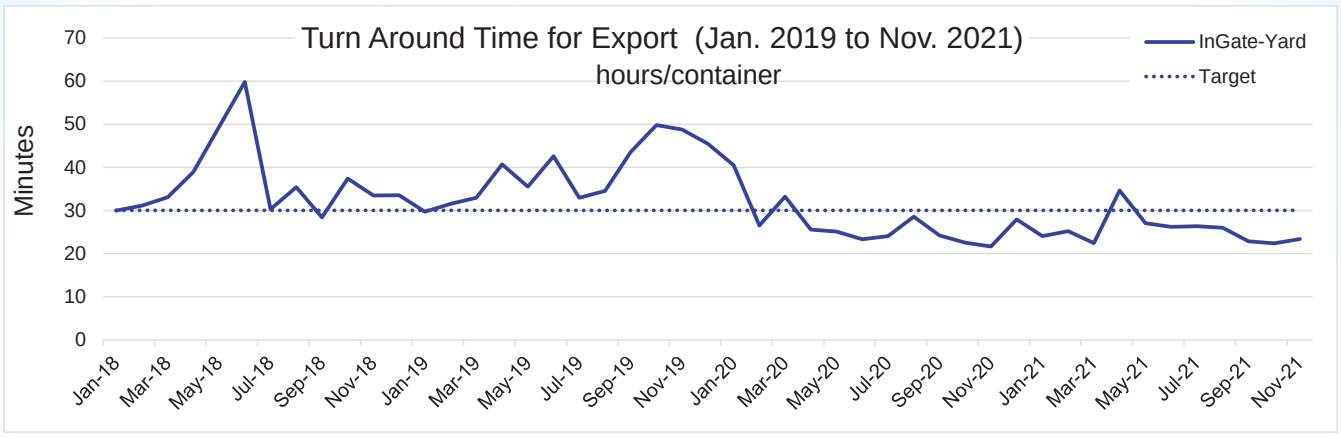


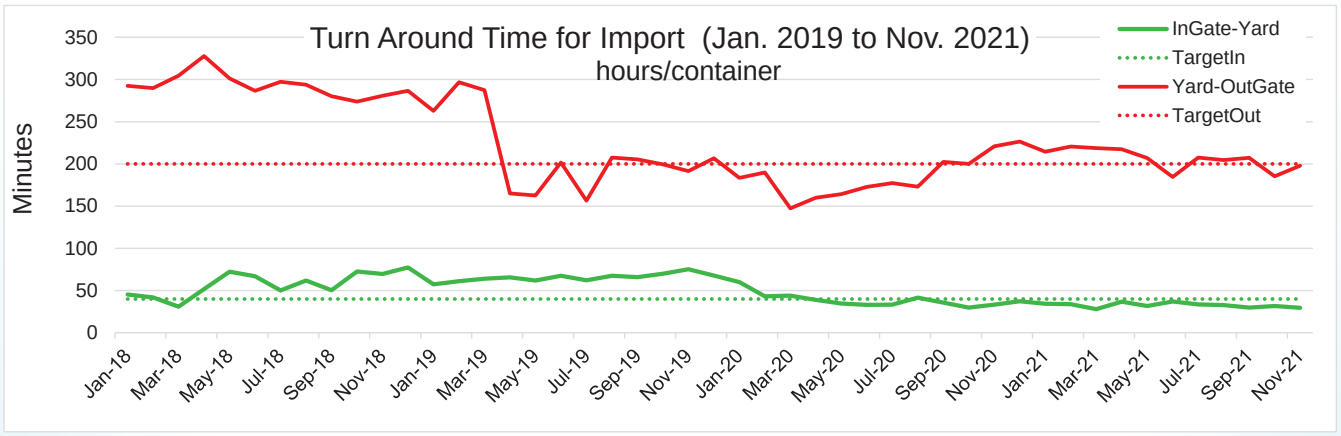
KPI Values from 2018 to 2021 (Dwell Time)





KPI Values from 2018 to 2021 (Turn Around Time)





Improvement of General Cargo Handling

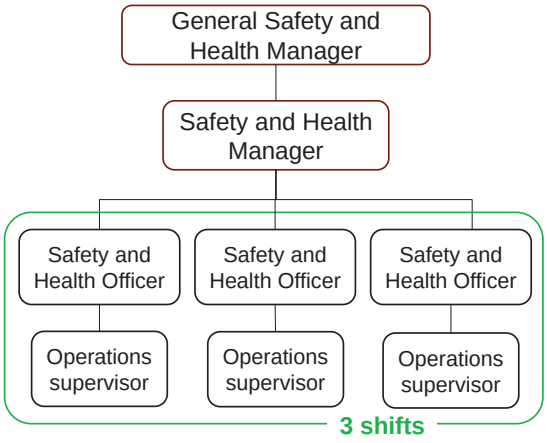
The need for safe operation should be stressed.

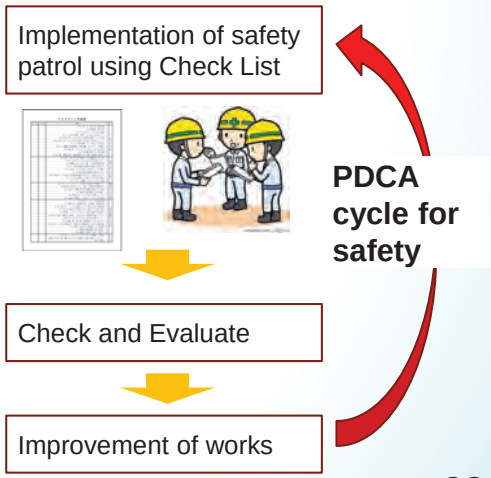
- Standard Operation Procedures (SOP) have been made for each type of cargo in the General Cargo Operation Department and training programs for the workers have been provided. However, safety equipment including helmets etc. is not always used in actual handling operations, particularly for outside workers
- Therefore, the Team proposes that the following organization be established to oversee work safety and safety procedures including "**Periodic Safety Patrol**" should also be established.

Proposal from the Team

- To organize safety management structure for the safe stevedoring work
- To conduct safety patrols on a regular basis using a checklist.
- To check and evaluate the results of patrols to improve work practices. (PDCA)

Organization for Safety Work

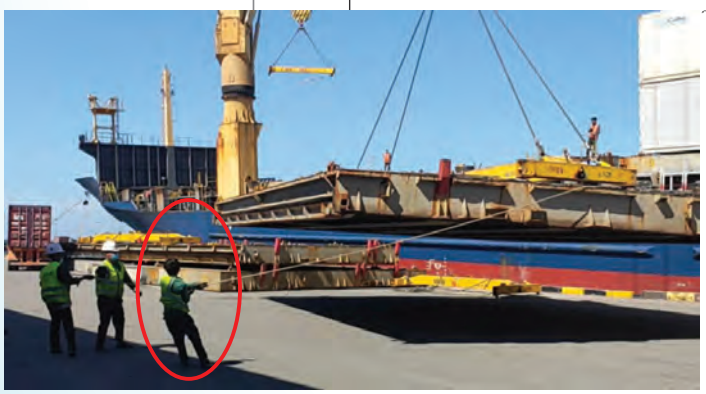




Safety Patrol

Safety Patrol Check List

Item	Area	stevedore in Vessel	stevedore landside	Yard	Ware house	Talle/Scale	
PPE	Are you wearing a **helmet** and chin strap?						
	Are you **wearing proper** clothing?						
	Are you wearing **safety shoes**?						
	Are you wearing a **safety belt** and using it properly?						
	Are there any other inappropriate actions?						
Crane trailer etc	Is the ground clearance of the crane secure?						
	Is the hoisting height of the crane sufficient?						
	Is the cargo-handling machine being operated with a sense of urgency?						
	Are the surroundings checked and warnings given when moving?						



Activities and Achievements (Output-3)

Activities and Achievements

- Objective: Entry and exit control and traffic flow management in port premises (including CT, rail yard and multi-purpose terminal) will be implemented.

No.	Major Activity	Achievements
3-1	Develop operation plan of entry and exit control based on the analysis conducted in 2-1.	“A Guideline for Entry and Exit Control (Stage 1)” was documented as a guideline of the Security Office of PAS.
3-2	Develop container operation plan of multi-purpose terminal linked to CT operation based on the analysis conducted in 2-1.	The Multipurpose Terminal will not be used as a container storage place. It is no longer necessary to create "Container Operation Plan" for the Multipurpose Terminal.
3-3	Develop a container operation plan of the rail yard linked to CT operation based on the analysis conducted in 2-1.	The draft of “Rail Yard Operation Plan was documented and propose it to the director and the chief of Control Center of Container Operation Dept. to be applied to the actual operation in the Rail Yard.
3-4	Implement pilot operation of entry and exit control based on the operation plan to be developed in 3-1 and develop roadmap to full-scale operation.	Based on the "A Guideline for Entry and Exit Control (Stage 1)" developed in 3-1 the Security Office has prohibited entering of motorcycles.
3-5	Implement pilot operation of empty container stacking yards and develop roadmap to full-scale operation.	The JICA Team proposed the candidate locations for empty container storage, the modification of container layout with their capacity. As a result, a container storage yard in the SEZ has been set up for empty containers.

Access Control

- Prohibiting customs-broker's motorcycles from entering the container operation
  - It is necessary to complete necessary procedures for discharge/receipt of containers before road-trailers reach the Gate 3.
  - Motorcycles, cars and persons should be prohibited from crossing over the safety zone in front of the Gate 3. This passing zone is only for road-trailers to export and import containers and yard-trailers.
  - Signboard should be installed at both the entrance and exit of each passage to the container operation area.

Location of "Access guard clerk"

Traffic Signboard

- Traffic signboard to be installed in the port
  - The following signboard should be installed at the outside & inside entrances of Gate 3, the Passage next to PAS office and all passage to Container Operation Area.

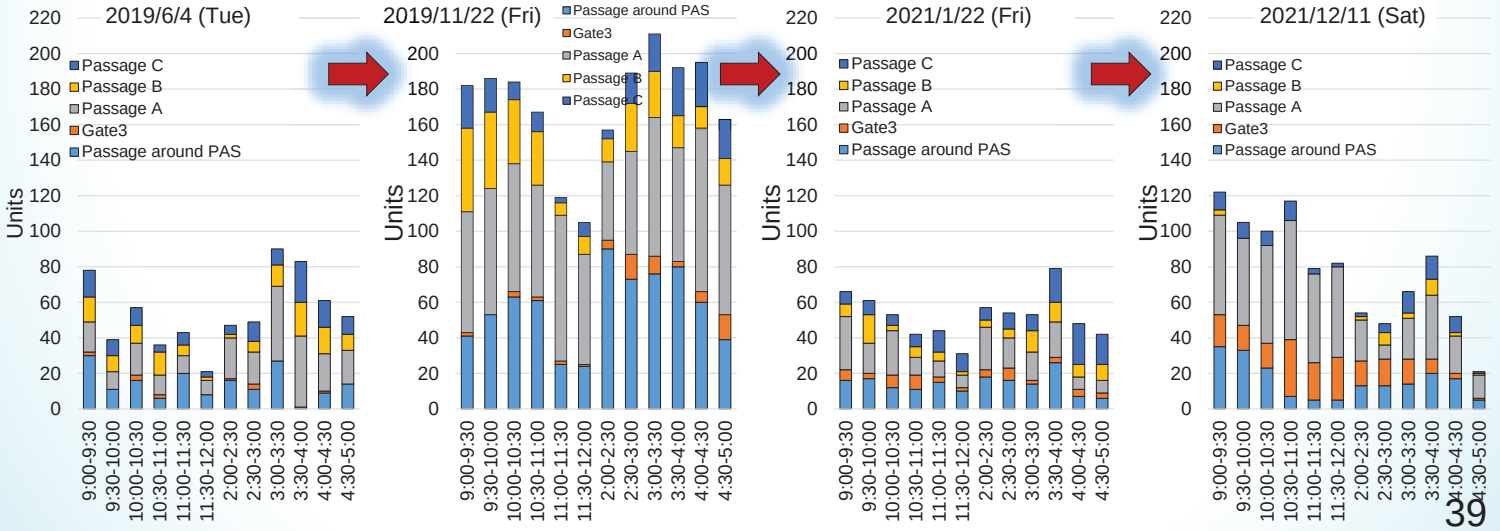
Not allowed in
Motorcycle/Tricycle & Car

Target vehicle	Entry/Exit to the Port			Access roads
	Gate 3	Passage next to PAS Office	Gate 2	Access roads in the Port/Terminal
Motorcycles	Prohibited	Prohibited	Allowed	Only authorized access roads shall be used
Cars	Prohibited	Prohibited	Allowed	Only authorized access roads shall be used
Employee's Cars	Prohibited	Allowed	Allowed	Only authorized access roads shall be used

KPI for Output-3 (Motorcycles Entering CT Operation Area)

Traffic Volume (9 am to noon & 2 pm to 5 pm)

Type of Vehicle	Place of Entry	2019/6/4	2019/11/22	2021/1/22	2021/12/11
Motorcycle	Passage around PAS	169	685	168	190
	Gate3	12	62	52	178
	Passage A	237	827	189	452
	Passage B	117	284	87	27
	Passage C	121	192	134	85
	Total	**656**	**2,050**	**630**	**932**
Car	Passage around PAS	67	76	28	30
	Gate3	5	6	0	0
	Passage A	57	51	58	0
	Passage B	29	13	9	5
	Passage C	27	27	12	10
	Total	**185**	**173**	**107**	**45**



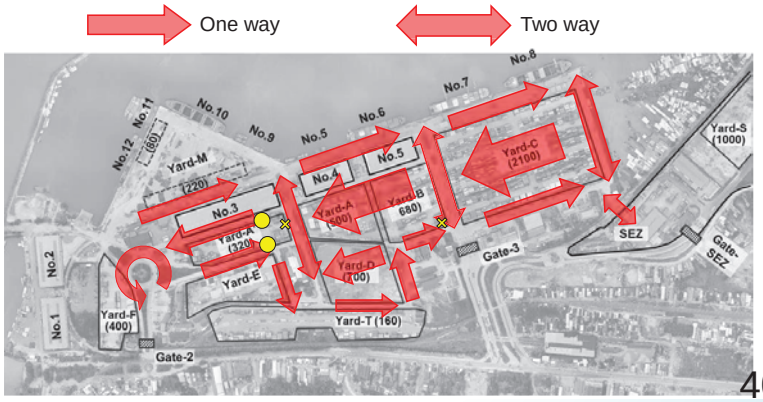
Traffic Flow in the Port

- Expert Team proposed the "Traffic Flow in the port" in the 5th dispatch (June ~ July 2019).
- PAS reviewed and modified the traffic flow in accordance with the latest yard layout, and the smooth traffic flow in the port has been realized at his moment.

Outline of Trailers' Traffic Flow Control

- The trailers' traffic flow shall be controlled properly according to the yard arrangement plan.
- The traffic flow control/rule shall be shared among drivers of yard trailers as well as outside trailers by such as the route map, the signboard on the road side so that they are able to follow the traffic flow control.
- The traffic flow of outside trailers shall be restricted to enter RTG yard during the vessel operation in order to alleviate the congestion inside the yard. In particular, outside trailers shall be stopped once at the landside of Yard-C (i.e., designated waiting area) and be controlled by yard checkers with the cooperation of the control center when entry into the yard lanes.

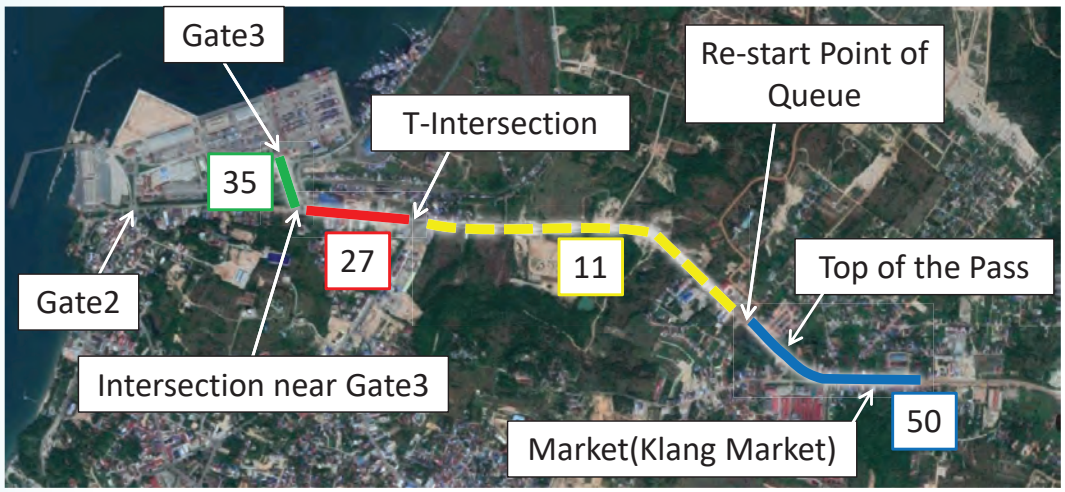
Basic Traffic Flow (Modified)



Activities and Achievements (Output-4)

Trailers Queue in front of the Gate-3

- The longest queue was observed on the morning of May 12, 2018; 123 trailers were observed up to the market located on the top of the pass of NH No.4



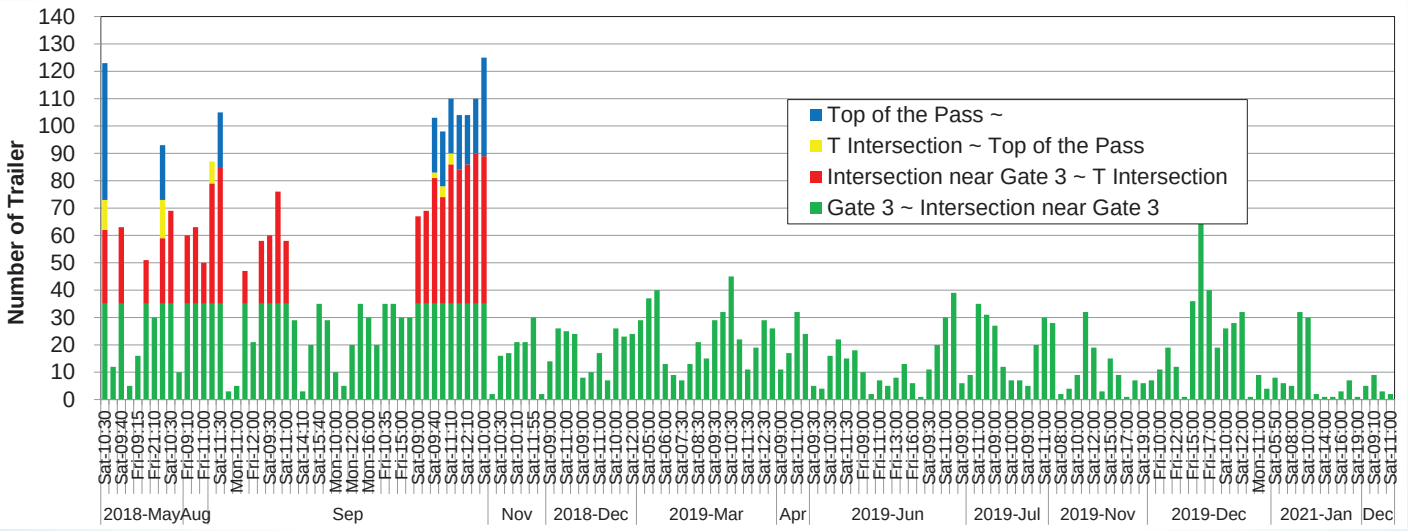

Intersection near Gate3

Four lanes all in one direction are used


Top of the Pass near Klang Market

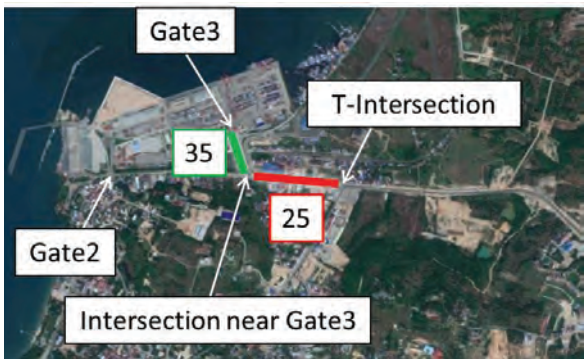
Traffic Situation at the Gate 3

- The following countermeasures were introduced from October 2018 by the Special Team in PAS.
  - All 6 lanes begin operation at 6:00.
  - Gates open 24 hours on Friday (until Saturday morning)
  - Gate clerks and gate checkers are deployed around the gate to give instructions to trailer drivers.
  - Trailers having incomplete documents are allowed to go inside the port and wait in the backyard of the Yard-C.
  - To expedite the procedure at the gate



KPI Values for Output-4

Output	Objectively Verifiable Indicator (as per the PDM)	**KPI**	Baseline	**Target Value (1)**	Results (2)	(2)/(1)
4 (1)	Waiting trailers in front of the terminal gate will be reduced	**Number of Waiting Trailers**	123	**60**	**32**	**53.3%**
4 (2)	Trailers passing the gate will be increased	**Number of Trailers Passing Gate (All lanes at Gate3) /(hour) Friday and Monday**	80	**104**	**106**	**101.9%**
Additional data	Trailers passing the gate will be increased	**Number of Trailers Passing Gate (All lanes at Gate3) /(hour) Saturday**	91	**118.3**	**126**	**106.5%**



The figure of 60 in the table was set assuming that 35 trailers with the length of 20m are waiting in front of the gate 3 and 25 trailers are queuing in one lane of the Rout-4 (500 meters).

Activities and Achievements (Output-5)

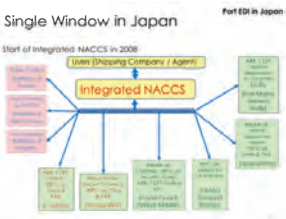
Activities of Output 5

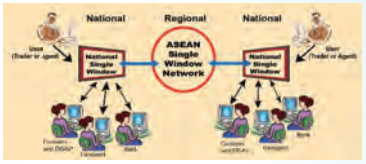
- Activity 5 has been planned under the pre-condition that the Port EDI system will be installed in Cambodia. Port EDI System project started in November 2020 but it will not be completed before the end of this Technical Cooperation Project.
- Although the output “Vessel arrival/departure procedure will be improved via Port EDI” could not be achieved, PAS personnel learned about port-related procedures under international standards and Port EDI System for ship clearance formality. Tasks currently conducted at the Clearance Committee will be smoothly transferred to the Port EDI System based on adequate preparation through the User Acceptance Test once the system enters operation.

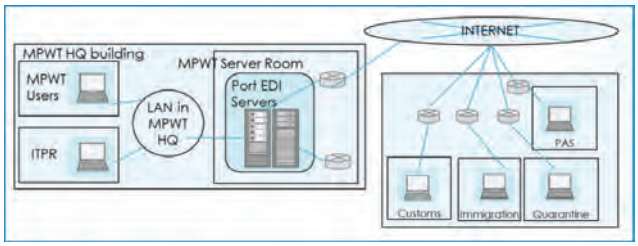
	1sty (Apr/2018-2019)	2ndy (Apr/2019-2020)	3rdy (Apr/2020-2021)	4thy (Apr/2021-Jan)	2022
Workshop	May: FAL Convention Port EDI (Japan)	Dec Cam-Port EDI Port and ICT	Feb Statistics of PAS Future Direction	Jul Port EDI System and Statistics	
Port EDI System Development Project	<GA: Feb. 2019>	(**Jul:** Start) ➠	**Nov:** Start **Dec** Kickoff-M	Monthly Meeting **Proto-Type** **Jan**: **UAT** (**Apr:** Go-Live)➠	- - - - - **Aug/2022** Go Live

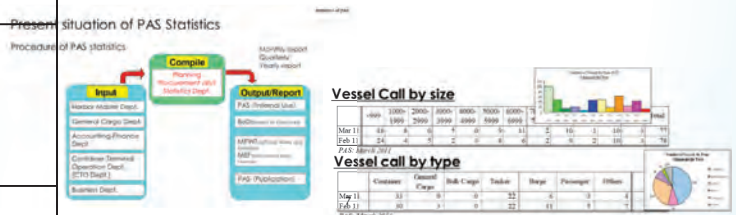
Workshop

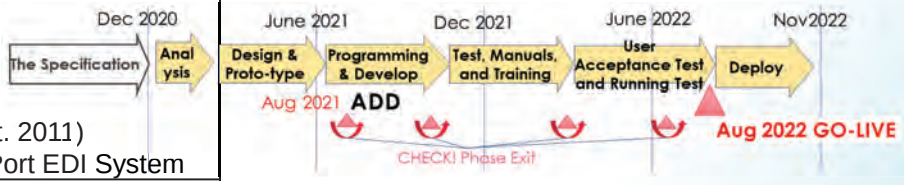
Port Entry/Departure Clearance Procedures and Port EDI(29 May 2018, JICA team)
1. FAL 2. Port EDI in Japan 3. Port EDI in ASEAN
Port EDI System and Port related procedures (20191220 JICA Expert Team
1. Introduction 2. Port EDI System of Cambodia 3. Port-related Procedures 4. Port EDI of Japan 5. Port EDI in ASEAN Countries 6. Expansion of Utilization of ICT
Guidance to the compilation of cargo statistics by use of Port EDI (8th February 2021 JICA Expert Team)
1. PAS Statistics 3. Method of Gathering Data 4. Data owned by Each Department 5. Efficient Statistical Work 6. Future Policy
Output 5 of the Project (20210728 JICA Expert Team)
1. Port EDI System and Statistics 2. Outline of Output 5 3. Port EDI System of Cambodia 4. Statistics of PAS 5. Port Statistics Survey and Analysis (Sept. 2011) 6. Guidance for Making Port Statistics via Port EDI System











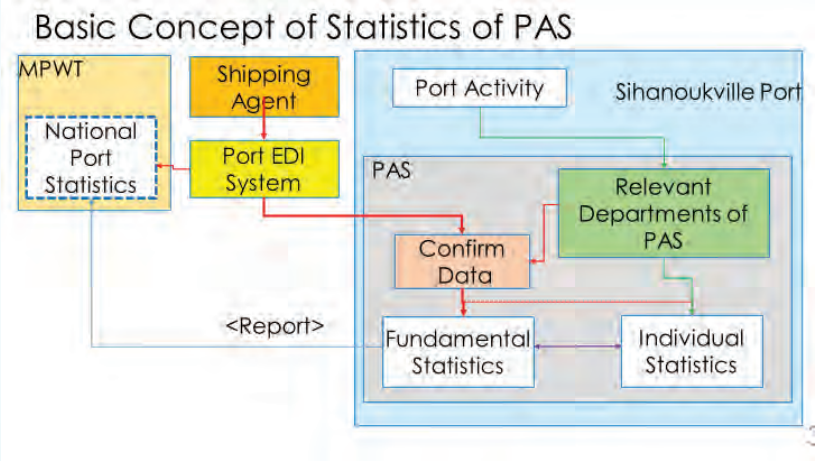
Outputs of Activities (1)

- PAS personnel deepened their understanding of the international standards on procedures for ship entry and departure, importance of digitization, experiences of Japanese ports and ASEAN countries through discussion at workshops..
- PAS personnel understood the Port EDI system, which is developed by Japan's grant aid-project, through discussions at Monthly meeting of Management Committee organized by MPWT and implementation session of proto type system. User Acceptance Test will be implemented from January to July.
- BY effective implementation of User Acceptance Test. PAS personnel are expected to implement digitized ship clearance procedures by the Port EDI system.

User Acceptance Test		
Objective to confirm the functions and performance of the system through User verification to be conducted by the Buyer		
UAT1	UAT2	UAT3
Jan. - Mar.	Apr.- May	Jun. – Jul.
Functional Test	Regression Test, Business operation	Business operation (Running test)

Outputs of Activities (2)

- Guidelines to compile calling vessel statistics via Port EDI was created.
- When the port EDI system is placed in operation, calling vessel statistics of Sihanoukville Port will be organized by using data from Port EDI System.



Guideline to Compile Calling Vessel Statistics via Port EDI System

the Project for the Capacity Development on Container Terminal Management and Operation in Sihanoukville Port-Phase 2

Other Activities & Proposal

Countermeasures to Increase T/L Capacity

Yard side

- Purpose
  - To increase the yard capacity
  - To improve berth productivity through reducing peak loads of the yard
- Countermeasures
  - Conversion of Warehouse No.5 to the container yard (Yard-B': around 220 TEU Grand Slots)
  - Introduction of additional RTGs to improve yard performance
  - Reduction of container dwelling in the yard in collaboration with shipping lines and importers/exporters, or by **imposing kinds of penalties for long-dwelling containers** (particularly for export empty container)

[Import container]

- Strong request to shipping companies and consignees for early delivery from the port

[Export laden]

- Strong request to shippers for refraining from early delivery to the port

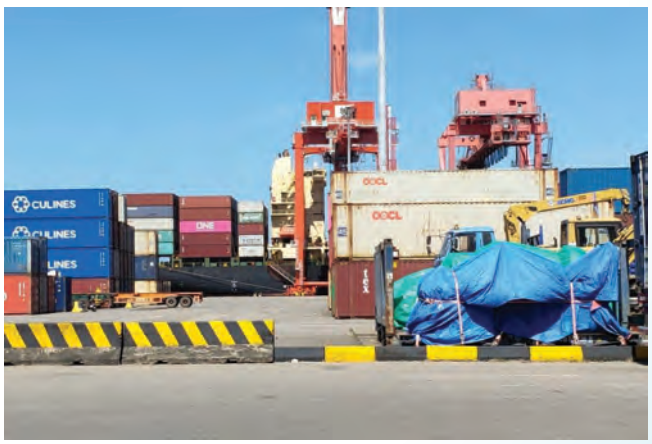
[Export empty]

- Strong request to shipping lines for reduction/eradication of empty container leftovers in the port
- Strong request to shipping lines for refraining from early delivery to the port

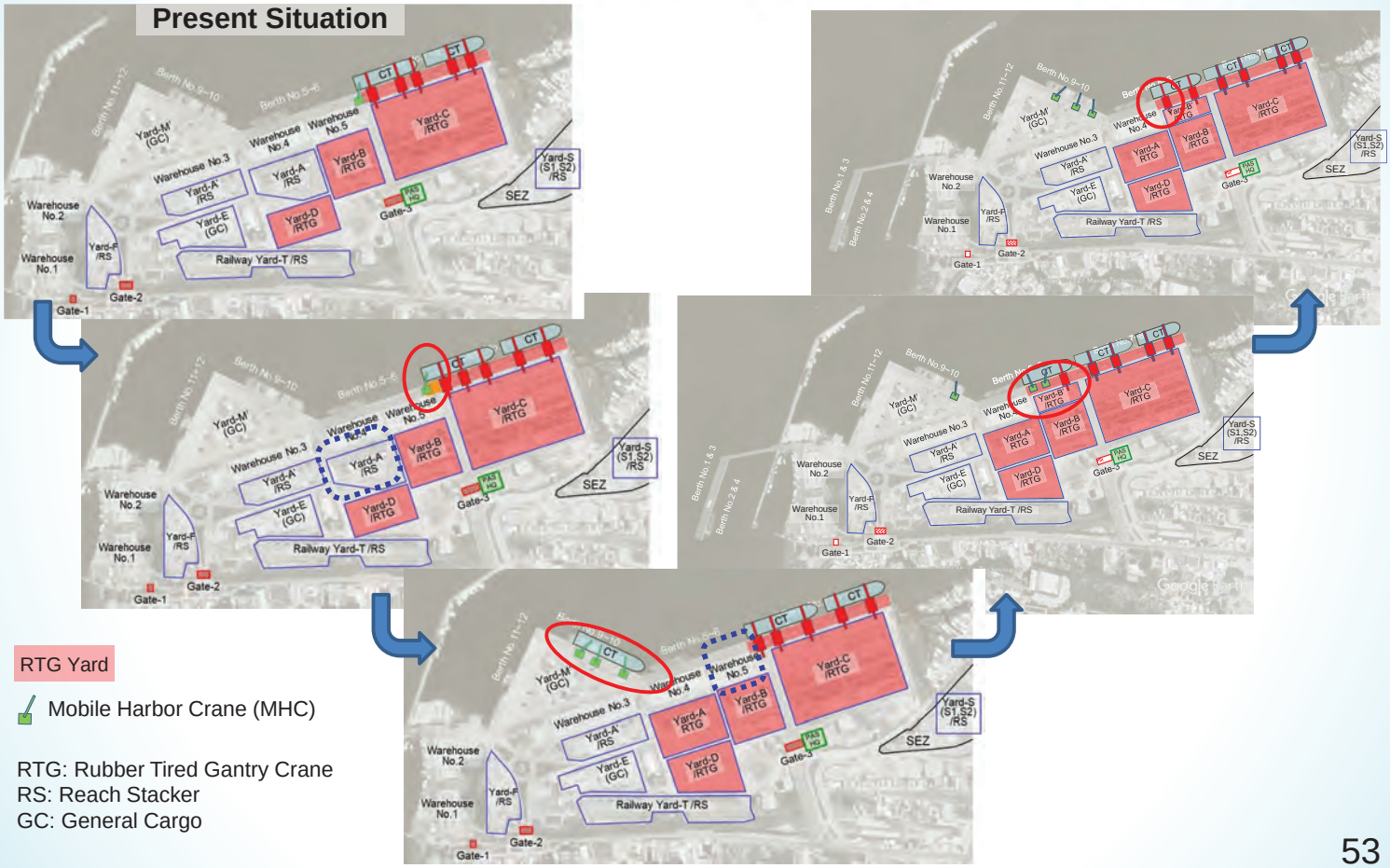
Countermeasures to Increase T/L Capacity

Berth / Quay Crane side

- Purpose
  - To avoid the berth shift operation
  - To improve the berth window
- Countermeasures
  - Extension of the crane rail by 25m toward Berth-6
  - Extension of crane rail by 246m onto Berth-6 (together with the Yard-B').
  - Introduction of 2 MHCs for container handling at general cargo berth, i.e., Berth 5~6 or Multi Purpose berth. ***(Expected in the end of 2022 by Grant Aid)***
  - Introduction of 1 QGC (Total 6 QGC)



Improvement of the Existing T/L Capacity

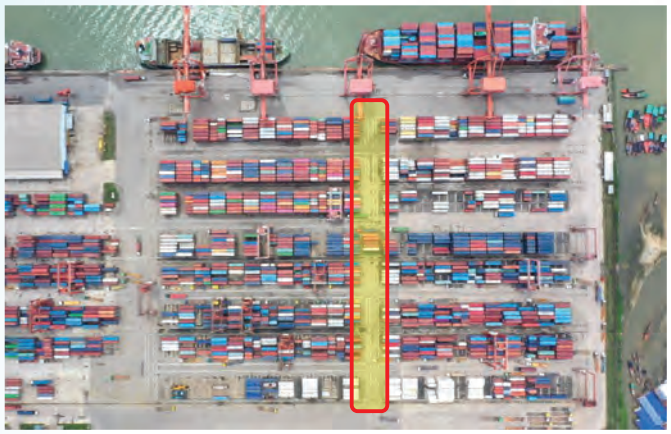


RTG Yard

Mobile Harbor Crane (MHC)

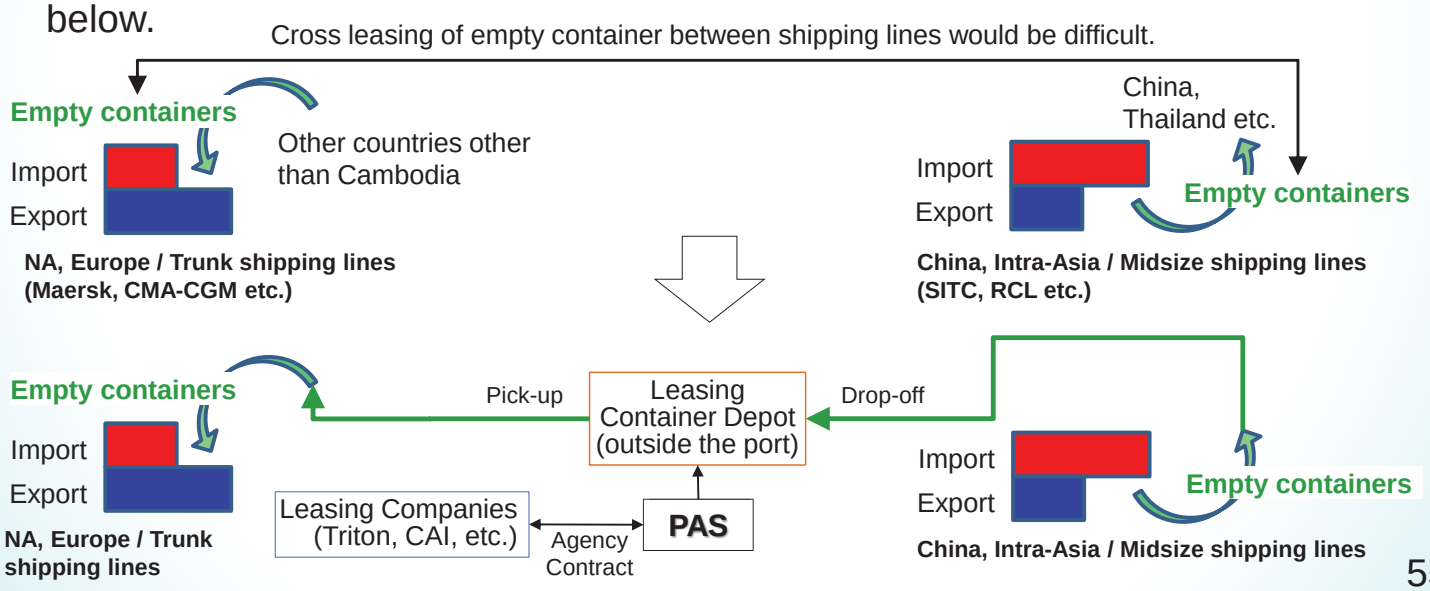
RTG: Rubber Tired Gantry Crane
RS: Reach Stacker
GC: General Cargo

Possible Area to Expand the Container Yard



Resolution of the Imbalance of Empty Containers

- Regarding empty import and export container, the Team observed a large imbalance between large-scale shipping lines for trunk route linking the North American and European region and midsize shipping lines for Intra-Asia region including China. However, cross leasing of empty containers between shipping lines which has different market area would be difficult. One idea to resolve the imbalance of empty container between the shipping companies and to reduce empty export containers is to set up a "**Leasing Container Depot**" as shown below.



Drafting Standard Operation Procedures (SOP)

- SOP for the major duties of the departments have been drafted upon request by PAS. They are still work-in-progress and will be compiled in the completion report which will be submitted in next January.

Department	Duty
Administration & Human Resource Dept.	Human resource development
Planning Procurement & Statistics Dept.	Formulation/performance monitoring of 5-year management plan
Marketing Dept.	Marketing
General Cargo Operation Dept.	General & special cargo handling
Container Terminal Operation Dept.	Container terminal operations
Business Dept.	Billing
Technical-Materials Dept.	Preventive maintenance of equipment
Construction-Engineering Dept.	Construction/maintenance of facilities

PDCA (Plan, Do, Check, and Action) is vital in each operation.

Remaining Issues

- Publishing 5-year plan to the shareholders/Investors with CSX's approval
- Follow-up of Port EDI installation and operation
- Follow-up of the capacity improvement of the current container terminal.

etc.

Some of the remaining issues will be addresses in the forthcoming project.

Thank you very much !
We appreciate your good collaboration during the Project !

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The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port (Phase 2)

5th Joint Coordination Committee

Reference

Contents

- Current Situation of SHV Port
- Activity List in the PDM
- Records of JCC, PIU and Workshop

December 20, 2021

OCDI

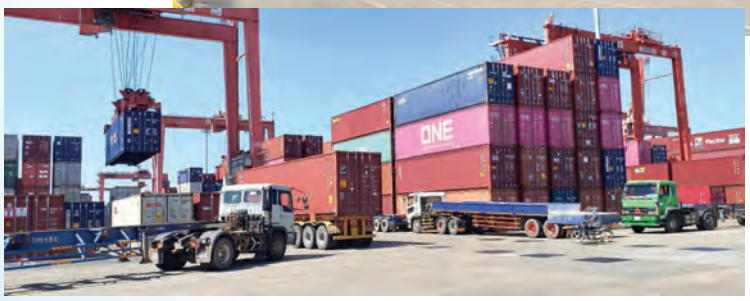
(The Overseas Coastal Area Development Institute of Japan)

Bird's-eye View of SHV Port (December 11, 2021)

Bird’s-eye View of SHV Port (December 11, 2021)

Bird’s-eye View of SHV Port (December 11, 2021)

Field Observation on Saturday (December 11, 2021)



Main Port Facilities of SHV Port

Aerial Photo (Afternoon on December 11, 2021)

Activities in the PDM

Output 1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.

1-1. Analyze formulation process of corporate strategy (mainly CT) of PAS considering the similar best practices at other ports.
1-2. Analyze applicability of corporate strategy (mainly for CT) formulation process of port operation companies (e.g. certain Japanese companies).
1-3. Systemize formulation process of corporate strategy (mainly CT) to gain the understanding of shareholders/investors based on the results of 1-1 & 1-2.
1-4. Develop roadmap to set-up strategic planning department which is responsible for formulating corporate strategy (mainly CT) in PAS.
1-5. Support setting-up of a strategic planning department in PAS.
1-6. Support to formulate Standard Operation Procedures (SOP) for selected departments of PAS as well as support the assessment of organization including job specifications.
1-7 Support the formulation of a facility investment plan for medium/long-term.

Output 2. CTMS operation capacity will be enhanced.

2-1. Examine and analyze causes of congestion at gate, traffic flow congestion inside/outside CT.
2-2. Analyze operational conditions of CT by making full use of CTMS after installation of additional QGCs and RTGs.
2-3. Develop staff-enhancement plan of PAS to make full use of CTMS after installation of additional QGCs and RTGs.
2-4. Implement on-the-job-training to make full use of CTMS based on the staff-enhancement plan.
2-5. Support to formulate Standard Operation Procedures (SOP) in each cargo handling department.

Output 3. Entry and exit control and traffic flow management in port premises (including CT, rail yard and multi-purpose terminal) will be implemented.

3-1. Develop operation plan of entry and exit control based on the analysis conducted in 2-1.
3-2. Develop container operation plan of multi-purpose terminal linked to CT operation based on the analysis conducted in 2-1.
3-3. Develop a container operation plan of the rail yard linked to CT operation based on the analysis conducted in 2-1.
3-4. Implement pilot operation of entry and exit control based on the operation plan to be developed in 3-1 and develop roadmap to full-scale operation.
3-5. Implement pilot operation of empty container stacking yards and develop roadmap to full-scale operation.
3-6. Implement pilot operation of container handling at rail yard based on the container operation plan to be developed in 3-3 and develop roadmap to full-scale operation.

Output 4. Incoming/outgoing traffic flow congestion will be mitigated at gate as well as outside of Sihanoukville Port premises.

4-1. Support to design a system which publishes the operating status of the container terminal using Web system.
4-2. Implement pilot operation of the above system and develop roadmap to full-scale operation.
4-3. Preliminarily design off-dock yard as pre-screening system of improper document trailers (IDTs) with evacuation space based on the analysis (to be conducted in 2-1).
4-4. Implement pilot operation of pre-screening system of improper document trailers (IDTs) together with evacuation space based on the preliminary design (to be achieved in 4-3) and develop roadmap to full-scale operation (in case that PAS introduces the system at its own expense).
4-5. Propose countermeasures to cope with the increase of container handling up to 800,000 TEU, and support its implementation.

Output 5. Vessel arrival/departure procedure will be improved via. Port EDI.

5-1. Assist Port EDI taskforce (PAS, PPAP, MPWT) to appropriately introduce and operate Port EDI for vessel arrival/departure procedure.
5-2. Document procedure of vessel arrival/departure will be eliminated soon after Port EDI is introduced.
5-3. Develop guideline to compile calling vessel statistics via. Port EDI data.

Records of JCC, PIU and Workshop

- Joint Coordination Committee (JCC) and Project Implementation Unit (PIU) meetings were held as follows:

	No	Date	Subject	# of Att's
JCC	1	May 9th 2018	Approval of the Work Plan	30
	2	December 4th 2018	Results of the Baseline Surveys and setting of Target Value of KPIs Progress of the Project in the 1st, 2nd and 3rd Dispatches	33
	3	April 8th 2019	Modification of PDM Progress of the Project in the 4th Dispatch	30
	4	December 23rd 2019	Modification of PDM and KPIs Progress of the Project in the 6th Dispatch	27
	5	December 20th 2021	Achievement of the Project	
PIU	1	May 17th 2018	Method of Baseline Surveys and Follow-up Surveys	33
	2	August 16th 2018	Progress of the 1st Dispatch and Activity Plan of the 2nd Dispatch	25
	3	September 19th 2018	Results of Baseline Surveys and setting of Baseline/Target Value	24
	4	November 14th 2018	Activity Plan of the 3rd Dispatch	26
	5	March 19th 2019	Activity Plan of the 4th Dispatch	25
	6	June 21st 2019	Activity Plan of the 5th Dispatch	29
	7	November 18th 2019	Activity Plan of the 6th Dispatch	23
	8	September 25th 2020	Follow-up activities on remote basis (KPIs, Topics from the Team) (Web Meeting)	24

Records of JCC, PIU and Workshop

- Workshops of Team-A (Strategic Management) related to Output 1) were held as follows:

No	Date	Agenda	# of Att's
1	September 14th 2018	Issues related to Output 1	26
2	November 19th 2018	Marketing Action Plan	21
3	December 6th 2018	Introduction to Managerial Accounting	16
4	April 3rd 2019	Methodology of Managerial Accounting	20
5	July 15th 2019	Profit & Loss Statements by Business Sector	20
6	July 29th 2019	Unit Revenues & Unit Costs to be used for the Simulation of 5 Year Management Plan	20
7	Dec 4th 2019	Trial Formulation Works for 5-Year Management Plan	21
8	February 8th 2021	Formulation Works for 5-Year Management Plan	17
9	October 13th 2021	Formulation & technology transfer of 5-Year Management Plan	20

Records of JCC, PIU and Workshop

- Workshops of Team-B (Container Operation and Management) related to Output 2 & 3 were held as follows:

No	Date	Agenda	# of Att's
1	August 27th 2018	Issues related to container handling efficiency/sharing information and examining countermeasures	34
2	September 6th 2018	Current situation and issues of motorcycles and cars entering gates 2,3, etc. Sharing information and examining countermeasures	32
3	September 13th 2018	SOP for the Lashing Team and Traffic Flow of Trailers inside the Port	29
4	September 21st 2018	Proposal of Measures for Enhancement of Container Handling Capacity	17
5	November 16th 2018	1. Comparison of Productivity between Gate and Yard (RTG) using CTMS data (Output 2) 2. Container Storage Plan and Utilization of the Multi-Purpose Terminal (Output 3)	20
6	November 30th 2018	Role of the Control Center and Current Issues (Output 2)	23
7	December 11th 2018	1. Issues concerning Vessel Operation and SOP for RTG Operators (Output 2) 2. Current Situation of Motorcycles entering Container Yard C and entering from Gate 3 and Passage (Output 3)	16
8	March 28th 2019	Observation of Container Handling at Site / Issues and Countermeasures (Output 2)	24
9	April 5th 2019	A Guideline for Entry and Exit Control Operation Plan of Multi-purpose Terminal (Output 3)	24
10	July 12th 2019	Traffic Flow of Trailers in the SHV (Output 3)	23
11	July 24th 2019	Follow up of baseline survey and the simulation on weekly container handling based on the berth schedule (Output 2)	19
12	July 31st 2019	Trailer's Traffic Flow Control (Output 3)	23
13	December 2nd 2019	Follow-up Survey on New KPI of Motorcycles entering the Container Yard C (Output 3)	
14	December 4th 2019	1. Follow up of baseline survey /SOP for Container Terminal Operation Dept. (Vessel related operation) 2. Observation of General Cargo Operation and Terminal at Site / Issue and Countermeasures (Output 2)	23

Records of JCC, PIU and Workshop

- Workshops of Team-C (Congestion Mitigation) related to Output 4 and workshops of Team-D (Port EDI Task Force) related to Output 5 were held respectively as follows:

No	Date	Agenda	# of Att's
1	September 21st 2018	Congestion issues (Results of congestion surveys outside the port and at the gate)	13
2	November 8th 2018	Trial Countermeasures for Mitigating the Congestion at Gate 3	24
3	April 9th 2019	Trial Countermeasures for Mitigating the Congestion at Gate 3	20
4	July 31st 2019	Baseline Survey and Off Dock Yard	20
5	December 22nd 2019	Traffic Situation at the Gate 3	20
6	February 8th 2021	Traffic Situation at the Gate 3	20

No	Date	Agenda	# of Att's
1	May 29th 2018	Port Entry/Departure Clearance Procedures and Port EDI	12
2	December 20th 2019	Port EDI and Port EDI Procedure	12
3	February 8th 2021	Guidance on the compilation of cargo statistics by use of Port EDI	20
4	July 28th 2021	Port EDI System and Statistics	25

Reference -4　Minutes of Discussion（JCC）

Minutes of Discussions
of
The 1st Joint Coordinating Committee
for
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

Following the provisions of the Record of Discussions for the Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2, signed on February 1, 2018, the 1st meeting of the Joint Coordinating Committee (hereinafter referred to as "JCC") for the Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2 (hereinafter referred to as "Project") was held on May 9, 2018 at the conference room of PAS. The attendants of the meeting are listed in the Attachment 1.

At the meeting of JCC, the Work Plan (Draft) including the Project Design Matrix (hereinafter referred to as "PDM") and the Plan of Operation (hereinafter referred to as "PO") was presented by the JICA expert team. Following the presentation, JCC approved the Work Plan (Draft) including the PDM and PO.

JCC acknowledged the comments from the attendants as follows:

H.E. Lou Kim Chhun, Chairman and CEO of PAS stated that there would be 2 ideas to increase the capacity of PAS for the peak time; one is to utilize the off-dock CY, and the other to utilize a pre-gate facility. He stated that he would expect the Project Team to examine these ideas.

Mr. Kotaro Tanaka, Senior Representative of JICA Cambodia Office, stated that he would expect the Project Team to make a consolidated effort not only with the Port EDI Project but also with other JICA projects to produce synergized effects; appropriate inputs are expected to be given to the New Container Terminal Development Project, and a free port concept be sought jointly with SEZ Project.

H.E. Lou Kim Chhun
Project Director,
Delegate of the Royal Government
in Charge as Chairman and CEO, PAS

Mr. Akira Koyama
Leader of JICA Expert Team,
Senior Executive Director of OCDI

Attachment-1

ATTENDENTS LIST

For

The 1st Joint Coordinating Committee

Of

The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port (Phase 2)

Date:	09th May 2018	**Time**	15:00 -17:00pm
Venue:	PAS's Conference Room		

N°	List of Attendants	Positions/ Organization	Signatures
1	H.E Lou Kim Chhun	Delegate of the Royal Government of Cambodia In charge of Chairman and CEO of PAS	
2	H.E Chan Dara	Director General, Representative of MPWT	
3	Mr. Atsushi HIROSE	Second Secretary, Embassy of JAPAN	
4	Mr. Kotaro TANAKA	Senior Representative, JICA Cambodia Office	
5	Mr. Akira KOYAMA	Team Leader, JICA Expert Team for the Project	
6	Mr. YABUNAKA Katsuichi	JICA Expert to PAS	
7	Toshimasa KAWASAKI	JICA Expert to MPWT	
8	CHEA YUTHDIKA	Deputy Director General, PAS	
9	Chhun Hong	——〃—— 〃 ——	
10	So Seang	Director of Planning	
11	Neak, Sophyan	Dept of Machinery	
12	CHEY SOCUNTHEA	Marketing Director	
13	NGOUN Rathana	Business Dpt	
14	Mr. Souk KOLCHENDA	Assistant to Chairman & CEO / (Project Coordinator of PIU)	

15	Khem Sitha	Dept Operation Planning, Procurement, Statistic	
16	Path Setha	Director of Accounting Dept	
17	Ouk Somaroth	Planning Dept	
18	TY SAKUN	Director of Technical Dept.	
19	May Sam Ann	Deputy of G C handling operation Dept.	
20	RATH SELA	Director of Admin Dept.	
21	CHHORN chamna	Program officer, JICA	
22	Norihito Fukuzawa	Member of JICA Expert Team, OCDI	
23	Kiyoshi Nakashima	JICA Expert Team, OCDI	
24	Mon Chamroeun	Director of Internal Audit	
25	Takehiko Saikawa	JICA Expert Team, OCDI	
26	Susumu Kimura	JICA Expert Team, OCDI	
27	Chiv Chansotheap	Internal audit of department	
28	Heng Sokhsan	SPSEZ Dept.	
29	Khin Vy	Marketing Dept	
30	SAN Chhon	officials of Admin-HR Depart.	

Minutes of Discussions
of
The 2nd Technical Meeting
for
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

The 2nd Technical Meeting (hereinafter referred to as "TM") for the Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2 (hereinafter referred to as "Project") was held on December 4, 2018 at the conference room of PAS. The attendants of the meeting are listed in the Attachment 1.

At the TM, the result of the Baseline Surveys was presented and based on that, the Baseline Values and Target Values of the Key Performance Indicators (KPIs) were proposed by JICA Expert Team as per the Part 1 of the Attachment 2, as approved at the 3rd meeting of Project Implementation Unit (PIU) on September 19, 2018.

Following the presentation, TM approved all of the Baseline Values and Target Values on the proposal.

TM also acknowledged the progress of the 1st, 2nd and 3rd Dispatches as presented by the JICA expert team as per the Part 2 of the Attachment 2.

H.E. Lou Kim Chhun, Delegates of the RGC in Charge as Chairman and CEO of PAS and the Chairman of TM shared the information with TM members with pleasure that the cargo handling volume of the Port for this year is expected to increase at more than 18% compared with that for the last year, and concurrently the stock price of PAS has exceeded KHR 7,000.

H.E. Lou Kim Chhun
Project Director,
Delegate of the Royal Government
in Charge as Chairman and CEO, PAS

Mr. Akira Koyama
Leader of JICA Expert Team,
Senior Executive Director of OCDI

Attachment 1

ATTENDENTS LIST

For
The 2nd Technical Meeting
Of
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

Date:	04th December 2018	**Time**	15:00 - 16:45
Venue:	PAS Conference Room		

N°	List of Attendants	Positions/ Organization	Signatures
1	H.E Lou Kim Chhun	Delegate of the Royal Government of Cambodia In charge as Chairman and CEO of PAS	
2	Mr. Nhem Savong	Deputy Director General, GDWMP, MPWT	
3	Mr. Bun Channa	Program officer, JICA Cambodia Office	
4	Mr. YABUNAKA Katsuichi	JICA Expert to PAS	
5	Mr. Akira KOYAMA	Team Leader, JICA Expert Team for the Project	
6	Mr. Kiyoshi NAKASHIMA	Co-Team Leader, JICA Expert Team for the Project	
7	Mr. Toshimasa KAWASAKI	JICA Expert to HPW	
8	Mr. Thay Rithy	PAS	
9	Mr. Chea Yuthdika	PAS	
10	Dr. Chhum Hong	PAS	
11	PATH SITH	PAS	
12	So SEANG	PAS	
13	SREY. Narim	PAS	
14	Theng Viru	PAS	

15	PLTIA PRAKATIA	PAS	
16	Ty. SAKUN	PAS	
17	LOU LIUHENG	PAS	
18	OUK SOVANNARITH	PAS	
19	Sath. Bunna	PAS	
20	CHIV CHAN SOPHAL	PAS	
21	OUK SOMETHY	PAS	
22	Hen phakdey	PAS	
23	SAN Chhon	PAS	
24	Souk KOLEHENDA	PAS-PIU Coordinator	
25	Hem Chann	PAS	
26	Kong. David	OCDI translator	
27	Chey Sokunthea	PAS	
28	Norihiko. Kataoka	JICA	
29	Takashi Furuno	JICA EXPERT	古野隆志
30	Susumu Kimura	JICA Expert	
31	Yutaka Mikami	JICA Expert	
32	Norihiro Fukazawa	JICA Expert	
33	chan simey	Assistant to JICA Expert to PAS	
34			

Minutes of Discussions
of
The 3rd Joint Coordinating Committee
for
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

The 3rd Joint Coordinating Committee (hereinafter referred to as "JCC") for the Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port - Phase 2 (hereinafter referred to as "the Project") was held on April 8, 2019 at the conference room of PAS. The attendants of the meeting are listed in the Attachment 1.

At the JCC, JICA Expert Team presented following topics: Progress of the project during the 4th dispatch from March 12 to April 8; Modification of Project Design Matrix (hereinafter referred to as "PDM"); Other topics including the study tour to Japan and the schedule of next 5th dispatch; as per the Attachment 2.

JCC approved the modification of PDM, while confirming that selected departments of PAS for the formulation of Standard Operation Procedures in Activity 1-6 will be determined later through the discussion among PAS and the Team. JCC also confirmed MPWT, PAS, and PPAP are in charge of Port EDI after dissolving KAMSAB in the end of February 2019.

Mr. Thay Rithy shared the information with JCC members that the container cargo handling volume during the last 3 months is still highly growing by around 15.58%. He also introduced the PAS challenge for the improvement of gate control as well as yard operation through making clear job specification of each workers as well as the electrifying the necessary procedure using online and asked the Team for continuous support to PAS in this filed.

H.E. **Lou Kim Chhun**
Delegate of the Royal Government
In Charge as Chairman and CEO, PAS
And Project Director of PIU,

Mr. **Koichi Miyake**
Leader of JICA Expert Team,
Senior Executive Director of OCDI

Attachment-1: Attendants List of 3rd JCC

ATTENDENTS LIST

For
The 3rd Joint Coordinating Committee
Of
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

Date:	8th April 2019	**Time**	9:00 - 11:20
Venue:	PAS's Conference Room		

N°	List of Attendants	Positions/ Organization	Signatures
1	Mr. Thay Rithy	Deputy Director General of PAS	
2	Mr. Nhem Savong	Deputy Director General, General Department of Waterway-Maritime Transport and Port, MPWT	
3	Mr. Toshi Kawasaki	JICA Expert to Ministry of Public Works and Transport	
4	Mrs. Okubo Kaori	Senior Program Officer, JICA Cambodia Office	
5	Mr. Koichi Miyake	Team Leader of JICA's Expert Team	
6	Mr. YABUNAKA Katsuichi	JICA Expert to PAS	
7	Mr Chhun Homg	Deputy Director General of PAS	
8	TY SAKUN	Director of Technical Department	
9	LOU LIMENG	Director GC.	
10	POTH SETH	Director A/C F/N	
11	Neak, Sophyan	Dir. Machinery Dept	
12	CHEY SOKUNTHEA	Dir. Marketing	
13	RATH SEIA	Dir Admin Dept	
14	PETH PRAKASH	Director of Business	

15	Mr. Bun Channa	Program officer (JICA)	
16	Mr. Chiv Chansopheap	PAS (internal Auditor)	
17	~~Ms. Okubo Kaori~~	~~Representative (JICA)~~	
18	Takashi Furuno	JICA Expert	古野隆志
19	Takehiko Saikawa	〃	
20	Susumu Kimura	〃	S. Kimura
21	Yutaka Mikami	〃	
22	Norihito Fukagawa	〃	
23	Atsushi Ito	JICA HQ	
24	Souk KOLCHEDA	~~Assistant to CEO~~	
25	Mem chann	~~Director of Internal audit~~	M. Chann
26	Chan Simey	Assistant to JICA Expert	
27	Seng Sopha	Adm Staff	
28	Kong David	CCDI Secretary	
29			
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Attachment-2: Tentative 5th Dispatch of JICA Expert Team

Name		派遣回数	2018 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2019 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2020 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2021 Jan	Feb	Mar
Koichi MIYAKE (Akira KOYAMA)	Plan	9	(26)				(38)			(36)					(30)		(36)					(30)							(36)					(36)			(22)		
Leader/Strategic Port Management (1)	Actual	3	4/22 5/12 (21)				8/28 9/28 (32)			11/6 12/14 (39)				3/24 4/12 (20)			(39)					(30)							(40)					(38)			(22)		
Kiyosi NAKAJIMA	Plan	9	(26)				(38)			(36)					(30)		(36)					(36)							(36)					(38)			(22)		
Co-Leader/Strategic Port Management (2)	Actual	3	4/22 5/20 (29)				8/14 9/21 (39)			11/6 12/20 (45)				3/13 4/6 (25)			(39)					(39)							(36)					(36)			(22)		
Susumu KIMURA	Plan	9	(26)				(38)			(36)					(30)		(36)					(36)							(36)					(38)			(22)		
Entry/Exit Control of Container Terminal	Actual	3	5/5 6/2 (29)				8/14 9/21 (39)			11/6 12/14 (39)				3/13 4/12 (31)			(30)					(30)							(36)					(38)			(22)		
Norihiro FUKAZAWA	Plan	9	(26)				(38)			(36)					(30)		(36)					(36)							(36)					(38)			(22)		
CTMS Operation/ Management Information (1)	Actual	3	5/5 6/2 (29)				8/14 9/28 (46)			11/6 12/14 (39)				3/13 4/12 (31)			(30)					(30)							(36)					(35)			(22)		
Norihoto KATAOKA	Plan	6	(22)				(30)								(22)		(30)												(22)					(30)					
Container Handling Equipment	Actual	3	5/19 6/2 (15)				8/14 9/15 (33)			12/1 12/15 (15)				3/17 3/30 (14)			(30)												(22)					(30)					
Yukihiro Matsumoto	Plan	6	(22)				(30)								(22)		(30)												(22)					(30)					
Operation of Rail Yard and Multi-Purpose Terminal	Actual	2	5/13 6/2 (21)				8/14 9/9 (27)										(30)												(22)					(30)					
Yutaka MIKAMI	Plan	7	(26)				(38)			(36)							(36)					(36)							(36)					(38)					
Traffic Flow Management of Off-Dock Yards	Actual	3	5/5 6/2 (29)				8/28 9/28 (32)			11/6 11/10 11/18 12/20 (5) (33)				3/23 4/12 (21)			(30)					(30)							(36)					(38)					
Tomohiro ARAI	Plan	6	(22)							(30)							(30)					(22)							(30)					(22)					
Information System on Container Status	Actual	2	5/13 6/2 (21)							11/17 12/1 (15)							(30)					(22)							(30)					(22)					
Tatsuyuki SHISHIDO	Plan	6					(22)			(30)					(22)							(30)							(22)					(30)					
Port EDI/ Management Information (2)	Actual	1	5/26 6/14 (20)														(22)					(30)							(30)					(30)					
Yutaka TAKAGI	Plan	6	(22)							(30)							(30)					(22)							(30)					(22)					
Capacity Enhancement for Marketing	Actual	2	5/13 6/2 (21)							11/17 12/1 (15)							(30)					(22)							(30)					(22)					
Takashi FURUNO	Plan	0																																				
Capacity Enhancement for Marketing	Actual	1								12/1 12/15 (15)				3/17 4/6 (21)																									
Takehiko SAIKAWA	Plan	5	(26)				(37)										(30)												(30)							(22)		
Baseline Surveys/Study Tours/Project Administration	Actual	2	4/22 5/20 (29)				8/14 9/21 (39)							3/23 4/12 (21)			(30)												(30)							(22)		

Modified Project Design Matrix (PDM)

Project Title: Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2
Implementing Organization: Sihanoukville Autonomous Port (PAS)
Period of Project: April 2018 to March 2021 (36 months in total)
Target Groups: (Direct Beneficiary) Staff members of Sihanoukville Autonomous Port (PAS), Ministry of Public Works and Transport (MPWT, including Kampuchea Shipping Agency and Brokers (KAMSAB))
(Indirect Beneficiary) Users of the Port of Sihanoukville
Project Site: Sihanoukville Autonomous Port (PAS)

As of March 25, 2019

Narrative Summary	Reasons of Revision	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal				
Modernized Corporate strategy (mainly Container Terminal (CT)) of PAS will contribute to trade promotion in Cambodia.		Annual container throughput of Sihanoukville Port will reach 800,000TEU in 2023.	Annual activity report of PAS.	
Project Purpose				
Capacity of business operation (mainly CT) of corporatized PAS will be enhanced.		Annual container handling capacity of Sihanoukville Port will be enhanced.	Parameters observed by monitoring survey to estimate annual container handling capacity. Annual container handling capacity = Min {Quay-side capacity, Container Yard capacity} Quay-side capacity = N×α×1.65×0.4×356×24 Where Number of QC (Quayside Crane): N Max. Net Productivity of QG (Box/hr/QG): α Utilization ratio pf GC = 0.4 TEU/Box ratio = 1.65 (TEU/Box) CY capacity = V×0.75／1.3×｛365×2／（β＋γ）｝ Where CY storage capacity: V (TEU) Terminal working ratio = 0.75 Peak Ratio = 1.3 Container dwelling time (Import): β(day)	1. The economic situation of related countries including Cambodia does not deteriorate markedly. 2. New container terminal will start its operation in 2023 as planned.
成果				
1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.		1. Corporate strategy will be submitted to the shareholders/Investors	1.1 Monitoring Survey	1. The Cambodian Government continues to give priority to its logistics policy. 2. Cambodian Government can actually control management policy of PAS.
		1.2 Approval procedure and standard is authorized.	1.2 Monitoring Survey	
2. CTMS operation capacity will be enhanced.		2.1 Dwelling time of import containers will be shortened. 2.2 Dwelling time of export containers will be shortened. 2.3 Berthing / Time of vessels will be reduced.	2.1 Monitoring survey (6 days [2016]) 2.2 Monitoring survey (5 days [2016]) 2.3 Monitoring survey	
3. Entry and exit control and traffic flow management in port premises (including CT, rail yard and multi-purpose terminal) will be consistently implemented.		3.1 Vehicles and motorcycles other than container trailers will not enter CT. 3.2 Turn Around Time of Trailers will be reduced.	3.1 Monitoring survey (XX Vehicles/day [2018]) 3.2 Monitoring Survey	

Narrative Summary	Reasons of Revision	Objectively Verifiable Indicators	Means of Verification	Important Assumption
4. Incoming/outgoing traffic flow congestion will be mitigated at gate as well as outside of Sihanoukville Port premises.		4.1 Waiting trailers in front of the terminal gate will be reduced. 4.2 Gate processing time will be reduced.	4.1 Monitoring survey (61 Vehicles [2018]) 4.2 Monitoring Survey	
5. Vessel arrival/departure procedure will be improved via. Port EDI.		5-1. Vessel arrival/departure procedure will be electronically processed by Port EDI. 5-2. Calling vessel statistics will be prepared through Port EDI.	5.1. Monitoring survey 5.2. Monitoring survey	
Activities		Inputs		
Activities for Output 1 1. Capacity to formulate corporate strategy (mainly CT) of PAS will be enhanced.		***<Japanese Side>*** (a) Dispatch of Short-term experts Short-term expert (Output) ・Corporate strategy (mainly CT) analysis of PAS (Overall) ・Co-Team Leader/ Strategic Port Management (2) (Output 1) ・Entry/Exit Control of Container Terminal (Output 3) ・CTMS Operation/ Management information (Output 2) ・Container Handling Equipment (CT) (Output 2) ・Operation of Rail Yard and Multi-Purpose Terminal) (Output 3) ・Traffic Flow Management of Off-dock Yards (Output 4) ・Information System on Container Status (Output 4) ・Port EDI System/ Management Information (2) (Output 5) ・Capacity Enhancement for Marketing (Output 1) ・Baseline Survey/ Study Tours/ Project Administration (Overall) (b) Training ・Study Tour in Japan ・Study Tour in Thailand (c) Equipment ***<Cambodian Side>*** (a) C/P personnel will be appropriately assigned to the project. (b) Appropriate office space will be prepared and provided to the expert team. (c) Appropriate office equipment (electricity, utility, internet environment, desk, chair, etc.) will be prepared and provided to the expert team. (d) Port EDI task force will cooperate with JICA expert team.	<Pre-Conditions> 1. C/P personnel will be appropriately assigned to the project. 2. C/P personnel will remain the same during the project period. 3. Multi-purpose terminal will start its operation in 2018 as planned. 4. PAS will appropriately build and operate off-dock yard at its own expense. 5. PAS will build railway yard and prepare yard equipment at its own expense. 6. Port EDI system will be installed in Cambodia.
1-1. Analyze formulation process of corporate strategy (mainly CT) of PAS considering the similar best practices at other ports.				
1-2. Analyze applicability of corporate strategy (mainly for CT) formulation process of port operation companies (e.g. certain Japanese companies).				
1-3. Systemize formulation process of corporate strategy (mainly CT) to gain the understanding of shareholders/investors based on the results of 1-1 and 1-2.				
1-4. Develop roadmap to set-up strategic planning department which is responsible for formulating corporate strategy (mainly CT) in PAS.				
1-5. Support setting-up of a strategic planning department in PAS.				
1-6. Support to formulate Standard Operation Procedures (SOP) for selected departments of PAS as well as support the assessment of organization.	Added: Based on the request from PAS.			
Activities for Output 2 2. CTMS operation capacity will be enhanced.				
2-1. Examine and analyze causes of congestion at gate, traffic flow congestion inside/outside CT.				
2-2. Analyze operational conditions of CT by making full use of CTMS after installation of additional QGCs and RTGs.				

Narrative Summary	Reasons of Revision	Objectively Verifiable Indicators	Means of Verification	Important Assumption
2-3. Develop staff-enhancement plan of PAS to make full use of CTMS after installation of additional QGCs and RTGs.				
2-4. Implement on-the-job-training to make full use of CTMS based on the staff-enhancement plan.				
~~2-5. Propose data sharing method between CTMS and inquiry system (by telephone, fax and/or e-mail) for availability status of carry-in/carry-out containers (to be developed in 4-1).~~	Deleted: It is not realistic to introduce container status inquiry system based on the observation at the site as well as opinions of PAS and truck companies.			
2-6. Support to formulate Standard Operation Procedures (SOP) in each cargo handling department.	Added: Based on the request from PAS.			
Activities for Output 3 3. Entry and exit control and traffic flow management in port premises (including CT, rail yard and multi-purpose terminal) will be implemented.				
3-1. Develop operation plan of entry and exit control based on the analysis conducted in 2-1.				
3-2. Develop container operation plan of multi-purpose terminal linked to CT operation based on the analysis conducted in 2-1.	Particularly focusing on the empty container yard operation.			
3-3. Develop container operation plan of rail yard linked to CT operation based on the analysis conducted in 2-1.				
3-4. Implement pilot operation of entry and exit control based on the operation plan to be developed in 3-1 and develop roadmap to full-scale operation.				
~~3-5. Implement pilot operation of container handling at multi-purpose terminal based on the container operation plan to be developed in 3-2 and develop roadmap to full-scale operation..~~ 3-5. Implement pilot operation of empty container stacking yards and develop roadmap to full-scale operation	Replaced: It would be difficult for the multi-purpose terminal to deal with containers. Instead, operation of empty container stacking yards will be focused on in the context of entry/exit control as well as traffic flow management in port premises.			
3-6. Implement pilot operation of container handling at rail yard based on the container operation plan to be developed in 3-3 and develop roadmap to full-scale operation.				
Activities for Output 4 4. Incoming/outgoing traffic flow congestion will be mitigated at gate as well as outside of Sihanoukville Port premises.				

Narrative Summary	Reasons of Revision	Objectively Verifiable Indicators	Means of Verification	Important Assumption
~~4-1. Preliminarily design inquiry system (by telephone, fax and/or e-mail) for availability status of carry-in/carry-out containers.~~ 4-1. Support to design a system which publishes the operating status of the container terminal using Web system.	Replaced: It is not realistic to introduce container status inquiry system based on the observation at the site as well as opinions of PAS and truck companies. Instead, a system which publishes the operating status of the container terminal using the Web system. is proposed which would be effective for elimination of the traffic congestion outside of SHV port.			
~~4-2. Implement pilot operation of inquiry system (by telephone, fax and/or e-mail) for availability status of carry-in/carry-out containers and develop roadmap to full-scale operation. (in case that PAS will introduce the system at its own expense.)~~ 4-2. Implement pilot operation of the above system and develop roadmap to full-scale operation.				
4-3. Preliminarily design off-dock yard as pre-screening system of improper document trailers (IDTs) with evacuation space based on the analysis (to be conducted in 2-1).	Added: Countermeasures to cope with the increase of container handling which could reach 800,000 TEUs when the new container terminal enters operation, should be added as one of the activities of Output 4.			
4-4. Implement pilot operation of pre-screening system of improper document trailers (IDTs) together with evacuation space based on the preliminary design (to be achieved in 4-3) and develop roadmap to full-scale operation. (in case that PAS will introduce the system at its own expense.)				
4-5. Propose countermeasures to cope with the increase of container handling up to 800,000 TEU, and support its implementation.				
Activities for Output 5 5. Vessel arrival/departure procedure will be improved via. Port EDI.				
5-1. Assist Port EDI taskforce (PAS, PPAP, MPWT including KAMSAB) to appropriately introduce and operate Port EDI for vessel arrival/departure procedure.				
5-2. Document procedure of vessel arrival/departure will be eliminated soon after Port EDI is introduced.				
5-3. Develop guideline to compile calling vessel statistics via. Port EDI data.				

Minutes of Discussions
of
The 4th Joint Coordinating Committee
for
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

The 4th Joint Coordinating Committee (hereinafter referred to as "JCC") for the Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port - Phase 2 (hereinafter referred to as "the Project") was held on December 23, 2019 at the conference room of PAS. The attendants of the meeting are listed in the Attachment 1.

At the JCC, JICA Expert Team presented following topics: KPIs (Key Performance Indicators) monitoring; Progress of the project during the 6th dispatch from November 12 to December 26; and Modification of Project Design Matrix (PDM); as per the Attachment 2. JCC approved the modification of PDM adding the activity to "Support the formulation of a medium/long-term plan including operation and management system of PAS and human resource development in PAS" and extension of the project period until September 2021 (6 months extension).

H.E. Lou Kim Chhun shared his views with JCC members that the container throughput will exceed the cargo handling capacity of the existing terminal (700,000TEUs) with the growth rate of 15% in 2020 and will reach the volume of 1 million TEUS in 2023.

In terms of KPIs, the Team emphasize that container dwelling time in the port becomes longer than before, which might be obstacle to increase the yard capacity. Mr. Thay Rithy mentioned that PAS struggles to increase the storage charge for long dwelling containers and waits for the approval from MEF.

H.E. Lou Kim Chhun introduced the PAS challenge including expanding container yard, procurement of additional handling equipment, renovation of the existing quays No.6 into a container berth. He also asked JICA and the Team for continuous support to PAS in this filed.

H.E. Lou Kim Chhun
Delegate of the Royal Government
In Charge as Chairman and CEO, PAS
And Project Director of PIU,

Mr. Koichi Miyake
Leader of JICA Expert Team,
Senior Executive Director of OCDI

Appendix1
Attachment 1

ATTENDENTS LIST

For
The 4th Joint Coordinating Committee
Of
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port Phase 2

Date:	23rd December 2019	**Time**	9:00 - 11:30
Venue:	PAS's Conference Room		

N°	List of Attendants	Positions/ Organization	Signatures
1	H.E Lou Kim Chhun	Chairman & CEO of PAS	P
2	Mr. Sou Phaly	Director of Port Administration Department, Representative of MPWT	P
3	Mr. Kubota Hiroaki	Formulation Advisor, Representative of JICA Cambodia Office	
4	Mr. Koichi Miyake	Team Leader of JICA's Expert Team	
5	Mr. YABUNAKA Katsuichi	JICA Expert to PAS	
6	Mr. Thay Rithy	Deputy Director General of PAS	
7	Mr. Chhun Hong	Deputy Director General of PAS	
8	Mr. Chea Yuthdika	Deputy Director General of PAS	
9	Mr. Bun Channa	Program Officer, JICA Cambodia Office	
10	Men Chann	Director of Internal Audit	
11	PITH PRAKATH	Director of Business	
12	SREY MANIM	Director of Container Terminal	
13	RATH SELA	Director of Admin	
14	TY. SIHKUN	Director of Tech. Materials	

15	Thong viro	Director of Harbor	[signature]
16	Neak, Sophyan	Dir Machinery	[signature]
17	Li Kheng.	Dir. GC	[signature]
18	CHIV. CHAN SOPHAL	Dir. SEZ	[signature]
19	So SEANG	Director of Planning	[signature]
20	Mean Koeung	Dir. Technical	[signature]
21	SAM SOPHEAP	Deputy. Director of FINANCE	[signature]
22	SUON BUNSONG	IT Dept	[signature]
23	Yutaka Mikami	JICA Expert Team	[signature]
24	Takuyuki SHISHIDO	JICA/OCDI	[signature]
25	Sour Kolchenda	Project Coordinator of PIU	[signature]
26	Uen Pakoley.	Administration Dept (Staff)	[signature]
27	MAO SAMON	Staff of Marketing Department	[signature]
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Minutes of Discussions
of
The 5th Joint Coordinating Committee
for
The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port-Phase 2

The 5th Joint Coordinating Committee (hereinafter referred to as "JCC") for the Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port - Phase 2 (hereinafter referred to as "the Project") was held on December 20, 2021 at the conference room of PAS. The attendants of the meeting are listed in the Attachment 1.

Mr Hirotsugu Mori, a representative of the Japan International Cooperation Agency (JICA) and Mr. Sok Sophara, a representative of the Ministry of Public Work and Transport made remarks expressing their heartfelt congratulation for the successful ending and achievement of "The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port-Phase 2".

H.E Lou Kim Chhun, Chairman & CEO of Sihanoukville Autonomous Port (hereinafter referred to as "PAS"), made opening remarks expressing his sincere appreciation to all members of JICA Experts Team, JICA Advisors to PAS, and all members of PIU, who have committed with the hardest and tireless efforts to carry out this Project with efficiency and fruitfulness. He explained that the volume of container throughput at PAS is sharply increased around 15% for 11 months 2021 comparing with the same period in 2020 and the volume of container throughput is forecasted over than the port capacity of 700,000TEUs from 2022 to 2025. In this connection, he expressed his expectation for the continuous support from Japanese side.

Then, Mr. Koichi Miyake, the leader of the JICA Expert Team made a presentation on the overall activities and achievements of the Project while other Team members presented each activity and output. The leader explained that the overall goal and purpose of the project have been achieved as a whole and that the verification indicators shown in PDM have been fulfilled with following exceptions: 1) While PAS's capacity to formulate a corporate strategy has been increased as a whole, the corporate strategy was not submitted to the shareholders/investors due to time constraints and 2) Vessel arrival/departure procedure was not electronically processed by the Port EDI system because it was not installed at MPWT during the project period (consequently, statistics on calling vessels could also not be prepared). However, PAS personnel have deepened their understanding of the Port EDI system and are well-prepared to use the system after it is installed. The follow-up activity for Port EDI system would be addressed in the forthcoming project. In addition, challenges for terminal capacity improvement including the existing container terminal and the new terminal will also be addressed in the forthcoming project to cope with the future increase of container cargoes.

JCC accepted the outputs of the project and acknowledged that the project purpose, "Capacity of business operation (mainly CT) of corporatized PAS will be enhanced" has been achieved as a whole. JCC also acknowledged that the Completion Report of the Project will be circulated to JCC members in January.

H.E. Lou Kim Chhun expressed his satisfaction with the project outcomes and appreciated the Expert Team members' efforts during the project which was made difficult due to the COVID-19 pandemic. His Excellency and Cambodian members in JCC stressed that PAS shall continue the good cooperation with JICA for the implementation the next step of "The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port - Phase 3", and expressed it would be started as soon as possible to strengthen port productivity and to enhance the capacity development of port human resources.

H.E. Lou Kim Chhun	Mr. Koichi Miyake
Delegate of the Royal Government	Leader of JICA Expert Team,
In Charge as Chairman and CEO, PAS	Senior Executive Director of OCDI
And Project Director of PIU,	

ATTENDEES LIST

For:

"The Project for Capacity Development of Container Terminal Management and Operation in Sihanoukville Port"

Date: 20 December	Time: 3pm - 5.30 pm.
Subject: Progress and Achievement of the project.	

No.	Name	Position	Signature
1	H.E LOU Kimchhun	Chairman&CEO of PAS	[signature]
2	Mr. THAY Rithy	Deputy Director General	
3	Mr. THONG Viro	Deputy Director General	
4	Mr. TY Sakun	Deputy Director General	[signature]
5	Mr. KAZUYA Narukawa	JICA Expert of PAS	[signature]
6	Mr. Pith Prakath	Director of Accounting-Finance	[signature]
7	Mr. Sam Sopheap	Dep. Director of A/c&Finance	[signature]
8	Mr. KARANEY SORM	Director of IT	[signature]
9	Mr. Souk Kolchenda	Assistant to CEO	[signature]
10	Mr. Ouk Vannara	Director of Technic Material	[signature]
11	Ms Chey Sokunthea	Director of Marketing	[signature]
12	Mr-Chiv chan SoPhal	Director of SEZ	
13	Mr. Kom Sokvichea	Officer of MMO	[signature]

No.	Name	Position	Signature
14	Thay Heng Ly	Director Container Terminal	
15	Ouk Sovannarith	Deputy GC Dept.	
16	Ouk Sonetty	Deputy Planning Dept	
17	So Seang	Director of Planning	
18	Mao Samon	Officer of Marketing Dept.	
19	San Chhon	Admin. HR Department	
20	Ngaun. Rottanak	Director of Business	
21	Chan Sokha	Deputy D. of Harbor Dept	
22	Masanori Ito	ADMIN / JICA	
23	Kosuke Shibasaki	JICA TEAM	
24	Susumu Kimura	JICA Team	
25	Yosuke Yamashita	JICA Team	
26	Tatsuyuki Shishido	JICA Team	
27	Sasa Kenji	JICA ADVISOR	
28	Hiroaki Kubota	JICA Cambodia Office Project Formulation Advisor	
29	Hayashi Kensuke	JICA officer	林健介
30	Koichi Miyake	JICA Team	

No.	Name	Position	Signature
31	Hirotsugu Mori	Jica HQ.	
32	Sok Sophara	HPWT	
33	Hiroyuki Tokito	Embassy of Japan	時任
34	Mean Channa	Director of Internal Audit	M. Channa
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Reference -5 Standard Operation Procedure (SOP)

Standard Operation Procedure (SOP)

Human resource development (Training)

: Administration - Human Resource Department

STANDARD OPERATING PROCEDURE
For
Human Resource Development (Training)

- Administration – Human Resource Department -

(Ver.1)

JICA Expert Team

Contents

I. Objective

Human resource development is one of the important operations of PAS to achieve sustainable development of Sihanoukville port. Needless to say, the port must be managed and operated efficiently and effectively, which requires the best efforts of the PAS staff. Accordingly, the staff must do their best to develop their own capability and experience corresponding to the level of their carrier. Therefore training, including seminars and/or workshops (the same applies hereinafter), is indispensable and forms the basis for sustainable development of the port.

The Standard Operating Procedures for Human Resource Development focusing on training are prepared as a guideline to build a common understanding among related departments of PAS describing their responsibilities and operational recommendations for effective training of the staff.

II. Principle of Operation

In order to conduct effective capacity development in PAS, Human Resource Office (hereinafter referred to as "HR Office") in the Administration – Human Resource (hereinafter referred to as "Adm-HR") Department shall act as the coordinator of all the departments of PAS. The operation shall be conducted with the following principles:

- ✓ To prepare an appropriate training plan considering the carrier/experience of each staff
- ✓ To evaluate training results and provide feedback for future training
- ✓ To encourage the staff to participate in training

III. Roles and Responsibilities

III-1. Administration - Human Resource Dept.

Main role of HR Office in the Adm-HR Dept. is to prepare a training plan for the next year, which may include seminar and/or workshop participation, and monitor and manage the progress of the training of the current year.

HR Office shall draft a training plan for the next year based on the needs and requests from all the departments of PAS. The Director of Adm-HR Dept. submits the plan, which may be modified when needed, to the PAS committee chaired by CEO. The Director finalizes the training plan based on the comments from the committee.

HR Office shall monthly report to the Director the progress of the training in the current-year. The Director reports the progress to the senior management when necessary.

III-2. Other departments of PAS

All the Departments of PAS are requested:

- ✓ To conduct internal training including OJT.
- ✓ To send the staff to outside training, including overseas
- ✓ To encourage the staff to participate in seminars/workshops which are useful for enhancing their capabilities and experience
- ✓ To evaluate the training results/outcomes
- ✓ To propose a training plan for the next year based on the evaluation of the ongoing and past training results

III-3. Stakeholders outside of PAS

The following organization would be stakeholders which provide training programs / trainees)

- ✓ MPWT and other ministries
- ✓ Foreign Governments / agencies / companies

The private companies engaged in stevedoring activities in SHV port would also be stakeholders from the viewpoint that their employee shall be well-trained for their activities in the port.

IV. Standard Operating Procedures

Duty-1: Formulation of Training Plan

- To formulate a training plan of PAS for the next year based on the training needs of officers and employees (including contract workers) - From October to December

Tasks:

- ✓ HR Office shall conduct surveys on training needs/requests for the next year (and after) to all the departments of PAS [October]
- ✓ All the departments shall draft and submit a request for necessary training for the next year considering the evaluation of the past training results/outcomes, which should include titles of training programs, purpose, implementing organization, schedule and period, number of trainees from the department, and estimated budget when necessary. [by the end of October]
- ✓ HR Office shall evaluate training plans submitted by the departments and develop a draft of training plan of PAS for the next year. [November]
- ✓ HR Office shall submit the draft of training plan to the Director of Adm-HR for review and any necessary amendments. HR Office shall submit the amended training plan to CEO as well as the senior management and BOD. [Early December]
- ✓ Adm-HR Dept. shall finalize the training plan based on the comments from BOD and the senior management. [by the end of December]

Duty-2: Monitoring, Management and Evaluation of Training Results

- To monitor and manage the progress of the training, and to evaluate training results

Tasks:

- ✓ HR Office and each department shall periodically monitor the progress of the training plan for the current year.
- ✓ Each department shall report the progress of the training and the feedback from the trainees to HR Office, and HR Office shall submit a summary of the progress to the Director of Adm-HR on a quarterly basis. The Director reports to CEO if necessary. [Every quarter]
- ✓ HR Office revises the training plan, if necessary, based on the progress of the training and obtains the approval from CEO. [Every quarter]
- ✓ Each department shall evaluate the achievement of the training in the previous year and submit an evaluation report to HR Office [January]

- ✓ HR office compiles all the results and achievements of the training and seminars/workshops conducted in the previous year into the “Annual Training Report” [February - March]

Duty-3: Internal Seminars/Workshop

- To organize and coordinate internal seminars/workshop for the staff

Tasks

- ✓ HR office and/or a relevant department could propose seminars and/or workshops for the staff (including contract staff) where necessary, which will be incorporated into the training plan with the date/period, trainer(s), and target participants. [Early December or when necessary]
- ✓ The Director of Adm-HR shall review the above proposal and obtain the approval from CEO and the senior management. [End of December or when necessary]
- ✓ The related departments and/or HR Office shall prepare the place, program, materials of the seminar/workshop, attendance list and so on. [As necessary]
- ✓ Upon the completion of the seminar/workshop, HR office shall obtain the feedback from the trainees and participants or conduct a test if necessary. [Immediately after the completion of the seminar/workshop]
- ✓ HR Office shall review the feedback and report to senior management [Every quarter]

Duty-4: Documentation

- To prepare necessary documents for the staff to attend a training program or a seminar/workshop

Tasks:

- ✓ When PAS receives an invitation to attend a training program/seminar, Adm-HR Dept. circulates it to relevant departments for comments and candidate staff to attend, which are forwarded to the senior management and CEO. [As necessary]
- ✓ CEO decides candidate staff to attend the training program/seminars [As necessary]
- ✓ Adm-HR Dept. sends a response letter to the above invitation with related documents prepared by the relevant PAS department. [As necessary]
- ✓ Adm-HR Dept. files a copy of the letter sent and relevant documents in the Documentary Office of Adm-HR Dept. [As necessary]

Standard Operation Procedure (SOP)

Formulation/performance monitoring of 5-year management plan

: Planning-Procurement and Statistics Department

STANDARD OPERATING PROCEDURE

FOR

FORMULATION/PERFORMANCE MONITORING

OF

5-YEAR MANAGEMENT PLAN

- Planning – Procurement and statistics Department -

(Ver.1)

JICA Expert Team

Contents

List of Tables and Figures

OBJECTIVE

This Standard Operating Procedure (SOP) establishes instructions and guidelines for the formulation of the 5-year management plan and the performance monitoring thereof.

SCOPE

This SOP basically applies to the formulation and monitoring processes of the 5-year management plan. This SOP may also be applicable to other mid-term plans formulated by PAS management from time to time, including the 3-year plan.

METHODOLOGY

Managerial accounting

The formulation of this 5-year plan and the performance monitoring afterwards are both conducted by use of a managerial accounting method.

It should be noted that the characteristics of managerial accounting are different from that of financial accounting as summarized in the below.

Table 0-1 Comparison of characteristics between financial & managerial accounting

	Financial Accounting	Managerial Accounting
Purpose	Communication of financial position	Decision making, planning, evaluation, control
Requirement	Mandatory	Optional
Primary Audience	External (Investors, regulators, tax authorities, etc.)	Internal (Management)
Focus	Backward looking	Forward looking
Regulation /guidelines	• Generally Accepted Accounting Principles (GAAP) • International Financial Reporting Standard (IFRS) • International Accounting Standards (IAS)	None
External review	Auditors, regulations	None
Scope	Company wide	Narrow per segment, customer, service, etc. as needed
Frequency	Quarterly, Annual	As needed & ongoing

Work steps

(1) Formulation

This five-year plan will be formulated according to the following work steps.

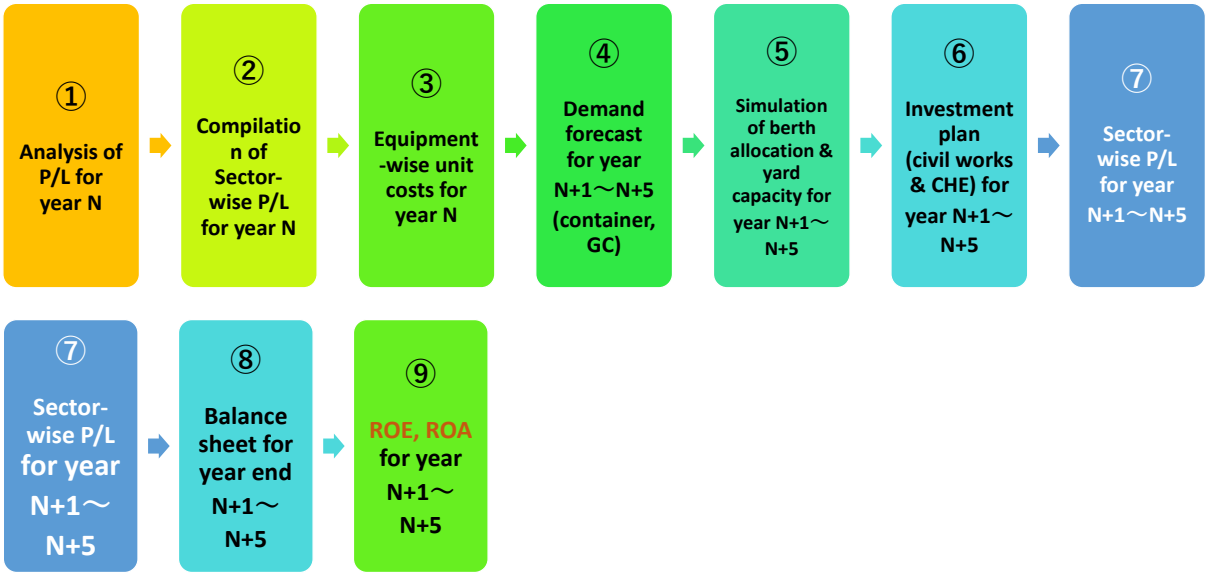

Figure 0-1 Work steps for the formulation of the 5-year plan

(2) Performance monitoring

After the formulation, performance of each business sector is reviewed according to the following work steps.

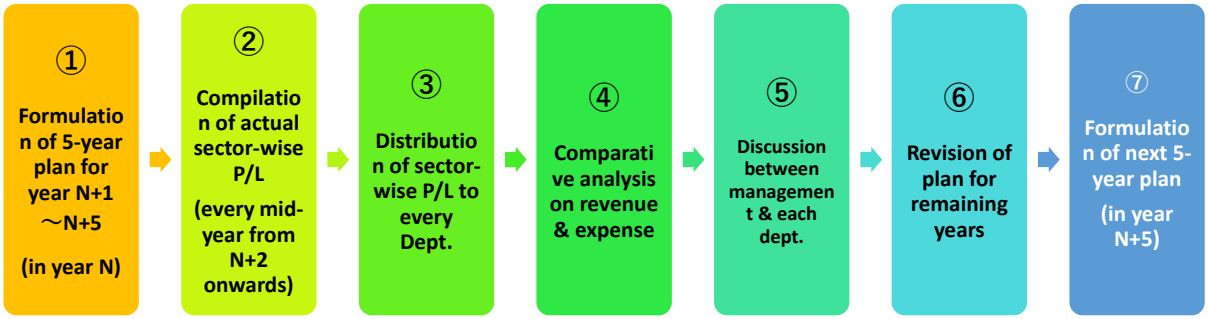

Figure 0-2 Work steps for the formulation of the 5-year plan

Calculation sheets

This document indicates the basic methodology of formulation and performance monitoring of 5-year plan and the calculation results thereof. Since the details of calculation works cannot be incorporated in this document, the relevant Excel files were provided to the Planning-Statistics and Procurement Department separately.

UTILIZATION

The 5-year plan is expected to meet the various management needs of PAS as follows.

1) To evaluate the financial strength of PAS against the fluctuations in the med-term business environment
2) To set proximate goals and develop mid-term corporate strategies
3) To visualize the profitability of each business sector and diagnose how to improve the weakness
4) To estimate cash availability in a mid-term for loan repayments, dividends, investment, wage increase etc.

STANDARD OPERATING PROCEDURES FOR THE FORMULATION

1. Analysis of profit & loss statement for the previous year

1.1. Obtaining the audited financial statements

Obtain the profit & loss statement (P/L) for the previous financial year (audited and submitted to the Cambodia Securities Exchange).

1.2. Breakdown of revenues and expenses

Break down the amounts of revenue and expenses into the details described in the “notes” of audited financial statement and summarize them in one table.

1.3. Distribution of revenues

Supporting data are collected from the Accounting-Finance Dept. and Business Dept. Since the amounts of both departments usually do not match, the amounts shall be unified with the figures of the Accounting-Finance Dept. The total amount is distributed to each business sector according to the portions shown in the data of the Business Dept.

1.4. Distribution of expenses

1.4.1. Direct distribution

Supporting data are obtained from the relevant departments in PAS as listed below.

Table 1-1 List of data source by expense item

Expense item	Data source
Combustible	Technical-Material Dept.
Spare parts	Technical-Material Dept.
Oil & lubricant	Technical-Material Dept.
Repairs & maintenances	Technical-Material Dept.
Salaries, wages & related expenses	Administration-Human Resource Dept.
Depreciation & amortization	Accounting-Finance Dept.

1.4.2. Indirect distribution

There may be some expense items for which the sector to distribute cannot be identified. In such cases, the amount shall be tentatively pooled in the “indirect costs” and distributed later to the appropriate sector based on the criteria determined separately.

Table 1-2 and Table 1-3 show a sample of sector-wise P/Ls before and after distribution of indirect costs, respectively.

Table 1-2 Sector-wise P/L for the previous year (before distribution of indirect costs, sample)

Profit/loss statement 2020_Summary_by business sector (KHR mil)

					Total	Contr	GC	SEZ	Pilot /tug	Others	Indirect
Revenue				Stevedoring	144,838	138,907	5,931	0	0	1	0
				Lift on/off	83,822	83,822	0	0	0	0	0
				Port chgs. for ship services	67,584	0	0	0	67,584	0	0
				Storage	11,378	9,346	2,032	0	0	0	0
				Rental fee	1,141	0	0	0	0	1,141	0
				Transportation	65	62	3	0	0	0	0
				Rental income from SEZ	2,408	0	0	2,408	0	0	0
				Passenger ships	266	0	0	0	0	266	0
				Others	313	0	0	0	0	313	0
				Revenue total	**311,814**	**232,136**	**7,966**	**2,408**	**67,584**	**1,720**	**0**
Expense	Comsumable Supplies	Combustible expenses	Business	Cargo	2,107	1,791	316	0	0	0	0
				Maintenance	1,794	1,794	0	0	0	0	0
				AT	133	26	90	0	7	0	10
				Cont. Terminal	8,213	8,213	0	0	0	0	0
				Group Electric	6,790	6,111	475	204	0	0	0
				Remorquer	6,465	0	0	0	6,465	0	0
				Business S. Total	**25,502**	**17,935**	**882**	**204**	**6,471**	**0**	**10**
				Administration	4,840	0	0	0	0	0	4,840
				Construction	2,688	1,344	806	134	269	0	134
				Total	**33,030**	**19,280**	**1,688**	**338**	**6,740**	**0**	**4,984**
		Spare parts		SPA	31,464	21,692	1,450	276	6,178	1,862	5
				Tyres	3,485	3,446	39	0	0	0	0
				Total	**34,949**	**25,138**	**1,489**	**276**	**6,178**	**1,862**	**5**
				Warehouse supplies	**6,886**	**0**	**6,886**	**0**	**0**	**0**	**0**
		Oil & lubricant		Maintenance	758	758	0	0	0	0	0
				AT	1,106	774	276	0	33	0	22
				Cont. Terminal	78	78	0	0	0	0	0
				Group Electric	422	401	13	0	0	0	8
				Remorquer	565	0	0	0	565	0	0
				Business S. Total	**2,929**	**2,011**	**289**	**0**	**598**	**0**	**31**
				Administration	136	0	0	0	0	0	136
				Construction	492	246	148	25	49	0	25
				S. Total	**3,557**	**2,257**	**437**	**25**	**647**	**0**	**191**
				Office supplies	3,265	0	0	0	0	0	3,265
				Other consumables	1,857	**0**	0	0	0	0	1,857
				Total	**83,545**	**46,675**	**10,501**	**639**	**13,565**	**1,862**	**10,303**
	Salaries, wages & related expenses	Nos of staff: 1192	348	Container Terminal	30,081	30,081	0	0	0	0	0
			239	General Cargo	23,593	21,847	1,746	0	0	0	0
			10	SEZ	902	0	0	902	0	0	0
			65	Harbour Master	6,101	0	0	0	6,101	0	0
			47	Security	2,683	1,878	268	268	134	134	0
			181	Admin-HR	8,332	5,696	1,636	125	812	62	0
			16	Accounting	1,194	889	31	9	259	7	0
			13	Planning	868	647	22	7	188	5	0
			17	Business	1,124	836	29	9	244	6	0
			10	Internal Audit	585	435	15	5	127	3	0
			8	Marketing	739	517	74	74	37	37	0
			15	IT	729	511	73	73	36	36	0
			5	Machinery	367	225	51	2	79	10	0
			218	Technic+Constru.	12,830	**7,874**	1,779	65	2,776	335	0
				Total	**90,128**	**71,436**	**5,724**	**1,538**	**10,794**	**636**	**0**
	Depreciation & amortisation	Property & equipment		Sea port equipment	10,834	8,719	845	0	1,270	0	0
				Buildings & port facilities	9,592	6,582	2,673	0	68	0	270
				Motor vehicles	3,218	1,730	755	0	0	89	644
				Computer & office equip.	1,410	734	0	0	0	0	676
				Tech. & other equip.	3,714	3,502	128	0	43	20	21
				Land improvement	1,443	1,392	9	0	7	3	31
				Palettes	88	0	88	0	0	0	0
				Furniture & fittings	358	0	0	0	0	0	358
				S. Total	30,656	22,659	4,498	0	1,388	112	2,000
				Investment properties	6,262	102	0	6,155	0	5	0
				Intangible assets	1,071	1,063	0	0	0	0	8
				Total	**37,990**	**23,824**	**4,498**	**6,155**	**1,388**	**117**	**2,008**
	Repairs & maint			Subcontracted service expenses	6,567	4,285	0	0	1,855	0	427
				Computer & electronic	1,560	637	2	0	7	0	913
				CHE & admin cars	753	254	0	0	5	0	494
				Total	**8,880**	**5,177**	**2**	**0**	**1,866**	**0**	**1,834**
	Other expenses			Contributions and donations	6,564	0	0	0	0	0	6,564
				Reception and hospitality	3,821	0	0	0	0	0	3,821
				SEZ operating expense	2,389	0	0	2,389	0	0	0
				Administrative expenses	1,782	458	407	0	153	0	764
				Training, workshops and seminars	515	165	123	46	41	0	139
				Missions	1,189	226	166	95	143	0	559
				Publications	1,139	0	0	0	0	0	1,139
				Expected credit losses	1,475	1,475	0	0	0	0	0
				Professional and related costs	762	0	0	0	0	0	762
				Post services	476	0	0	0	0	0	476
				Utilities	620	159	142	0	53	0	266
				Health-care supplies	186	48	42	0	16	0	80
				Equipment rental	111	0	0	0	0	0	111
				Other taxes	163	0	0	0	0	0	163
				Other expenses	440	**0**	0	0	0	0	440
				Total	**21,631**	**2,531**	**881**	**2,531**	**406**	**0**	**15,283**
				Other losses - net	**144**	**0**	**0**	**0**	**0**	**0**	**144**
				Expense total	**242,318**	**149,643**	**21,606**	**10,863**	**28,019**	**2,615**	**29,572**
Operating profit					**69,496**	**82,493**	**-13,640**	**-8,455**	**39,565**	**-895**	**-29,572**

Table 1-3 Sector-wise P/L for the previous year (after distribution of indirect costs, sample)

Profit/loss statement 2020_Summary_by business sector (KHR million)

					Total	Contr	GC	SEZ	Pilot /tug	Others
Revenue				Stevedoring	144,838	138,907	5,931	0	0	1
				Lift on/off	83,822	83,822	0	0	0	0
				Port chgs for ship services	67,584	0	0	0	67,584	0
				Storage	11,378	9,346	2,032	0	0	0
				Rental fee	1,141	0	0	0	0	1,141
				Transportation	65	62	3	0	0	0
				Rental income from SEZ	2,408	0	0	2,408	0	0
				Passenger ships	266	0	0	0	0	266
				Others	313	0	0	0	0	313
				Revenue total	**311,814**	**232,136**	**7,966**	**2,408**	**67,584**	**1,720**
Expense	Consumable Supplies	Combustible expenses	Business	Cargo	2,107	1,791	316	0	0	0
				Maintenance	1,794	1,794	0	0	0	0
				AT	133	34	90	0	9	0
				Cont. Terminal	8,213	8,213	0	0	0	0
				Group Electric	6,790	6,111	475	204	0	0
				Remorquer	6,465	0	0	0	6,465	0
				Business S. Total	25,502	17,943	882	204	6,474	0
				Administration	4,840	3,603	124	37	1,049	27
				Construction	2,688	1,444	810	135	298	1
				Total	33,030	22,990	1,815	377	7,821	27
		Spare		SPA	31,464	21,696	1,451	276	6,179	1,862
				Tyres	3,485	3,446	39	0	0	0
				Total	34,949	25,142	1,489	276	6,179	1,862
				Warehouse supplies	6,886	0	6,886	0	0	0
		Oil & lubricant		Maintenance	758	758	0	0	0	0
				AT	1,106	790	277	0	38	0
				Cont. Terminal	78	78	0	0	0	0
				Group Electric	422	407	13	0	2	0
				Remorquer	565	0	0	0	565	0
				Business S. Total	2,929	2,034	290	0	605	0
				Administration	136	101	3	1	29	1
				Construction	492	265	148	25	55	0
				S. Total	3,557	2,399	442	26	688	1
				Office supplies	3,265	2,431	83	25	708	18
				Other consumables	1,857	1,383	47	14	403	10
				Total	**83,545**	**54,346**	**10,764**	**718**	**15,798**	**1,919**
	Salaries, wages & related expenses	Nos of staff: 1192	348	Container Terminal	30,081	30,081	0	0	0	0
			239	General Cargo	23,593	21,847	1,746	0	0	0
			10	SEZ	902	0	0	902	0	0
			65	Harbour Master	6,101	0	0	0	6,101	0
			47	Security	2,683	1,878	268	268	134	134
			181	Admin-HR	8,332	5,696	1,636	125	812	62
			16	Accounting	1,194	889	31	9	259	7
			13	Planning	868	647	22	7	188	5
			17	Business	1,124	836	29	9	244	6
			10	Internal Audit	585	435	15	5	127	3
			8	Marketing	739	517	74	74	37	37
			15	IT	729	511	73	73	36	36
			5	Machinery	367	225	51	2	79	10
			218	Technic+Constru.	12,830	7,874	1,779	65	2,776	335
				Total	**90,128**	**71,436**	**5,724**	**1,538**	**10,794**	**636**
	Depreciation & amortisation	Property & equipment		Sea port equipment	10,834	8,719	845	0	1,270	0
				Buildings & port facilities	9,592	6,783	2,680	2	126	1
				Motor vehicles	3,218	2,210	772	5	140	92
				Computer & office equip.	1,410	1,237	17	5	146	4
				Tech. & other equip.	3,714	3,518	128	0	47	20
				Land improvement	1,443	1,415	10	0	14	3
				Palettes	88	0	88	0	0	0
				Furniture & fittings	358	267	9	3	78	2
				S. Total	30,656	24,148	4,549	15	1,821	123
				Investment properties	6,262	102	0	6,155	0	5
				Intangible assets	1,071	1,069	0	0	2	0
				Total	**37,990**	**25,319**	**4,549**	**6,171**	**1,823**	**128**
	Repairs & main			Subcontracted service expenses	6,567	4,603	11	3	1,947	2
				Computer & electronic	1,560	1,317	26	7	205	5
				CHE & admin cars	753	622	13	4	112	3
				Total	**8,880**	**6,542**	**49**	**14**	**2,264**	**10**
	Other expenses			Contributions and donations	6,564	4,887	168	51	1,423	36
				Reception and hospitality	3,821	2,845	98	30	828	21
				SEZ operating expense	2,389	0	0	2,389	0	0
				Administrative expenses	1,782	1,027	427	6	318	4
				Training, workshops and seminars	515	268	127	47	71	1
				Missions	1,189	642	181	99	264	3
				Publications	1,139	848	29	9	247	6
				Expected credit losses	1,475	1,475	0	0	0	0
				Professional and related costs	762	568	19	6	165	4
				Post services	476	354	12	4	103	3
				Utilities	620	357	148	2	111	1
				Health-care supplies	186	107	45	1	33	0
				Equipment rental	111	83	3	1	24	1
				Other taxes	163	122	4	1	35	1
				Other expenses	440	327	11	3	95	2
				Total	**21,631**	**13,908**	**1,272**	**2,649**	**3,718**	**84**
				Other losses - net	**144**	**107**	**4**	**1**	**31**	**1**
				Expense total	**242,318**	**171,327**	**22,693**	**11,091**	**34,428**	**2,778**
				Operating profit	**69,496**	**60,809**	**-14,727**	**-8,684**	**33,156**	**-1,058**

2. Calculation of unit costs for the previous year

2.1. Extraction of variable costs related to cargo handling equipment and utility ships

Variable costs for cargo handling equipment and utility ships (tug boats, pilot boats, mooring work ships) are extracted from the profit & loss statement for the previous year. The items of variable costs to be extracted are as follows.

- combustible expenses (DO)
- spare parts (spare parts, tires, spare parts for generator)
- oil & lubricant

2.2. Identification of unit values

2.2.1. Unit value for major container handling equipment

For major cargo handling equipment such as quay cranes (QCs), mobile harbour cranes (MHCs), rubber tyred gantry cranes (RTGs), reach stackers (RS), the working hours shall be deemed as the unit value of each equipment. The actual working hours for the equipment could be obtained from the statistical data of the Technical-Material Dept. for the previous year such as Working Results Summary, etc.

2.2.2. Unit values for other cargo handling equipment

For other cargo handling equipment, TEU shall be deemed as the unit value for the container handling equipment while general cargo tonnage shall be the unit value for the general cargo handling equipment. Those values could be extracted from PAS statistical data.

2.2.3. Unit value for the utility ships

For the utility ships, gross tonnage of vessels calling at PAS and adjacent ports shall be the unit value which is available in PAS statistical data.

2.3. Calculation of unit costs

The unit cost is calculated by dividing the variable cost amount by the unit value for each type of cargo handling equipment and utility ship.

Table 2-1 Summary of unit costs by equipment/ship type (sample)

Unit costs of equipment/boats for 2020 (USD)

		Fixed cost	Variable cost										
					Spare parts					Unit value		variable cost /unit value	
		Depreciation	Combustible (DO)	Lubricant oil	Equipment /ship	Generator	Tyres	S.Total	Variable Total				
QCs	5 units total	1,288,450	1,717,553	300,185	1,435,771	2,008,000	-	3,443,772	5,461,510	18,517	hrs	294.95	/hr/unit
RTGs	14 units total	663,418	1,419,503	145,717	883,766		80,454	964,220	2,529,439	43,031	hrs	58.78	/hr/unit
Reach stackers	15 units total	256,133	461,002	47,323	519,028		387,846	906,874	1,415,198	32,455	hrs	43.60	/hr/unit
HMCs	1 unit total	104,444	68,189	8,444	32,741		-	32,741	109,374	1,617	hrs	67.64	/hr/unit
Fork Lifts (Contr)	11 units total	33,884	197,572	20,281	46,616		17,630	64,246	282,099	641,842	TEUs	0.44	/TEU
Trailers (Contr)	34 units total	562,776	620,167	63,662	423,408		351,721	775,129	1,458,957	641,842	TEUs	2.27	/TEU
Shore cranes	8 units total	218,939	179,028	18,378	106,664		-	106,664	304,071	349,820	Tons	0.87	/ton
Fork Lifts (GC)	6 units total	22,101	66,163	6,792	70,451		9,616	80,067	153,022	349,820	Tons	0.44	/ton
Trailers (GC)	17 units total	67,095	5,647	580	17,282		14,356	31,638	37,865	349,820	Tons	0.11	/ton
Tug boats	6 ships total	323,621	1,451,759	100,981	408,006		-	408,006	1,960,746	16,784,979	GT	0.12	/GT
Pilot boat	1 ship total	7,982	102,317	9,798	953,882		-	953,882	1,065,997	16,784,979	GT	0.06	/GT
Mooring boat	1 ship total	110	15,702	1,868	162,705		-	162,705	180,276	14,422,935	GT	0.01	/GT

3. Demand forecast for the next 5 years

3.1. Demand forecast for container cargo

Container handling volumes are forecasted in TEUs over the next 5 years for laden and empty respectively. CEO's approval will be required for the forecasted results.

3.2. Demand forecast for conventional cargo

Handling volumes of general cargo are forecasted in tons over the next 5 years. Commodity-wise breakdown would be recommended in case an accurate forecast is required. When converting storage yards from general cargo to container, effective storage capacity needs to be considered. CEO's approval will be required for the forecasted results.

3.3. Demand forecast for vessels calling at neighboring ports

Gross tonnage of vessels which do not call at PAS terminals but are provided with tug and pilot services by PAS is forecasted. Most of those vessels are product tankers calling at the jetties of oil tank sites near Sihanoukville. The gross tonnage could be calculated in proportion to oil import values in Cambodia. The forecasted tonnage figures will be used for the calculations of the amounts of revenues related to navigation charges.

3.4. Demand forecast for passengers

Number of passengers onboard cruise ships calling at PAS is forecasted. The trend of passengers could be predicted using the statistics compiled by the Ministry of Tourism. The forecasted numbers will be used for the calculations of the amount of revenues related to passenger ships, which is categorized into "other sector".

3.5. Demand forecast for SEZ tenants

Areas in SEZ to be occupied by the tenants are forecasted over the next 5 years based on the progress of negotiations with the target tenants or the promotional activities of the SEZ Dept. This forecast results will be used for the calculations of the rental income of the SEZ sector.

4. Quay side capacity simulations for 5 years

4.1. Analysis of the latest berth windows

4.1.1. Berth window chart

The latest berth window chart is obtained from the Container Terminal Operation Dept., which shows the standard arrival/departure times and the number of loading/unloading containers for each service.

Each window is plotted in Excel format with formula cells for MPH calculations as per the Figure 4-1 below.

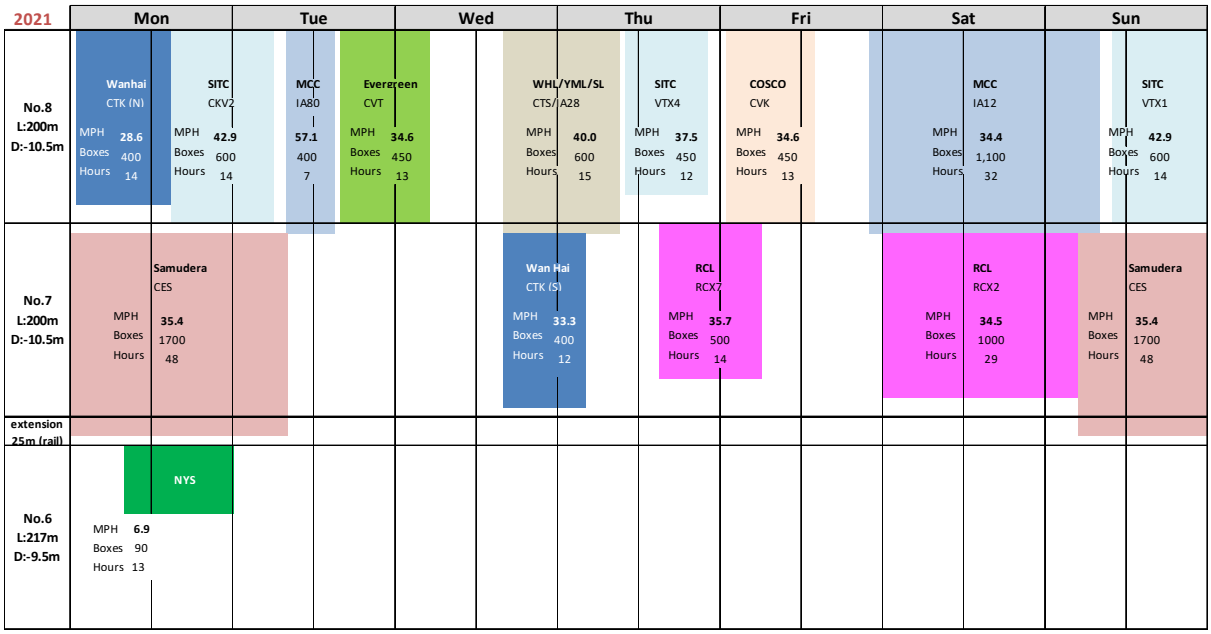

Figure 4-1 Berth window chart with MPH calculation cells (sample)

Berthing hours, number of loading/unloading boxes and vessel productivity for each berth window are summarized as per the Table 4-1 below.

Table 4-1 Berth window summary (sample)

(as of Aug. 1, 2021)

Shipping line	Service	Berth window 2019	Hours	Boxes	Vsl. Prod. (MPH)
SITC	CKV2	Mon 14:00 - Tue 05:00	14	600	42.86
	VTX4	Thu 10:00 - Thu 22:00	12	450	37.50
	VTX1	Sun 09:00 - Mon 01:00	14	600	42.86
RCL	RCX7	Thu 15:00 - Fri 06:00	14	500	35.71
RCL/CNC	RCX2	Sat 00:00 - Sun 05:00	29	1,000	34.48
WanHai	CTK(N)	Mon 01:00 - Mon 15:00	14	400	28.57
	CTK(S)	Wed 16:00 - Thu 04:00	12	400	33.33
WanHai/SL/Yang Ming	CT5(IA12)	Wed 16:00 - Thu 09:00	15	600	40.00
Evergreen	CVT	Tue 16:00 - Wed 05:00	13	450	34.62
Sealand	IA12	Fri 22:00 - Sun 06:00	32	1,100	34.38
	IA80	Tue 08:00 - Tue 15:00	7	400	57.14
COSCO	RBC2	Fri 01:00 - Fri 14:00	13	450	34.62
Samudera	CES	Sun 06:00 - Tue 08:00	31	1,098	35.42
			17	602	35.42
Namyuen Yong		Mon 08:00 - 00:00	13	90	6.92
Total	week	14	250	8,740	34.96
	year	730	13,036	455,729	

4.1.2. Average berth & crane productivities

The statistical data of “Vessels Working Productivities Record” are obtained from the Container Terminal Operation Dept. to identify the average MPH of vessel productivity and crane productivity (gross basis) for QCs & MHCs for the previous year.

Table 4-2 Vessels Working Productivities Record (sample)

Vessels working productivities's record 2020

WEEK#	N°	SL	Vessel Name / Voy n°	Berth N°	Crane	Vessels's Berthing Time	Operation Starting	Operation Ending	Vessels's Departure Time	Volume (Boxes)	Operation Period (h)	Berthing Period (h)	Idle time Period	Net Oper. Period	Cross Pro.ty	Net Pro.ty	Berth Pro.ty
WEEK#1	1	SITCI	SITC LIAONING 1926	8	Q3	30/12/19 19:27	30/12/19 19:57	31/12/19 11:18	2019/12/31 11:48	290	0:15:21	0:16:21	4:22	0:10:59	18.89	26.40	35.72
					Q4		30/12/19 20:04	31/12/19 11:17		294	0:15:13		4:11	0:11:02	19.32	26.65	
	2	WAH	WAN HAI 105-0252	7	Q1	31/12/19 12:34	31/12/19 13:04	1/1/20 3:41	2020/1/1 4:11	280	0:14:37	0:15:37	3:42	0:10:55	19.16	25.65	34.58
					Q2		31/12/19 13:05	1/1/20 2:54		260	0:13:49		3:36	0:10:13	18.82	25.45	
	3	EEP	UNI-PERFECT 447	7	Q1	1/1/20 11:00	1/1/20 11:30	1/1/20 23:30	2020/1/2 0:00	232	0:12:00	0:13:00	3:03	0:8:57	19.33	25.92	35.62
					Q2		1/1/20 11:30	1/1/20 23:30		231	0:12:00		3:19	0:8:41	19.25	26.60	
	4	WAH	ASIATIC BAY S33	7	Q1	1/1/20 19:00	1/1/20 19:30	2/1/20 6:00	2020/1/2 6:30	206	0:10:30	0:11:30	2:46	0:7:44	19.62	26.64	35.83
					Q2		1/1/20 19:30	2/1/20 6:00		206	0:10:30		2:19	0:8:11	19.62	25.17	
	5	MCCI	MAESK ABERDEEN 951	8	Q3	2/1/20 3:00	2/1/20 3:30	2/1/20 15:30	2020/1/2 16:00	220	0:12:00	0:13:00	3:49	0:8:11	18.33	26.88	33.77
					Q4		2/1/20 3:30	2/1/20 15:30		219	0:12:00		3:34	0:8:26	18.25	25.97	
	6	SITCII	SITC LIAONING 1926	8	Q3	2/1/20 9:00	2/1/20 9:30	2/1/20 17:00	2020/1/2 17:30	143	0:7:30	0:8:30	2:11	0:5:19	19.07	26.90	33.65
					Q4		2/1/20 9:30	2/1/20 17:00		143	0:7:30		2:05	0:5:25	19.07	26.40	
3271 19.04	7	RCLI	RATHA BHUM 696	7	Q1	2/1/20 15:30	2/1/20 16:00	3/1/20 6:30	2020/1/3 7:00	274	0:14:30	0:15:30	4:06	0:10:24	18.90	26.35	35.29
					Q2		2/1/20 16:00	3/1/20 6:30		273	0:14:30		4:03	0:10:27	18.83	26.12	
WEEK#02	8	SITCI	SITC JIANGSU 1924	8	Q3	6/1/20 15:03	6/1/20 15:33	6/1/20 21:05	2020/1/6 21:35	105	0:5:32	0:6:32	0:45	0:4:47	18.98	21.95	32.14
					Q4		6/1/20 15:46	6/1/20 21:15		105	0:5:29		0:34	0:4:55	19.15	21.36	
	9	EEP	TOKYO TOWER 014	8	Q3	7/1/20 10:26	7/1/20 10:56	7/1/20 17:14	2020/1/7 17:44	144	0:6:18	0:7:18	1:12	0:5:06	22.86	28.24	31.37
					Q4		7/1/20 11:16	7/1/20 14:42		85	0:3:26		0:19	0:3:07	24.76	27.27	
	10	WAH	WANHAI 216-376	8	Q3	8/1/20 1:07	8/1/20 1:37	8/1/20 16:48	2020/1/8 17:18	279	0:15:11	0:16:11	3:58	0:11:13	18.38	24.87	31.95
					Q4		8/1/20 2:01	8/1/20 14:33		238	0:12:32		3:46	0:8:46	18.99	27.15	
	11	WAH	WANHAI 163-327	8	Q3	9/1/20 1:11	9/1/20 1:41	9/1/20 11:58	2020/1/9 12:28	213	0:10:17	0:11:17	2:48	0:7:29	20.71	28.46	37.31
					Q4		9/1/20 1:35	9/1/20 11:08		208	0:9:33		2:34	0:6:59	21.78	29.79	
	12	SITCII	SITC KAWASAKI 1926	8	Q3	10/1/20 8:03	10/1/20 8:38	10/1/20 22:11	2020/1/10 23:14	221	0:13:33	0:15:11	4:16	0:9:17	16.31	23.81	29.18
					Q4		10/1/20 8:33	10/1/20 22:44		222	0:14:11		4:29	0:9:42	15.65	22.89	
	13	RCLI	PIRA BHUM 484	7	Q1	10/1/20 8:31	10/1/20 9:01	10/1/20 20:19	2020/1/10 20:49	218	0:11:18	0:12:18	3:11	0:8:07	19.29	26.86	33.82
					Q2		10/1/20 9:07	10/1/20 19:12		198	0:10:05		3:28	0:6:37	19.64	29.92	
	14	RCLII	GANTA BHUM 476	7	Q1	10/1/20 22:26	10/1/20 22:56	11/1/20 22:13	2020/1/11 23:10	399	0:23:17	1:0:44	6:19	0:16:58	17.14	23.52	32.79
					Q2		10/1/20 22:57	11/1/20 22:40		412	0:23:43		6:49	0:16:54	17.37	24.38	
	15	MCCII	NEFELI 002	8	Q3	11/1/20 0:43	11/1/20 1:13	12/1/20 2:19	2020/1/12 6:40	477	1:1:06	1:5:57	5:22	0:19:44	19.00	24.17	33.49
					Q4		11/1/20 1:31	12/1/20 6:10		526	1:4:39		5:29	0:23:10	18.36	22.71	
	16	SSL	BRIDGE 0108	7	Q1	12/1/20 14:22	12/1/20 14:57	14/1/20 9:00	2020/1/14 9:30	864	1:18:03	1:19:08	6:45	1:11:18	20.55	24.48	39.90
					Q2		12/1/20 14:52	14/1/20 9:00		857	1:18:08		6:38	1:11:30	20.34	24.14	
	17	WAH	WAN HAI 163-0237	8	Q3	12/1/20 15:10	12/1/20 15:48	13/1/20 3:46	2020/1/13 4:16	250	0:11:58	0:13:06	3:11	0:8:47	20.89	28.46	36.26
					Q4		12/1/20 15:40	13/1/20 2:21		225	0:10:41		3:01	0:7:40	21.06	29.35	
6734 19.86	18	COSO	SINAR SANGIR 337	8	Q3	13/1/20 9:12	13/1/20 9:42	14/1/20 3:00	2020/1/14 3:30	359	0:17:18	0:18:18	3:14	0:14:04	20.75	25.52	26.67
					Q4		13/1/20 9:50	13/1/20 15:00		129	0:5:10		0:24	0:4:46	24.97	27.06	

Productivity's record 2020

Gross Productivity (Boxe*h) =	21.62	Boxes*h*per QC	Total berthing time in year 2020 (h)=	10,084 (h)	For both berth 7,8 (One berth=5042(h)
Net Productivity (Boxe*h) =	27.75	Boxes*h*per QC	Rate of QC's idle time in oeration in year 2020 (h)=	3,874 (h)	22% (QC Breakdown Ship shifting and other)
Average berth productivity =	36.69	Boxes* hour*per vessel	Average berth occupancy rate 365days*24=8760(h))		58% For each berth 7, 8

4.2. Assumption of productivities for 5-year forecast

Crane productivity (gross basis) is assumed in MPH for the next 5 years for QC & MHC respectively. In case any improvement is assumed in the productivity rate, it must be supported by certain measures to achieve it, such as purchase of additional equipment etc.

4.3. Berth window simulation

4.3.1. Allocation of forecasted TEU values to each window/year

The TEU values forecasted for each year in Chapter 3 are converted into box numbers. The box number figures are allocated to each berth window in proportion to its box share in the total. The TEU/box conversion rate is available in the statistics of the previous year.

Table 4-3 Allocation of TEU values to berth windows (sample)

Shipping Line	Service	2021				2022				2023				2024				2025			
		Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod
SITC	CKV2	14	591	989	42.19	14	642	1,075	45.86	14	737	1,234	52.64	14	808	1,352	57.70	14	889	1,489	63.53
	VTX4	12	443	742	36.92	12	482	806	40.13	12	553	925	46.06	12	606	1,014	50.49	12	667	1,117	55.59
	VTX1	14	591	989	42.19	14	642	1,075	45.86	14	737	1,234	52.64	14	808	1,352	57.70	14	889	1,489	63.53
RCL	RCX7	14	492	824	35.16	14	535	896	38.22	14	614	1,028	43.87	14	673	1,127	48.08	14	741	1,241	52.94
RCL/CNC	RCX2	29	985	1,648	33.95	29	1,070	1,791	36.90	29	1,228	2,056	42.36	29	1,346	2,254	46.43	29	1,482	2,481	51.11
WanHai	CTK(N)	14	394	659	28.13	14	428	717	30.57	14	491	823	35.10	14	539	902	38.47	14	593	993	42.35
	CTK(S)	12	394	659	32.82	12	428	717	35.67	12	491	823	40.95	12	539	902	44.88	12	593	993	49.41
WanHai/SL/Yang Ming	CT5 (IA12)	15	591	989	39.38	15	642	1,075	42.80	15	737	1,234	49.14	15	808	1,352	53.85	15	889	1,489	59.29
Evergreen	CVT	13	443	742	34.08	13	482	806	37.04	13	553	925	42.52	13	606	1,014	46.60	13	667	1,117	51.31
MCC (Sealand)	IA12	32	1,083	1,813	33.84	32	1,177	1,971	36.79	32	1,351	2,262	42.23	32	1,481	2,479	46.28	32	1,631	2,729	50.95
	IA80	7	394	659	56.26	7	428	717	61.15	8	491	823	61.42	9	539	902	59.84	10	593	993	59.29
COSCO	RBC2	13	443	742	34.08	13	482	806	37.04	13	553	925	42.52	13	606	1,014	46.60	13	667	1,117	51.31
Samudera	CES	31	1,081	1,810	34.87	31	1,175	1,967	37.90	31	1,349	2,258	43.50	31	1,478	2,474	47.68	31	1,627	2,724	52.50
		17	593	992	34.87	17	644	1,079	37.90	17	740	1,238	43.50	17	811	1,357	47.68	17	892	1,494	52.50
Namyuen Yong		13	89	148	6.82	13	96	161	7.41	13	111	185	8.50	13	121	203	9.32	13	133	223	10.26
Total	Weekly	**250**	**8,605**	**14,405**	**34.42**	**250**	**9,353**	**15,657**	**37.41**	**251**	**10,736**	**17,972**	**42.77**	**252**	**11,767**	**19,698**	**46.70**	**253**	**12,955**	**21,687**	**51.21**
	Yearly	**13,036**	**448,686**	751,100		**13,036**	**487,686**	816,386		**13,088**	**559,806**	937,115		**13,176**	**615,257**	1,029,941		**13,192**	**675,523**	1,130,826	

4.3.2. Assume standard productivities for quay side equipment

Standard productivities for QCs and MHCs are assumed for the next 5 years. Improvement in the productivity of newly purchased equipment may be considered.

Table 4-4 Assumption of standard productivities (sample)

Equipment	MPH
QC	21.83
HMC (old)	10.00
HMC (new)	14.00

4.3.3. Berth window charts for 5 years

Based on the number of boxes allocated to each berth window above, berth window charts are drawn paying special attention to the following points.

(3) In case the productivity is insufficient to maintain the contracted berthing hours

Simulation is made to determine whether the loading/unloading work can be completed within the contracted berthing hours for each berth window. Standard vessel productivity assumed in 4.4 above is applied in the simulation.

In case the loading/unloading cannot be completed in time, the following measures will be considered.

1) Additional cargo handling equipment (RTG and/or RS) may be deployed to enhance the productivity. The amount of additional purchase shall be added to the investment plan in the subsequent process.

2) The demand overflown from the existing berth windows may be absorbed by some new calling services which will be allocated to vacant berth windows such as weekdays.

3) Berthing hours may be extended to complete loading/unloading works without improving the productivity. It needs to be examined whether it is appropriate for PAS to revise the berth window contract with the shipping line.

(4) Enlargement of vessels' LOA

When the throughput of PAS increases, the throughputs of other ports could increase as well. Accordingly, it needs to be assumed that vessel size will increase. The occupied quay length of a vessel could be simply calculated as the sum of LOA and beam of the vessel. The draft restrictions need to be considered since vessels with longer LOA also generally have deeper drafts.

Figure 4-2 Calculation of the occupied quay length of a vessel (sample)

(5) Even allocation of working hours among QCs

When allocating QCs to each berth, it shall be kept in mind that the total working hours of each QC become as equal as possible for each year to avoid overloading a particular QC.

Figure 4-3 shows a sample of simulation by use of a berth window chart.

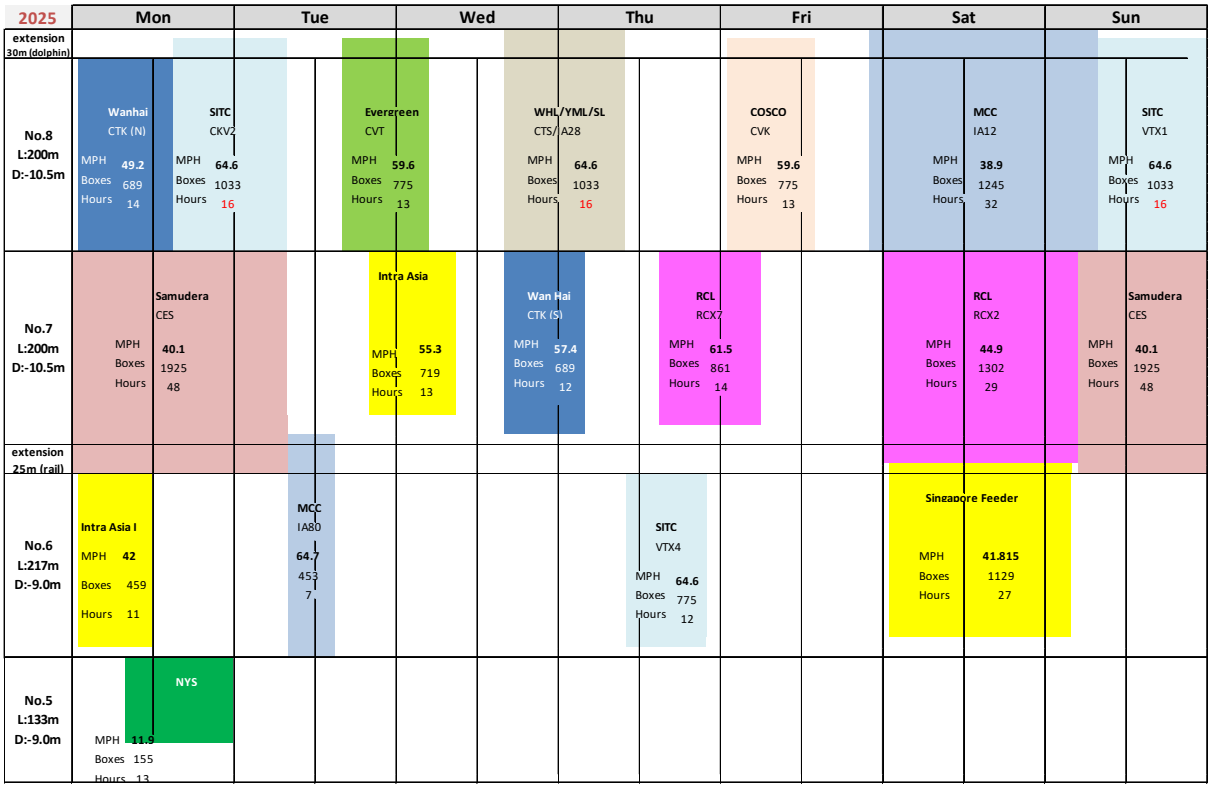

Figure 4-3 Simulation by use of berth window chart (sample)

Table 4-5 shows a sample of the allocation of QCs/MHCs corresponding to Figure 4-3.

Standard Operation Procedure (SOP)

Marketing：Marketing Department

STANDARD OPERATING PROCEDURE
For
Marketing

- Marketing Department -

(Ver.1)

JICA Expert Team

Contents

Ⅰ.Objective

Marketing is the important function for the Terminal Operators as the window for the Port Users, the Public Bodies and the other Stakeholders in outside to maintain close communication with them and reflect their request, demands, opinion, recommendation, suggestion and complaint for not only future improvement and efficiency of the operation and increase of PAS value but also for keeping PAS as a reliable and user friendly Terminal Operator for all performances such as cargo handling, ships husbanding, documentation/billing, IT/EDI, repair & maintenance, administration, safety, security and governance.

Ⅱ. Principle of Operation

In order to fulfil the important roles of Marketing Activity of PAS, Marketing Department shall act as the window of PAS for the Port Users, the Public Bodies and the other Stakeholders in outside including Medias for public relations and promotion, and shall maintain close communication with them politically, strategically, logically, reasonably, transparently, timely and courteously as a window of PAS, to assist the activity of PAS Managements and to keep the status of PAS as a reliable and user friendly Terminal Operator, and for the mutual understanding and collaboration with the other Departments of PAS. Information accumulated through communication with the Stakeholders should be utilized for the PAS Managements after the weekly and monthly assessment based on relevant statistics and analysis.

Ⅲ. Roles and Responsibilities

1) Marketing Department

Main roles of Marketing Department shown below are defined in Decision Letter No.227 SSR/PAS/Mkt by the CEO dated on 29th April 2020.

(1) Market Research and Service Quality Development
(2) Market Information (and Promotion)
(3) Customer Relations
(4) Office Coordination

Marketing Director shall make reports monthly or when necessary to CEO for further actions.

Marketing Department shall execute above four Roles based on the Standard Operation Procedure mentioned below

2) Stakeholders inside of PAS

All Departments and Staffs of PAS, for the purpose to

(1) Maintain close communication with Marketing Department for mutual understanding and collaboration.
(2) Reflect the information and analysis by Marketing Department for their daily and routine operation.
(3) Get the practical advice and suggestion, expected Q&A, relative data and statistics for the regular visit of Marketing Department to the Stakeholders in outside or joint visit upon the necessity.

(4) Get their assistance to arrange the Conference, Seminar, Discussion, Working Group, Committee and Port Tour for or with the stakeholders in & outside.

3) Stakeholders outside of PAS

(1) Shipping Lines and Agencies
(2) Shippers and Consignees, and their Industrial Associations such as "Garment Manufactures Association in Cambodia" (GMAC)
(3) Freight Forwarders and Customs Brokers, and their Industrial Association "Cambodia Logistics Association" (CLA)
(4) Truckers, and their Industrial Association "Cambodia Trucking Association" (CAMTA)
(5) Dry Ports (Off-dock CY/CFS), ICDs (Inland Container Depot), Railway Operator and the other Logistics Infrastructure Providers
(6) Customs
(7) Public Bodies
(8) Chamber of Commerce
(9) Medias (Newspaper, Magazine, Visual Media, Internet, etc.)
(10) Local Authorities & Residents

Ⅳ. Standard Operating Procedure

Ⅳ-1. Market Research and Service Quality Development.

(1) Draft up the Yearly Schedule of the Activity at the beginning of December with the Strategy Plan including regular job, and show it to all staffs of Marketing Department to be shared for the transparency and mutual understanding, and then get the approval by CEO. Review the results of activity every 3 month and amend the schedule upon the necessity.
(2) Related with below Role (Ⅳ－3. Customer Relations and Promotion), get the Market information such as trend/price and activities by competitors including pricing strategy from the Users like Shipping Lines (Ships Agents), Truckers, Freight Forwarders, Major Shippers and Consignees by face to face communication and the other proper methods for the sound and reliable management and operation by PAS.
(3) Discuss with the other Departments of PAS about counter measure by PAS for the demand and needs of the Port Users to be reflected to the daily operation of PAS.
(4) Monitor and Check the relative Internet News and the other Medias constantly to get the Market information such as Trading, Shipping and Port/Terminal of international and regional.
(5) Monitor and Analyze the weekly and monthly relative statistics as a back-up data for the information at the communication with the Stakeholders and Medias.
(6) Report the Action Plan of above (2), (3), (4) and (5) including pricing, and report the Outcome of activities to Director of Marketing, and provide necessary information to PAS concerned departments.

Ⅳ-2. Market Information

(1) Draft up the Yearly Schedule of the Activity at the beginning of December with the Strategy Plan including regular job, and show it to all staffs of Marketing Department to be shared for the transparency and mutual understanding, and then get the

approval by CEO. Review the results of activity every 3 month and amend the schedule upon the necessity.

(2) Regularly Maintain and update the Web information of PAS/Marketing and Information Network with the Port Users.

(3) Plan the Digital Marketing Strategy by utilization of statistics and opinion by the Port Users.

(4) Report the effectiveness and outcome of above ②,③ to Director of Marketing, and provide necessary information to PAS concerned departments for collaboration.

Ⅳ-3. Customer Relations & Promotion

(1) Draft up the Yearly Schedule of the Activity at the beginning of December with the Strategy Plan including regular job, and show it to all staffs of Marketing Department to be shared for the transparency and mutual understanding, and then get the approval by CEO. Review the results of activity every 3 month and amend the schedule upon the necessity.

(2) Produce and update Promotional Material for Organization of the Promotional Activities.

(3) Plan the Sales Promotion of PAS for the potential and future Port Users. Regular visit to the current Port Users by regular Communication, and Timely visit to the potential or future Users to induce as and when appropriate.

[Preparation for visit,]

- ✧ Pre-study of latest situation including the market price and competitors' activity and future plan of PAS as for Q&A by the Users' expected question, complain, claim, etc.
- ✧ Pre-study of the latest information and topics of the relative industries of Users to visit.
- ✧ Cargo Prospect of before and after long holidays which might generate the yard congestion.
- ✧ Special but Courteous request of the counter measures to users in order to avoid the yard congestion especially before and after long holidays such as quick delivery of import cargo, etc.
- ✧ Full understanding of SWOT (strength, weakness, opportunity, threat) of PAS.
- ✧ Preparation and Update of Presentation material of PAS upon the necessity to visit the potential/future users.

(4) Catch up the latest demand and needs of the Port Users, i.e. Solution of EDI of Ships' Operation, Container Inventory and Traffic, Documentation, Billing, Delivery of Containers to be loaded or discharged, etc

(5) Report the demand and needs of the Users and the Action Plan for counter measure to Marketing Director.

(6) Feed-back the outcome of discussion with PAS concerned parties and counter measure for solution and improvement by PAS to the Port Users immediately such as within one week.

(7) Monitor if PAS concerned parties carry out counter measure as discussed by above (5) and inform to the Port Users accordingly to the above (6)

(8) Monitor the satisfaction of the Port Users with counter measure by PAS if such a contributing to improvement of the Users' business such as Total Logistics and Supply Chain Management.

(9) Repeat (3), (5), (6), (7), and (8) procedure, such as PDCA (Plan-Do-Check-Action /Amend/Adjust)
(10) Regular message to the Investors to report the activities of PAS for the Investors' Relationship (IR) besides the Annual Report (Published by PAS/CSX).
(11) Cooperate with the Shipping Lines and/or Freight Forwarders to request major Shippers and Consignees who handle big volume of containers for in-time delivery of Export containers and for quick delivery of Import containers, especially before the long holidays such as the Cambodian New Year Holidays.

Ⅳ-4. Office Coordination

(1) Draft up the Yearly Schedule of Market Research and Development Activity, at the beginning of December with the Strategy Plan including regular job, and show it to all staffs of Marketing Department to be shared for the transparency and mutual understanding, and then get the approval by CEO. Review the outcome of activity every 3 month and amend the schedule upon the necessity.
(2) Monitor the Governance and Compliance of the Marketing Department.
(3) Materialize and Keep the Records and Documents.
(4) Coordinate the Staff Meeting.
(5) Assist to Public Relationship and Advertising Activities
- ✧ Select Medias to utilize such as Web, TV, General and Industrial News Paper and Magazine
- ✧ Materialize the List of person in charge of each Media to maintain the close communication
- ✧ Plan of frequent Press-Release for the transparency
- ✧ Plan the other Public Relationship activity such as mentioned at below (6), (7) as an example.

(6) Arrange the Port Tour for not only Users but also for Students, Media, Communities, etc. as for the Public Relationship (PR) and Corporate Social Relationship (CSR) of PAS in addition to the usual PR and Advertising activity.
(7) Arrange the Conference, Seminar, Discussion, Committee with the Port Users regularly. Promote Environment Management System (EMS), start from clean-up of the Port facility.
(8) Report the Governance and Compliance updated situation of the Marketing Department to
(9) Marketing Director.

[END]

Standard Operation Procedure (SOP)

Billing：Business Department

STANDARD OPERATING PROCEDURE

For

BILLING

- Business Department -

(Ver.1)

JICA Expert Team

CONTENTS

1. OBJECTIVE

This Standard Operating Procedure (SOP) establishes instructions and guidelines for billing external entities for services provided by Sihanoukville Autonomous Port (PAS).

2. SCOPE

This SOP applies to all billing arrangements between PAS and external entities, does not apply to interdepartmental billings.

3. STANDARD OPERATING PROCEDURES

3.1. Making contracts

3.1.1. Preparation

For the contracts for lift on/off, transportation, equipment leasing, parking and location rental, Operating & Contract Office shall prepare the draft of contracts.

3.1.2. Checking

The draft of contracts and the bills thereof shall be checked by Business Director.

3.1.3. Signing

The contract for a short term (less than 1 year) shall be signed by CEO. The contracts for any longer terms shall be approved by Board of Directors.

3.2. Collecting reports

Business & Summary Report Office shall collect following reports from the relevant departments in PAS.

Table 1 Name of reports & reporting departments

Name of report	Reporting department
Navigation Report	Harbor Master Dept.
Loading-Unloading Report	Container Terminal Operation Dept. General Cargo Operation Dept.
Discharge & Load Container Report	Container Terminal Operation Dept.

3.3. Proforma invoice

3.3.1. Preparation

Operating & Contract Office shall prepare the proforma invoice for customers

3.3.2. Checking

The proforma invoice shall be checked by Business Director.

3.4. Invoice

3.4.1. Preparation

(1) Navigation Charges

Business & Summary Report Office shall prepare the invoice based on the reports collected from relevant departments as per the **Table 1**.

(2) Stevedoring Charges

Business & Summary Report Office shall prepare the invoice based on the reports collected from relevant departments as per the **Table 1**.

(3) LO/LO Charge for containers

Business & Summary Report Office shall prepare the invoice based on the release order issued by shipping lines.

In case the committee account is applied, Business Director shall decide to modify the charges.

(4) LO/LO Charge for general cargo

Business & Summary Report Office shall prepare the invoice based on the release order issued by shipping lines, and the Cargo Voucher made by General Cargo Operation Dept.

In case the committee account is applied, Business Director shall decide to modify the charges.

(5) Container storage

Business & Summary Report Office shall prepare the invoice. In case of continued storage, the payment of previous invoices shall be referred to.

In case the committee account is applied, Business Director shall decide to modify the charges.

(6) General cargo storage

Business & Summary Report Office shall prepare the invoice. In case of continued storage, the Warehouse Report of General Cargo Operation Dept. shall be referred to.

In case the committee account is applied, Business Director shall decide to modify the charges.

(7) Location Rental Fee

Business & Summary Report Office shall prepare the invoice based on the agreements between PAS and the company.

In case the committee account is applied, Business Director shall decide to modify the charges.

(8) Other Lifting Charges

Business & Summary Report Office shall prepare the invoice based on the reports from Container Terminal Operation Dept. and General Cargo Operation Dept.

In case the committee account is applied, Business Director shall decide to modify the charges.

(9) Transportation Charge

Communication & Tracking Management Office shall prepare the invoice based on the container LO/LO invoices.

(10) Other than above

Business & Summary Report Office shall prepare the invoice based on the reports from Container Terminal Operation Dept., General Cargo Operation Dept. and other relevant departments.

3.4.2. Checking

All the bills prepared above shall be checked by Business Director.

3.4.3. Signing

The bills checked by Business Director shall be signed by the authorized persons as per the **Table 2** below

Table 2 Name of charges & authorized signer

Name of charges	Signer
Navigation Charges	CEO
Stevedoring Charges	CEO
LO/LO Charges	Business Director
Storage	Business Director
Location Rental Fee	CEO
Other Lifting Charges	Business Director
Transportation Charge	Business Director
Other than above	Business Director

3.5. Monitoring debts and accounts receivable

3.5.1. Monitoring

Business & Summary Report Office shall monitor internal business activities with customers and check documents prepared by customers on their debts and account receivables.

3.5.2. Unpaid invoice

(1) Business & Summary Report Office shall observe all invoices not yet paid by customers.

(2) Business & Summary Report Office shall inform the customer to pay according to the invoice already issued.

(3) Business & Summary Report Office shall suspend billing for unpaid customers.

3.6. Revenue report

(1) Business & Summary Report Office shall summarize weekly, monthly, quarterly, semi-annual and annual revenue reports to CEO, Business Director, Audit Dept., Planning-Procurement and Statistics Dept. and Accounting-Finance Dept.

(2) Communication & Tracking Management Office shall summarize daily, weekly and monthly revenue reports on the Transportation Charge.

3.7. Revenue plan

Business & Summary Report Office shall draft business plans quarterly, semi-annually and annually and submit to Planning-Procurement and Statistics Dept.

3.8. IT

(1) IT Office shall collaborate with relevant departments to enter data into SWSS and CTMS system and prepare bills in a timely and smooth manner.

(2) IT Office shall collaborate with relevant departments to prepare daily and weekly reports to superiors on the containers passing through PAS.

(3) IT Office shall collaborate with relevant departments to obtain reports that are already in the system or to be input into SWSS and CTMS to make the payment smoothly and on time.

(4) IT Office shall collaborate with IT Dept., and ICT companies to revise the tariff of PAS.

(5) IT Office shall collaborate with relevant departments to maintain and repair SWSS and CTMS.

End

Standard Operation Procedure (SOP)

Container terminal operations

: Container Terminal Department

STANDARD OPERATION PROCEDURE
FOR
COTNAINER TERMINAL OPERATION

- Container Terminal Department -

(Ver.1)

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List of Abbreviations and Terminology

Abbreviation	Description
ATD	Actual Time of Departure
CFS	Container Freight Station
CHE	Container Handling Equipment, such as QGC, RTG, RS
CTMS	Container Terminal Management System. The name of the Terminal Operation System (TOS) for PAS
CTOD	Container Terminal Operation Department of PAS
CY	Container Yard
EDI	Electronic Data Interchange
EIR	Equipment Interchange Receipt. EIR is issued by the container terminal to show a container is received from / delivered to a customer.
ETA/ETD	Estimated Time of Arrival / Estimated Time of Departure
GCOD	General Cargo Operation Department of PAS
HMSD	Harbor Master & Security Department of PAS
ID	Identification
KPI	Key Performance Indicator
OOG	Out of Gauge
PAS	Sihanoukville Autonomous Port
PDF	Portable Document Format. The name of the form of the document.
QGC	Quay Gantry Crane
QR code	Quick Response code. A machine-readable code consisting of an array of black and white squares
RS	Reach Stacker
RTG	Rubber Tired Gantry Crane
SOP	Standard Operation Procedure
SQL	Structured Query Language
SWSS	Single Window Service System. One of the systems used in PAS.
TDR	Terminal Departure Report
TEU	Twenty-foot Equivalent Unit.
UN/EDIFACT	United Nations/Electronic Data Interchange for Administration, Commerce and Transport.
UPS	Uninterrupted Power Supply
MDT	Mobile Data Terminal. MDT is a PC, which installed on the cabin of QGC, RTG, and Reach Stacker and use as a devices for CTMS.

CONTENTS

1. OVERVIEW

This document clarifies the job description and the operational flow for the Container Terminal Operation Department of PAS. It also describes the responsibilities of each party involved in the process, operational recommendations as well as terms and conditions to ensure that predetermined productivity and safety levels are achieved during container handling operations.

2. JOB DESCRIPTION

The jobs to be conducted by the Container Terminal Operation Department (CTOD) is classified as follows.

Operation Group	Description
Vessel Operation	Jobs concerning the vessel calls and the container handling operation for loading/discharging to/from the vessel
Gate Operation	Jobs concerning the operation for receiving and delivery of containers through the Terminal Gate.
Yard Operation	Jobs concerning the management of container stacking yard, and container movements in the yard.
Administration Operation	Jobs concerning the resource control and future planning as for the operations above,
Others	Jobs related to the CFS operation, Container handling for the railway, and the maintenance of the container berths and yard. These jobs are not described in this document.

2.1. Vessel Operation

2.1.1. Vessel Calling Schedule Management

(1) Management of the middle or long-term Vessel Schedule.

a. Maintenance of the Berth Window

CTOD Director prepares the Weekly Berth Window shown below and distributes it to the organization concerned, whenever the berth utilization contract is updated or newly made with the shipping lines.

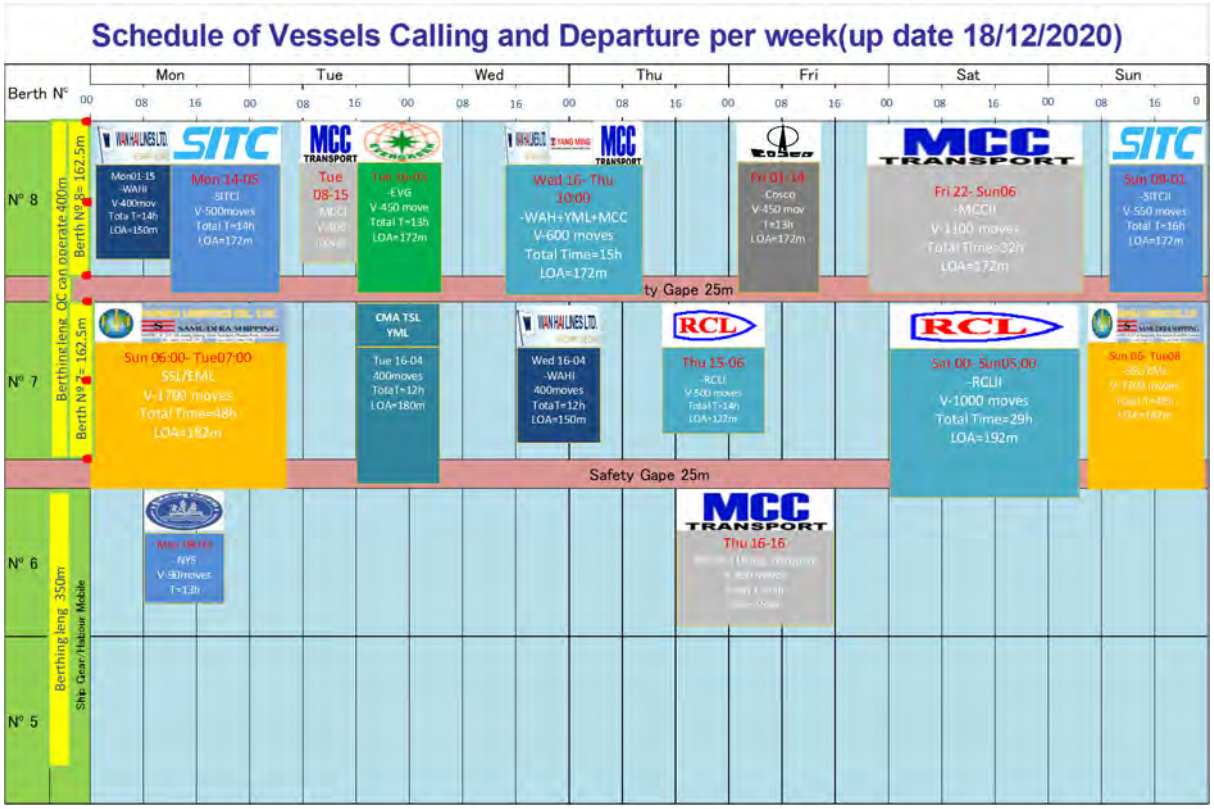


Figure 1 Sample of Weekly Berth Window

b. Allocation of the person in charge of the vessel planning
The chief of the Vessel Planning Section allocates the person in charge of the planning of the vessel which will call the Sihanoukville Port next week.

c. Registration of the vessel schedule in CTMS
The person in charge of the vessel planning shall register the vessel schedule information in CTMS.

(2) The procedure for vessel arrival

a. Submission of the application form for Vessel call and the change of calling schedule
Harbor Master & Security Department (HMSD) receives the application for the vessel call and the change of the calling schedule from the shipping line through the Port EDI system.

b. Berth adjustment
HMSD decides the berth number and the time for berthing and departing in coordination with the CTOD and shipping line.

The vessel planner in charge shall update the berth number and estimated arrival/departure date (ETA/ETD) of the vessel based on the decision by the Harbor Department.

c. Approval of the vessel call
The vessel call is approved by PAS Harbor Master, Customs, Immigration police, and Quarantine using Port EDI system.

d. Sending the information of vessel call
HMSD sends the information of vessel call to the sections concerned including the CTOD soon after it is approved. The vessel planner in charge shall register the actual arrival date and time in CTMS and CTOD starts the vessel discharging / loading operation for the vessel.

(3) The procedure for vessel departure

a. Approval of the vessel departure

After the captain of the vessel confirms the completion of all the container handling operation, the shipping line applies Port EDI System for the departure of the vessel. All the procedures for the vessel departure are conducted through the system. The departure must be approved by PAS Harbor Master, Customs, Immigration police, and Quarantine.

b. Sending the information of vessel departure
HMSD sends the information of vessel departure to the sections concerned including the CTOD soon after it is approved. The vessel planner in charge shall register the actual departure date and time in CTMS.

2.1.2. Control of Vessel Discharge/Loading Container Information

(1) Confirmation of the information of vessel discharging containers

a. Receiving import cargo information from shipping line
CTOD Document Section receives the import cargo information such as Cargo Manifest, etc. from the shipping line. The Import Cargo Manifest can be obtained from Port EDI system by PDF file.

b. Registration of the import cargo manifest data
CTOD Document Section enters the data, which is received from the shipping line, in Excel file and transfers them to SWSS and CTMS.

c. Registration of the discharging container data
Currently, CTOS Document Section receives the arrival Bayplan data, which is issued at the previous port, from the shipping line in Excel forms and registers them in CTMS.

However, the Vessel Panning Section should in future receive the data by email in the form of UN / EDIFACT BAPLIE, which is recognized as the international standard. The file of BAPLIE form can be registered directly in CTMS.

d. Collation of arrival Bayplan data with the Import Cargo Manifest
CTOD Document Section collates arrival Bayplan data with the Import Cargo Manifest. If the data do not agree, one of the data shall be modified after the confirmation with the shipping line. If a container number differs between two documents, the Document Section shall inform the vessel planner in charge that the container number must be verified when it is actually discharged from the vessel.

e. Picking up the special containers
CTOD Document Section collects information on special containers, such as reefer, hazardous, out of gauge, etc. and of containers which are requested for botanical / zoological inspection. The obtained information is transferred to the vessel planner in charge.

(2) Confirmation of Loading Full Containers

a. Confirmation of export booking information
CTOD Document Section receives the export booking details and summary from the shipping line and transfers them to the Vessel Planning Section together with the details of the special containers, such as reefer, hazardous, out of gauge, etc.

b. Confirmation of received export full containers
The vessel planner in charge asks the working team of the Operation Steering Group to checks the export full containers received in the yard. In case of special containers, size of over gauge, the proper cargo lashing for over gauge containers, labels sticked on the hazardous containers, power cables for reefer containers, etc. shall be confirmed. The vessel planner in charge also confirms that the export containers are ready for loading from the viewpoint of Custom clearance, restriction from the shipping line, etc.

The vessel planner in charge may request Yard Planning Section to shift containers, which may require shuffling moves at the time of ship loading operation due to the weight balance, etc. before the loading plan is started.

(3) Preparation for Loading Empty Containers

a. Receiving the information of loading empty containers

CTOD Document Section receives the number of empty containers to be loaded on the vessel from the shipping lines and transfers the information to the vessel planner in charge and CTOD Empty Container Control Section.

b. Picking up the empty containers to be loaded

- CTOD Empty Container Control Section confirms the inventory of empty containers for the shipping line and check if the nominated empty containers are stacked in the yard and/or the nominated quantity of empty containers exist in the yard. The check shall be conducted not only in CTMS but also visually in the yard. After the confirmation, Empty Container Control Section changes the status of the empty containers to be loaded from empty to export using CTMS and informs the vessel planner in charge of the list of the empty containers to be loaded.
- The vessel planner in charge may request Yard Planning Section to shift containers, which may require shuffling moves at the ship loading operation before the loading plan is started
- He may also shift all the empty loading containers to RTG area before the vessel operation is started in order to reduce the time for vessel loading operation in coordination with the Yard Planning Section.

(4) Preparation of Vessel Loading /Discharging Plan

Currently, vessel planners prepare the discharging plan first and the loading plan is made during the actual discharging operation because the instructions for loading operation can be only obtained from the shipping line after the vessel arrives. Therefore, it is difficult for vessel planners to make an efficient loading plan as time to formulate the plan is limited. PAS shall strongly request all the shipping lines to send the stowage instructions for vessel loading in advance to the vessel arrival.

a. Confirmation of the arrival bayplan

The vessel planner in charge reviews the arrival bayplan using the General Plan (Discharging) screen of CTMS and check below.

- if any mistakes are found in load/discharge port, vessel cell location of containers, etc.
- if any re-stow operation is required in any cell of the vessel. If required, the vessel planner shall confirm the shipping line and register the re-stow plan in CTMS.
- It is all also necessary to summarize number of load/discharge containers for each type of cargo and examine the operation step and sequence for each Quay Gantry Crane (QGC) for vessel operation.

b. Confirmation of the stowage instruction for loading containers

- The vessel planner in charge receives the stowage instruction for loading containers such as stowage positions for each discharging port, for each special containers, etc. from the shipping lines.
- The vessel planner enters the stowage instruction (loading cells for each discharging port, container attribute, etc.) in CTMS. If the data can be received by EDI (UN EDIFACT MOVINS/BAPLIE), it can be directory registered by using CTMS EDI file translation function (The modification of CTMS software may be required to add MOVINS form by CTMS supplier.)

c. Making Vessel discharge/load plan

- The vessel planner in charge grasps the quantity and types of discharge/load containers from the summary of discharging containers for each attribute and the summary of loading containers for each attribute and stacking area. As for the loading containers, he also checks the containers which has not arrived at the terminal, whose Custom clearance is not completed, and whose movements are restricted from the shipping line, etc.

- The vessel planner in charge examines the work plan (operation schedule) for QGC for vessel operation and registers it in CTMS.
- The vessel planner in charge, then, informs yard planners of discharging/loading containers summary for the vessel, operation schedule data, etc. and asks them to secure the yard space for discharging containers.
- The yard planner checks the container stacking state using CTMS and confirms if there is enough empty space for discharging containers. If the space is enough, he registers the stacking plan for vessel discharge in CTMS and informs the vessel planner of the area. If the space is not enough, empty bays are secured by shifting some of the import containers to the other area.
- The vessel planner in charge generates the discharging plan (nomination of discharging location and change of the discharging sequence if it is needed) using CTMS.
- As for the loading plan, the vessel planner in charge requests yard planners to shift loading containers whenever it is necessary. After the shift is completed, the vessel planner generates the loading plan by allocating a vessel cell to each loading container using CTMS.

(5) Performing the Vessel Operation

a. Arrangement of vessel operation
- CTOD confirms arrival date of the vessel and examines the number of cranes and gangs.
- Based on the above, CTOD arranges the gang members. He arranges gang boss and operators for container handling equipment in CTOD and asks GCOD (General Cargo Operation Department) to arrange the lashers and tallyman on the vessel and at the quayside.
- CTOD informs the department concerned of the estimated start/end time of the vessel operation, number of gangs, etc.

b. Preparation of the container handling operation
- The vessel planner in charge explains the vessel plan to the chief officer of the vessel when the vessel arrives at the Port and obtains the approval from him. If the chief officer requests the changes, the plan shall be modified accordingly.
- CTOD Operation Steering Group checks the maintenance and operational status of container handling equipment and asks Equipment Maintenance Department to repair or check the container handling equipment if it is necessary.
- CTOD allocates the gang boss and the operators for the container handling equipment for the vessel.
- The vessel planner in charge explains the plan to the gang boss, such as handling of the special containers, remarks for lashing operation, the yard allocation, overview of the vessel plan, etc. before the vessel operation is started. He also prints out the work lists used for the vessel operation and delivers them to the persons concerned for the vessel operation. Furthermore, the vessel planner contacts the shipping line, asks for the emergency contact, and shares the emergency contact with the persons concerned.
- CTOD gang boss gathers the gang members and holds a meeting before the vessel operation is started. He confirms that all the members wear the safety gear, such as helmet, safety vest, work shoes, etc. and explains the precautions for the vessel operation.
- The operators of QGC, RTG, RS, yard trailers shall conduct the opening check for the concerned equipment before starting the operation. The Quayside checkers shall check the hand-held terminal including the battery status before the operation.

c. Performing the vessel operation
- The gang boss of each gang shall announce the commencement, stop, completion of the work to the concerned department/staffs. He also instructs the container location to yard trailers, monitors the situation, and sends necessary instruction at the site. If any issues happen, he grasps the situation, examine countermeasures, and implements them in coordination with the Control Center.
- CTOD QGC operator discharges/loads the hatch covers and containers according to the instruction of work lists and the Mobile Data Terminal (MDT). He shall also follow the instruction of the gang boss and Control Center.

- CTOD QGC signal man checks the container handling operation of the QGC on the vessel deck. He issues the necessary instruction or guidance to the QGC operator to ensure the safety. He also supports QGC operator for confirming load/discharge containers in order to avoid the incorrect container handling.
- GCOD lashers on the vessel release lashing ropes for discharging containers before the container handling and fix lashing rope for loading containers after the container handling. On the vessel, they shall always work on a container in pairs with the utmost care and attention while wearing the safety rope. During the container handlings for the vessel in-hold area, they shall assist the signal man as lashing work is not required in the hold area.
- GTOD lashers at the quayside removes stacking corns from containers in vessel discharging and attach them to containers in vessel loading operation. The stacking corns shall be taken out from the Gear Box (a container storing stacking corns and carried by the vessel), sorted in the storage box, and placed where the load/discharge operation is conducted before the vessel operation is started. The removal and attaching stacking corns shall be conducted by two lashers in tandem. The work shall be performed rapidly and with the utmost care and attention.
- GTOD checker (tally man) confirms that the correct container is loaded or discharged according to the instructions. He also checks if the container doors are correctly sealed one by one for full container. The confirmation shall be done both visually and by using hand-held terminal. The checker enters the container number (last 4 digits of the number) and the yard trailer ID in hand-held terminal for discharging and just container number for loading. He also checks the outside the container. If the damage is found, its details are noted on the tally sheet.
- GTOD operator of a Fork List moves the stacking corns in the storage box to the place where containers are discharged or loaded at the quayside according to the instruction by the gang boss before the operation is started. When the discharging and loading is completed, he shall move the storage box to the place near the Gear Box.
- CTOD yard trailer driver follows the instruction from the gang boss and Control Center. He receives a container at the quayside, moves to the yard, and delivers the container to RTG or Reach Stacker (RS) in discharging operation. In loading operation, He receives a container from RTG or RS in the yard, moves to the quayside, and delivers the container to QGC. These operations are conducted according to the work lists.
- CTOD RTG operator moves to the target yard and moves a container between yard trailer and the stacking yard according to the instruction displayed on the MDT. He shall also follow the instruction from Control Center. Soon after the container handling is completed, he shall enter the completion of the movement using the MDT. If shuffling is conducted before picking up a loading container in loading operation, its results are also entered in MDT. If any problems occur or if there are any questions pertaining to the operation, RTG operator shall contact Control Center promptly using wireless radio and ask for the instructions or the answers. Please refer to chapter 4. for the basic operation procedure for RTG.
- CTOD Control Center enters the start, stop of the operation in CTMS. Before the vessel operation, he shall confirm the phone numbers or SMS addresses for necessary contacts and confirm everything is ready for vessel operation. During the vessel operation, he shall keep monitoring the progress of the container handling operation and provide the necessary advice to the operators of RTG or RS in order to keep the operation from becoming stagnant. Control Center also responds to the queries from the gang members including the gang boss and crane operators. He monitors the congestion status in the yard and changes the discharging location of containers if it is needed in coordination with the Working Team of CTOD Operation Steering Group and the gang boss. He also instructs the Working Team to attach or detach the electric power plug for reefer containers according to the progress of the vessel operation. Furthermore, he changes the work sequence or container stacking address in CTMS based on the request or report from the gang bosses or crane operators.
- CTOD Operation Steering Group Management Team monitors the progress of the vessel operation and takes necessary actions if any delay in operation occurs. The team also takes the necessary measures, such as stopping trailers from the gate going into RTG lane, etc. when the traffic congestion occurs in the yard. The actual monitoring and countermeasures at site is

conducted by the Working Team of the Operation Steering Group based on the instruction by the Management Team. After the vessel operation is completed or the end of the day, the Management Team summarizes the activity (number of container handlings, work efficiency, equipment efficiency, delays, etc.) and reports to CTOD Director. The Management Team gathers the leaders of the concerned organization daily to examine issues in operation and discuss countermeasures.

- CTOD Operation Steering Group Working Team constantly patrols the yard and monitors the situation of the container handling operation / traffic flow of trailers in the yard. The Working Team confirms the container stacking situations in the yard based on the instruction of the Management Team. If the Working Team finds any issue in the yard, it is reported to the Management Team for further instructions. The Working Team attaches / detaches the electrical plugs for reefer containers according to the instruction from CTOD Control Center.
- CTOD vessel planner in charge shall standby to answer any calls during the vessel operation. If any problem occurs, he shall contact the chief officer of the vessel and the shipping line, examine the countermeasures, change the vessel plan if it is needed, and inform the changes to the parties concerned. If heavy damage is found on a discharged container, he shall contact the chief officer of the vessel and the shipping line and obtain their signatures confirming the damage. After the vessel operation, he shall confirm the results of the lashing of containers on the vessel.

d. Response in case of failures in container handling equipment

- CTOD crane operators contact Control Center if any failure occurs in container handling equipment.
- Control Center contacts Maintenance Shop through CTOD Operation Steering Group and ask for repair. When the failure is corrected, the Control Center informs relevant parties and re-starts the operation.

(6) Completion of the Vessel Operation

a. Confirmation of vessel lashing status

- The chief of Vessel Planning Section visually confirms the status of the vessel lashing result with the vessel crew and the representative of the GCOD lashing team on the vessel.

b. Collecting the operation result and report

- After the vessel operation is completed, the vessel planner in charge collects the data of vessel operation and files these data.
- The vessel planner in charge submits the departure bayplan sheet and EDI files to the vessel.
- The vessel planner in charge prepares the cell location list and TDR (Terminal Departure Report) and sends them to the shipping line.
- CTOD Document Section prepares the following documents for invoicing and submits them to the Business Department.
  - Storage Report: Details of loaded / discharged containers including number of storage days for loading containers
  - Handling Report: Summary of loaded / discharged containers for each full/empty, container handling time, number of container handling equipment, etc.
- CTOD Document Section enters the data for export containers such as Commodity, Cargo Weight, Final Destination (Country) in SWSS (Single Window Service System) based on the Export Cargo List received from the shipping lines.

2.2. Gate Operation

(1) Preparation and confirmation of the status

a. Confirmation of the stacking state of export containers

- CTOD Yard Plan Section confirms if the container stacking plan, which is enough for assigning the yard location for all the containers to be received on the day, is registered in CTMS. If any shortage in the plan is expected, the additional plan is entered for export containers. If there is any shortage in empty bays for the additional plan, container shift is

planned/arranged/conducted for securing empty bays. If multiple container shifts are conducted all together in batch, the shift pan is registered first, then the shifts are conducted after arranging the operators and equipment. If the container shift is conducted one by one, each container shift is instructed to the container handling equipment using the random shift function of CTMS.

b. Confirmation of the stacking status of empty containers
   - CTOD Empty Container Control Section checks the inventory of empty containers in order to check the following.
     - Every empty container is stacked based on the empty container area plan
     - Empty containers must be stacked without mixing the shipping line
     - There is no shortage of the stacking area.

     After the confirmation, container shift for sorting / classification is requested to the Yard Planning Section if it is required.
   - CTOD Empty Container Control Section also checks the staking plan for empty container registered in CTMS and adds the plan if there are any shortage in plan for each shipping ling or attribute.
   - If there is a shortage or excess of empty containers, CTOD Empty Container Control Section shall request the shipping line to adjust the inventory of empty containers. If there are any damaged empty containers, the section contacts shipping lines for further instructions.
   - CTOD Yard Planning Section plans / arranges / conducts the shift plan based on the request from Empty Container Control Section.

c. Arranging container handling equipment
   - CTOD Management Team of Operation Steering Group daily grasps the availability and maintenance status of container handling equipment, such as RTG, Reach Sacker, etc. They decide the number of container handling equipment to be deployed for the day and allocate/arrange operators for each equipment.

d. Data entry for Fast Track service
   - Forwarders, shipping lines, or truck drivers can select either the document base reception or the Fast Track reception at the terminal gate. The procedure after the reception at the gate is the same in both procedures.
   - In case of the Fast Track service, forwarders, shipping lines, or truck drivers shall register the reception data for receiving /delivery of containers prior to the arrival of trailers at the gate by using dedicated application software for smartphone and get the QR code. Truck driver shall show the QR code on a smartphone or printed on paper at the terminal gate for the reception.

(2) Work in front of the Terminal Gate

a. Control of traffic in front of the terminal gate
   - The checker of the Security Office shall conduct the traffic control work below in front of the terminal gate
     - To prohibit vehicles other than container trailers from entering the gate lane
     - To remove parked trailers in front of the terminal or allow them to proceed to the gate lane gate especially during traffic congestion.
     - To control the traffic flow of waiting trailers by letting trailers enter the gate lane one by one smoothly
     - To guide trailers without the proper documents to the prescribed area inside the terminal when there is traffic congestion in front of the terminal gate on Saturday.

b. Confirmation of containers
   - Security Office checker checks the purpose of the driver's visit to the Port and confirms that the driver carries the proper documents for the reception procedure at the gate. Export containers whose Customs clearance are applied in Sihanoukville are guided to pass through the gate lane without any reception procedure as they are inspected by Customs inside the Port before the reception procedure.
   - Security Office checker performs the following tasks before trailer carrying a container enters the gate lane.

- To check if the lock between the container and the chassis is released.
- To check for damage on the outside the container and record details of any damage in the Survey Report.
- To write the Seal Number in the Survey Report for full containers
- To confirm that empty containers are empty
- To collate container size, number, seal number with the documents carried by the driver.
- To check if the proper cargo lashing is conducted for the out of gauge containers.

- Customs checker performs the following tasks.
  - To write container number and seal number on a paper and deliver it to Customs officer in the gate booth.
  - To cut container seal for Customs in case of bonded transfer export containers

(3) Gate Reception

a. Gate reception for receiving export/empty containers
- CTOD gate clerk checks the following documents carried by the truck driver.
  - Request of Container Receiving (for PAS)
  - Booking List (Empty Cont. Release Advice)
  - EIR at the Import Out
  - Survey Report (delivered by the checker in front of the gate lane)
- CTOD gate clerk enters the data on the gate reception screen of CTMS. In case of Fast Track service, the gate clerk scans the QR code shown on the smartphone or printed out on a paper and confirms the information shown on the CTMS screen. After the data entry, the gate clerk delivers the EIR, which is printed out by CTMS, and instructs the driver to proceed to the yard location shown on the EIR.
- If any problem is found in the documents, the clerk allows the driver to proceed inside the terminal and informs him that he must come to the window again after getting the proper documents.
- In case of OOG containers, the clerk shall contact the Control Center and request them to guide the trailer to OOG container stacking yard.
- In case of reefer containers, the clerk shall contact the Control Center and request that an electric plug be attached after the container is stacked.
- Immigration Police checks the driving license of the truck driver and confirms the purpose of the visit from the documents carried by the driver.

b. Handling for errors in automatic assignment of stack location in export/empty receiving
- When the stack location of the container cannot be decided by CTMS on the gate reception screen, the gate clerk shall inform the yard planner of Control Center with the reception data. The gate clerk instructs the truck driver to wait until the yard location is instructed. When the gate clerk receives the yard location from the yard planner, he enters the yard address on the screen.
- CTOD Yard Planner of Control Center, who received the information from the gate clerk, finds the empty slot in the yard for the container considering the attributes of container such as vessel to be loaded, discharging port, container size, etc. When he finds the empty slots, he informs the gate clerk of the location and adds the yard bay to the corresponding stacking plan.

c. Gate delivery reception for import/empty containers
- CTOD gate clerk checks the documents, which is carried by the truck driver, below
  - The copy of the Delivery Order for import containers and the copy of the Pickup Order for empty containers.
- CTOD gate clerk enters the data on the gate reception screen of CTMS. In case of Fast Track service, the gate clerk scans the QR code shown on the smartphone or printed on a paper and confirms the information shown on the CTMS screen. After the data entry, the gate clerk delivers the Gate Slip, which is printed out by CTMS, and instructs the driver to proceed to the yard location shown on the Gate Slip.

- If any problem is found in the documents, the clerk allows the driver to proceed inside the terminal and informs him that he must come to the window again after getting the proper documents.
- In case of OOG containers, the clerk shall contact Control Center to request them to arrange the delivery of OOG container and guide the trailer to OOG container stacking yard.
- In case of reefer containers, the clerk shall contact Control Center to ask to detach electric plug before the container is picked up from the yard.

(4) Container handling in the Yard

a. Control of the container handling for receiving/delivery operations
- CTOD Control Center solves the issues on container handling when they are contacted from the operator of container handling equipment. In considering the countermeasures for the issues, Control Center shall obtain advice from the CTOD Operation Steering Group
- CTOD Control Center confirms the container information and the container stacking state in the yard. They may correct the yard location of containers or enter the manual completion of the container movements in place of the operator of container handling equipment.

b. Receiving / delivery of the special containers
- CTOD Director makes sure all personnel are aware of the services to be provided for special containers based on the contract with the shipping line, shippers, consignee, etc.
- CTOD Control Center asks the Working Team of Operation Steering Group to attach or detach the electric power plug for reefer containers when he is asked by the gate clerk.
- CTOD Control Center asks the Working Team of Operation Steering Group to guide the trailers to OOG stacking yard when he is asked by the gate clerk. If the devanning of container in the yard is required, he shall arrange cargo handling equipment with an operator, staffs in charge, conductor, etc. and dispatch them at site.
- CTOD Working Team of Operation Steering Group performs the tasks below based on the instruction from the Control Center
  - Attach/detach electric plug for reefer containers
  - Guide trailers of OOG container between terminal gate and the OOG container stacking yard.

c. Container handling for receiving / delivery operations
- The operator of RTG or RS conducts the container movement according to the instructions shown on the MDT screen. If the container cannot be handled based on the instruction, the operator shall contact Control Center for further instruction. If the container is stacked or moved to the different location from the instruction or shuffling moves are conducted in addition, their result shall be entered in the CTMS through MDT screen or by asking Control Center to enter these data.
- If the yard lane is congested with trucks, the operator shall inform Control Center of the congestion status and request that measures to alleviate the congestion be taken.

d. Access control for the gate traffic
- CTOD Management Team of Operation Steering Group instructs relevant personnel to take the following measures in order to control the traffic flow from the terminal gate to the yard lanes when the yard lanes are congested by the trailers during the vessel operation.
  - CTOD gate clerk instructs the truck driver to wait at the waiting area without proceeding to the yard lane and to follow the instruction of the Working Team of the Operation Steering Group after completing the gate reception procedure.
  - CTOD Working Team of Operation Steering Group stays at the waiting area of trailers and let the trailer wait until a container movement at the respective yard lane is completed by confirming RTG operator using wireless radio.
  - RTG operator contacts Working Team by wireless radio and asks that the next container trailer brought whenever a container movement is completed.
  - By observing the situation and listening the communication among gate clerk, Working Team, and RTG operators, CTOD Control Center provides the necessary advice or instructions to avoid the further congestion.

(5) Delivery Completion for import container at the Out-Gate

a. Damage check for delivery containers
   - CTOD checker checks the damage outside the import or empty containers to be delivered around the area behind the CFS warehouse at the quayside. Any damage is recorded in the Survey Report.

b. Delivery completion for Import Container
   - CTOD gate clerk confirms that the storage and handling charges have already been paid on the CTMS screen. Then, the clerk enters the delivery data in CTMS. The details of the damage are also entered if there is any damage is described on the Survey Report, which is carried by the truck driver. EIR, which is printed out on completion of the data entry by CTMS, is delivered to the truck driver.
   - Customs officer checks the documents, such as Customs Declaration, Customs Receipt, Scanning Report, Cargo Release Note, etc., which are carried by the truck driver, etc. to verify that the container number and seal number on these documents agree with the actual ones.
   - Immigration Police confirms the documents such as customs permission, delivery order, and the license of the driver.

c. Delivery Completion for empty container at the Out-Gate
   - CTOD gate clerk confirms that the storage charge and handling charges have already been paid on the CTMS screen. Then, the clerk enters the delivery data in CTMS. The details of the damage are also entered if there is any damage is described on the Survey Report, which is carried by the truck driver. EIR, which is printed out on completion of the data entry by CTMS, is delivered to the truck driver.
   - Immigration Police confirms the documents, such as pick-up order, and the license of the driver, etc.

2.3. Yard Operation

(1) Conducting Container Shift in the yard

CTOD Yard Plan Section makes a plan for shifting containers upon a request from the shipping line or from other sections of CTOD. It is also planned in order to create empty bays or integrate multiple allocations into one, etc.

The shift may be conducted for multiple containers all at once or one by one. In the former case, the shift plan is first generated in CTMS. When the plan is started, the instruction is automatically transferred to MDT of the container handling equipment one by one. Then, the next instruction is transferred whenever the completion of the previous instruction is entered from the MDT. In the latter case, a random shift is registered in CTMS for each movement and the work instruction is transmitted to the MDT of the equipment one by one. Then, the movement completion is entered one by one from the MDT of the container handling equipment.

In case of emergency shift, the instruction may be transmitted directly to the operator of container handling equipment by wireless radio and the result is also informed to Yard Plan Section by the wireless radio. In this case, the location change can be entered using the yard location correction function of CTMS by Yard Plan Section.

(2) Managing Yard Allocation Data
   - CTOD Yard Plan Section registers the stacking plan for discharging container according to the schedule of the vessel call. If there is any shortage of empty bays in the yard, container shift shall be conducted to secure the necessary empty bays.

(3) Empty Container Control
   - CTOD Empty Container Control Section registers the stacking plan for empty containers in CTMS for each shipping line and attribute. Empty Container Control Section shall monitor the stacking state of empty containers both from CTMS screen and visually at site and checks if empty containers are stored according to the allocation plan for each shipping line. Furthermore, Empty Container Control Section checks the number of empty containers in the yard. If the volume is more than expected, they shall ask CTOD Management Team of the

Operation Steering Group to contact the shipping line and request that the volume of inventory be adjusted.

(4) Reefer Container Control

- CTOD Yard Plan Section, based on the contract with shipping line, instruct Working Team of Operation Steering Group to monitor the following while reefer containers are stored in the yard. The result of the monitoring shall be recorded properly for the future query from the shipping line.
  - Power is supplied and the plug is connected
  - Temperature is correctly set according to the order.
  - Refrigeration unit is working properly

(5) Dangerous Container Control

- CTOD Yard Plan Section shall grasp kind of goods and the locations of dangerous containers in the yard. They shall monitor them to ensure that these containers are segregated properly according to the domestic regulations on the storage of dangerous cargoes in the yard.

(6) Managing Long Stay Containers

CTOD Yard Plan Section identifies import containers that have been stored for more than one month in the yard and attempts to determine why they have not been delivered. These long staying containers shall be stacked together as much as possible.

- Long staying containers which stay in the yard for more than three months shall also be identified and the reason for the longs staying time shall be investigated. These containers shall be periodically shifted to the area dedicated for Long Stay containers.

2.4. Administration Operation

(1) Monitoring and Improvement

a. Monitoring KPI and the improvement

- CTOD Director keeps monitoring the KPI value such as quayside productivity, container dwell time, trailers turnaround time, etc. If the KPI value does not reach the target value, the improvement shall be ordered to CTOD Operation Monitoring Group. CTOD Director introduce measure to improve KPI based on the examination by the Operation Monitoring Group.
- The monitoring sheets of KPI value are shown below.

Sheet for Follow-up Survey (Draft)

Sept, 2021 （Person inCharge,PAS)
. Fukazawa （Person in Charge, JICA Team)

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (3)	Berthing Time of vessels will be reduced	Berth Productivity

Follow-up Survey

Survey Method	Berthing Productivity is picked up from the Vessel Schedule List compiled by Container Terminal Operation Department of PAS. Vessel Productivity = (Number of load/discharge moves) / (Berth Time) STS Crane Productivity = (Number of load/discharge moves) / (Operation Time of Cranes) The monthly average Berth Productivity is calculated as the KPI.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

(Results of current survey)

	Mar	Apr	May	Jun	Jul	Aug	Average
STS Crane	42.4	40.6	40.8	44.2	43.6	40.4	41.9
Vessel Prod.	21.2	21.0	21.9	21.6	21.2	20.6	21.2

(Comparison from the begining)

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
STS Crane Productivity	20.2	25	16.1	22.1	21.8	21.2
Improvement Rate			80%	109%	108%	105%
Vessel Productivity	30.1	40	27.2	37.4	36.9	41.9
Improvement Rate			90%	124%	123%	139%

(Improvement Rate = (Surveyed Value/Baseline) x 100)

Please attach Reference Figures/Tables and Pictures related to Surveys

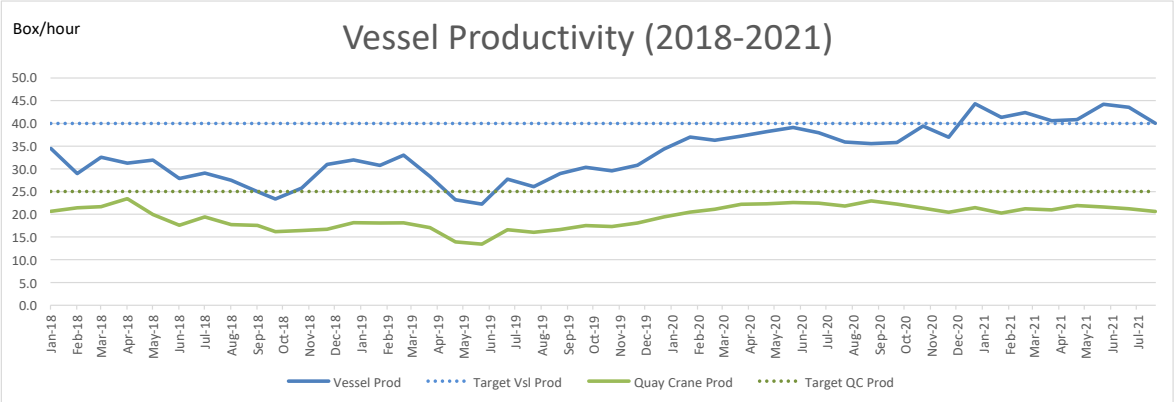


Figure 2 Sample of Quayside Productivity

Sheet for Follow-up Survey (Draft)

Sept, 2021 （Person inCharge,PAS)
N. Fukazawa（Person in Charge, JICA Team)

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (1)	Dwelling Time of Import containers will be shortened.	Import Container Dwell Time

Follow-up Survey	
Survey Method	Dwell time of import container is calculated using the history information of CTMS. The import dwell time is calculated from the discharge time of a container from a vessel and its delivered time from the gate. As the KPI, the average dwelll time of import containers delivered for a month is calculated.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

(Results of current survey）

	Mar	Apr	May	Jun	Jul	Aug	Average
Empty	3.5	4.8	4.0	3.2	4.1	2.7	2.6
Full	4.9	5.8	7.4	5.4	4.5	4.5	5.4

（Comparison from the begining）

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
Import Empty Dwell Time	4.2	4	11.7	4.6	4.0	2.6
Improvement Rate			279%	110%	95%	62%
Import Full Dwell Time	4.5	4	8.7	5.3	5.1	5.4
Improvement Rate			193%	118%	113%	120%

(Improvement Rate = (Surveyed Value/Baseline) x 100)

Please attach Reference Figures/Tables and Pictures related to Surveys

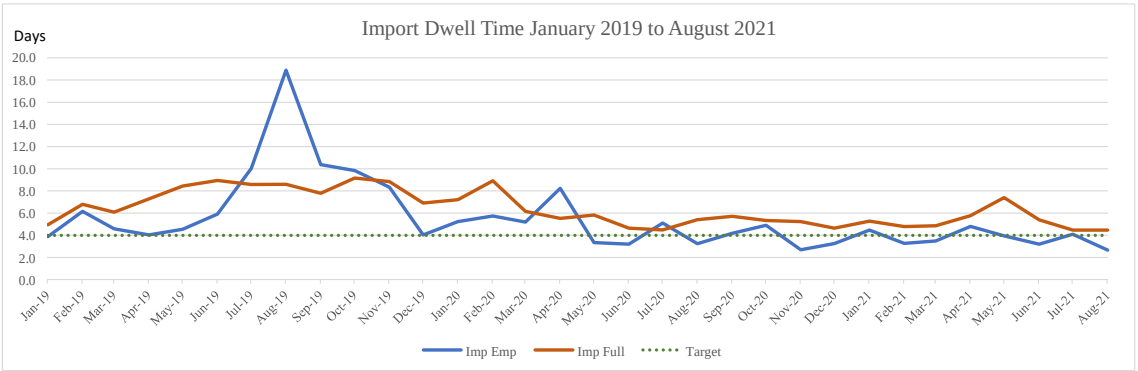


Figure 3 Sample of Quayside Container Dwell Time

Sheet for Follow-up Survey (Draft)

May, 2021 (Person inCharge,PAS)
N. Fukazawa (Person in Charge, JICA Team)

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (4)	Turn Around Time of trailers will be reduced	Turn Around Time of Trailers

Follow-up Survey

Survey Method	Turn around time of trailers is calculated using the history information of CTMS as below. 1) Receiving: Time from the reception at the gate to the stacking completion in the yard. 2) Delivery a) A: Time from the reception at the gate to the pickup completion in the yard. b) B: Time from the pickup completion in the yard to the delivery completion at the gate. As the KPI, the monthly average trun aound time is calculated.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

(Results of current survey)

	Mar	Apr	May	Jun	Jul	Aug	Average
Receiving	22.4	34.6	27.0	26.2	26.3	26.0	26.9
Delivery A	27.8	36.6	31.7	37.1	33.6	32.7	33.2
Delivery B	218.7	217.3	207.0	184.4	207.6	204.7	206.2

(Comparison from the begining)

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
TurnAround Time Receiving	41.4	30	41.8	26.5	24.8	26.9
Improvement Rate			101%	64%	60%	65%
TurnAround Time Delivery A	53.6	40	68	37.6	35.1	33.2
Improvement Rate			127%	70%	65%	62%
TurnAround Time Delivery A	300.7	200	192.9	165.6	201.7	206.2
Improvement Rate			64%	55%	67%	69%

(Improvement Rate = (Surveyed Value/Baseline) x 100)

Please attach Reference Figures/Tables and Pictures related to Surveys

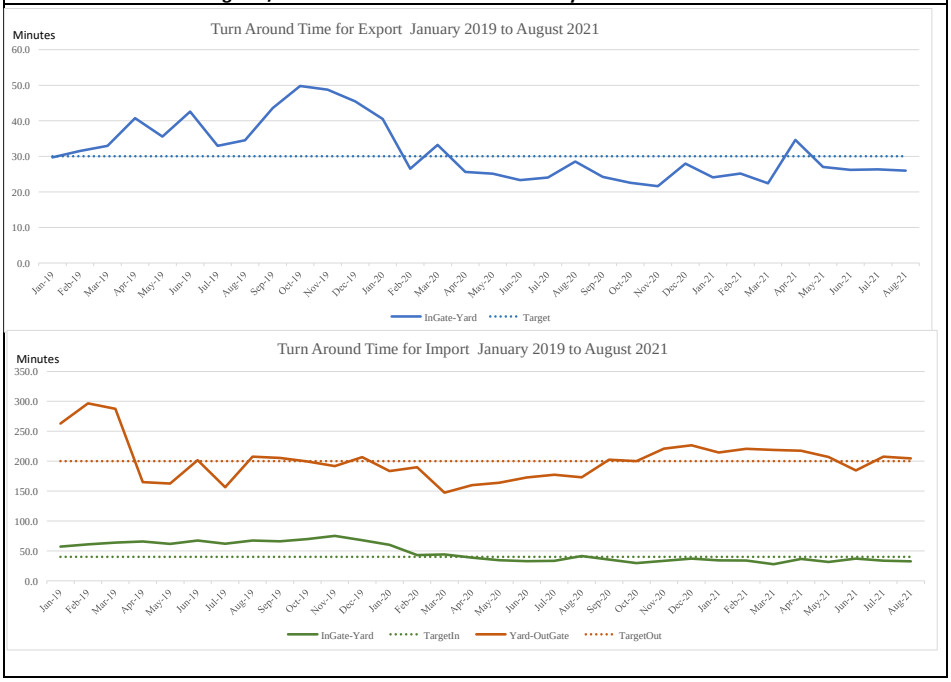


Figure 4 Sample of Trailer Turnaround Time

b. Examination of traffic flow of trailers
   - CTOD Director shall clarify the traffic flow of trailers inside and outside the container yard and ensure that it is optimum for realizing high container handling efficiency. He also examines and changes the traffic flow whenever the layout of the container yard is changed for improving the container handling efficiency or due to the surrounding environment.

c. SOP / Safety control
   - CTOD Director conducts a periodical site observation and confirms that the container handling operation is conducted according to the SOP and the safety rules of PAS. If the dangerous action or other issues are found, their correction and the change in SOP, if needed, shall be ordered to his staff accordingly. If there are any changes in the surrounding environment (change of shipping lines, vessel services, vessels, kind of container, transport mode, etc.), the current operational procedure shall be reviewed and examined to determine if any change is required. If it is required, the SOP shall be promptly updated, distributed, and made well known to the concerned sections.

(2) Resource Management

a. Management of Weekly Berth Window
   - CTOD Director maintains the latest version of Weekly Berth Window. He shall examine the Weekly Berth Window whenever the shipping line asks for the introduction of the new service or change of the vessel type.

b. Management of terminal facilities
   - CTOD Director shall examine the validity of the following facilities as needed
     - Berth facilities: Berth, Quay Gantry Crane, Mobile Harbor Crane, etc.
     - Yard facilities: RTG, Reach Stacker, Yard Trailers, Traffic route of trailers, etc.
     - Number of gate lanes and their allocation
   - If any excesses and deficiencies are found, the Director shall prepare and submit his recommendations to the top management of PAS.

c. Management of container stacking area
   - CTOD Director checks the daily container stacking status and confirm if there is sufficient stacking space available for export/import/empty containers. If there are any issues, he shall instruct CTOD Operation Steering Group to examine the current situation and possible countermeasures. After the examination by Operation Steering Group, he shall conduct the necessary countermeasures.

d. Management of human resource and training plan
   - CTOD Director shall made the plan for human resources based on the container handling volume of the container terminal. He shall submit the proposal to the top management if any change is required. He also needs to grasp the capability of personnel and examine / conduct the necessary training program.

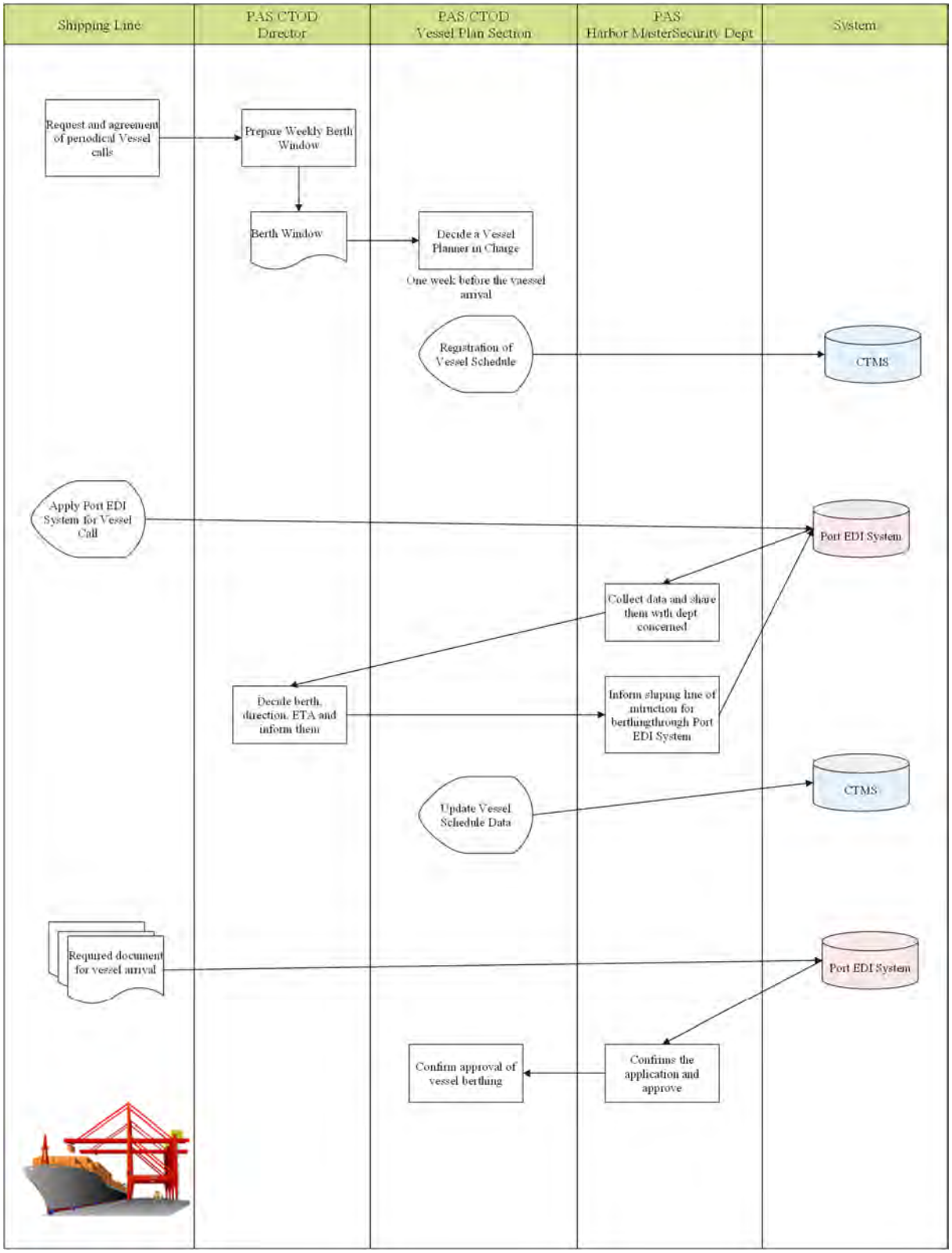
(3) Future Plan

a. Examination of the future plan
   - CTOD Director shall examine the validity of the berth capability, yard stacking capability, and gate processing capability according to the future increase of container throughput. If excesses and deficiencies are expected, Director shall prepare and submit recommendations to address such issues to the top management of PAS.

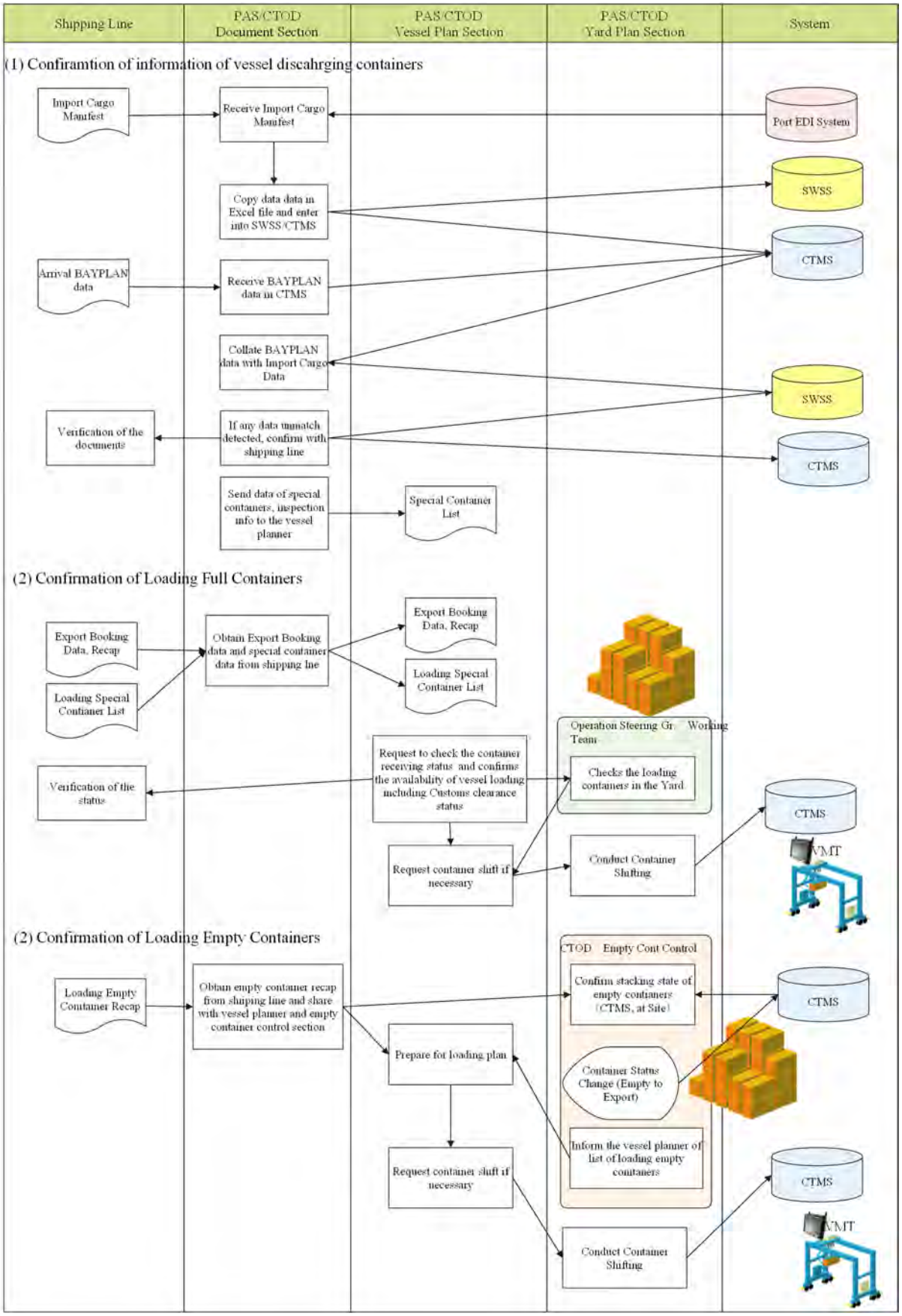
3. OPERATION FLOW

3.1. Vessel Operation

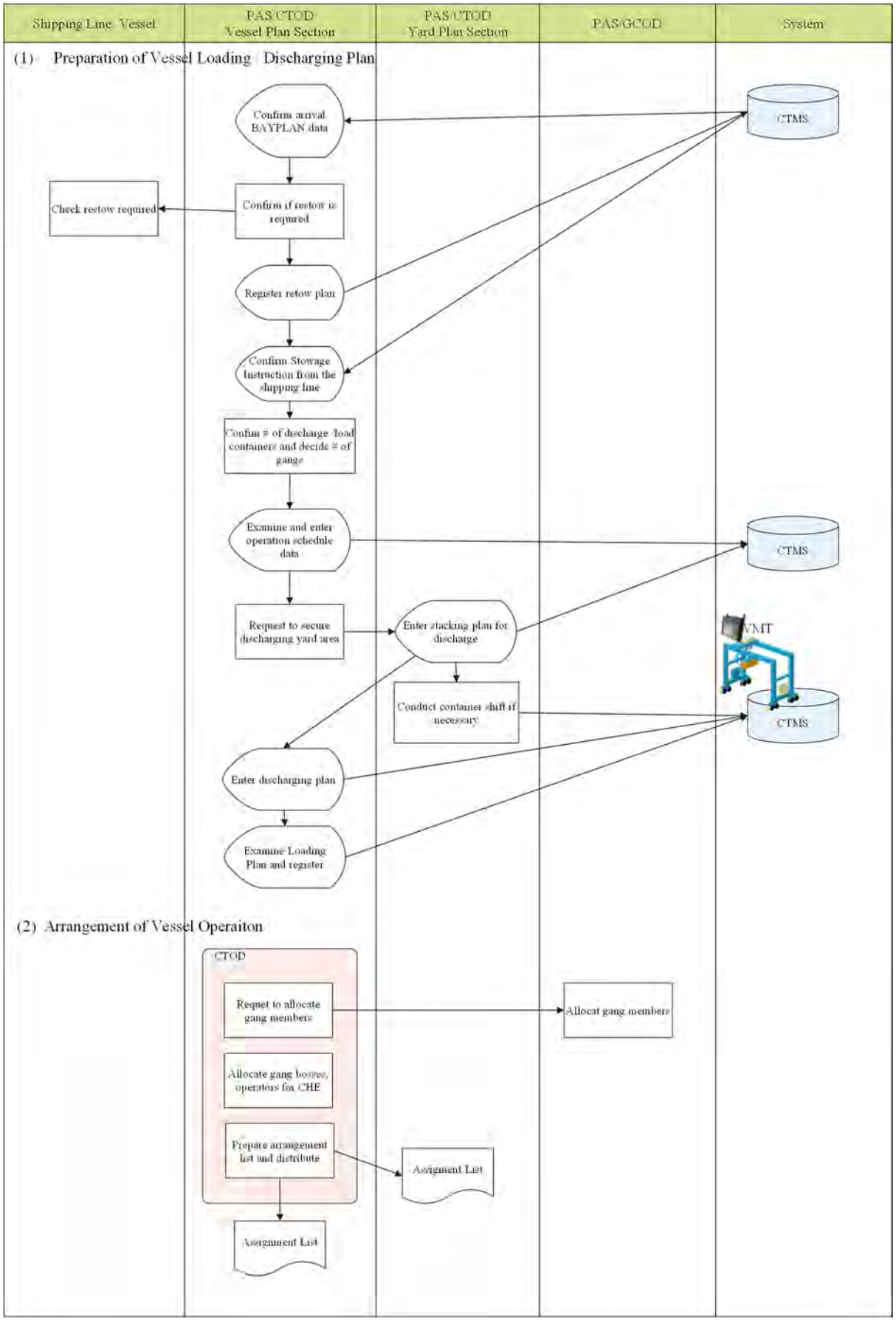
(1) Vessel Schedule Control

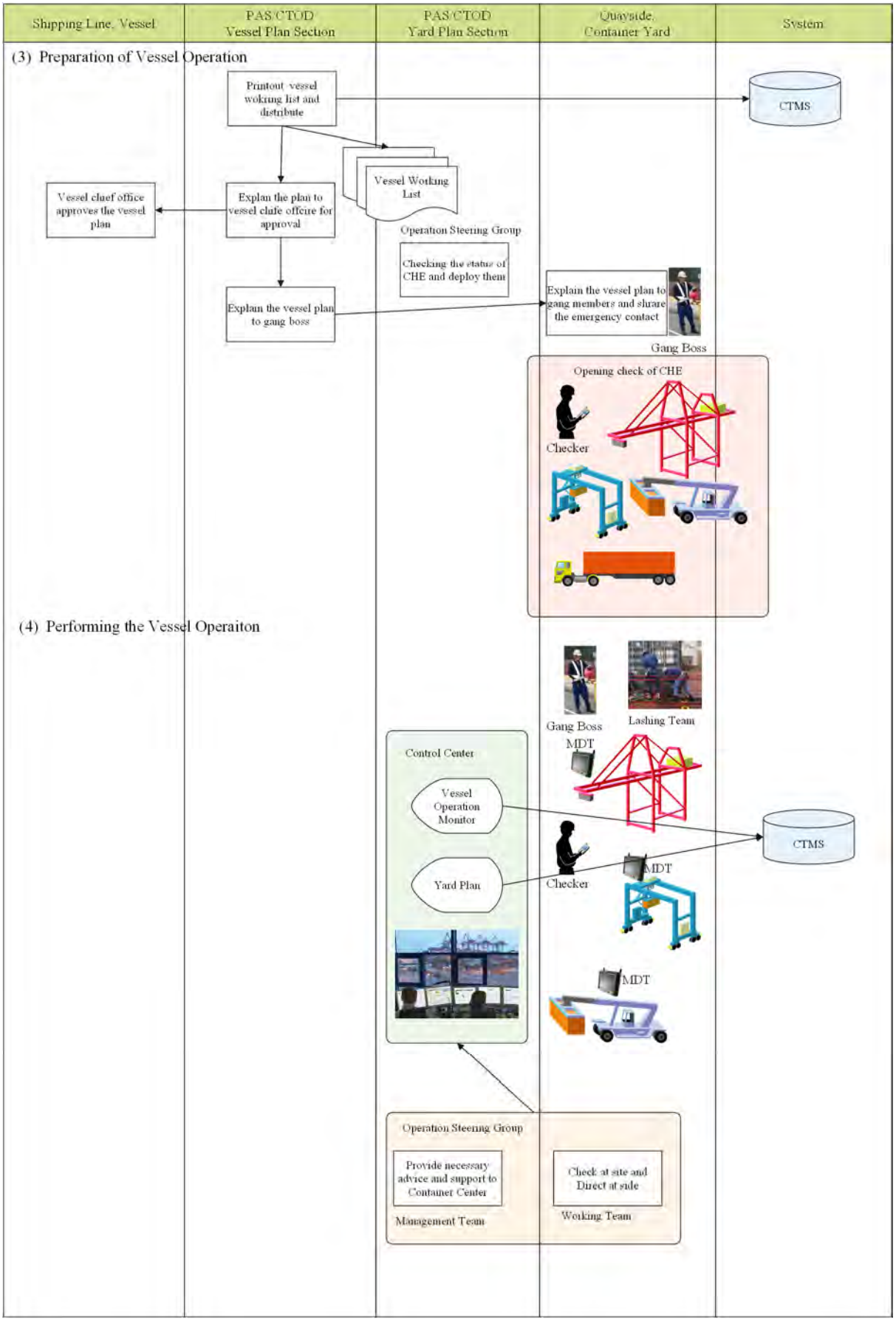


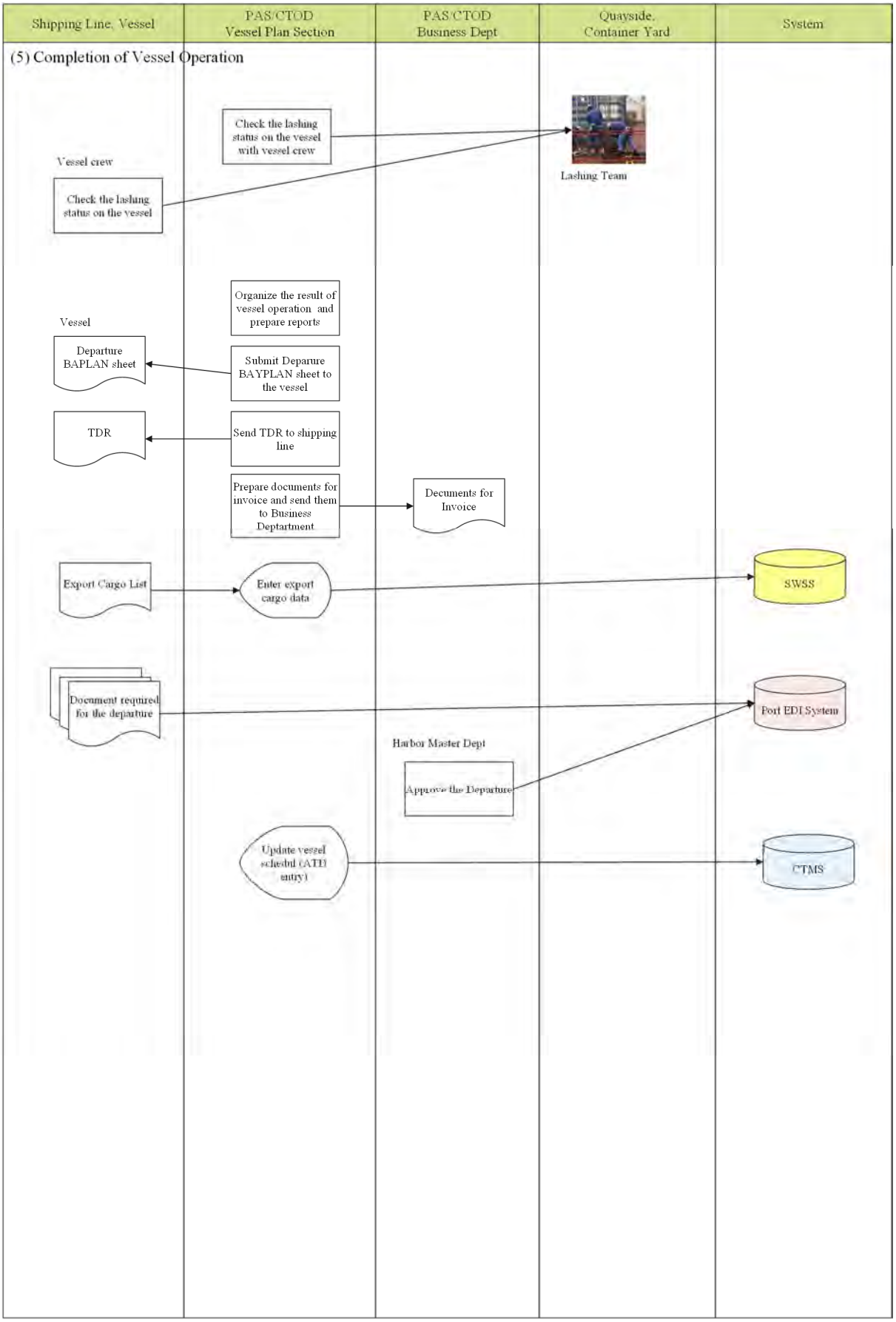
(2) Load Discharge Information Control



(3) Vessel Planning and Vessel Operation

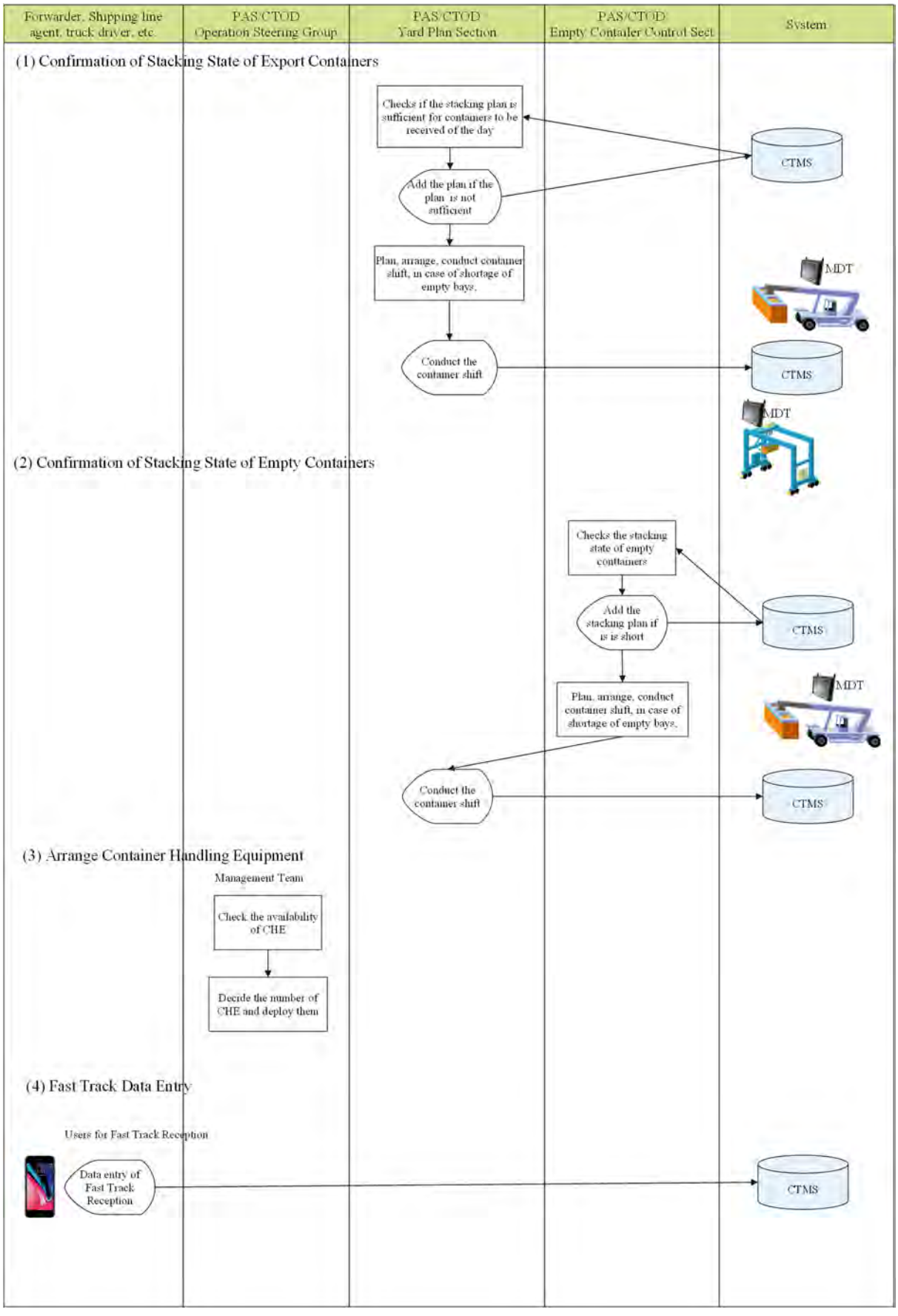



Shipping Line, Vessel
PAS/CTOD Vessel Plan Section
PAS/CTOD Yard Plan Section
Quayside, Container Yard
System
(3) Preparation of Vessel Operation
Printout vessel woking list and distribute
CTMS
Vessel Working List
Vessel cluef office approves the vessel plan
Explan the plan to vessel clufe offcire for approval
Operation Steering Group
Checking the status of CHE and deploy them
Explain the vessel plan to gang members and share the emergency contact
Gang Boss
Explain the vessel plan to gang boss
Opening check of CHE
Checker
(4) Performing the Vessel Operaiton
Gang Boss
Lashing Team
MDT
Control Center
Vessel Operation Monitor
CTMS
Yard Plan
Checker
MDT
MDT
Operation Steering Group
Provide necessary advice and support to Container Center
Management Team
Check at site and Direct at side
Working Team

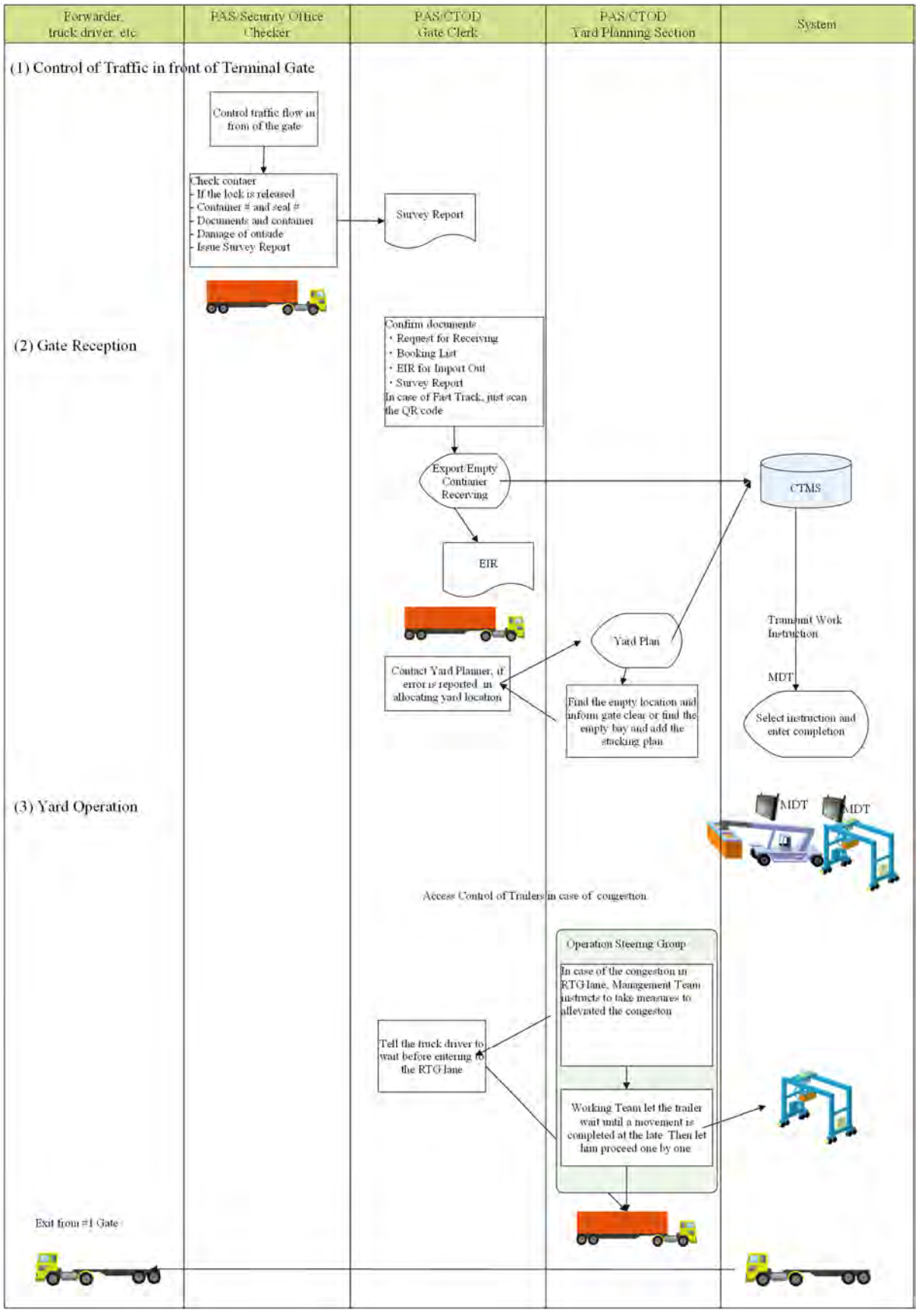

Shipping Line, Vessel
PAS/CTOD Vessel Plan Section
PAS/CTOD Business Dept
Quayside, Container Yard
System
(5) Completion of Vessel Operation
Check the lashing status on the vessel with vessel crew
Lashing Team
Vessel crew
Check the lashing status on the vessel
Organize the result of vessel operation and prepare reports
Vessel
Departure BAPLAN sheet
Submit Deparure BAYPLAN sheet to the vessel
TDR
Send TDR to shipping line
Prepare documents for invoice and send them to Business Deptartment
Decuments for Invoice
Export Cargo List
Enter export cargo data
SWSS
Document required for the departure
Port EDI System
Harbor Master Dept
Approve the Departure
Update vessel schedul (ATD entry)
CTMS

3.2. Gate Operation

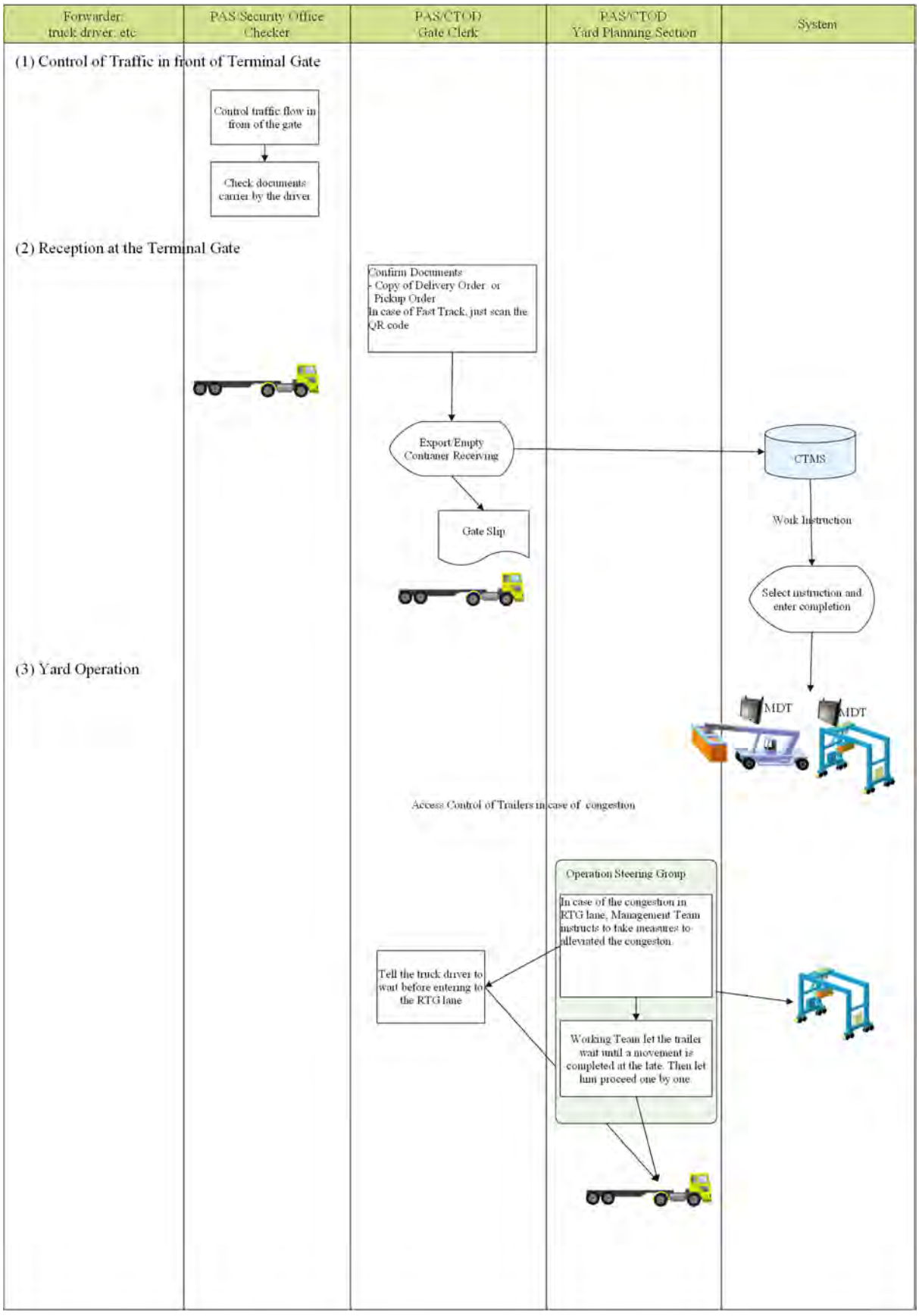
(1) 事前準備・状況確認

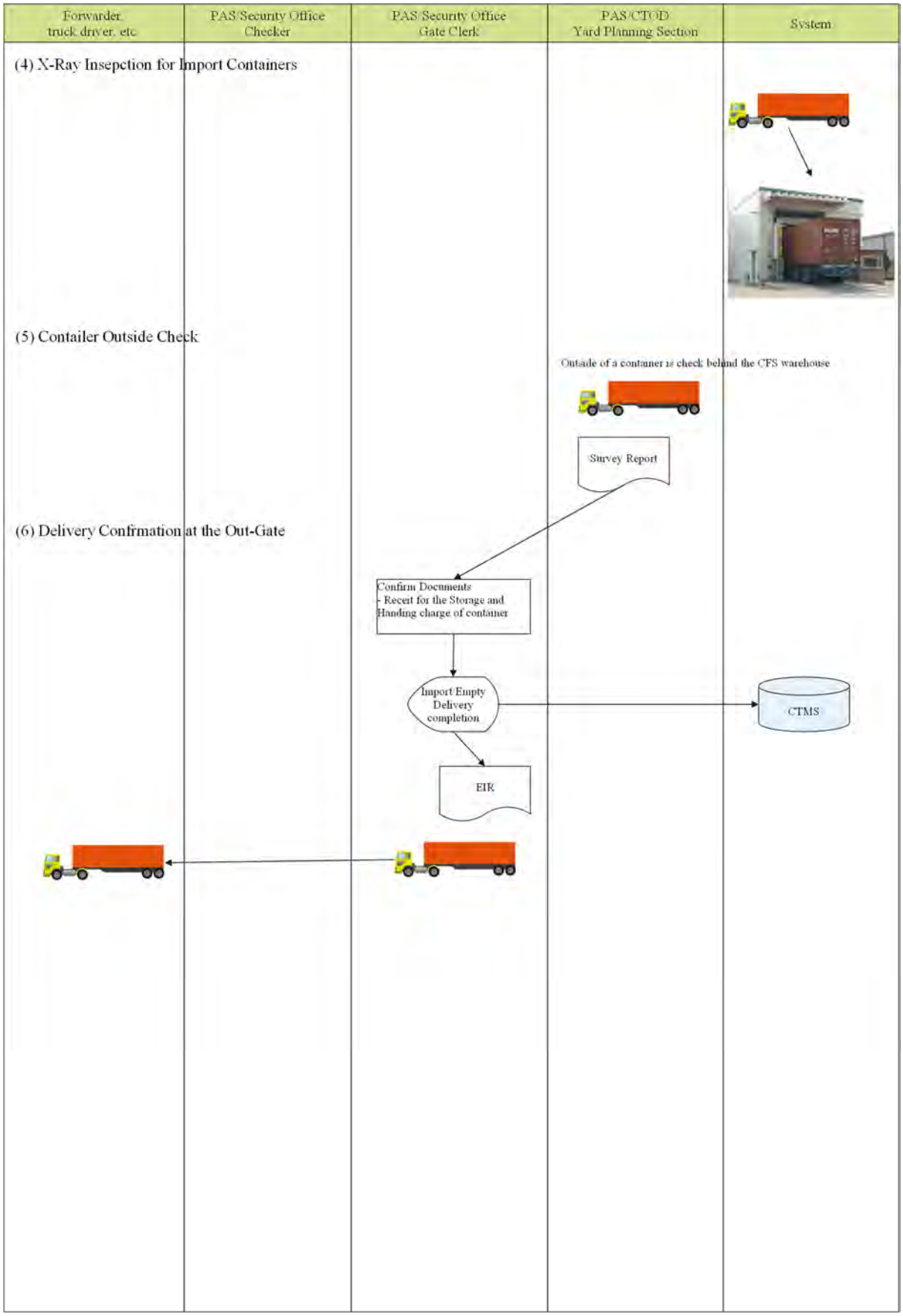


(2) コンテナ搬入


Forwarder, truck driver, etc
PAS/Security Office Checker
PAS/CTOD Gate Clerk
PAS/CTOD Yard Planning Section
System
(1) Control of Traffic in front of Terminal Gate
Control traffic flow in from of the gate
Check contaer
- If the lock is released
- Container # and seal #
- Documents and container
- Damage of outside
- Issue Survey Report
Survey Report
(2) Gate Reception
Confirm documents
・Request for Receiving
・Booking List
・EIR for Import Out
・Survey Report
In case of Fast Track, just scan the QR code
Export/Empty Container Receiving
CTMS
EIR
Yard Plan
Transmit Work Instruction
MDT
Contact Yard Planner, if error is reported in allocating yard location
Find the empty location and inform gate clear or find the empty bay and add the stacking plan
Select instruction and enter completion
(3) Yard Operation
MDT
MDT
Access Control of Trailers in case of congestion
Operation Steering Group
In case of the congestion in RTG lane, Management Team instructs to take measures to alleviated the congestion
Tell the truck driver to wait before entering to the RTG lane
Working Team let the trailer wait until a movement is completed at the late. Then let him proceed one by one
Exit from #1 Gate

(3) コンテナ搬出


Forwarder: truck driver, etc
PAS/Security Office Checker
PAS/CTOD Gate Clerk
PAS/CTOD Yard Planning Section
System
(1) Control of Traffic in front of Terminal Gate
Control traffic flow in from of the gate
Check documents carrier by the driver
(2) Reception at the Terminal Gate
Confirm Documents
- Copy of Delivery Order or Pickup Order
In case of Fast Track, just scan the QR code
Export/Empty Container Receiving
CTMS
Gate Slip
Work Instruction
Select instruction and enter completion
(3) Yard Operation
MDT
MDT
Access Control of Trailers in case of congestion
Operation Steering Group
In case of the congestion in RTG lane, Management Team instructs to take measures to alleviated the congestion.
Tell the truck driver to wait before entering to the RTG lane
Working Team let the trailer wait until a movement is completed at the late. Then let him proceed one by one


Forwarder truck driver, etc
PAS/Security Office Checker
PAS/Security Office Gate Clerk
PAS/CTOD Yard Planning Section
System
(4) X-Ray Insepction for Import Containers
(5) Contailer Outside Check
Outside of a container is check behind the CFS warehouse
Survey Report
(6) Delivery Confirmation at the Out-Gate
Confirm Documents
- Receit for the Storage and Handing charge of container
Import/Empty Delivery completion
CTMS
EIR

4. PROCEDURE FOR OPERATOR OF CONTAINER HANDLING EQUIPMENT

4.1. RTG

(1) Toolbox Meeting (Toolbox talk)
A daily meeting that focuses on the following matter
- Re-confirming safety instructions
- Confirmation of work arrangement: Vessel schedule, gang arrangement, etc.

(2) Pre-operation Inspection

RTG should be inspected before operation based on the procedure.
- Any malfunctions need to be informed to the control center.
- The control center shares the information and examines the next action of the operator with the sections concerned.
- The same procedure must be followed when he finds any malfunctions during the operation.

(3) Stepping Stairs of RTG
The steps must be watched and the handrails must be held tightly when climbing stepping the stairs in order to prevent from falling.

(4) Refueling
- To inform the control center whenever refueling is required.
- To stop operation when a tank lorry arrives
- Not to start travelling until confirming that the lorry operator has finished the refueling

(5) Stop
An operator must confirm tires are locked by the stopper whenever RTG is parked

(6) Travelling

a. Followings must be confirmed before start travelling
   - The pervious operator has got off RTG
   - The spreader is lifted up at the right position

b. An operator must confirm RTG is travelling straight by looking ahead to the travel path.

c. An operator must confirm there is no obstacle or any vehicles on the access path.

d. An operator must confirm the position of other RTG visually and by the voice radio If any RTG is working in the same lane.

e. Trailer path side should be more carefully watched as the trailer door may be open.

f. An operator must monitor the surrounding environment as a truck driver may conduct unexpected moves. He must stop the RTG immediately on hearing any unusual sound.

g. An operator must be ready to push the emergency stop button while travelling and travel carefully around the vicinity of the Turn Table as trailers may cut in RTG run way.

h. RTG must be slowed down gradually to the target location

i. An operator must adjust the direction if the alarm says the RTG has deviated more than 100 mm from the center of the path (RTG also slows down automatically.)

j. An operator must change RTG mode to manual and the direction by travelling backward when RTG automatically stops due to the deviation of more than 150mm. Then, he must change RTG mode back to automatic after confirming the situation in safe.

a. An operator must move RTG to the Turn Table (shown in yellow line) after confirming safety around and stop it on the Table.

b. An operator must pay attention to any unusual noise or malfunctions in the Table until the rotation stops. He must stop RTG immediately whenever he recognizes any unusual noise or finds any malfunction.

(8) Hoisting

a. An operator must confirm that there are no obstacles near RTG before start hoisting.

b. The hoisting joystick must be operated by the operator's right hand - not by the left hand or foot.

c. An operator must start hoisting by slowest speed (1 notch) so that ropes become taut and stop once to confirm the ropes are actually taut.

d. An operator must start hoisting again slowly; speed can be increase after confirming the container is actually lifted off the trailer.

e. It is prohibited to start hoisting with loose ropes and without a stop to confirm rope status.

f. An operator must watch the status of hoisting during the operation. He must stop hoisting if he cannot watch it and he can re-start only after confirming the safety around the area.

g. An operator must stop hoisting immediately if any danger of hitting another container can be expected.

h. An operator must pay attention to any unusual noise or a malfunction of RTG during the hoisting.

(9) Lowering

a. An operator must make sure that there are no obstacles near the RTG before the start of lowering.

b. An operator must confirm that no person is on the container or on the trailer. He must stop lowering immediately If there is any.

c. The joystick must be operated by the operator's right hand – not by the left hand or foot.

d. An operator must start lowering from 1 notch of speed. It is prohibited to start lowering by full notch.

e. An operator must watch the status of lowering during the operation. He must stop lowering if he cannot watch it. He can re-start only after confirming the safety around the area.

f. An operator must stop lowering if he expects any danger of hitting the other container or any vehicle or person to go into the area beneath the spreader.

g. An operator must ensure that the spreader does not make heavy impact at landing as it may cause damage to the RTG

h. An operator must pay attention to unusual noise or malfunction of RTG during the lowering

(10) Skewing

a. An operator must not skew when the spreader or the container is landed.
b. An operator must skew gradually but not at one go.
c. An operator must keep eyes on the status around during the skewing.
d. An operator must pay attention to unusual noise or malfunction of RTG during the skewing

(11) Lock / Unlock

a. An operator must confirm landing lamp before the operation and lock/unlock lamp after operation has been completed.
b. An operator must anticipate the incomplete lock/unlock may occur. If it happens, he must release it after confirming the container has been landed.

(12) Lifting a Container from the yard

a. An operator must lower the spreader in accordance with the rules.
b. An operator must slow down and stop lowering when the spreader approaches the roof of the container (before the side flippers of the spreader touch the roof).

(12) Lifting a Container from the yard - continued

c. An operator must make sure the positions of the twist-lock of the spreader and the corner casting of the container match.

d. An operator must restart lowering slowly by one notch of speed and connect the twist lock and the container corner casting. Lowering and Linking must not be operated without slowing down and stopping as it may damage the spreader or the container.

e. An operator must confirm below visually
- The proper connection of the spreader and the container
- The landing lamp is on

f. if the lamp is not on or the container is not properly connected to the spreader, an operator must try grabbing the container again without locking operation.

g. It is prohibited to start grabbing while the spreader is swinging because it may cause an accident or damage to the spreader.

a. An operator must follow the rules for lifting a container and hoisting.

b. An operator must adjust the spreader position and ask the trailer driver to adjust the trailer position to grab the container.

c. An operator must move a container carefully so as not to give the strong impact to trailers. He must not land the spreader strongly or start the grab operation while the spreader is swinging as it may cause damage to the spreader or the container.

c. In case of trailers with Side Gate, an operator must stop lowering the spreader over it, confirm visually that the spreader does not touch it, then start lowering the spreader.

(14) Loading a Container on a trailer

a. An operator must load a container on a trailer in accordance with the rules for lifting and hoisting/lowering.

b. An operator must lower the spreader gradually and confirm that nothing is on the trailer. He must stop loading if there is anything on it.

c. An operator must stop lowering over the trailer once, then start lowering slowly until the container is landed. The policy of Safety First must be observed.

d. An operator must instruct a driver for position adjustment using the RTG speaker in landing operation if the driver doesn't adjust it by himself.

e. It is prohibited to land containers strongly as it may cause an accident or damage to the spreader.

f. When two 20' containers are loaded on a trailer, the 2nd container must be loaded carefully to avoid a collision with the 1st container. An operator must stop lowering the spreader over the roof of the 1st container, then start lowering slowly by 2 notches of speed after confirming both containers are not touching. if contact seems possible, he must stop lowering until safety measures are taken.

(15) Overall rules during container handling

a. In bay shift operation, an operator must grasp the container stacking state first as the actual container location may be different from the one shown on the Mobile Data Terminal.

b. When a container is moved into a space between containers, an operator must stop lowering once and move a container carefully so as not to touch the other containers.

c. An operator must land a container without the aberration of the position of the container below by checking visually (Top holes of corner casting of the container below must be hidden by the upper one). If the aberration is found after the movement, the operation should be retried.

d. In case of travelling backward, the travel path should be checked visually from the bottom window in the RTG cabin. In case of travelling forward, it should be checked from the fore window.

e. In case of in bay shifting, a container once located in 5-tier must be shifted back to the lower tier.

f. The spreader must be lifted to the top when the spreader or the container is moved within a bay.

g. In case of loading a 45’ container on a trailer, the operator must lower the container carefully as the space between trailer cabin and a container is narrow.

4.2. Lashing Team for Vessel Operation

(1) Meeting before the operation

a. To share matters requiring attention related to container handling operations.

b. To inform members of the gang structure and their roles. The person responsible for lashing work shall confirm the allocation of workers during the operation.

c. Lashing Team not only conducts the works to be done but also support operators of Quay Crane by signaling

(2) Working Wear

a. All workers concerning container handling operation have to wear designated safety wear such as a helmet, safety vest, safety shoes, etc.

b. The team leader has to ensure that all workers wear the proper safety wear.

c. When a worker sees that another worker is not wearing the proper safety wear he should instruct that worker to comply with the safety rules and also report the incident to the team leader.

(3) Transportation to a vessel

a. The lashing team has to walk from the rest area to a Vessel (Quayside); the use of motorcycles is prohibited.

b. Parking bicycles or motorcycles under quay cranes is prohibited in order to avoid accidents, and to secure sufficient space for safe vessel operation, etc.

c. Team members who find someone driving or parking such vehicles should instruct them to comply with the rules.

d. Cases of emergency will be discussed later from the aspect of safety.

(4) Use and storage of working tools

a. Team member has to check to see if there is any problem with the tools for locking/unlocking the lashing prior to boarding a vessel. It is also necessary to confirm that there are enough tools.

b. These same checks have to be conducted after the work as well.

c. Tools should not be treated roughly. They should not be used for any other purpose than the lashing work.

d. Tools has to be stored in the designated location.

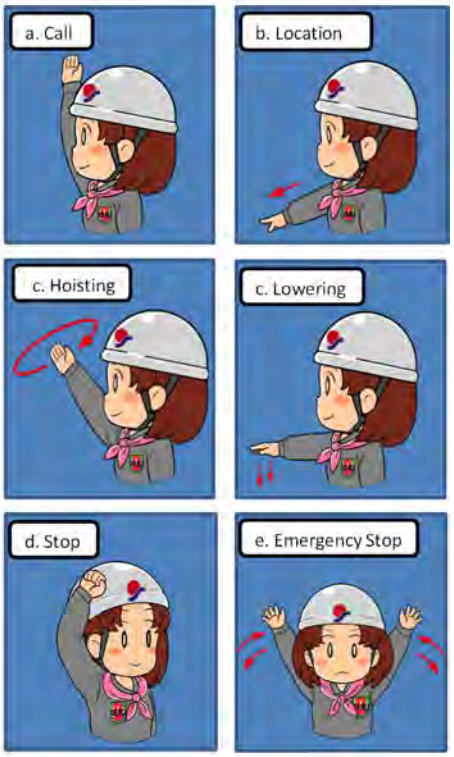
e. Whenever defects are found in tools, the request for repair has to be issued as soon as possible.

(5) Boarding a vessel

a. Team member should confirm a vessel crew if he can board the vessel after the lifting ladder is down.
b. Team member should confirm if the ladder is correctly touches the ground.
c. Team members should hold the handrail when walking up and down the lifting ladder.
d. Running and Jumping are prohibited when using the ladder.

(6) Basis of Signaling

a. Call : Raise your hand
b. Location: Indicate by pointing
c. Hoisting : Raise your hand and rotate your arm
d. Lowering: Extend your hand and gradually lower and raise it as required
e. Stop: Raise your hand and make a fist
f. Emergency Stop: Raise both hands and flap your arms

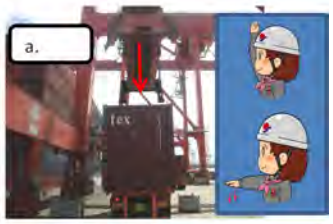


(7) Rules in Signaling

a. If the signal man is absent, a substitute will be assigned.
b. Multiple signal men are prohibited in order to avoid confusion.

(8) Signaling for Removing/ Attaching Stackers

a. Call a quay crane operator and send the signal for lowering



b. Send the signal to stop lowering before a spreader is coupled with a container

c. Send a signal of lowering for coupling a spreader and a container.

d. Send a signal for hoisting up to a side guide of a chassis after attaching stackers by 2 workers

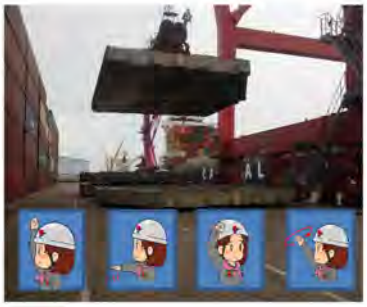
e. Stop hosting after a spreader reaches the side guide of a chassis

f. Send a signal for hoisting after confirming the spreader is separated from a chassis completely.

(9) Attach/Remove Stackers

a. Attaching/removing stackers must be conducted by 2 workers
b. Confirm the stackers can be rotated properly before attaching them.
c. Workers have to monitor the surrounding situation to avoid making contact with chassis.
d. One of the workers send signals to a quay crane operator as described in (8)
e. Workers should evacuate from the area beneath a spreader as stackers may drop
f. Attach/detach stackers rapidly

(10) Open/Close Hatch Cover



a. A team member should signal a quay crane operator to support loading and discharging of hatch covers at the back reach side of a quay crane
b. Workers should evacuate from the area under a quay crane.

(11) lashing work on Deck

a. Two or three workers a pair should conduct lashing work on deck.
b. Evacuate from the area under a spreader and wait for a container to be loaded.
c. Lock a base stacker on a container.

d. One worker holds and tightens the turnbuckle while the other hooks a long bar to a container being careful of his step and fingers.（The lashing method needs to be understood by all workers

e. The lashing work should be conducted in order for each container loaded.

f. Workers should take care that the long bar does not fall on their head when it does not fit to a container.

g. Measures to prevent falls should be examined for works at the most seaside or landside row.

h. Tools should not be treated roughly.

(12) Unlashing work on Deck

a. Two or three workers should conduct unlashing work on the deck.

b. One worker holds and tightens the turnbuckle while the other hooks a long bar to a container being careful of his steps and fingers.

c. Unlashing work should be conducted step by step efficiently according the discharging order.

d. Unlashing work conducted at the fore side of the vessel should be monitored in order to avoid hooking up of stackers.

e. Measures to prevent falls should be examined for works at the most seaside or landside row.

f. Works should be conducted safely by grasping the surrounding status.

(13) Lock/Unlock Stackers on a Container

a. Measures to prevent falls should be examined. The gap between containers should be closely watched.
b. Workers should not go into the area under the spreader with a container.
c. Workers should always act with the assumption that a container fall from a spreader.
d. Close attention should be paid during the lock release work on the roof of a container in order to prevent accidents.
e. Workers should abandon the unlocking operation if the tool is stuck in a container in order to avoid a fall accident
f. Emergency stop should be signaled to a quay crane operator when a container is to be discharged before unlock is completed.

(14) Riding on/off a Spreader

a. Workers should pay close attention in riding on and off a spreader; specifically, they should watch their step and fingers.
b. Workers should not jump up or down from a spreader

(15) Stand-by during container handlings

a. Workers should not sit or sling a hammock on a quay crane.
b. Workers should not eat or fish under a quay crane during the operation.
c. Use of mobile phones is prohibited during the work

Standard Operation Procedure (SOP)

Safety and Health Management

: General Cargo Department

STANDARD OPERATING PROCEDURE

For

Safety and Health Management

- General Cargo Department -

(Ver.1)

JICA Expert Team

Contents

Chapter 1 General Provisions

(Purpose)

Article 1 The purpose of these regulations is to set forth the matters necessary for safety and health in order to prevent accidents that may occur in the course of operations of the General Cargo Division of the Port Authority of Sihanoukville (here-in-after referred to as PAS), to ensure the safety and health of employees, to create a comfortable working environment, and thereby to facilitate the execution of operations and improve performance. The purpose is to ensure the safety and health of employees and to create a comfortable working environment, thereby facilitating the execution of work and improving performance.

(Significance of Terms)

Article 2 The main terms used in these regulations shall have the following meanings

1. "Staff" shall mean those who belong to PAS and are enrolled in the General Cargo Section.

2.Safety and health management refers to the planning and implementation by the General Cargo Section of measures to prevent occupational accidents among employees and physical damage to work equipment and cargo handled.

3.Occupational accidents refer to injuries and illnesses that occur to employees in the course of performing their duties.

4.Accidents and disasters refer to those that occur in the course of performing work and are listed below.

a. occupational injuries and property damage

b. Injury, illness, or property damage to a third party.

c. Accidents that may result in injury or illness.

(Standards for application)

Article 3 These rules shall apply to the employees specified in the preceding article.

(Responsibility of the Department)

Article 4　The General Cargo Department shall establish a safety and health management system to prevent accidents and disasters, and shall take necessary measures for equipment, machinery, work environment, and work methods.

(Obligations of Employees)

Article 5　Employees shall endeavor to prevent accidents and disasters by observing these rules and regulations and standards based on these rules and regulations, and shall cooperate with them.

Chapter 2 Safety and Health Management Organization

(General Safety and Health Manager)

Article 6　The General Cargo Division shall establish a general safety and health manager in order to supervise the necessary safety and health management operations in the workplace.

Article 7　The general safety and health manager shall appoint safety and health managers (safety managers and health managers) for each workplace where it is necessary in order to have them manage technical matters related to safety and health among the operations related to safety and health management.

(Safety Managers and Health Managers)

Article 8　The general safety and health manager shall appoint a safety manager or a health manager for each workplace where it is necessary in order to have them manage technical matters pertaining to safety or health among the operations related to safety and health management.

(Chief Worker)

Article 9　The general safety and health manager shall appoint a chief work manager for specific work that requires management to prevent accidents and disasters, and have him/her direct workers.

Chapter 3 Work of the General Safety and Health Manager

(Work of the General Safety and Health Manager)

Article 10　The overall safety and health manager shall perform the following duties

1.Determination and implementation of the safety and health management plan

2.Implementation of rules, regulations, standards, etc. related to safety and health

3.Implementation of related events and public relations activities

4.Preparation of draft work procedures, inspection standards, etc.

5.Determination of standards for the use of protective equipment, protective gear, etc.

6.Conduct education and training on safety and health.

7.Review safety and health measures and improvements related to equipment, machinery, work environment, work methods, etc.

8.Investigate the causes of serious accidents and take action.

9.Investigate the causes of accidents and disasters and consider countermeasures.

10.Implementation of health checkups and promotion of health management

11.Establishment and operation of safety and health committees or holding of safety and health meetings by workplace

12.Investigation of safety and health

13. Other matters necessary for safety and health management

Chapter 4 Duties of the Safety Manager

(Duties of the Safety Manager)

Article 11　The safety manager shall, under the direction of the overall safety and health manager, manage technical matters related to safety among the duties set forth in Article 10, and his/her duties shall be those listed in the following items

1. Formulation of a safety management implementation plan

2. Drafting safety work procedures, inspection standards, and standards for the use of protective equipment and protective gear, and examining improvements
3. Planning of safety-related work plans
4. Implementation of education and training
5.Implementation of basic education for hired workers and transferred workers
6. Patrol workplaces and take necessary measures to prevent danger.
7.Implementation of personal guidance for employees and education for supervisors, etc.
8. Training and education of legally required special skilled workers
9.Corrective guidance for rule violators
10.Examination of the inspection system and confirmation of the implementation status
11.Confirmation of safety of new machines and equipment, etc.
12.Examine and check the implementation status of tidy and orderly classification.
13.Guidance on the inspection, maintenance, and use of protective equipment, protective gear, etc.
14. Investigate the causes of accidents and disasters, and examine post-accident measures.
15.First aid, disaster reporting, and liaison work in the event of a disaster
16.Operation of safety and health committees and support for safety and health meetings by workplace, workplace meetings, etc.
17. Liaison and coordination with other contractors working at the same site regarding safety
18.Preparation and storage of reporting documents and consideration of budgets
19.Safety-related auditing
20.Other matters necessary for safety management

(Duties of the Health Supervisor)

Article 12　The health administrator shall, under the direction of the general safety and health administrator, manage technical matters concerning occupational health among the Article 10 services, and his/her duties shall include the following items listed in the following items

1. Formulation of plans for the implementation of hygiene management
2. Preparation of drafts of work procedures, inspection standards, and standards for the use of protective equipment and protective gear, etc. related to hygiene, and their revision
3. Planning of work plans related to hygiene
4. Implementation of education and training
5. Detection and treatment of persons with health problems
6. Inspecting the work area and taking necessary measures to prevent health problems.
7. Management of the working environment and health guidance
8. Improvement of hygiene regarding working conditions, facilities, etc.
9. Guidance on cleaning and tidying
10.First-aid treatment
11.Consideration of appropriate placement plans based on medical examinations
12.Guidance on the inspection, maintenance, and use of sanitary protective equipment, first aid tools, etc.
13.Health counseling and other measures necessary to maintain health
14. Measures for matters arising from injuries and illnesses
15.First aid in the event of a disaster, reporting of disasters, and liaison work
16.Operation of safety and health committees and support for workplace-specific safety and health meetings, workplace meetings, etc.
17. Liaison and coordination with other contractors working at the same site regarding health
18.Preparation and storage of reporting documents and consideration of budgets
19. Auditing of hygiene
20.Other matters necessary for hygiene management

(Duties of the person in charge of safety management and health management)

Article 13　The duties of the person in charge of safety management and the person in charge of health management shall be to assist the safety manager or the health manager in the matters prescribed in Article 12 and Article 13, and to share the duties instructed by the overall safety and health manager

or the person in charge of the workplace.

(Duties of Safety and Health Promoters)

Article 14　A safety and health promoter shall be in charge of the duties set forth in Article 11 under the direction of the overall safety and health manager.

(Duties of the Chief Worker)

Article 15　The duties of a chief work manager shall be to perform the duties listed in the following items

1. Informing and instructing workers of the important safety and health issues and precautions related to the work for which they are in charge
2. Inspection and maintenance of the machinery and equipment in charge, and emergency measures or appropriate protective measures in case of danger
3. Appropriate measures for handling dangerous cargo
4. Maintenance of safety equipment, protective equipment, protective gear, etc.
5. Confirmation, guidance, and monitoring of compliance with work procedures and inspection standards related to safety and health
6. Confirmation, guidance and monitoring of the use of protective equipment and gear.
7. Provide basic training and personal guidance to hired and transferred employees.
8. Correction and guidance for rule violators
9. Emergency measures in case of emergency or disaster, first aid for victims, and preparation of current certification
10. Implementation or confirmation of tidiness, orderliness, and cleanliness
11. Participate in investigating the causes of accidents and disasters and studying countermeasures
12. Lead workplace meetings.
13. Liaison and coordination with other contractors working at the same site
14. Other matters necessary for safety and health management

Chapter 5 Standards for Safety and Health Management

(Facility Management Rules, etc.)

Article 16　The General Cargo Section shall establish and implement various facility management rules, standards, etc. to ensure safety and health in order to prevent accidents and disasters arising from the hazards of machinery, equipment, and the work environment.

(Work Standards for Safety and Health)

Article 17　In order to prevent accidents and disasters caused by the work activities of employees, the general cargo department shall establish and implement work standards related to safety and hygiene for necessary work, and ensure safety and hygiene in work activities.

(Protective equipment, etc.)

Article 18　The general cargo department shall ensure the effective use of protective equipment, protective gear, etc., and establish the safety and health of employees.

(Fire Prevention Regulations)

Article 19　In order to prevent accidents caused by fire or explosion, the General Cargo Section shall establish and manage fire prevention rules for buildings, vehicles, and cargo handled.

(Establishment of Other Standards)

Article 20　The General Cargo Section shall establish and implement standards in addition to the provisions set forth in Article 17 and Article 18, when it finds it necessary to prevent disaster accidents.

(Prevention of Accidents Caused to Third Parties)

Article 21　The General Cargo Division shall take all possible measures to prevent physical injury or illness to third parties or physical damage to property.

Chapter 6 Reporting of Disaster Accidents and Investigation of Causes and Countermeasures

(Measures to be taken when a disaster accident occurs)

Article 22　In the event of a disaster or accident occurring during work, work shall be stopped immediately, and if there are victims, rescue of the victims shall be given the highest priority.

(Submission of Personal Accident Report)

Article 23　The general safety and health manager shall promptly submit the prescribed personal injury report to PAS in the event of death, injury, or illness of an employee due to work.

(Submission of Property Damage Accident Report)

Article 24　The general safety and health manager shall promptly submit the prescribed property damage accident report to PAS when any of the following accidents occur during the performance of duties

1. Accident of fire or explosion
2. Accidental cutting of cables of hoisting machines, etc.
3. Collapse of construction equipment, cranes, etc.
4. Accidents that cause physical damage other than those listed in items 1. through 4. above.
5. Accidents involving cargo handled that cause physical damage
6. Injury or illness inflicted on a third party or serious property damage
7. Other accidents that require measures to prevent recurrence

(Submission of Other Event Reports)

Article 25　The General Safety and Health Manager shall promptly submit the prescribed "Other Event Report" to PAS when any of the following events occur during the performance of duties

1. An event that causes no physical damage but requires measures to prevent recurrence
2. Events that do not cause monetary damage but require measures to prevent recurrence
3. Other events that require measures to prevent recurrence

(Obligation to report)

Article 26　The general safety and health manager shall be obliged to report any of the following types of accidents under Article 23 and Article 24.

The general health and safety manager shall report directly to the department in charge of PAS on the following types of accidents

1. Death or injury that is expected to cause permanent total disability for work
2. Occupational accidents that result in three or more victims at one time
3. Accidents in accordance with Article 24, Paragraphs 1 through 3.
4. Accidents causing serious damage to third parties and personal injury

(Investigation of causes of accidents and countermeasures)

Article 27　The general safety and health manager shall promptly conduct a fact-finding investigation in the event of an accident in accordance with Article 26, hold a safety and health committee or a safety and health meeting for each workplace to prevent the same type of accident, investigate the cause of the accident, take measures to prevent recurrence, and ensure that all persons concerned are aware of the measures. In addition, a written measure to prevent recurrence must be prepared and submitted to the department in charge of PAS.

(Submission of Near miss accident Reports)

Article 28　In the event that a phenomenon that may lead to a disaster or accident occurs during work, employees shall immediately report it to their superiors, prepare a prescribed Near miss accident report, and submit it to the general safety and health manager.

Article 28-2　The general health and safety manager shall promptly submit the Near miss accident report described in the preceding paragraph to the department in charge of PAS, and shall ensure that all relevant personnel are aware of the report in order to help prevent accidents and disasters.

Chapter 7 Miscellaneous Provisions

(Responsibilities as a Principal Business Operator)

Article 29　When the general cargo division has contractors perform part of

the work, the division shall instruct the contractors concerned or their employees as necessary not to violate laws and regulations concerning safety and health, as well as the company's rules and regulations, or instruct them to take corrective measures.

(Responsibility as a Contractor)

Article 30　The General Cargo Division shall instruct its employees to follow the instructions on safety and health given by the main contractor when it has undertaken a part of the work.

Chapter 8 Award and Punishment

(Award and Punishment)

Article 31 Matters concerning commendations or sanctions shall be prescribed in the Safety and Health Award and Punishment Rules

Standard Operation Procedure (SOP)

Preventive maintenance of RTG

: Technical-Material Department

STANDARD OPERATING PROCEDURE

For

Preventive Maintenance of RTG

- Technical – Material Department -

(Ver.1)

JICA Expert Team

Contents

1. Necessity of Annual Inspection

RTG performance has been significantly improved in recent years due to technological advances in maintenance management.

The inspection and testing of cranes must be carried out to prevent failures or accidents and to ensure efficient cargo handling work. The maintenance manager of cranes has to monitor the daily state of cranes and to ensure that repairs are made and parts are replaced based on the results of inspection and testing.

Inspection and testing should be carried out in consideration of the life cycle of RTGs. Daily inspections, periodical inspections and unscheduled inspections (such as an inspection after a storm or earthquake) need to be carried out to ensure that cranes are in good working order. These inspections are classified and defined as follows.

- Inspection before Use (Inspection before starting Cargo Handling Work)
- Regular self-inspections: Monthly Inspection
- Regular self-inspections: Annual Inspection
- Inspection after Storm and Earthquake
- Performance Testing

This manual stipulates the standard inspection items, method and decision criteria with respect to the Annual Inspection, which is considered to be the ‘key inspection’ for preventing failures and accidents and ensuring efficient cargo handling work.

In addition, this manual should be officially adopted and followed by “Department of Technical-Material (Mechanical Dept.) and Department of Machinery-Electro mechanic (Electrical Dept.)”, and added as a one of the Standard Operation Procedures.

In particular, the inspection items listed below must be regularly inspected to prevent serious accidents.

- Presence or Absence of Over winding Protection Device and other safety device, Overload Warning Device and other warning device and Brake & Clutch
- Presence or Absence of damage of Wire rope and Lifting Chain
- Presence or Absence of Spreader and Lifting Beam such as Over-height Attachment
- Presence or Absence of Electrical Wiring, Power Collector, Distribution Switchboard, Switch Gear and Controller

2. Inspection Items

2.1. Foundation (Gantry Runway & Crane Anchoring Device)

< Gantry Runway >

No.	Classification Name	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Gantry Runway	Crack of Gantry Runway	Visual confirmation		No crack, No damage			
		Ground subsidence of the Gantry Runway	Visual confirmation		No hindrance to the running of the crane			
		Gradient of Gantry runway	Measurement	Transit	2/1000 or less			
2	Crane Anchoring Device	Crack, damage & deformation of Pin and Link of Anchoring Device	Visual confirmation		No crack, No damage, No deformation			
		Rust & corrosion of Main Member	Visual confirmation		No rust, No corrosion			
		Loosening & Dropout of Bolts and Nuts	Visual confirmation Hitting test	Test Hammer	No looseness, No dropout			(Example) Grease supply to Chain

2.2. Main Structure, Trolley Rail & Auxiliary Structure

<Main Structure & Trolley Rail>

No.	Classification Name	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Main Structure	Crack, damage & deformation of Main Member	Visual confirmation		Presence / Absence of Crack and damage			
		Rust and corrosion of Structural members	Visual confirmation		No significant rust & corrosion			
		Peeling of the coating film	Visual confirmation		No significant peeling of the coating film			
		Loosening & dropout of Bolts & nuts	Visual confirmation Hitting test	Test Hammer	Presence / Absence of Loosening & Dropout			
2	Trolley Rail	Wear & deformation of Rail head	Visual confirmation		Non-presence of Wear & deformation			
		Welding of Rail	Visual confirmation		No abnormal condition			
		Rail Span	Measurement	Transit	+/-5mm			
		Height difference between left side and right-side rails	Measurement	Transit	(Span x 1/500) or less			
		Bentness in the right & left direction of Trolley rail	Measurement	Transit	5 mm or less with respect to the reference line			
		Gradient of Rail	Measurement	Transit	1/500 or less			
		Wobbling of attachment portion of ladder, stairway & handrail	Visual confirmation		No wobbling			
		Loosing and drop off of mounting bolts & nuts of ladder, stairway and handrail	Visual confirmation Hitting test	Test hammer	No loosing, no drop-off			
		Presence or absence of	Visual		No presence			

3	Auxiliary Structure	dangerous auxiliary structural members	confirmation		dangerous members			
		Wobbling ofMounting portion of ladder, stairway and handrail	Visual confirmation		No wobbling			
		Crack of welding portion	Visual confirmation		No abnormal condition			
		Deformation of Members	Visual confirmation		No abnormal condition			
		Significant rust and corrosion	Visual confirmation		No significant rust and corrosion			
		Significant peeling of Coating film	Visual confirmation		No significant peeling of the coating film			
		Loosening & drop-off of Mounting bolts & nuts of ladder, stairway and handrail	Witness test Hitting test	Test Hammer	No presence of Loosening and drop-off			
		Vibration, Wobbling	Visual confirmation		No abnormal condition			

2.3. Engine-Generator Set

<Engine-Generator Set>

No.	Classification Name	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
	Engine-Generator	Rotating condition at acceleration during idling	Visual confirmation		No abnormal condition			
		Amount of cooling water, Presence or absence of leak	Visual confirmation		No leakage			
		Condition of Engine oil	Visual confirmation		No abnormal condition			Exchange the whole amount Abt. **L
		Condition of Oil element	Visual confirmation		No abnormal condition			Exchange Element (Oil, Water)
		Level of Battery fluid	Visual confirmation		It must be the level of the specified value.			
		Looseness & damage of Fan belt	Visual confirmation		No looseness, No damage			
		Dirty & damage of Air filter	Visual confirmation		No dirty, No damage			Cleaning
		Presence or absence of Contamination & damage of Air filter	Visual confirmation		No contamination, No oil-leakage			
		Display of proper value of each meter	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bracket	Visual confirmation		No looseness, No damage			
		Damage of Fuel tank & hoses	Visual confirmation		No damage			
		State of Exhaust	Visual		No abnormal			

			confirmation		condition			
		Damage of Fan blade & portion of Holder	Visual confirmation		No damage			
		Operating & mounting condition of Radiator cap	Visual confirmation		No abnormal condition			
		Abnormal noise, offensive smell & abnormal vibration during operation	Visual confirmation, Auscultation		No abnormal condition			
		State of frequency & voltage	Measurement		Be within specified value			
		Others (Appearance and others)	Visual confirmation		No abnormal condition			
		Working hours of Engine	Visual confirmation		Measurement			Engine operating hour: Hr

2.4. Mechanical Equipment

1. < Hoisting Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Reducer	Installation state of Reducer Wear condition of Gear case & each shaft	Visual confirmation, Retightening		No abnormal condition No-presence of Loosening			
		Abnormal noise, Vibration, Abnormal heat	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Tooth surface, Teeth contact condition, Damage	Visual confirmation, Sensory perception		No abnormal condition			
		Damage & contamination of Pump and Strainer	Visual confirmation, Cleaning		No abnormal condition			
		Oil quantity, Oil leak, contamination	Visual confirmation, (Refueling, Exchange)		No abnormal condition, No oil leakage			
2	Motor	Installation state, Abnormal noise, Vibration	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Lubrication state of Bearing	Visual confirmation, (Refueling)		No abnormal condition Refueling			
3	Cooling fan	Installation state, Noise, Vibration Corrosion of Cover	Visual confirmation, Palpation, Auscultation	Hammer Test	No looseness, No dropout			Retighten Cotter bolts to fix Wire-clamp: ***

4	Disc brake	Gap of Lining	Measurement			***mm		
		Wear & damage of Pin & Link	Visual confirmation		No abnormal condition			(Example) Oil leakage from the coupling oil seal
		Installation state, Damage	Visual confirmation		No abnormal condition			(Example) Grease supply by Centralized Lubrication equipment
		Wear & damage of Disc wheel	Visual confirmation, Palpation		No abnormal condition			
		Operation check, Stroke, Torque	Visual confirmation Measurement		No abnormal condition			
		Oil quantity & contamination of Thruster hydraulic fluid	Visual confirmation, (Refueling)		No abnormal condition			
5	Gear coupling	Looseness & damage of Mounting bolt	Visual confirmation Retightening		No abnormal condition			
		Damage & lubrication condition of Tooth surface and Seal	Visual confirmation, Refueling		No abnormal condition			
		Mounting condition, Crack, Damage	Visual confirmation		No abnormal condition			
6	Rope drum	Looseness & damage of Rope clamp	Visual confirmation Retightening		No abnormal condition, Retightening			
		Abnormal noise, vibration & abnormal heat of Bearing	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Wear & striation of Rope groove	Visual confirmation, Auscultation		No abnormal condition			
		Lubrication state of bearing	Visual confirmation, (Refueling)		No abnormal condition, Refueling			

7	Rope sheave	Installation condition, Wear, Damage, Striation	Visual confirmation, Measurement		No abnormal condition			
		Noise, vibration & abnormal heat of bearing	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Damage of Pin, Anti-rotation plate and bolt	Visual confirmation		No abnormal condition			
		Lubrication status	Visual confirmation, (Refueling)		No abnormal condition			
8	Wire rope	Refueling condition, Wear	Visual confirmation, Measurement		No abnormal condition			
		Kink, Rust, Damage	Visual confirmation		No abnormal condition			
		Looseness & damage of End clip	Visual confirmation (Retightening)		No abnormal condition			
9	Rope guide roller	Mounting state, Deformation, Wear, Damage	Visual confirmation		No abnormal condition			
		Abnormal sound, Operation confirmation	Visual confirmation, Auscultation		No abnormal condition			
10	Detecting device	Mounting state & damage of each detection device	Visual confirmation		No abnormal condition			
		Damage & lubrication condition of Chain	Visual confirmation (Retightening)		No abnormal condition			
		Operation confirmation, damage & lubrication condition of Limit switch	Visual confirmation Operating		No abnormal condition			

2. <Skewing Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Motor	Mounting state, Damage, Crack, Corrosion	Visual confirmation, Hammer Test		No abnormal condition			
		Abnormal noise, Vibration, Abnormal heat	Visual confirmation, Palpation, Auscultation		No abnormal condition			
2	Disc brake	Damage, Crack, Corrosion, Looseness of Mounting bolt	Visual confirmation, retightening		No abnormal condition			
		Gap of Lining	Measurement		No abnormal condition			
		Wear & damage of Brake shoe	Visual confirmation, Palpation		No abnormal condition			
		Abnormal noise, Vibration, Operating condition	Visual confirmation, Palpation, Auscultation		No abnormal condition			
3	Screw jack (Electrical power jack)	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Abnormal noise, Vibration, Operating condition	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Lubrication state	Visual confirmation, (Refueling)		No abnormal condition			
4	Chain coupling	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			

		Lubrication state, Leakage of oil	Visual confirmation, (Refueling)		No abnormal condition			
5	Link mechanism	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Wear & damage of each pin	Visual confirmation, Palpation		No abnormal condition			
		Damage, loosening & adjustment state of Adjusting mechanism	Visual confirmation, Hammer Test Retightening		No abnormal condition			
		Lubrication state	Visual confirmation, (Refueling)		No abnormal condition			
6	Limit switch	Mounting state, Damage, Operating condition	Visual confirmation		No abnormal condition			

3. <Anti-sway Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Motor	Mounting state, Damage, Crack, Corrosion	Visual confirmation, Hammer test		No abnormal condition			
		Abnormal noise, Vibration, Abnormal heat	Visual confirmation, Palpation, Auscultation		No abnormal condition			
2	Disc brake	Damage, Crack, Corrosion, Looseness of Mounting bolt	Visual confirmation, Retightening		No abnormal condition			
		Gap of lining	Measurement		No abnormal condition			
		Wear & damage of Brake shoe	Visual confirmation, Palpation		No abnormal condition			
		Abnormal noise, Vibration, Operating condition	Visual confirmation, Palpation, Auscultation		No abnormal condition			
3	Screw jack (Electrical power jack)	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Abnormal noise, Vibration, Operating condition	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Lubrication state	Visual confirmation, (Refueling)		No abnormal condition			
4	Chain coupling	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			

		Lubrication state, Oil leakage	Visual confirmation, (Refueling)		No abnormal condition			
5	Link mechanism	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Wear & damage of each pin	Visual confirmation, Palpation		No abnormal condition			
		Damage, loosening & adjustment state of Adjusting mechanism	Visual confirmation, Hammer test Retightening		No abnormal condition			
		Lubrication state	Visual confirmation, (Refueling)		No abnormal condition			
6	Limit switch	Mounting state, Damage, Operating condition	Visual confirmation		No abnormal condition			

4. <Traversing Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Reducer	Mounting state of Reducer, Damage of Gear casing & each shaft	Visual confirmation		No abnormal condition			
		Abnormal noise, Vibration, Heat occurrence	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Oil quantity, Oil leakage, Contamination	Visual confirmation (Refueling)		No abnormal condition			
2	Motor	Mounting state, Abnormal noise, Vibration	Visual confirmation, Palpation, Auscultation		No abnormal condition			
3	Brake	Gap of Lining	Measurement		No abnormal condition			
		Mounting state, damage & crack of Disc plate	Visual confirmation		No abnormal condition			
		Operation check, Dirt	Visual confirmation Cleaning		No abnormal condition			
		Mounting state & damage of PG	Visual confirmation		No abnormal condition			
4	Gear coupling	Damage & looseness of Mounting bolt	Visual confirmation Retightening		No abnormal condition			
		Damage of Gear tooth & Oil seal, Lubrication state	Visual confirmation (Refueling)		No abnormal condition			
5	Drive shaft	Mounting state, Damage, Deformation,	Visual confirmation		No abnormal condition			

		Corrosion						
6	Ruck gear	Damage, Crack, Deformation, Crack of Welding portion	Visual confirmation		No abnormal condition			
		Surface of gear, Lubrication state	Visual confirmation, (Refueling)		No abnormal condition			
7	Pinion gear	Damage, Crack, Mounting state, Surface condition of Gear	Visual confirmation		No abnormal condition			
		Backlash	Visual confirmation, Measurement (Adjustment)		No abnormal condition			
8	Traverse wheel	Mounting state, Damage, Crack	Visual confirmation		No abnormal condition			
		Wear, dirt & adhesion of wheel tread	Visual confirmation, Cleaning		No abnormal condition			
9	Side roller	Mounting state, Damage, Crack Looseness of Mounting bolt	Visual confirmation, Hammer test		No abnormal condition			
		Wear, State of Rotation Mounting state	Visual confirmation		No abnormal condition			
		Lubrication condition	Visual confirmation, (Refueling)		No abnormal condition			
10	Traverse rail	Mounting state, Damage, Crack Corrosion	Visual confirmation		No abnormal condition			
		Wear, Deformation,	Visual confirmation, Palpation		No abnormal condition			
11	Bearing	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Lubrication condition	Visual confirmation,		No abnormal condition			

			(Refueling)					
		Abnormal noise, Vibration, Heat occurrence	Palpation, Auscultation		No abnormal condition			
12	Rubber buffer	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Looseness of Mounting bolt	Hammering test, Retightening		No abnormal condition			
13	Stowing Device	Mounting state, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
14	Limit switch	Mounting state, Damage, Corrosion Operating condition	Visual confirmation, Operating check		No abnormal condition			
		Wear and Damage of Gear & Chain of Cam type LS	Visual confirmation, Palpation		No abnormal condition			
		Open check, State of Water proof	Visual confirmation		No abnormal condition			

5. <Gantry Travelling Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Reducer	Mounting state of Reducer, Damage of Gear casing & each shaft	Visual confirmation		No abnormal condition No-presence of Loosening			
		Abnormal sound, Vibration, Heat occurrence	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Damage & contamination of Pump & strainer	Visual confirmation, Cleaning		No abnormal condition			
		Oil quantity, Oil leakage, Contamination	Visual confirmation (Refueling, Exchange)		No abnormal condition			
2	Motor	Mounting state, Abnormal sound, Vibration	Visual confirmation, Palpation, Auscultation		No abnormal condition			
3	Brake	Gap of Lining	Visual confirmation Measurement		No abnormal condition			
		Mounting state, damage and crack of Disc plate	Visual confirmation		No abnormal condition			
		Operation check Stroke, Torque	Visual confirmation, Cleaning		No abnormal condition			
		Mounting state & damage of PG	Visual confirmation		No abnormal condition			
4	Chain coupling	Lubrication state & damage of Chain & sprocket	Visual confirmation Retightening		No abnormal condition			
		Lubrication state & wear of Chain &	Opening of Chain cover,		No abnormal condition			

		sprocket	Visual confirmation, Refueling					
5	Drive chain	Mounting state, Damage, Elongation	Visual confirmation, Measurement		Pitch < mm			
		Lubrication state, Operating condition	Visual confirmation (Refueling)		No abnormal condition			
		Mounting state, damage & deformation of Chain cover	Visual confirmation, Palpation		No abnormal condition			
6	Sprocket	Mounting, state & wear of key plate	Visual confirmation, Palpation		No abnormal condition			
		Damage, Wear of Gear thickness	Visual confirmation		No abnormal condition			
7	Tyre	Presence / Absence of Mounting, Damage, Separation	Visual confirmation, Palpation		No abnormal condition			
		Air pressure, Abrasion (Depth of remaining groove)	Measurement, Adjustment		No abnormal condition Depth of groove < mm			
8	Wheel	Presence / Absence of Mounting, Damage, Separation	Visual confirmation		No abnormal condition			
		Lubrication state of Bearing	Visual confirmation (Refueling)		No abnormal condition			
9	Yoke and Yoke shaft	Mounting, Damage, Crack, Deformation	Visual confirmation		No abnormal condition			
		Damage, crack & deformation of Yoke shaft	Visual confirmation		No abnormal condition			
		Lubrication state & Damage of Bearing	Visual confirmation, Palpation		No abnormal condition			
10	Bogie	Mounting, Damage, Crack, Deformation	Visual confirmation		No abnormal condition			
		Wear & lubrication state of Bogie pin	Visual confirmation		No abnormal condition			

			(Refueling)					
		Wear of Keep plate, Loosening of Bolt	Visual confirmation (Retightening)		No abnormal condition			
11	Tyre guard	Mounting, Damage, Deformation Loosening of Bolt	Visual confirmation, Hammer test, Retightening		No abnormal condition			
12	Wheel stopper	Damage, Deformation, Loosening of Bolt	Visual confirmation, Retightening		No abnormal condition			
13	Securing device	Mounting, Damage, Deformation	Visual confirmation		No abnormal condition			
14	Alarm device	Mounting, Damage, Volume level of Siren	Visual confirmation, Auscultation		No abnormal condition			
		Mounting condition, damage, operating condition & bulb-burn out of Rotation lamp	Visual confirmation		No abnormal condition			
15	Detecting Limit switch for abnormal approach	Mounting state, Damage, Corrosion, Operating condition	Visual confirmation		No abnormal condition			
16	Sensor carrier	Mounting state, Damage, Corrosion Lubrication state of Screw jack	Visual confirmation (Refueling)		No abnormal condition			
		Mounting state, damage, & operating state of Tyre & LS	Visual confirmation		No abnormal condition			

6. <Gantry Travelling Steering Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Steering cylinder (Power cylinder)	Mounting state, Damage, Crack, Corrosion, Internal leakage	Visual confirmation, Auscultation		No abnormal condition			
		Mounting state, Looseness of Mounting bolt	Visual confirmation, Hammering test, Retightening		No abnormal condition			
2	Steering rod	Mounting state, Damage, Crack, Deformation	Visual confirmation		No abnormal condition			
		Looseness of Fixing bolt	Hammering test, Retightening		No abnormal condition			
3	Rock pin	Damage, Crack, Deformation, Looseness and Mounting position	Visual confirmation, Retightening		No abnormal condition			
		Lubrication state	Visual confirmation, (Refueling)		No abnormal condition			
4	Stoppers	Weariness, Deformation, Mounting position	Visual confirmation		No abnormal condition			
		Looseness of Mounting bolt	Hitting test, Retightening		No abnormal condition			
5	Slewing Bearing	Mounting state, Damage, Crack	Visual confirmation		No abnormal condition			
		Mounting state of Bush, damage, weariness	Visual confirmation		No abnormal condition			
		Lubrication state	Visual confirmation,		No abnormal condition			

			(Refueling)					
		Abnormal noise, Vibration	Palpation, Auscultation		No abnormal condition			
6	Limit switches	Mounting state, Damage, Crack, Deformation	Visual confirmation, Palpation		No abnormal condition			
		Confirmation of Operating position	Visual confirmation		No abnormal condition			

7. <Trolley Power Supply Cable Device>

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Power supply cable	Damage, Crack, Deformation, Wear	Visual confirmation		No abnormal condition			
		Mounting & wiring state of cable	Visual confirmation		No abnormal condition			
2	Rail	Mounting state, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Wear, Deformation	Visual confirmation, Palpation		No abnormal condition			
		Looseness of Mounting bolt	Visual confirmation (Retightening)		No abnormal condition			
3	Lead wire	Damage, Crack, Deformation, Wear, Breaking of wire	Visual confirmation		No abnormal condition			
		Damage, Wear, Looseness of shackle	Visual confirmation, Palpation		No abnormal condition			
4	Hanger	Damage, Crack, Corrosion, Mounting state	Visual confirmation, Palpation		No abnormal condition			
		Damage, Wear, Looseness of cable clip	Visual confirmation, Palpation		No abnormal condition			
5	Roller	Damage, Crack, Corrosion, Wear	Visual confirmation, Palpation		No abnormal condition			
		Damage & looseness of Mounting bolt	Visual confirmation, Palpation		No abnormal condition			
6	Buffer	Damage, Crack, Corrosion, Wear	Visual confirmation		No abnormal condition			

		Damage & looseness of Mounting bracket	Visual confirmation, Palpation		No abnormal condition			

8. < Lubricating Device >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Control panel	Mounting state, Damage, Deformation, Corrosion, State of Door	Visual confirmation, Palpation		No abnormal condition			
		Mounting state & damage of Switch & Display lamp	Visual confirmation		No abnormal condition			
2	Piping, Distributing valve	Mounting state, Damage, Crack, Corrosion, Operating state	Visual confirmation, Palpation		No abnormal condition			
3	Grease tank, Grease can	Mounting state, Damage, Corrosion, Remaining amount of grease of Tank & Grease can	Visual confirmation		No abnormal condition			
4	Gear box	Damage, Crack, Corrosion, Amount of Lubricant oil	Visual confirmation		No abnormal condition			

9. < Diesel Engine-Generator Set >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Engine	Appearance, Damage, Crack, Corrosion	Visual confirmation		No abnormal condition			
		Oil leakage, Water leakage, Exhaust leak	Visual confirmation		No abnormal condition			
		Looseness of Mounting bolt	Hammering test, Retightening		No abnormal condition			
		Abnormal vibration, Abnormal noise	Palpation, Auscultation		No abnormal condition			
2	Fuel supply device	Mounting and Operating state of Injection pump	Visual confirmation, Palpation		No abnormal condition			
		Mounting and Operating state of Governor device	Visual confirmation, Palpation		No abnormal condition			
		Mounting and Operating state of Stop Solenoid	Visual confirmation, Palpation		No abnormal condition			
		Mounting state & damage of Injection nozzle	Visual confirmation		No abnormal condition			
		Mounting state, damage & oil leakage of Fuel piping	Visual confirmation		No abnormal condition			
		Mounting state, oil leakage & clogging of Fuel filter	Visual confirmation, (Replacing)		No abnormal condition			
3	Lubrication	Oil quantity, Contamination of Engine oil	Visual confirmation (Replacing)		No abnormal condition			
		Mounting state, oil leakage & clogging of Fuel filter	Visual confirmation, (Replacing)		No abnormal condition			

		Mounting state, damage & oil leakage of Oil cooler	Visual confirmation		No abnormal condition			
		Mounting state, damage & oil leakage of Piping	Visual confirmation, Retightening		No abnormal condition			
4	Cooling water	Dirt, Concentration, Water quantity of Cooling water	Visual confirmation, Measuring, (Replacing)		No abnormal condition			
		Mounting and Operating state of Thermostat	Visual confirmation		No abnormal condition			
		Mounting state, damage & water leakage of Water pump	Visual confirmation, Retightening		No abnormal condition			
		Mounting state, damage & water leakage	Visual confirmation, Retightening		No abnormal condition			
		Mounting state, water leakage & clogging of Filter	Visual confirmation, (Replacing)		No abnormal condition			
5	Intake & exhaust device	Mounting state, Damage, crack of Air filter	Visual confirmation, Retightening		No abnormal condition			
		Dirt,, clogging & clogging of Element	Visual confirmation, Cleaning, (Replacing)		No abnormal condition			
		Mounting state, damage & exhaust leakage of Turbocharger	Visual confirmation		No abnormal condition			
		Mounting state, damage, corrosion & exhaust leakage of Exhaust piping	Visual confirmation, Retightening		No abnormal condition			
6	Drive device	Mounting state, Damage, Crack, Weariness of Pulley	Visual confirmation, Palpation		No abnormal condition			

		Damage, Crack, Weariness, Abnormal noise of Pulley bearing	Visual confirmation, Palpation		No abnormal condition			
		Mounting state, Damage, Crack, Degradation of Belt	Visual confirmation, Palpation (Adjustment)		No abnormal condition			
		Mounting state, Damage, Crack, of Fan	Visual confirmation, Retightening		No abnormal condition			
7	Starter motor	Damage, Crack, Corrosion, Appearance	Visual confirmation		No abnormal condition			
		Operating state, Abnormal sound, Heat occurrence	Visual confirmation, Palpation, Auscultation		No abnormal condition			
		Looseness of Mounting & terminal bolts	Visual confirmation, Retightening		No abnormal condition			
8	Sensor	Mounting state, damage, Mounting of Wiring	Visual confirmation, Palpation		No abnormal condition			
		Operating state (Confirmation of Meter)	Visual confirmation		No abnormal condition			
9	Radiator	Damage, Crack, Corrosion, Looseness of Mounting bolt	Visual confirmation, Hammering test, Retightening		No abnormal condition			
		Appearance, Water leakage, Water quantity	Visual confirmation		No abnormal condition			
		Smear & clogging of Fan	Visual confirmation, Cleaning		No abnormal condition			
		Mounting state of Cap	Visual confirmation, Palpation		No abnormal condition			

		Damage & water leakage of Piping & Hose	Visual confirmation		No abnormal condition			
10	Battery	Appearance, Damage, Corrosion Looseness of Terminal	Visual confirmation, Retightening		No abnormal condition			
		Specific gravity, Fluid volume	Visual confirmation, (Refueling)		No abnormal condition			
		Damage, Corrosion, Deformation of Battery cover	Visual confirmation		No abnormal condition			
11	Battery relay	Mounting state, Damage, Looseness of Terminal	Visual confirmation, Retightening		No abnormal condition			
		Operating state, Abnormal vibration, Abnormal sound	Visual confirmation, Palpation, Auscultation		No abnormal condition			
12	Fuel tank	Damage, Crack, Corrosion, Looseness of Mounting bolt	Visual confirmation, Retightening		No abnormal condition			
		Fuel leakage, Contamination of water	Visual confirmation, Water removing		No abnormal condition			
		Mounting & operating state of Oil level gauge	Visual confirmation		No abnormal condition			
13	Fuel supply device	Mounting state, damage & oil leakage of Piping & Coupler	Visual confirmation		No abnormal condition			
		Mounting state, damage of Alarm buzzer & Switch	Visual confirmation		No abnormal condition			
14	Drain piping	Mounting state, Damage, Deformation, Corrosion, Oil leakage	Visual confirmation		No abnormal condition			

		Clogging of Valve & Piping	Visual confirmation, (Cleaning)		No abnormal condition			
15	Engine control panel	Mounting state, Damage, Deformation, Corrosion, State of Door	Visual confirmation, Palpation		No abnormal condition			
		Mounting state & damage of Switch & Display lamp	Visual confirmation, Operating check		No abnormal condition			
		Mounting & Operating state of Instrument	Visual confirmation, (Adjusting)		No abnormal condition			
		Rating & idling speed	Visual confirmation, (Adjusting)		No abnormal condition			
		Rotating speed of Over-speed & low speed	Visual confirmation, Operating check (Measuring, Adjusting)		No abnormal condition			

10. < Generator >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	AC Generator	Damage, Crack, Corrosion, Looseness of Mounting bolt	Visual confirmation, (Retightening)		No abnormal condition			
		Abnormal vibration, Abnormal sound	Palpation, Auscultation		No abnormal condition			
		Dirtiness of Inside & Filter	Visual confirmation, Cleaning, (Replacing)		No abnormal condition			
		Mounting state of AVR	Visual confirmation, (Retightening)		No abnormal condition			
2	Generator Control Panel	Mounting state, Damage, Deformation, Corrosion, State of Door	Visual confirmation, Palpation		No abnormal condition			
		Mounting state, Damage of Switch & Display lamp	Visual confirmation, Operating check		No abnormal condition			
		Mounting & Operating state of Instrument	Visual confirmation, (Adjusting)		No abnormal condition			

11. < Operator Cab >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Operation desk	Mounting state, Damage, Deformation, Corrosion	Visual confirmation		No abnormal condition			
		Opening/closing state of Door, State of Packing	Visual confirmation, Operating check		No abnormal condition			
2	Chair	Mounting state, Damage, Deformation, State of Adjuster	Visual confirmation, Operating check		No abnormal condition			
		State of Fixing device & Roller	Visual confirmation, Operating check		No abnormal condition			
3	Controller	Mounting state, Damage, Deformation, Corrosion	Visual confirmation		No abnormal condition			
		Wear & lubrication state of Gear & Moving portion	Visual confirmation, Palpation, Refueling		No abnormal condition			
		Looseness of Stopper pin & Gear fixing screw	Visual confirmation, Retightening		No abnormal condition			
		Operating state (Confirmation of 0-Notch Interlock)	Visual confirmation, Operating check		No abnormal condition			
		Mounting state, Operating state of Cam switch	Visual confirmation, Operation		No abnormal condition			
		Mounting state,	Visual		No abnormal			

		Operating state of Encoder	confirmation, Operation		condition			
4	Operation switch	Damage, Looseness of Mounting portion, Operating state	Visual confirmation, Retightening		No abnormal condition			
		Operating state	Visual confirmation, Operating check		No abnormal condition			
5	Display lamp	Damage, Looseness of Mounting portion	Visual confirmation, Retightening		No abnormal condition			
		Bulb-burn out, Lighting state	Visual confirmation		No abnormal condition			
6	Lighting (Fluorescent light)	Mounting state, Damage, Crack	Visual confirmation		No abnormal condition			
		Bulb-burn out, Lighting state, Operating state of Switch	Visual confirmation, Palpation		No abnormal condition			
7	Interphone	Mounting state, Damage, Communication state	Visual confirmation, Auscultation		No abnormal condition			
8	Loudspeaker, Alarm Device	Mounting state, Damage, Operating state	Visual confirmation, Operating check		No abnormal condition			
		Mounting state, Damage, Display state of Speaker	Visual confirmation Auscultation		No abnormal condition			
9	Loudspeaker, Alarm Device Display of In-vehicle terminal	Mounting state, Damage, Display state	Visual confirmation, Palpation		No abnormal condition			
10	Air conditioner	Appearance, Damage, Mounting state	Visual confirmation, Hammering test		No abnormal condition			
		Water leakage, Fluid leakage, Clogging of Filter	Visual confirmation, Cleaning		No abnormal condition			

		Operating state, Abnormal sound, Abnormal vibration	Visual confirmation, Palpation		No abnormal condition			
11	Distribution panel	Mounting state, damage & corrosion, State of Door	Visual confirmation, Palpation		No abnormal condition			
		Mounting state & damage of Breaker	Visual confirmation, Palpation		No abnormal condition			

12. < Electrical House > (Control Panel House)

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Cooler (2 Units)	Appearance, Damage, Mounting state	Visual confirmation, Hammering test		No abnormal condition			
		Water leakage, fluid leakage & clogging of Filter	Visual confirmation, Cleaning		No abnormal condition			
		Operating state, Abnormal sound, Abnormal vibration	Visual confirmation, Palpation		No abnormal condition			
2	Lighting (Fluorescent light)	Mounting state, Damage, Crack	Visual confirmation		No abnormal condition			
		Bulb-burn out, Lighting state, Operating state of Switch	Visual confirmation, Palpation		No abnormal condition			
3	Interphone	Mounting state, Damage, Communication state	Visual confirmation, Palpation		No abnormal condition			

13. < Main Structural Portion >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Girder	Damage, Crack, Deformation, corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & crack of Welding portion	Visual confirmation		No abnormal condition			
2	Seaside / Landside Leg	Damage, Crack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & crack of Welding portion	Visual confirmation		No abnormal condition			
3	Connecting beam member	Damage, Crack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & crack of Welding portion	Visual confirmation		No abnormal condition			
		Wear & deformation of Connection pin and Pin hole	Visual confirmation, Palpation		No abnormal condition			
4	Trolley	Damage, Cack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & crack of Welding portion	Visual confirmation		No abnormal condition			
5	Walkway, Stairway, Handrail, Landing-steps	Damage, crack, deformation, corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & rack of Welding portion	Visual confirmation		No abnormal condition			
		Damage, Wear, Looseness of	Visual confirmation,		No abnormal condition			

		Mounting bolt	Hammering test, Retightening					
		Mounting state & damage of Stopper of each entrance	Visual confirmation, Palpation		No abnormal condition			
6	Operator's cab	Damage, Crack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & crack of Welding portion, Rain leakage	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt	Visual confirmation, Hammering test, Retightening		No abnormal condition			
		Damage, crack, Deformation, Opening/closing state of Window, Window frame & Door	Visual confirmation, Palpation		No abnormal condition			
7	Electrical house (Walk-in type Control panel house)	Damage, Crack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage, crack of Welding portion, Rain leakage	Visual confirmation		No abnormal condition			
		Damage, Looseness of Mounting bolt	Visual confirmation, Hammer test, Retightening		No abnormal condition			
		Damage, deformation & opening/closing state of Door	Visual confirmation, Palpation		No abnormal condition			
8	Engine room	Damage, crack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage & crack of	Visual		No abnormal			

		Welding portion, Rain leakage	confirmation		condition			
		Damage & looseness of Mounting bolt, Degradation of Vibration isolating object	Visual confirmation, Hammer test, Retightening		No abnormal condition			
		Damage & Operating state of Shutter	Visual confirmation, Palpation		No abnormal condition			
		Damage, deformation & operating state of Folding walkway	Visual confirmation, Palpation		No abnormal condition			
9	Lower sheave block	Damage, Crack, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage, crack of Welding portion	Visual confirmation		No abnormal condition			
		Damage, Lubrication & Wear of Connection pin of Spreader	Visual confirmation, (Refueling)		No abnormal condition			
10	Cable basket	Damage, Crack, Deformation, Corrosion	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt	Visual confirmation, Hammer test, Retightening		No abnormal condition			

14. < Others >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Trolley Auxiliary Panel	Damage, Crack, Deformation, Corrosion, Quality of waterproof	Visual confirmation		No abnormal condition			
		Damage, deformation & opening/closing state of Door	Visual confirmation, Palpation		No abnormal condition			
		Damage & degradation of Packing	Visual confirmation		No abnormal condition			
2	Resister Panel	Damage, Crack, Deformation, Corrosion	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt	Visual confirmation, Hammering test, Retightening		No abnormal condition			
3	Wiring Connection box 1) Girder: JB-1 2) Operator’s Cab: JB-C 3) Seaside Leg: JB-7	Damage, Crack, Deformation, Corrosion, Quality of waterproof	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt & Ground	Visual confirmation, Hammering test, Retightening		No abnormal condition			
		Damage & degradation of Packing	Visual confirmation		No abnormal condition			
4	Wiring Pull box	Damage, Crack, Deformation, Corrosion, Quality of	Visual confirmation		No abnormal condition			

		of waterproof						
		Damage & looseness of Mounting bolt & Ground	Visual confirmation, Hammering test, Retightening		No abnormal condition			
		Damage & degradation of Packing	Visual confirmation		No abnormal condition			
5	Grease supply piping 1) Trolley 2) Seaside Leg 3) Landside Leg	Mounting state, Damage, Deformation, Clogging	Visual confirmation		No abnormal condition			
		Damage of Grease nipple	Visual confirmation, (Refueling)		No abnormal condition			
		Mounting state & damage of Central lubrication block	Visual confirmation		No abnormal condition			
6	Hoist brake cover	Mounting state, Damage, Deformation, Corrosion	Visual confirmation, Hammering test		No abnormal condition			
		Opening/closing state of Door, Fixing state of Stopper	Visual confirmation, Operating check		No abnormal condition			
7	TAS Control Panel	Damage, Crack, Deformation, Corrosion, Quality of of waterproof	Visual confirmation		No abnormal condition			
		Damage, deformation & opening/closing state of Door	Visual confirmation, Palpation		No abnormal condition			
		Damage & degradation of Packing	Visual confirmation		No abnormal condition			
8	Communication phone (Seaside, Landside)	Mounting state, Damage, Communication state	Visual confirmation Auscultation		No abnormal condition			
9	Emergency button switch	Mounting state, Damage, Operating	Visual confirmation,		No abnormal condition			

	(Seaside, Landside)	state	Palpation					
10	Weight lever type Sensor (for Over-winding, Position correction)	Mounting state, Damage, Corrosion, Operating state	Visual confirmation, Palpation		No abnormal condition			
		Damage of Mounting wire of Weight	Visual confirmation		No abnormal condition			
11	Lighting instrument Sodium light 1) Girder (Left): 3 pc Seaside Leg: 2 pc 2) Girder (Land side): 3 pc Landside Leg: 2 pc 3) Operator's Cab: 4 pc	Damage, crack & corrosion of Instrument & Fixing part	Visual confirmation		No abnormal condition			
		Mounting state of Equipment, Looseness of Adjusting screw	Visual confirmation, Retightening		No abnormal condition			
		Damage of Consent & Cable	Visual confirmation		No abnormal condition			
		Bulb-burn out, Lighting state	Visual confirmation, Cleaning		No abnormal condition			
		Mounting state, damage & corrosion of Ballast	Visual confirmation		No abnormal condition			
		Mounting state, damage & corrosion of Ballast storage box	Visual confirmation, Hammering test		No abnormal condition			
12	Landside Eye lamp	Mounting state, damage, crack & corrosion of Instrument & Fixing part	Visual confirmation		No abnormal condition			
		Bulb-burn out, Lighting state	Visual confirmation, Cleaning		No abnormal condition			
13	Walkie-talkie of in-vehicle terminal	Mounting state, Damage, Crack, Deformation, Corrosion, Quality of	Visual confirmation, Palpation		No abnormal condition			

		waterproof						

< Spreader >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Main Frame	Mounting state, Damage, Deformation, Corrosion, State of Coating	Visual confirmation, Hammer test		No abnormal condition			
		Damage & crack of Welding portion	Visual confirmation, Hammering test		No abnormal condition			
2	Mounting bolt	Damage, Crack, Corrosion, Looseness	Visual confirmation, Hammering test, Retightening		No abnormal condition			
3	Sliding arm	Damage, Deformation, Corrosion, State of Coating	Visual confirmation		No abnormal condition			
		Damage, crack & lubricating state of Sliding surface	Visual confirmation, (Refueling)		No abnormal condition			
4	Sliding shoe	Damage, Wear, Clearance	Visual confirmation, Measuring, Adjusting		No abnormal condition			
		Damage & looseness of Mounting bolt	Hammering test, Retightening		No abnormal condition			
5	45FT Stopper of Telescopic	Damage, deformation, wear, Looseness of Mounting bolt	Visual confirmation, Hammering test, Retightening		No abnormal condition			

		Dimension & length at 20/40/45FT position, Mounting state of Liner	Measuring, Adjusting		No abnormal condition			
6	Hydraulic Unit for Telescopic (Hydraulic motor & brake)	Damage, corrosion & oil leakage of Hydraulic motor	Visual confirmation		No abnormal condition			
		Oil quantity & oil leakage of Reducer & Hydraulic brake	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt	Visual confirmation, Hammer test, Retightening		No abnormal condition			
7	Drive chain device for Telescopic	Damage, wear & lubrication state of Drive chain	Visual confirmation, Palpation		No abnormal condition			
		Mounting state, damage & wear of Sprocket	Visual confirmation, Hammering test		No abnormal condition			
		Damage & wear of Adjusting buckle & Belleville spring	Visual confirmation, Hammering test		No abnormal condition			
		Tension of Chain, Balance of Right & left side chain tension	Visual confirmation, Adjusting		No abnormal condition			
8	Corner guide arm	Damage, crack, Deformation, Corrosion	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt	Hammering test, Retightening		No abnormal condition			
9	Corner box	Damage, crack, deformation, wear, Crack of Welding portion	Visual confirmation		No abnormal condition			
		Damage, crack & wear of Landing plate	Visual confirmation		No abnormal condition			
		Wear & deformation of Twist-lock &	Visual confirmation		No abnormal condition			

		Landing pin holes						
10	Twist-lock pin	Damage, Crack, Deformation, Wear	Visual confirmation, Magnetic testing (MT)		No abnormal condition No crack			
		Damage, wear & deformation of Screw & Key groove	Visual confirmation, Palpation		No abnormal condition			
		Damage, crack & deformation of Twist-lock pin guide	Visual confirmation, Magnetic testing (MT)		No abnormal condition			
11	Twist-lock Connecting Mechanism	Mounting state, damage, crack & deformation of Connection rod	Visual confirmation		No abnormal condition			
		Damage of Rod end, Looseness of Fixing nut	Visual confirmation, Retightening		No abnormal condition			
12	Landing pin	Damage, Crack, Corrosion, Wear	Visual confirmation		No abnormal condition			
		Looseness of Mounting nut Damage of Spring	Palpation, Retightening		No abnormal condition			
		Stroke	Operating check, Measuring		No abnormal condition			
13	Twist-lock cylinder	Mounting state, Damage, Oil leakage, Operating state	Visual confirmation, Retightening		No abnormal condition			
14	Wiring	Mounting state, Damage, Crack, Degradation, Arrangement of wiring	Visual confirmation		No abnormal condition			
15	Hydraulic hose	Mounting state, Damage, Oil leakage, Degradation	Visual confirmation		No abnormal condition			
16	Cable rack	Mounting state, Damage, Crack, Degradation	Visual confirmation		No abnormal condition			

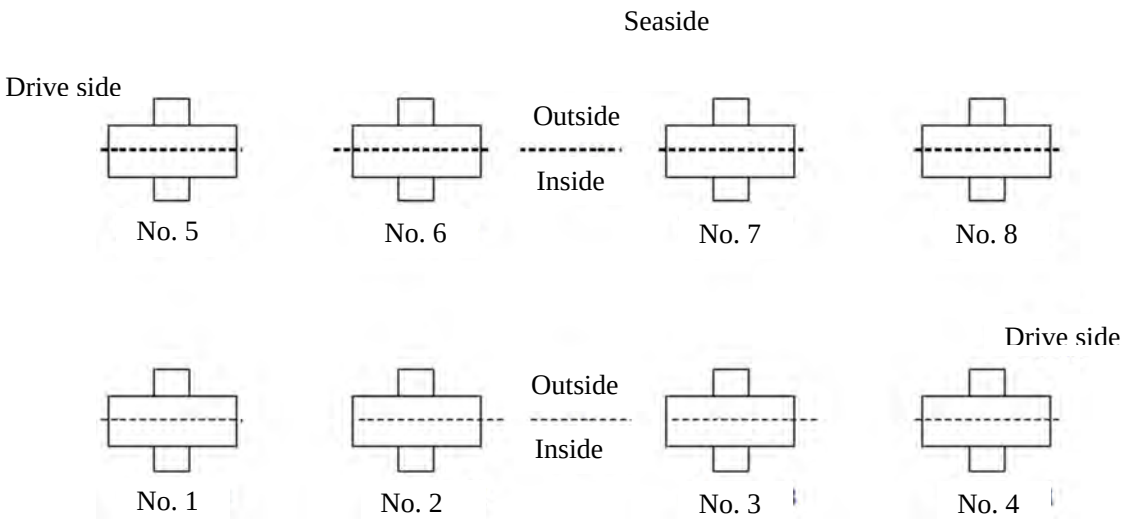
17	Wiring Connection box	Mounting state, Damage, Crack, Degradation, State of waterproof	Visual confirmation		No abnormal condition			
		Damage & looseness of Mounting bolt & Ground	Hammering test, Retightening		No abnormal condition			
		Damage & looseness of Connecting plug (JB-S1)	Visual confirmation, Retightening		No abnormal condition			
18	Proximity sensor	Damage, crack, Deformation, Looseness of Mounting nut	Visual confirmation, Retightening		No abnormal condition			
		Operating position, Operating check	Visual confirmation, Measuring		No abnormal condition			
19	Lever type Limit switch	Damage, crack, Deformation, Looseness of Mounting bolt	Visual confirmation, Retightening		No abnormal condition			
		Operating position, Operating check	Measuring, Operating check		No abnormal condition			

15. < Spreader Hydraulic Unit >

No.	Classification Name.	Inspection Item	Inspection Method	Measuring Instrument	Decision Criteria	Actual Measured Value	Judgement	Countermeasure or Remarks
1	Hydraulic motor	Damage, Corrosion, Looseness of Mounting bolt	Visual confirmation		No abnormal condition			
		Abnormal sound, Vibration, Heat occurrence	Visual confirmation, Palpation, Auscultation		No abnormal condition			
2	Hydraulic motor	Damage, Corrosion, Looseness of Mounting bolt	Visual confirmation		No abnormal condition			
		Looseness of Adjusting bolt of Pressure & Flow	Visual confirmation, Measuring		No abnormal condition			
		Abnormal sound, Vibration, Heat occurrence, Oil leakage	Visual confirmation, Palpation, Auscultation		No abnormal condition			
3	Coupling	Mounting state, (Centering & wear of Shaft and Key)	Visual confirmation, Palpation		No abnormal condition			
		Damage & wear of Chain & Sprocket	Visual confirmation, Palpation		No abnormal condition			
		Lubrication state	Visual confirmation, (Replacing)		No abnormal condition			
		Mounting state, Damage & oil leakage of Casing	Visual confirmation, Palpation		No abnormal condition			
4	Suction filter	Mounting state, Damage, Clogging, Dirt	Visual confirmation, Cleaning, (Replacing)		No abnormal condition			
5	Return filter	Damage & looseness of Mounting bolt,	Visual confirmation,		No abnormal condition			

		Oil leakage	Retightening					
		Mounting state, damage & clogging of Element	Visual confirmation, (Replacing)		No abnormal condition			
6	Hydraulic valve	Mounting state, Damage, Corrosion, Oil leakage	Visual confirmation, Retightening		No abnormal condition			
		Looseness of Adjusting portion & Mounting of Coil	Visual confirmation, Palpation		No abnormal condition			
		Abnormal sound, Heat occurrence, Operating state (Twist-lock pressure, etc.)	Visual confirmation, Palpation, Measuring		No abnormal condition			
7	Hydraulic tank	Mounting state, Damage, Corrosion, Deformation, Oil leakage	Visual confirmation		No abnormal condition			
		Damage & Degradation of Mounting bolt & Rubber pad	Visual confirmation, Palpation		No abnormal condition			
		Damage of Sight glass, Degradation of Packing Damage of Sight glass, Degradation of Packing	Visual confirmation		No abnormal condition			
		Damage & dirt of Internal separator & Piping	Visual confirmation, Cleaning		No abnormal condition			
		Oil quantity & contamination of Hydraulic oil	Visual confirmation, (Replacing, Refueling)		No abnormal condition			
8	Piping	Damage, Crack, Deformation, Corrosion	Visual confirmation		No abnormal condition			
		Mounting state, Oil leakage	Visual confirmation		No abnormal condition			

(1) Measurement of Remaining groove and Air pressure of Tyre



Groove of Tyre: Original size 35.0mm Wear limit 5.0mm

Air pressure: 9.0Kg/cm2

Measurement result

		No. 5	No. 6	No. 7	No. 8
Remaining groove	Inside (mm)				
	Outside (mm)				
Air pressure	Before adjustment (Kg/cm2)				
	After adjustment (Kg/cm2)				

		No. 1	No. 2	No. 3	No. 4
Remaining groove	Inside (mm)				
	Outside (mm)				
Air pressure	Before adjustment (Kg/cm2)				
	After adjustment (Kg/cm2)				

(2) Steering Device

A) Hydraulic Pump Unit

(Unit: Kg/cm2)

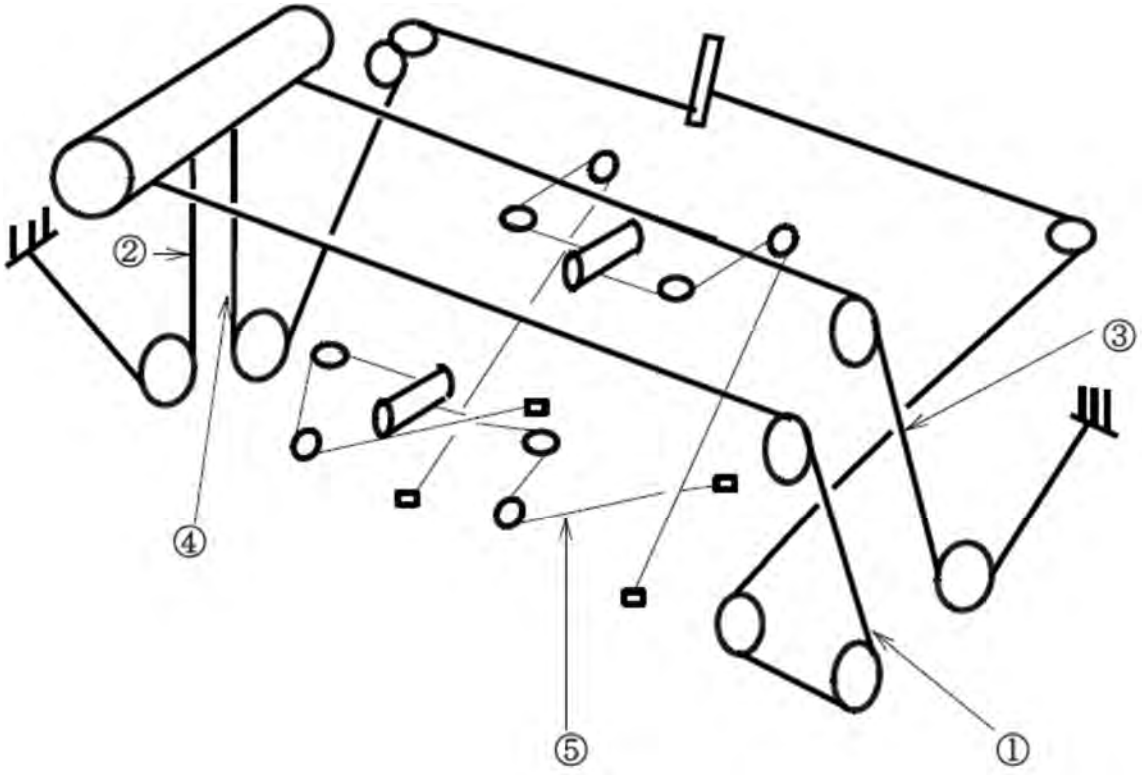
	Rated pressure	Measured value
Seaside (No. 1)	175	
Landside (No. 2)		

B) Operating time

(Unit: Sec)

	Normal value	Measured value
0 degree to 90 dgrees	45	
90 degree to 0 dgrees		

(3) Measurement of Wire ropes



①	Hoist Wire Rope	Φ25mm x 57m	6xFi(29) IWRC B-Class Z-Ordinary
②	Hoist Wire Rope	Φ25mm x 47m	6xFi(29) IWRC B-Class Z-Ordinary

③	Hoist Wire Rope	Φ25mm x 51m	6xFi(29) IWRC B-Class Z-Ordinary
④	Hoist Wire Rope	Φ25mm x 50m	6xFi(29) IWRC B-Class Z-Ordinary
⑤	Hoist Wire Rope	Φ12.5mm x 24m	6xFi(29) IWRC B-Class Z-Ordinary

1) Measurement method

Hoist: Measure 3 points of the inner wire of the hoist lower sheave, at the height position of the roof of the Electric House while holding the spreader.

Anti-sway: Measure one point at the exit of wire rope from the drum, at the upper limit position of hoist.

2) Usage limit

a) When more than 10 wires breaks for 1 strand of wire rope

b) When more than 5% of the wire diameter is worn

Allowance value: Φ23.8 mm for Hoist wire rope

Φ11.9 mm for Anti-sway wire rope

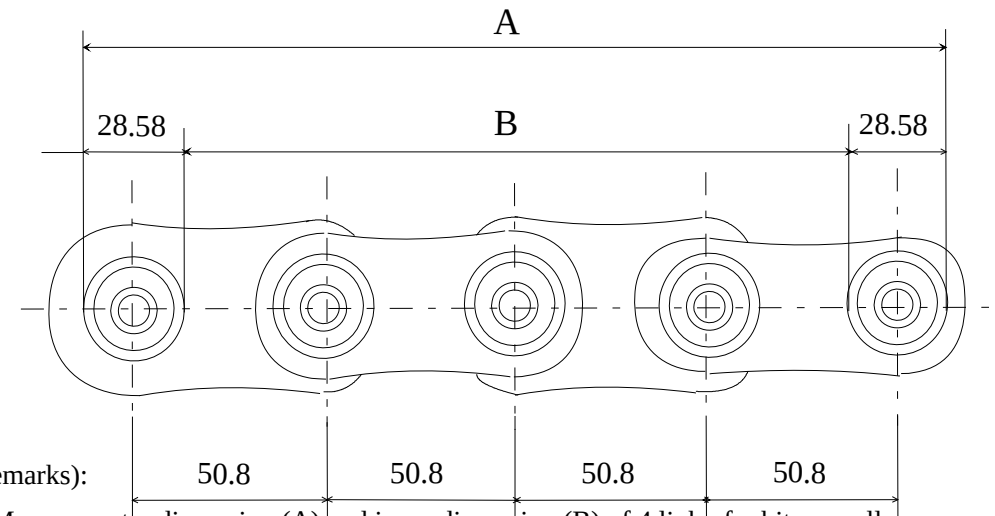
c) In addition, when it is deemed difficult to use due to local wear or rust caused by insufficient lubrication.

Measured value

	① Seaside Left	② Seaside Right	③ Landside Left	④ Landside Right
1				
2				
3				

From Seaside	⑤ Anti-sway
No. 1	
No. 2	
No. 3	
No. 4	

(4) Measurement of elongation of Gantry Drive Chain



(Remarks):
Measure outer dimension (A) and inner dimension (B) of 4 link of arbitrary roller

(Unit: mm)

	A	B	Reference size	Usage limit
Original size	231.78	174.62	203.20	206.24

$$\text{Judgment dimension} \quad \underline{\text{A+B}}$$

$$\text{Elongation rate of Chain} = \frac{\text{(Judgment dimension)} - \text{(Reference dimension)}}{\text{Reference dimension}} \times 100\ (\%) \qquad (1.5\% \text{ or less})$$

No. 1 (Seaside)

	A	B	Reference size	Elongation ate (%)
Measured value				

No. 1 (Landside)

	A	B	Reference size	Elongation ate (%)
Measured value				

(5) Measurement of Gantry Drive and Trolley Traverse Brake

Brake type	BM-31
Original dimension of Lining	16.0 mm
Wear limitation of Lining	10.0 mm
Standard gap	0.3 – 1.2 mm

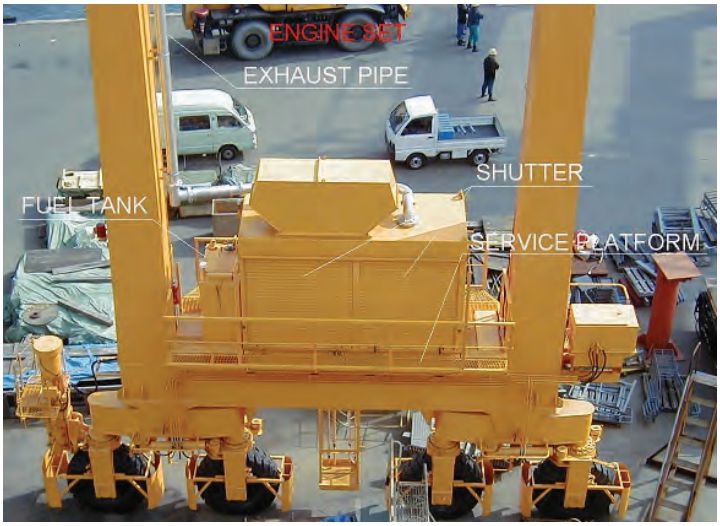
Measured value (Unit: mm)

	Gantry Travel (Seaside: No. 1)	Gantry Travel (Landside: No. 2)	Trolley Traverse
Gap			
Lining thickness			

Implementation Examples of Monthly Inspection of Rubber Tyred Gantry Crane

JICA Support Team
December 2021

Names of Main Parts of RTG

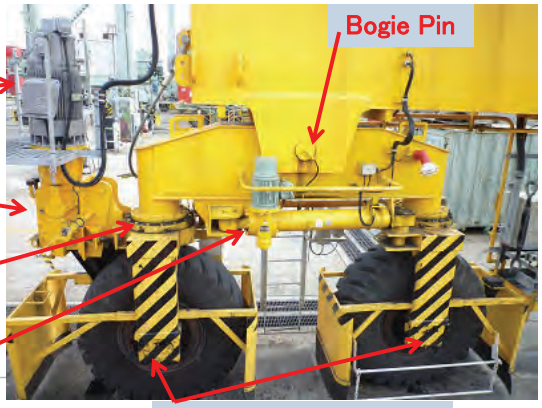


Gantry Travel Motor

Gantry Travel Reducer

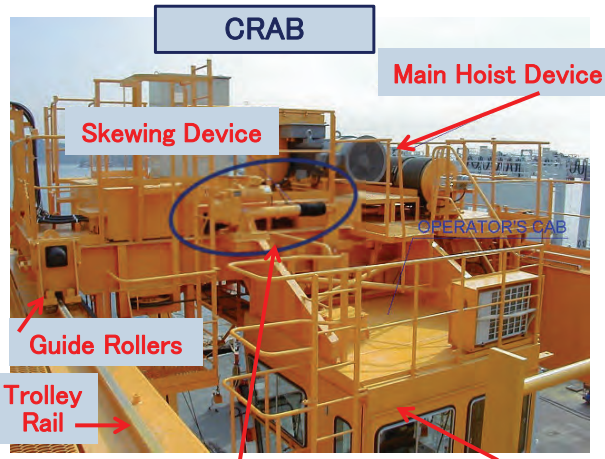
Steering Power Cylinder

Steering Power Cylinder

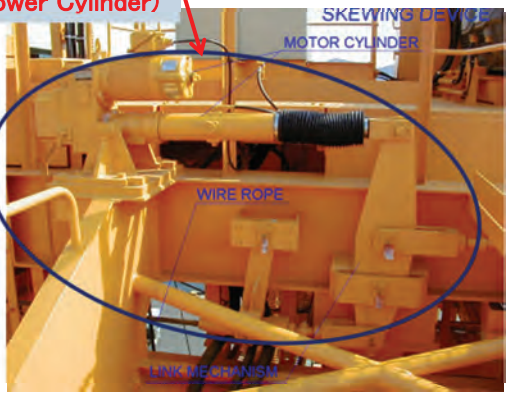


Bearing of Wheel Shaft

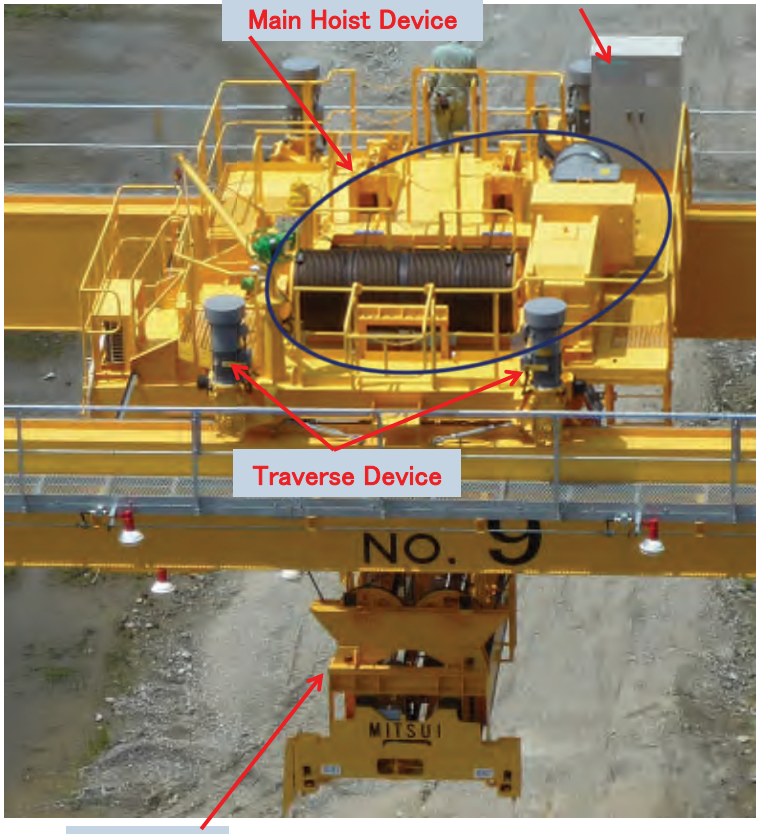
CRAB



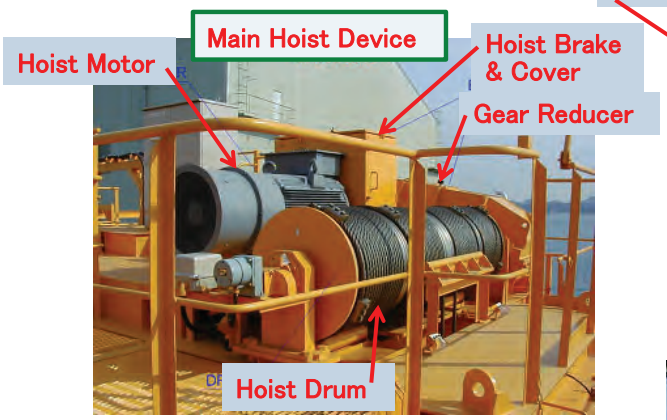
Skewing Device (Power Cylinder)



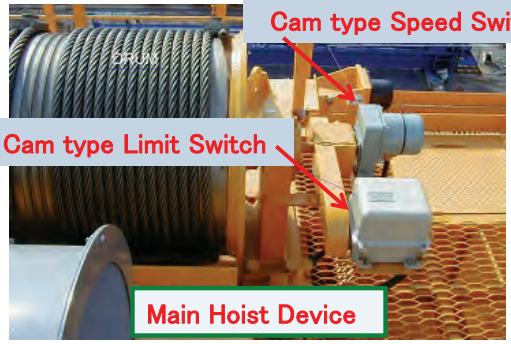
Crab Control Panel

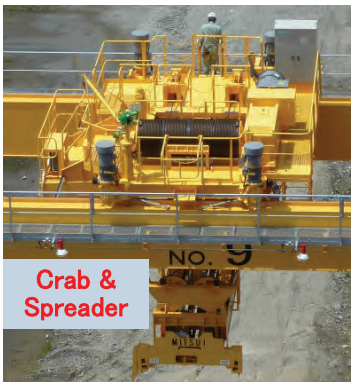


Spreader



Assembly of Crab and Spreader





Panoramic View of RTG

*** Monthly Inspection of RTG ***

Maintenance Location of RTG, Top-lifter and other handling equipment

Inspection Area

Refueling Location

Maintenance Area to carry out Monthly/Annual Inspection: close to Maintenance Shop / House

<Important Point>:

Safety Meeting should be held prior to the start of Monthly Inspection

Safety Meeting

<Purpose of Safety Meeting >

In order to prevent accidents and injuries during the inspection

In order to carry out effective inspection and exchange parts, etc. within predetermined time

*** Monthly Inspection of RTG ***

Procedure of inspection

Safety Meeting

Gantry Travel Part (D-G Set Side)

Gantry Travel Part (Electrical House Side)

Spreader

Crab Part

Tilt-correction of Spreader

Adjustment of the hoisting rope

Check the operation of the safety device

Confirmation of the operation of Hoist and Trolley Traverse

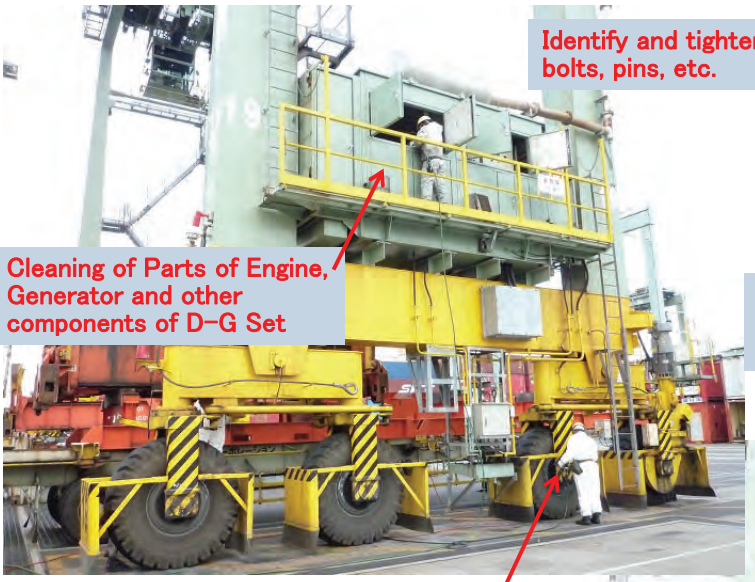
Report of the Result of Inspection

Official report will be submitted to the Customer later.

Gantry Travel Part
(D-G Set Side)

Gantry Travel Part
(Electrical House Side)

Gantry Travel Part



Identify and tighten any loose bolts, pins, etc.

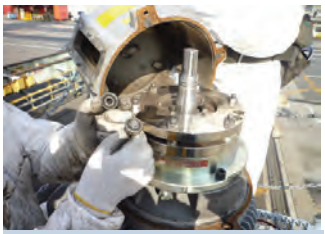
Cleaning of Parts of Engine, Generator and other components of D-G Set

Cleaning of Parts of Engine, Generator and other components of D-G Set

Refueling of grease to Slewing Ring for Steering

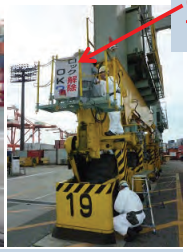
Refueling of grease to Bearings of Gantry wheels shaft

Gantry Travel Part
(D-G Set Side)



Cleaning of Pad of Disc brake of Travel Motor (Partially disassembled)

Wear of Gantry Tyre is checked.



Tyre pressure is checked.

Clearance of pad of Travel Brake is checked.

Lubrication to Pins of Steering Power Cylinder

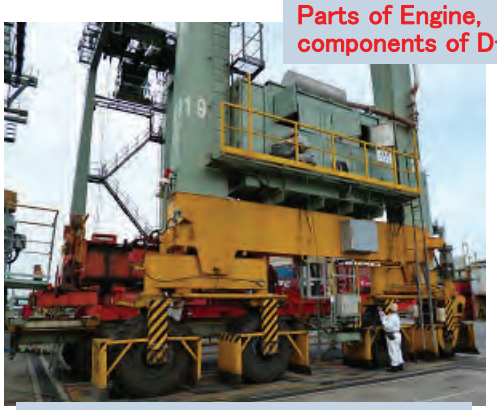
Clearance of pad of Travel Brake is checked and Brake units are cleaned by air-brush

Clearance of Brake Pad of Steering Power Cylinder is checked and Brake units are cleaned by air-brush.

Lubrication to Pins of Steering Power Cylinder

Gantry Travel Part (D-G Set Side)

Parts of Engine, Generator and other components of D-G Set are cleaned by air-brush



Refueling of grease to Gantry wheel shaft, Slewing Ring and other parts

Inspection of components of D-G Set

Outside

Inside

Gantry Travel Part (Electrical House Side)

Air pressure of Gantry tire is checked and adjust when necessary.

Air pressure of Gantry Tyres is checked and adjusted.

Wear of Gantry Tire is checked.

Clearance of pad of Travel Brake is checked and Brake unit is cleaned by air-brush.

Clearance of Brake Pad of Steering Power Cylinder is checked and Brake unit is cleaned by air-brush.

Gantry Travel (D-G Set side)

Gantry Travel Part (Electrical House Side)

Clearance of pad of Travel Brake is checked and Brake unit is cleaned by air-brush.

Clearance of pad of Travel Brake is checked.

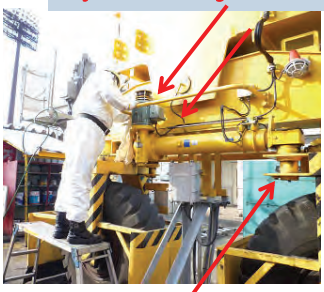
Wear of Gantry Tyre is checked.

Lubrication to Bearing of Wheel Shaft

Air-grease Gun

Clearance of Brake Pad of Steering Power Cylinder is checked and Brake unit is cleaned by air-brush.

Clearance of Brake Pad of Steering Power Cylinder is adjusted.



Lubrication to Pins of Steering Power Cylinder

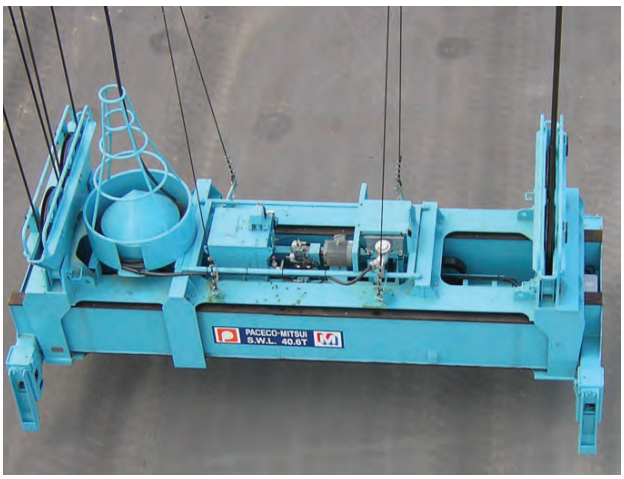
Adjustment of tension of Gantry Drive Chain and Refueling of grease to Drive Chain

Adjustment of clearance of Brake Pad of Steering Power Cylinder

Lubrication to Pins of Steering Power Cylinder

Twin-20 FT Spreader for Quayside Container Crane

20/40 FT Telescopic type



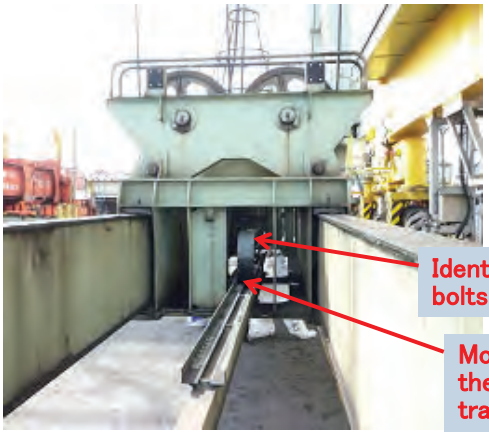
20/40 FT Telescopic type

Spreader (20/40 FT Telescopic type)

Refueling of grease to Sheave bearing

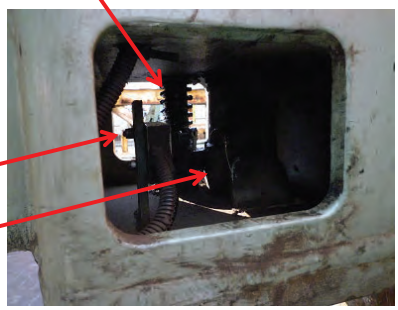
Refueling of grease to Sheave bearing

Refueling of grease to Link pin, Spherical bearing, etc.



Identify and tighten any loose bolts, pins, etc.

Moving parts and their guide/Guide tray are cleaned.



Twist lock assembly of Spreader

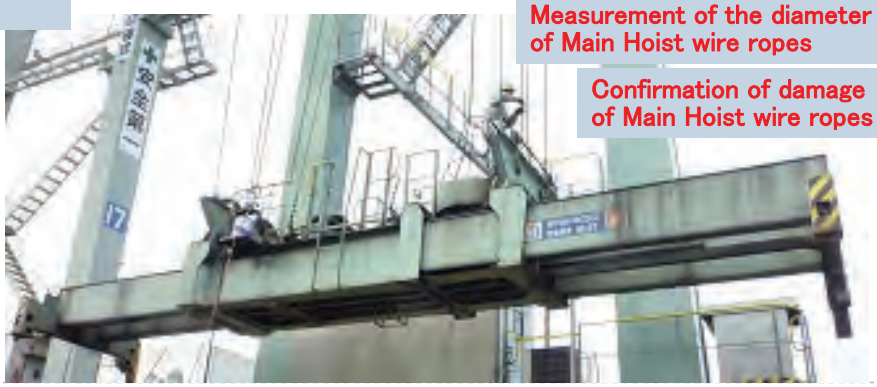
Moving parts and their guide/Guide tray are cleaned by air-brush

Confirmation of the movement of the Twist-lock Cylinder

Identify and tighten any loose bolts, pins, etc.

Measurement of the diameter of Main Hoist wire ropes

Confirmation of damage of Main Hoist wire ropes

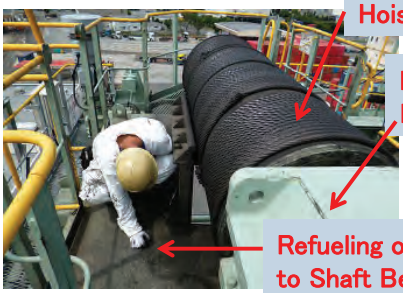


Crab

Inspection of Equipment of Crab after finishing the inspection of Spreader

Clearance of Brake Pad of Traverse Motor is checked and Brake unit is cleaned by air-brush.

Clearance of Brake Pad of Traverse Motor is checked and Brake unit is cleaned by air-brush.



Crab

Clearance of Pad of Hoist Brake is checked and Brake unit is cleaned by air-brush

Refueling of grease to Disk Brake Coupling of Main Hoist Motor

Confirmation of Cam type limit switch and

Refueling of grease to Bearings of Main Hoist and Anti-sway Sheaves

Refueling of grease to Bearing of Drum Shaft and drive chain, etc.

Crab

Refueling of grease to Drum Gear Coupling

Confirmation of the damage of Hoist Ropes

Clearance of Pad of Hoist Brake is checked and Brake unit by is cleaned air-brush.

Pad of Disc brake and other parts of Main Hoist Brake are cleaned by air-brash.

Crab

5 persons are in charge of Monthly Inspection of RTG.

Refueling of grease to Bearing and Pins of Main Hoist Fleeting Sheave

Clearance of Brake Pad of Trolley Traverse is checked and Brake unit is cleaned by air-brush

Clearance between Traverse Guide Rollers and Trolley Rail is checked.

Refueling of grease to Link pins and Pin of Rope End Socket of Anti-sway

Refueling of grease to Pins of Power Cylinder for Spreader Skewing

Crab

Confirmation of damage of the rail and crack in the welded line of traverse rail

Pad of Disc brake and other parts of Main Hoist Brake are cleaned by air-brush.

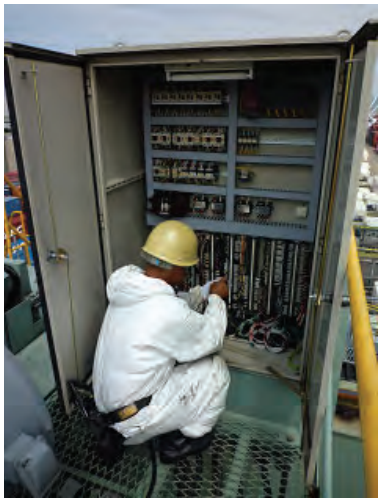
Refueling of grease to Drum, Coupling, etc. of Anti-sway Device

Refueling of grease to Sheave bearings for Anti-sway and Main Hoist

Refueling of grease to Bearing of Anti-sway Sheaves at the bottom of Crab

Refueling of grease to Bearing of Anti-sway Sheves at the bottom of Crab

Electrical unit, module and other parts of Trolley Control Panel are cleaned by air-brush



Identify and tighten any loose bolts, pins, etc.

Operation of equipment such as a relay is checked.

Trolley Control Panel on the Crab

Spreader
(20/40FT Telescopic Type)

Tilt-correction of Spreader

Adjustment of the hoisting rope

Standard Operation Procedure (SOP)

Construction/maintenance of facilities

: Construction-Engineering Department

STANDARD OPERATING PROCEDURE
For
Construction and Repair Work

- Construction – Engineering Department -

(Ver.1)

JICA Expert Team

CONTENTS

I. Objective

i) The Standard Operating Procedures are intended as a guideline for operations and services of the Construction - Engineering Department of SHV terminal.

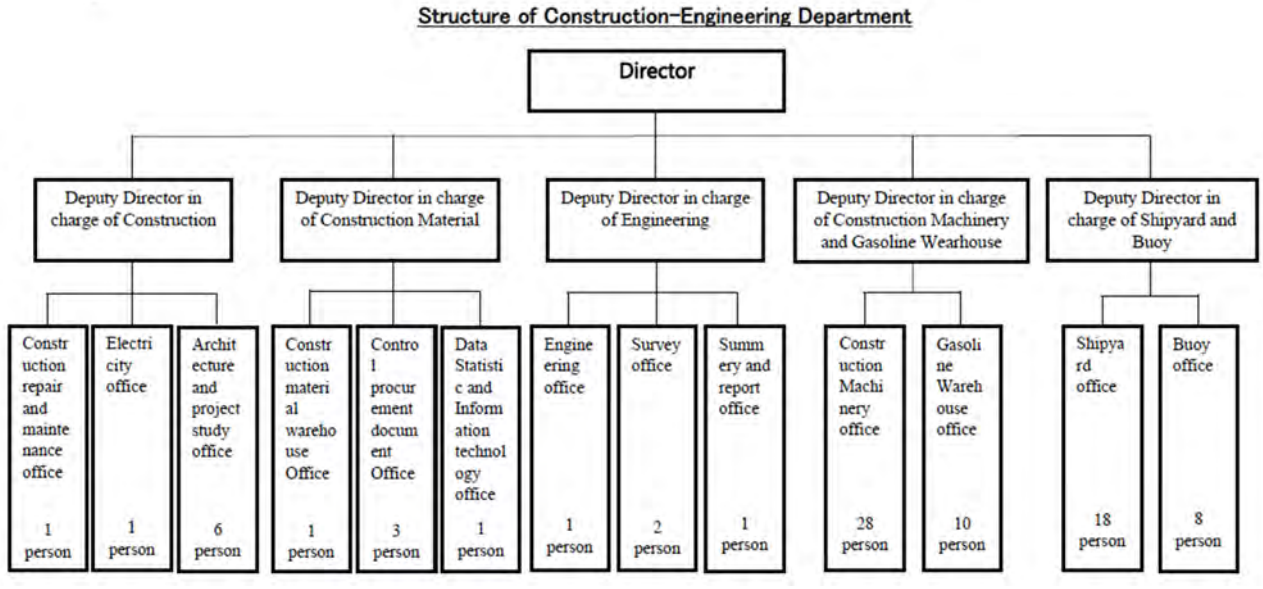
ii) Standard Operating Procedures are developed to describe the responsibilities, work recommendations and conditions for each party involved in the process to ensure that the work of the Construction - Engineering Department is accomplished.

II. Principle of Operation

- ✓ The Port will operate RTGs, RSs and yard trailers in such a way that the scheduling of vessels is given the highest priority and the smooth operation of vessels (cargo handling) is given the highest priority. They will also be operated with attention to avoiding congestion caused by road trailers. It is therefore important that port facilities are always maintained in a sound condition and that works, renovations and repairs are carried out appropriately and promptly.
- ✓ Civil engineering and construction facilities are closely linked not only to cargo handling operations, but also to the operation of electrical and other equipment and machinery. At all stages of planning, construction, and maintenance, it is important that work is always carried out in close co-operation with all parties concerned.

III. Roles and Responsibilities

1) Organisation Chart



(Ver. Oct.2021)

2) Function of Section

Office	Section (tentative)	Function
Civil/ Architecture	1	• routine maintenance check for facilities and infrastructure

		• repair/ restoration/cleaning of facilities and infrastructure • construction management including supervision of contractors • construction material procurement
	2	• project planning (new, improvement and modification project) • investigation and design including supervision of consulting firms • construction/repair planning and estimation • preparation of bid documents for facilities and infrastructure and bid evaluation • civil/architecture budget planning (business plan) and cost control

3） Duties and Responsibilities

(i) The Director of Department

The Director of Department shall, based on orders of the Deputy Director General of Technique (superior), control the Department in charge and manage the said business operations.

1) Participate in developing the business policy of the Department in charge related to the responsible business or assist and advise the Deputy Director General of Technique (superior).
2) Prepare the business plan of the Department in charge based on the business policy, obtain the approval of the Deputy Director General of Technique (superior), and order the Deputy Director and the Office Directors/Keypersons of the Section to execute it.
3) Approve the work plan of each Office, coordinate various work activities, and control its implementation.
4) Control and coordinate the budget plan of each Office and apply for the budget proposal of the Department in charge. The Director shall also approve the important expenditures of the working budget, supervise the budget implementation and apply for approval of budget expenditure.
5) Apply to the Deputy Director General of Technique (superior) for changes in departmental organization and its allocation of responsibilities and duties, and transfers of managerial personnel.
6) Evaluate and coordinate internal personnel evaluation and assess supervisors directly in the Department.
7) Order or approve business trips of the staff in the Department.
8) Provide departmental business reports and other materials necessary for business planning and management to the Deputy Director General of Technique (superior).
9) Instruct and supervise the Deputy Director, each Office Director/Keyperson of the Section and staff in the Department. In addition, plan and carry out educational programs for managerial personnel in the Department.

(ii) The Deputy Director

The Deputy Director shall execute the following tasks:

1) The Deputy Director shall assist the Director of Department and execute his duties in accordance with orders of the Director of Department.
2) Performs the duties of the Director of Department when the Director of Department is absent.
3) Provides advice and recommendations to the Office Directors/Keypersons of the Section under the direction of the Director of Department.

(iii) The Office Director/Keyperson of the Section

The Office Director/Keyperson of the Section shall, based on orders of the Director of Department, controls the Office in charge and manage its operations.

1) Participates in developing the business plan of the Department related to operations of the Office and assists and advises the Director of Department.
2) Prepares the work plan of the Office based on the business plan of the Department, obtains the approval

of the Director of Department, decides the assignment of work and the schedule plan, instructs the Office staff to execute it, and supervises the execution.

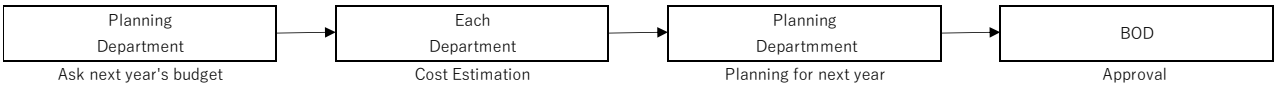
3) Submits the Office budget plan for approval to the Director of Department and approves minor expenditures within the working budget.
4) Applies to the Director of Department for approval of business trips for office personnel.
5) Reports the Office work progress and other work materials to the Director of Department as appropriate and stores such documents.
6) Instructs and supervises the Office staff to minimize costs and streamline procedures.
7) Conducts personnel evaluations of the Office staff and submits results to the Director of Department.
8) Approves requests for absences, leaves, etc. of the Office staff, and performs attendance management such as ordering overtime work.
9) Responsible for handling Office staff complaints and boosting their morale.
10) Establishes management policies, company orders, company announcements, internal company rules and oversees their implementation.
11) Leads and supervises the Office staff, determines and supervises the on-the-job training program.
12) Supervises the maintenance of facilities and equipment belonging to the Office and fire control.

IV. Standard Operating Procedures

1） Budget Request Procedures

(i) Normal Work

Budget request procedure is depicted in the following figure.

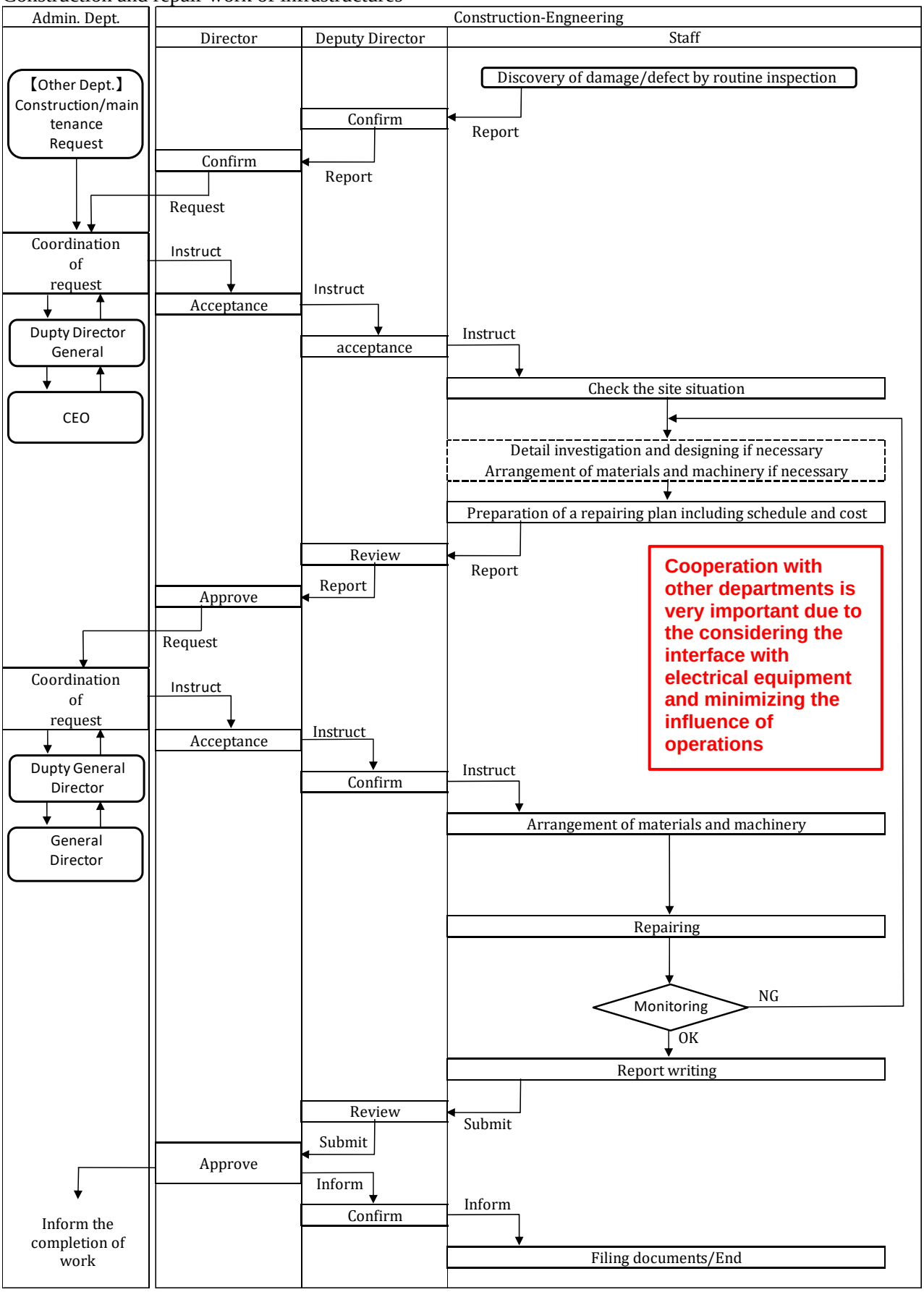


(ii) Urgent Work

When it becomes necessary to carry out urgent work, a budget will be secured separately from the above.

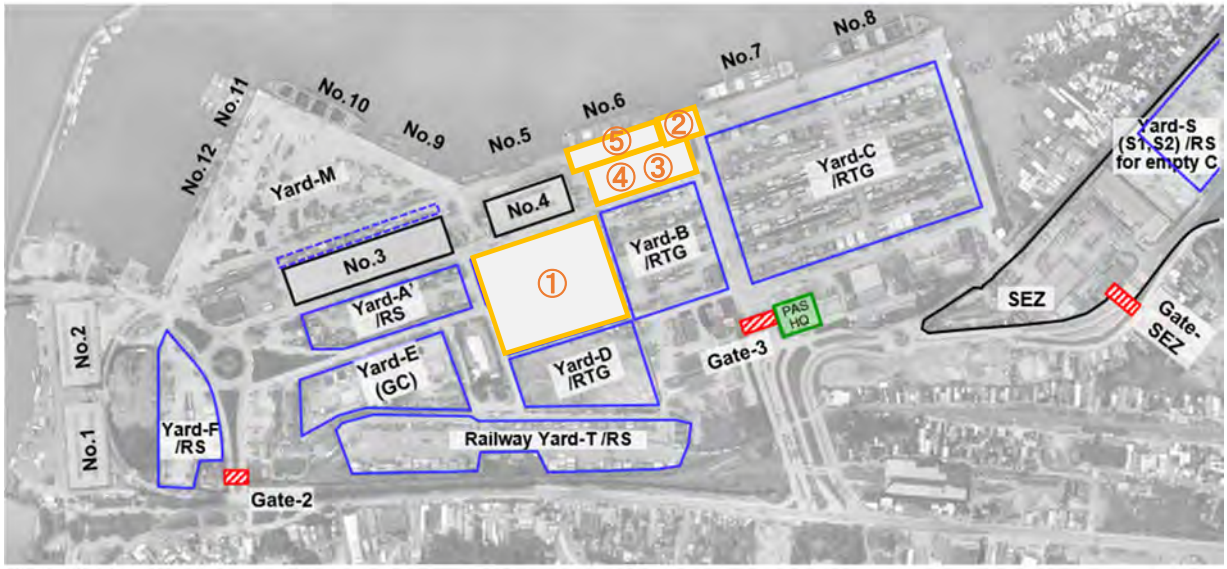
2） Operation Flow

Construction and repair work of infrastructures



3） Case study for construction of yard widening

Case study of a yard widening scheme to minimize operational impact.



RTG: Rubber Tired Gantry Crane
RS: Reach Stacker
GC: General Cargo

*) Yard-F and in front to f Warehouse No.3 are the yards for long stay containers.
Yard-S (SEZ) is the yard doe empty containers.

Planned construction items

① Yard upgrade from RS to RTG (approx. 20,000m2)

② Extension of QC Rail (approx. 25m)

③ Demolition of Warehouse No.5

④ Expansion of storage yard by RTG (approx. 10,000m2)

⑤ Extension of QC Rail (approx. 253m)

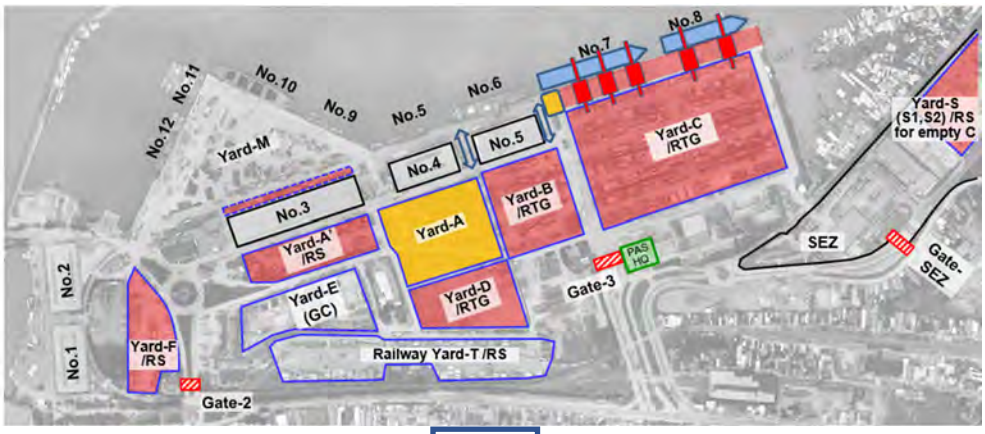
Key points for planning yard widening works

✧ To minimize the impact on operations

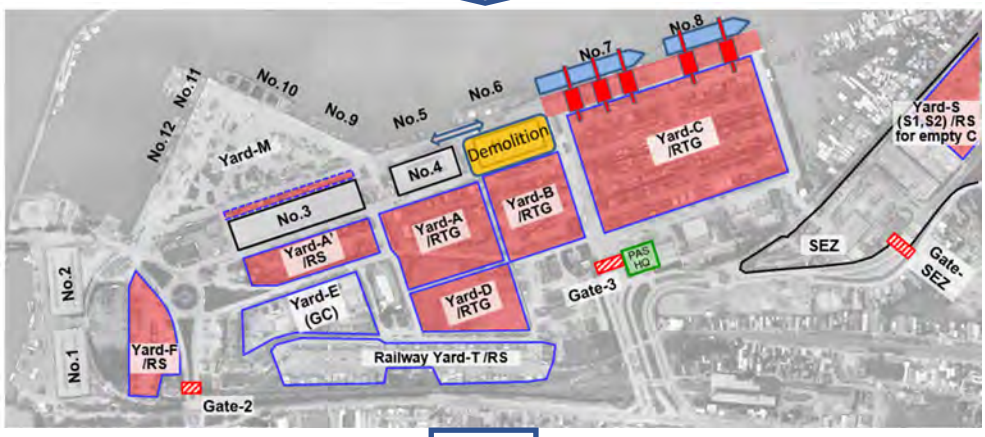
- ➢ To prepare an access road for Trailers handling equipment.
- ➢ To confirm planned elevations and existing elevations
- ➢ To check existing embedded objects/materials, such as electrical cables, communications, drainage, etc. and to examine countermeasures if necessary.
- ➢ To investigate/confirm soil conditions and to examine countermeasures if necessary.
- ➢ Value Engineering (Minimize cost and time)

For reference, an example of the construction flow and yard widening is shown below.

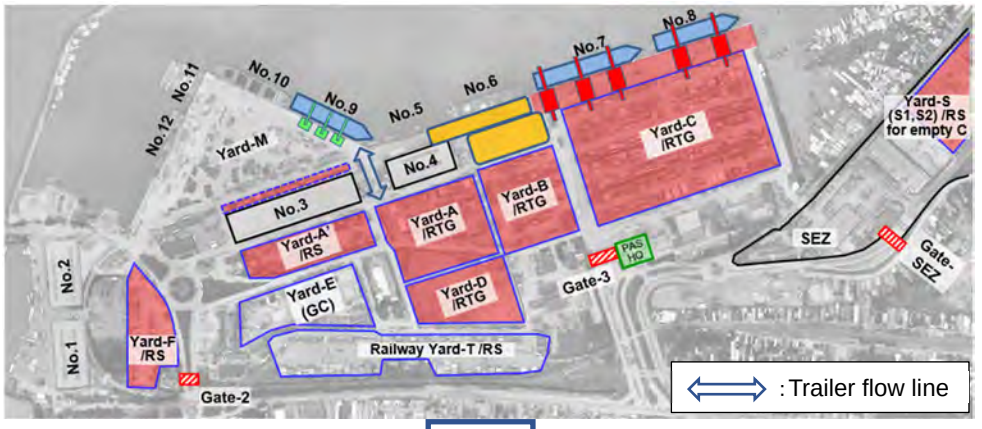
EX. Construction Flow



2022 (First half)
～
① Upgrade Yard-A
② QC Rail 25m



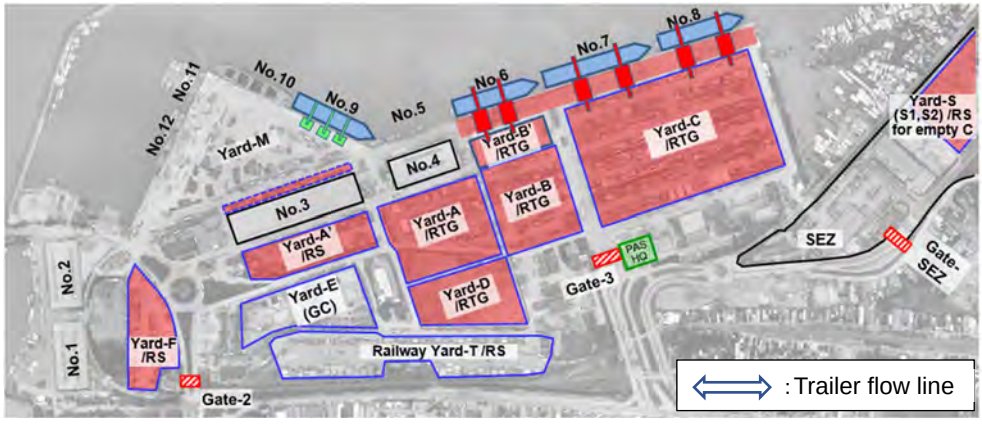
2022 (Second half)
～
③Demolition
WHNo.5
(Including the construction of a temporary road)



2023(First half)～

MHC: Installation of 2 units

④Yard Expansion
⑤QC Rail 253m



Completion
2024～

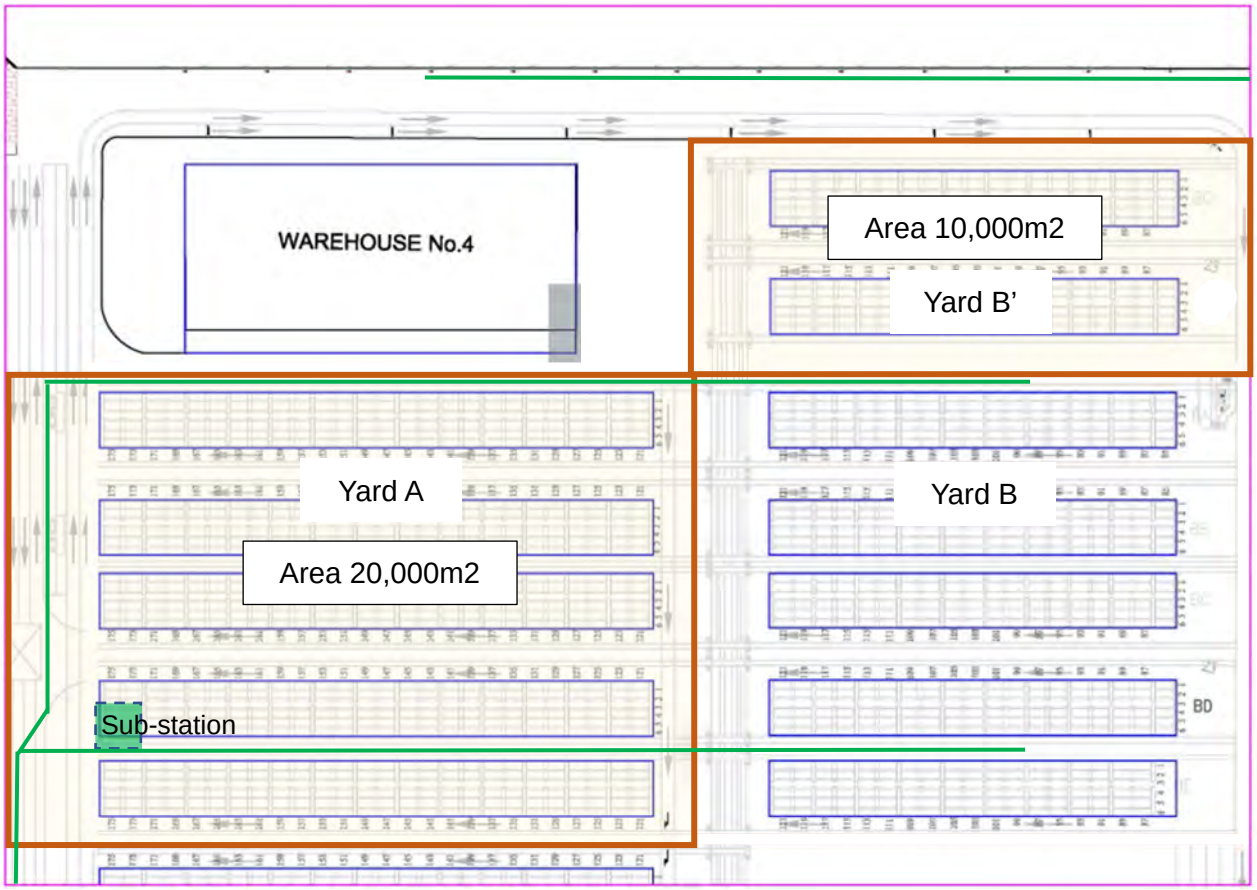
QC: Installation of 1 unit
(406)

The above information is for reference only and does not relate to the actual study.

EX. RTG Yard Widening

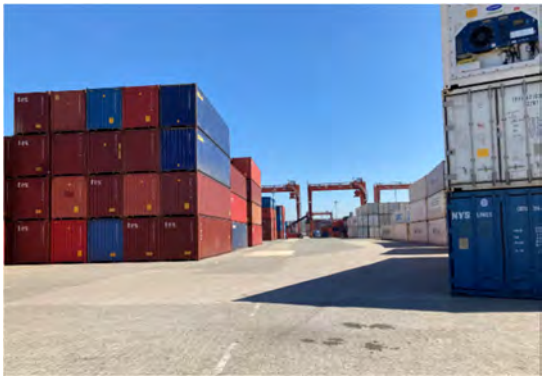
Traffic flow between Warehouse No.4 and No.3

Quay No.6 & Warehouse No.5



: Electrical conduits

Sub-station



Yard A

Scope of Works

- To check/investigate existing conditions, such as ground elevations, composition of pavement, location of embedded objects. Please note that if required information is not available it may be necessary to confirm these items during construction.
- To confirm the impact on embedded objects/materials due to the revision of the planned ground height.
- To start pavement work after discussion with the related departments.
- Take up some part of existing paving blocks at the lane of RTG Cranes, Trucks and Container Storage Area.
- Excavation of the subbase 650 mm thick) for RTG Cranes (650 mm thick) and truck lanes (400 mm thick) in the Container Storage Area.
- Excavation and installation of new underground stormwater drainage works.
- Supply and place crushed gravel, subbase course, 250 mm thick for RTG Cranes and 150 mm thick for Truck lanes in the Container Storage Area including compaction and watering.
- Supply and place plastic sheet on subbase surface.
- Supply and place Steel DB12mm@150mm (Double Stacks).
- Supply and place Steel (DB 16mm for Contraction Joint and Steel RB 25mm for Expansion Joint).
- Supply and cast the concrete C:35mpa (Cylinder).
- Supply and place bitumen at each joint.

Reference -6 Deliverables

A. Baseline and Monitoring Survey Report (KPI Monitoring Report)

Baseline and Monitoring Survey Report (KPI Monitoring Report)

December 2021

JICA Expert Team

Contents

Baseline Survey and Key Performance Indicators (KPIs)

Verifiable Indicators in the PDM were quantified by Key Performance Indicators (KPIs) based on the data obtained by the baseline survey. KPIs were set as follow, and Verifiable Indicators in the PDM were monitored using this table.

Output	Objectively Verifiable Indicator (as per the PDM)	KPI	Baseline (Set in Dec. 2018)	Target
Output 2-1	Dwelling time of import containers will be shortened.	Import Container Dwell Time	Full: 4.5 days Empty: 4.2 days	Full: 4 days Empty: 4 days
Output 2-2	Dwelling time of export containers will be shortened.	Export Container Dwell Time	Full: 3.4 days Empty: 10.0 days	Full: 4 days Empty: 6 days
Output 2-3	Berthing time of vessels will be reduced	Berth Productivity	QGC: 20.2 moves/hr Vessel: 30.1 moves/hr	QGC: 25 Vessel: 40
Output 3-1	Vehicles and motorcycles other than container trailers will not enter the container terminal	Number of Vehicles other than Container Trailers	Gate-3: 274 units Passage: 519 units	None (all from Gate-2)
Output 3-2	Turn Around time of trailers will be reduced	Turn Around Time of Trailers	Receiving: 41.4 min Delivery-A: 53.6 min Delivery-B: 300.7 min	Rec: 30 min Del-A: 40 min Del-B: 200 min
Output 4-1	Waiting trailers in front of the terminal gate will be reduced	Number of Waiting Trailers	123 trailers	60 trailers
Output 4-2	Trailers passing the gate will be increased	Number of Trailers Passing Gate	80 trailers/hr	104 trailers/hr

Output 2-1: Dwelling time of import containers will be shortened.

Import Container Dwell Time

Baseline: Full: 4.5 days, Empty: 4.2 days

Target: Full: 4 days, Empty: 4 days

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (1)	Dwelling Time of Import containers will be shortened.	Import Container Dwell Time

Follow-up Survey	
Survey Method	Dwell time of import container is calculated using the history information of CTMS. The import dwell time is calculated from the discharge time of a container from a vessel and its delivered time from the gate. As the KPI, the average dwelll time of import containers delivered for a month is calculated.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

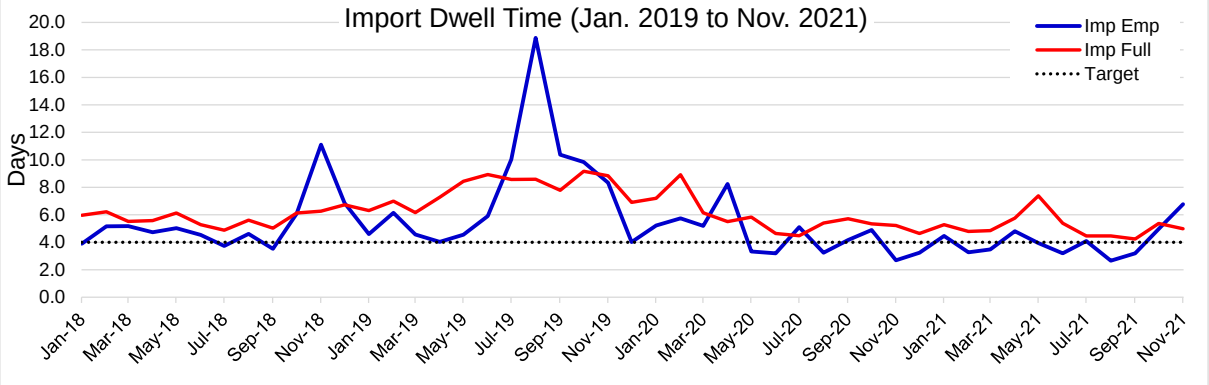
(Results of current survey)

	Jun	Jul	Aug	Sep	Oct	Nov	Average
Empty	3.2	4.1	2.7	3.2	5.0	6.8	4.2
Full	5.4	4.5	4.5	4.2	5.4	5.0	4.8

(Comparison from the begining)

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
Import Empty Dwell Time	4.2	4	11.7	4.6	4.0	4.2
Improvement Rate			279%	110%	95%	99%
Import Full Dwell Time	4.5	4	8.7	5.3	5.1	4.8
Improvement Rate			193%	118%	113%	107%

(Improvement Rate = (Surveyed Value/Baseline) x 100)



Output 2-2: Dwelling time of export containers will be shortened.

Export Container Dwell Time

Baseline: Full: 3.4 days, Empty: 10.0 days

Target: Full: 4 days, Empty: 6 days

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (1)	Dwelling Time of export containers will be shortened.	Export Container Dwell Time

Follow-up Survey	
Survey Method	Dwell time of export container is calculated using the history information of CTMS. The export dwell time is calculated from the received time of a container at the gate and its loaded time on a vessel. As the KPI, the average dwelll time of export containers loaded for a month is calculated.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

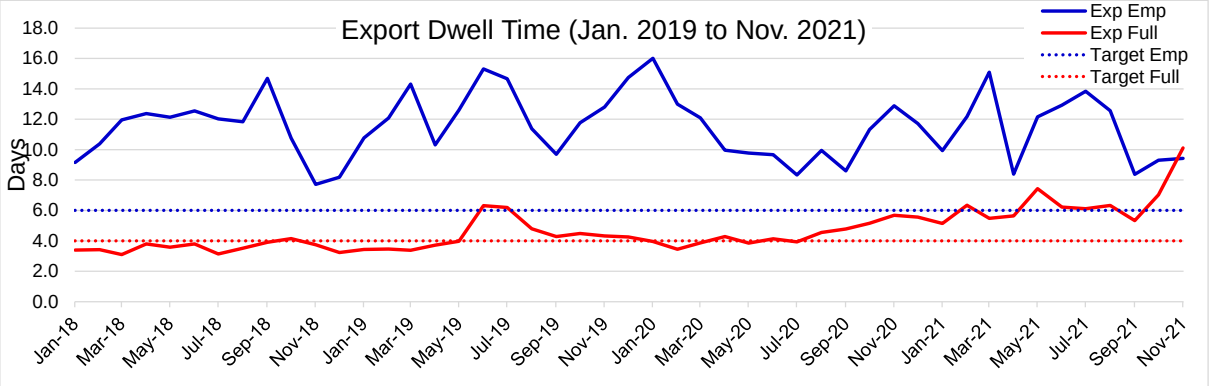
(Results of current survey)

	Jun	Jul	Aug	Sep	Oct	Nov	Average
Empty	12.9	13.8	12.6	8.4	9.3	9.4	11.2
Full	6.2	6.1	6.3	5.3	7.0	10.1	6.8

(Comparison from the begining)

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
Export Empty Dwell Time	10.0	6	12.6	9.9	10.5	11.2
Improvement Rate			126%	99%	105%	112%
Export Full Dwell Time	3.4	4	5.1	4.1	5.0	6.8
Improvement Rate			150%	121%	147%	199%

(Improvement Rate = (Surveyed Value/Baseline) x 100)



Output 2-3: Berthing time of vessels will be reduced.

Berth Productivity

Baseline: Full: QGC: 20.2 moves/hr, Vessel: 30.1 moves/hr

Target: Full: QGC: 25 moves/hr, Vessel: 40 moves/hr

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (3)	Berthing Time of vessels will be reduced	Berth Productivity

Follow-up Survey	
Survey Method	Berthing Productivity is picked up from the Vessel Schedule List compiled by Container Terminal Operation Department of PAS. Vessel Productivity = (Number of load/discharge moves) / (Berth Time) STS Crane Productivity = (Number of load/discharge moves) / (Operation Time of Cranes) The monthly average Berth Productivity is calculated as the KPI.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

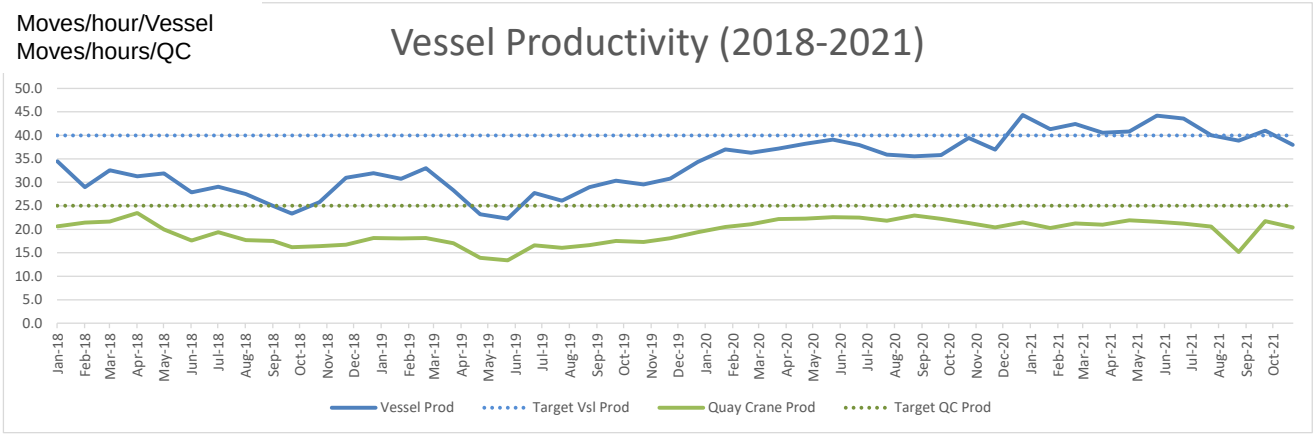
(Results of current survey)

	Jun	Jul	Aug	Sept	Oct	Nov	Average
STS Crane	21.6	21.2	20.6	15.1	21.7	20.4	40.8
Vessel Prod.	44.2	43.6	40.0	38.9	41.0	38.0	21.1

(Comparison from the begining)

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
STS Crane Productivity	20.2	25	16.1	22.1	21.8	21.1
Improvement Rate			80%	109%	108%	104%
Vessel Productivity	30.1	40	27.2	37.4	36.9	40.8
Improvement Rate			90%	124%	123%	136%

(Improvement Rate = (Surveyed Value/Baseline) x 100)



Output 3-1: Vehicles and motorcycles other than container trailers will not enter the container terminal.

Number of Vehicles other than Container Trailers

Baseline: Full: Gate-3: 274 units, Passage: 519 units

Target: Full: None (all from Gate-2)

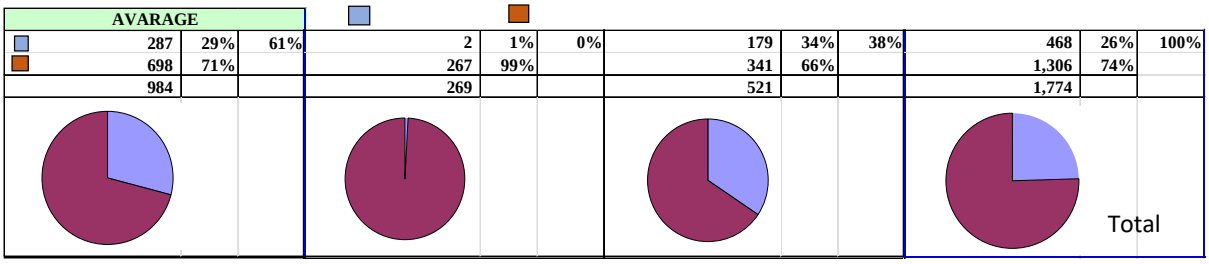
Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 3	Vehicles and motorcycles other than container trailers will not enter the container terminal	Number of Vehicles other than Container Trailers

Baseline Survey	
Survey Method	· The number of cars and motorcycles entering the port from gate 2, 3 and passage next to PAS admini. Buil. Total of 6 days (3 hours in the morning and 3 hours in the afternoon) were surveyed in collaboration with the security section of PAS. · At the same time, purposes for cars/motorcycles entering the port were grasped.
Person in Charge	(PAS): Capt. Thong Viro, Mr. Nhem Pisey, Mr. Kong Vibol (JICA Expert Team): Susumu Kimura, Yukihiro Matsumoto

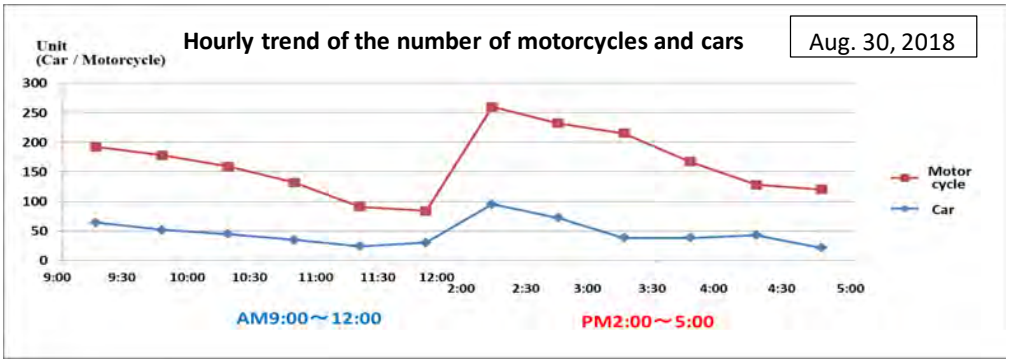
August 30, 2018 (Baseline)

Survey Date		24-May		25-May		Aug. 23		Aug. 24		Aug. 30		Aug. 31		Average	Average	Baselime	Target
		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	%	%
Gate 2	Car	259	56.3	285	69.2	234	61.1	283	61.0	351	63.0	278	59	282	61.7	61.7	100.0
	Motorcycle	775	47.5	822	66.2	664	61.1	704	54.3	683	48.8	740	51	731	54.9	54.9	100.0
	Sub-Total	1,034	49.5	1,107	66.9	898	61.1	987	56.1	1,034	52.8	1,018	53	1013	56.6	56.6	100.0
Gate 3	Car	6	1.3	0	0.0	3	0.8	2	0.4	2	0.4	2	0	3	0.6	0.6	0.0
	Motorcycle	436	26.7	128	10.3	160	14.7	259	20.0	317	22.6	331	23	272	19.6	19.6	0.0
	SubTotal	442	21.1	128	7.7	163	11.1	261	14.8	319	16.3	333	17	274	14.8	14.8	0.0
Passage	Car	195	42.4	127	30.8	146	38.1	179	38.6	204	36.6	188	40	173	37.8	37.8	0.0
	Motorcycle	420	25.8	292	23.5	262	24.1	333	25.7	401	28.6	369	26	346	25.6	25.6	0.0
	Sub-Total	615	29.4	419	25.3	408	27.8	512	29.1	605	30.9	557	29	519	28.6	28.6	0.0
Total	Car	460	100.0	412	100.0	383	100.0	464	100.0	557	100.0	468	100.0	457	100.0	100.0	100.0
	Motorcycle	1,631	100.0	1,242	100.0	1,086	100.0	1,296	100.0	1,401	100.0	1,440	100.0	1349	100.0	100.0	100.0
	Total	2,091	100.0	1,654	100.0	1,469	100.0	1,760	100.0	1,958	100.0	1,908	100.0	1807	100.0	100.0	100.0

AVARAGE												
287	29%	61%	2	1%	0%	179	34%	38%	468	26%	100%	
698	71%		267	99%		341	66%		1,306	74%		
984			269			521			1,774			



Current Situation of Car & Motorcycle



Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (1)	Vehicles and motorcycles other than container trailers will not enter the container terminal	Number of Vehicles other than Container Trailers

Follow-up Survey

Survey Method	· Field survey will be conducted as per the method determined for the baseline survey.
Person in Charge	(PAS): Capt. Thong Viro, Mr. Nhem Pisey, Mr. Kong Vibol (JICA Expert Team): Susumu Kimura, (Yukihiro Matsumoto)

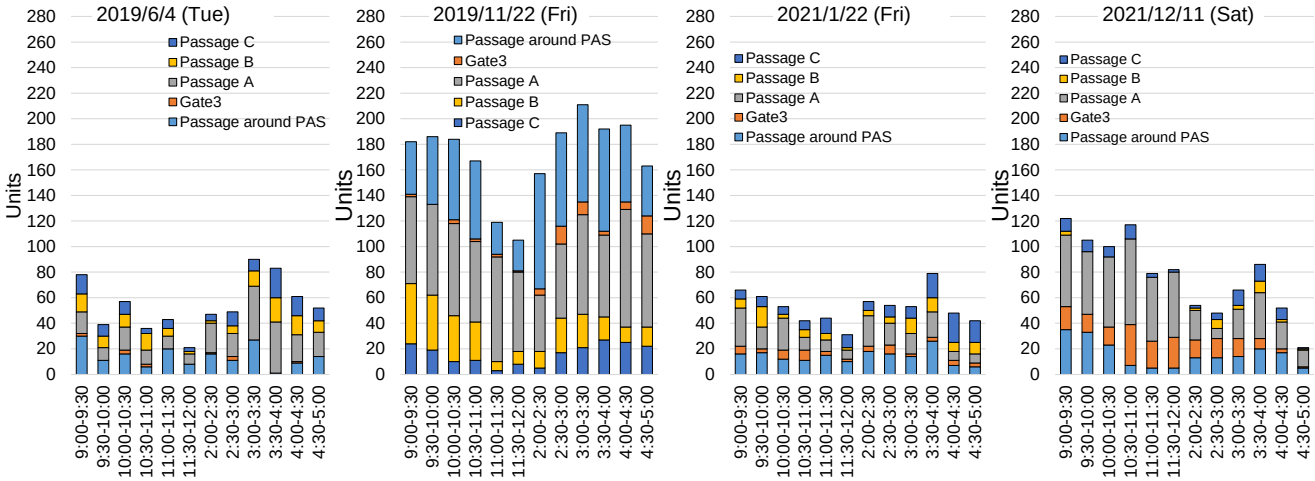
Compilation Method of Survey Results

(Results of current survey)
The following baseline indicators are agreed at 3rd PIU Meeting held on 19th September, 2018 by PAS.

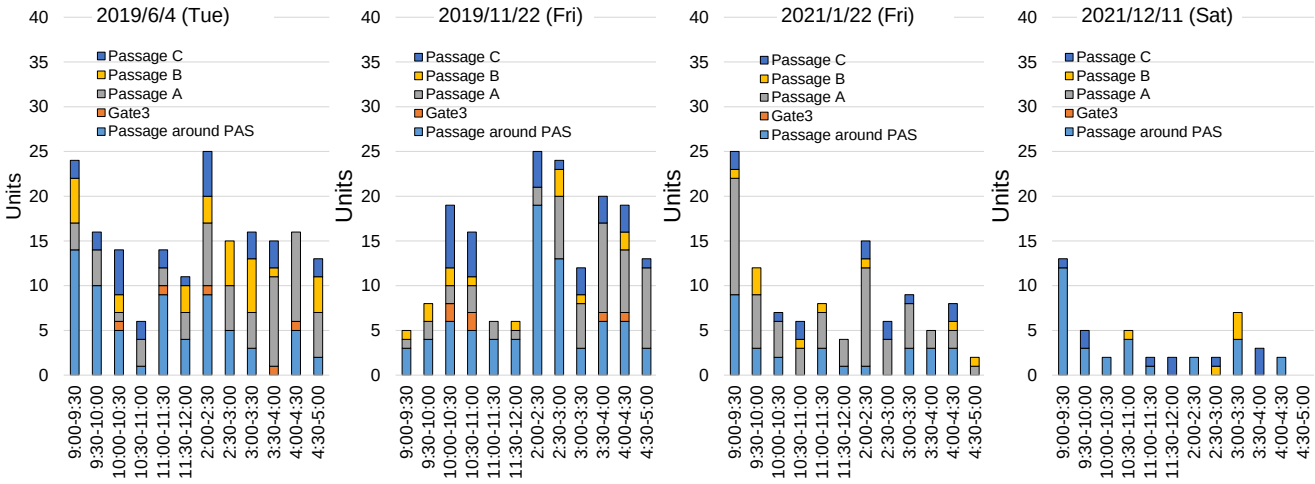
		Baseline	Target Value	First survey	Second Survey (Nov.22, 2019)	Third Survey (Jan. 22, 2021)
Gate 3 Passage	Car	2	0	0	6	0
	Motorcycle	295	0	178	62	52
(Comparison from the beginning)						
	Baseline	Baseline	Target Value	First survey	Second Survey	Third Survey
Gate 3 Motorcycle	Car	2	0	0	6	0
	Motorcycle	295	0	178	62	52
Passage	Car	183	-	-	76	28
	Motorcycle	351	0	701	685	168

Traffic Volume (9 am to noon & 2 pm to 5 pm)

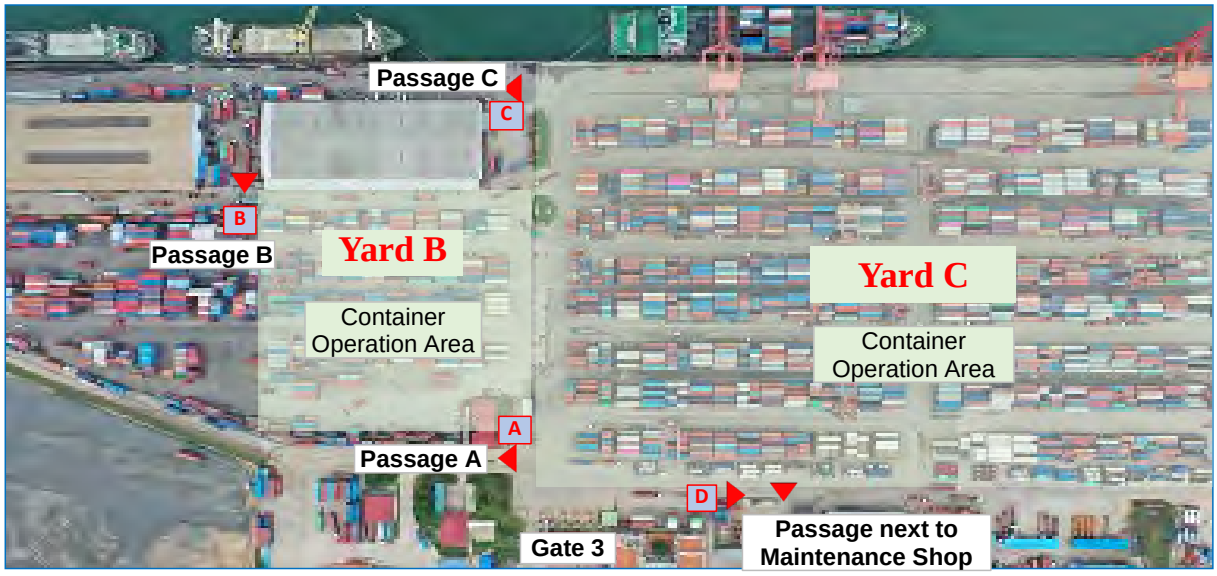
Type of Vehicle	Place of Entry	2019/6/4	2019/11/22	2021/1/22	2021/12/11
Motorcycle	Passage around PAS	169	685	168	190
	Gate3	12	62	52	178
	Passage A	237	827	189	452
	Passage B	117	284	87	27
	Passage C	121	192	134	85
	Total	**656**	**2,050**	**630**	**932**
Car	Passage around PAS	67	76	28	30
	Gate3	5	6	0	0
	Passage A	57	51	58	0
	Passage B	29	13	9	5
	Passage C	27	27	12	10
	Total	**185**	**173**	**107**	**45**



Number of Motorcycles to Enter the Container Handling Area



Number of Cars to Enter the Container Handling Area



Container Handling Area (Yard C and Yard B) and Monitoring Points

Output 3-2: Turn Around time of trailers will be reduced.

Turn Around Time of Trailers

Baseline: Receiving: 41.4 min, Delivery-A: 53.6 min, Delivery-B: 300.7 min

Target: Receiving: 30 min, Delivery-A: 40 min, Delivery-B: 200 min

* Receiving: From gate entry to discharing containers in the container yard (for export container(s)
* Delivery-A: From gate entry to loading containers in the container yard (for import container(s))
* Delivery-B: From loading containers in the container yard to gate out (for import container(s))

Output	Objectively Verifiable Indicator (as per the PDM)	KPI
Output 2 (4)	Turn Around Time of trailers will be reduced	Turn Around Time of Trailers

Follow-up Survey	
Survey Method	Turn around time of trailers is calculated using the history information of CTMS as below. 1) Receiving: Time from the reception at the gate to the stacking completion in the yard. 2) Delivery a) A: Time from the reception at the gate to the pickup completion in the yard. b) B: Time from the pickup completion in the yard to the delivery completion at the gate. As the KPI, the monthly average trun aound time is calculated.
Person in Charge	(PAS): Mr. Srey Narin, Mr. Thay Mengly, Mr. Sek Sovannara, Mr. Som Karoney (JICA Expert Team): Mr. Fukazawa / Mr. Kataoka

Compilation Method of Survey Results

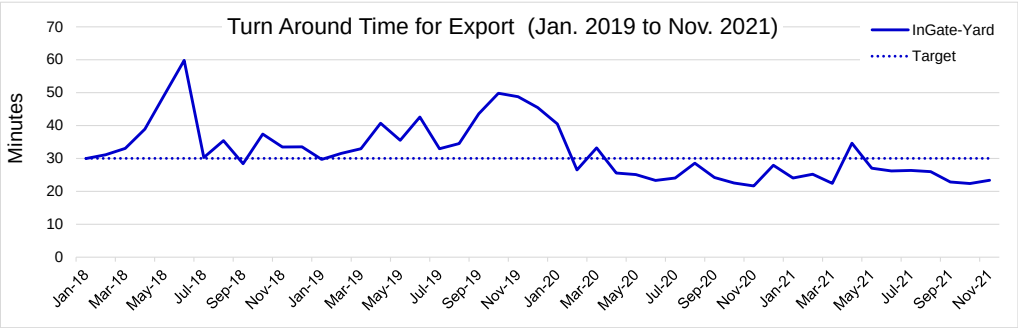
(Results of current survey)

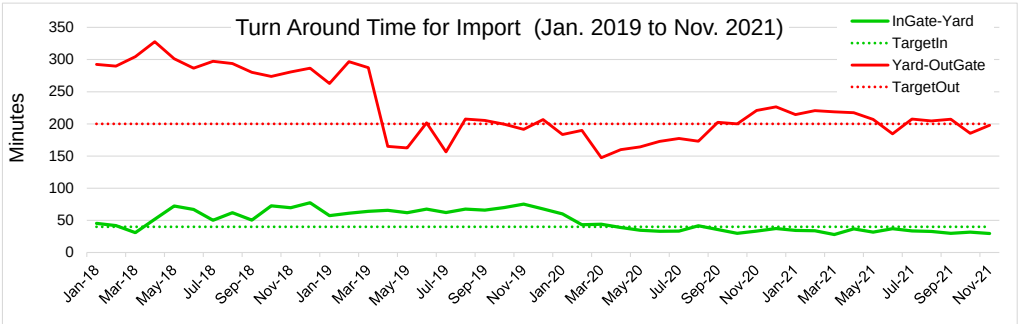
	Jun	Jul	Aug	Sep	Oct	Nov	Average
Receiving	26.2	26.3	26.0	22.9	22.4	23.4	24.6
Delivery A	37.1	33.6	32.7	29.7	31.6	29.4	32.4
Delivery B	184.4	207.6	204.7	207.3	185.4	197.9	197.9

(Comparison from the begining)

	Baseline	Target Value	Second Survey	Third Survey	Fourth Survey	Current Survey
TurnAround Time Receiving	41.4	30	41.8	26.5	24.8	24.6
Improvement Rate			101%	64%	60%	59%
TurnAround Time Delivery A	53.6	40	68	37.6	35.1	32.4
Improvement Rate			127%	70%	65%	60%
TurnAround Time Delivery A	300.7	200	192.9	165.6	201.7	197.9
Improvement Rate			64%	55%	67%	66%

(Improvement Rate = (Surveyed Value/Baseline) x 100)





Output 4-1: Waiting trailers in front of the terminal gate will be reduced.

Number of Waiting Trailers

Baseline: 123 trailers

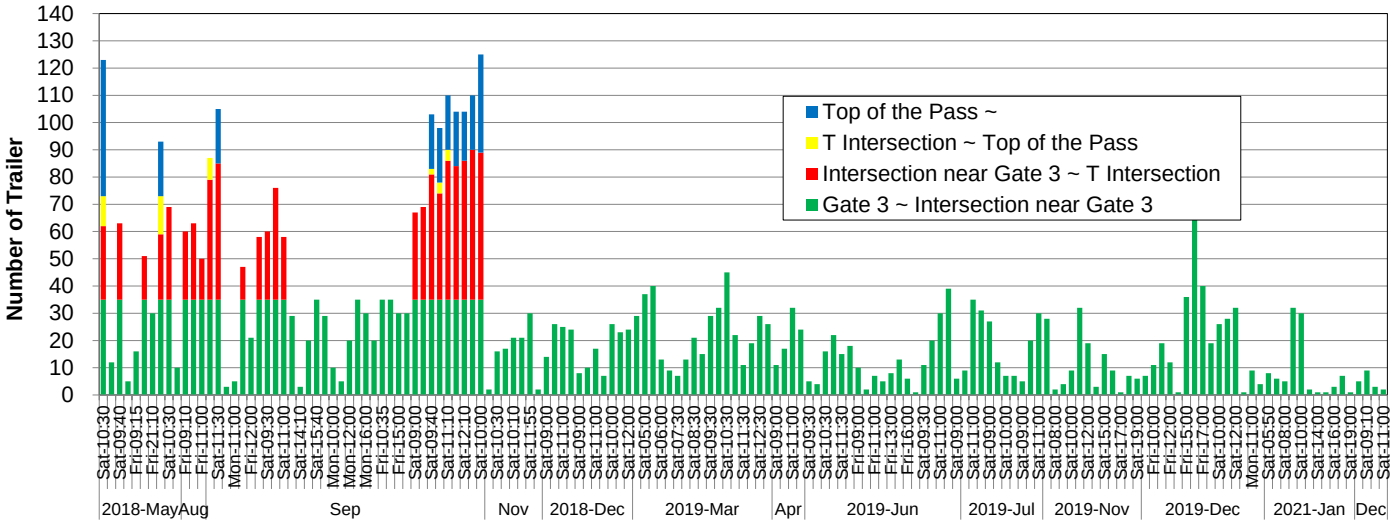
Target: 60 trailers

Output	Objectively Verifiable Indicator	KPIs	Baseline	Target Value (A)	Results (B)	B/A
Output 4-1	Waiting trailers in front of the terminal gate will be reduced	Number of Waiting Trailers	123	60*	32	53%

**) The figure of 60 in the table was set assuming that 35 trailers with the length of 20m are waiting in front of the gate 3 and 25 trailers are queuing in one lane of the Rout-4 (500 meters).*

Waiting Queue f Trailers from the Gate-3 to the Outside (Colored by Area)

Result of the monitoring survey



Number of Trailers in front of the Gate-3

Output-4-2: Trailers passing the gate will be increased

Number of Trailers Passing Gate

Baseline: 80 trailers

Target: 104 trailers

Output	Objectively Verifiable Indicator	KPIs	Baseline	Target Value (A)	Results (B)	B/A
Output 4-2	Trailers passing the gate will be increased	Number of Trailers Passing Gate per hour (All lanes at Gate-3; Friday and Monday)	80	104	106	102%

Results of the monitoring survey

Number of Trailers Passing the Gate-3

Date	Friday		Monday		Average
	AM	PM	AM	PM	
2018.5	-	65.8	-	76.5	71.2
2018.8-9	87.5	85.5	102.0	102.0	94.3
2018.4	103.0	80.0	116.0	98.0	99.3
2019.6-7	99.0	64.0	71.0	73.0	76.8
2019.12	109.0	16.5	84.0	71.0	70.1
2021.1	131.0	98.5	103.0	92.5	106.3

B. Roadmap for the Establishment of Mid-Term Planning Team

Roadmap for the Establishment of Mid-Term Planning Team

(Draft)

December 2021

The Overseas Coastal Area Development Institute of Japan

Contents

(Established on November 30, 2021)
(Revised on)

1. General

1. (Objective) The objective of this roadmap is to stipulate duties, delegation of authorities and a tentative schedule for the Team to be established in the Planning-Statistics and Procurement Department that will take charge of the formulation and performance monitoring of mid-term management plans including the 5-year plan.

2. (Abolition and revision) Any abolition or revisions of this roadmap must be approved by the Director of Planning-Statistics and Procurement Department.

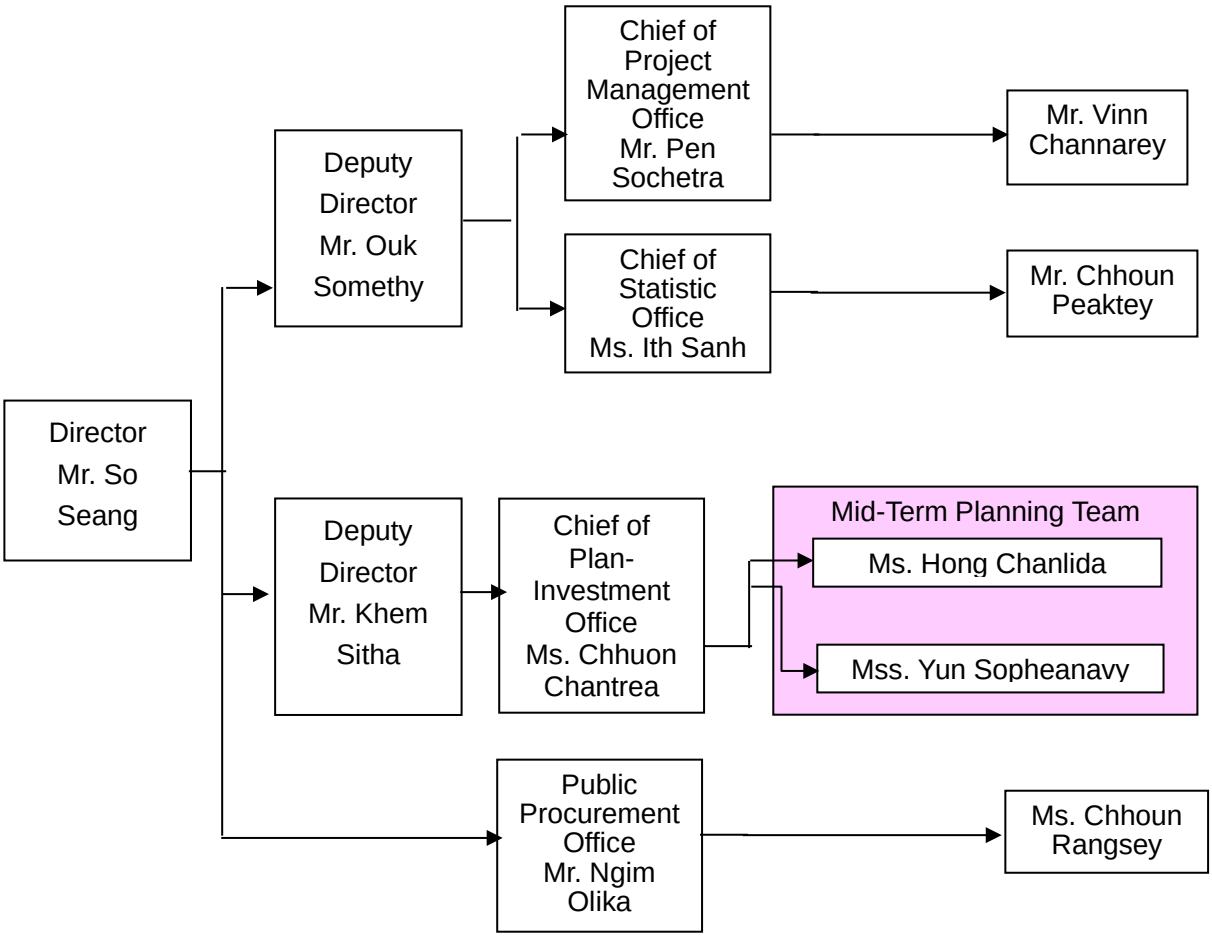
2. Organization

2.1 Organization chart

3. (Name and affiliation of the Team) The Team in charge of formulation and performance monitoring of mid-term management plans will be set up in the Plan-Investment Office of the Planning-Statistics and Procurement Department. The Team is called the “Mid-Term Planning Team”.

4. (Organization chart) The organization chart of the Department that includes the Team is as follows.

Planning Statistics & Procurement Department Organization Chart



2.2 Job titles

5. The Mid-Term Planning Team will be under the command of the Chief of Plan-Investment Office

6. If the position of Chief of Plan-Investment Office is vacant for a long period, the Director of Planning-Statistics and Procurement Department can nominate a person acting on its behalf.

7. The Chief of Statistics Office can concurrently hold the position of Chief of Plan-Investment Office.

8. Team Leader may be assigned for the Mid-Term Planning Team. The Team Leader will hold the same responsibility as the Deputy Chief of Plan-Investment Office.

2.3 Responsibilities of Team Leader

9. The Team Leader of the Mid-Term Planning Team shall assist the Chief of Plan-Investment Office (Office Chief), and under the direction of the Office Chief, supervise the Team and execute the Team's duties. In addition, the Team Leader shall execute the matters delegated by the Office Chief on behalf of him.

10. The Team Leader can request the office chiefs in any other Departments of PAS to submit the materials and data necessary for the execution of its duties relevant to mid-term planning.

3. Job description

3.1 Duties

11. (Duties) Duties of the Mid-Term Planning Team are defined as related to 5-year and 3-year plans out of the duty items of Plan-Investment Office stipulated in the Job Description of PAS as of January 27, 2016.

12. Details of the duties are as follows:

    1) Formulation and revision of 5-year or 3-year management plans
    2) Performance monitoring of 5-year or 3-year management plans
    3) Preparation and revision of Standard Operating Procedures (SOP) on 1) and 2) above.

13. SOP on the formulation and performance monitoring of 5-year plan will be prepared separately.

3.2 Delegation of authority

14. (Delegation of authority) The authority given to each position regarding the medium-term management plan is shown in the table below.

Subject		Designated person and mandate				Interaction with other Departments	
		Office Chief	Director	CEO	BOD	Action	Relevant Department (or Office)
Formulation and revision of 5-year or 3-year management plans	Important plan		△	○	◎	Counsel	Administration & Human Resource Dept., Accounting-Finance Dept., Technical Materials-Construction Dept., Special Economic Zone Dept., Business Dept., Container Terminal Operation Dept., General
	Ordinary plan		△	◎			
Performance monitoring of 5-year	Important plan		△	○	□		

or 3-year management plans	Ordinary plan		△	◎			Cargo Operation Dept., Harbor Master Dept.
Preparation and revision of SOP			△	◎			
Uploading on PAS website or reporting at the shareholder meeting regarding 5-year or 3-year management plans			△	○	◎		

Legend: (△:draft, ○:propose, ☐:report, ◎:approve)

15. When drafting a 5-year or 3-year management plan, the Director of Planning-Statistics and Procurement Department shall circulate his draft plan to all the departments to counsel.

16. If any director of the counseled departments doesn't agree or agrees conditionally, he shall submit remarks on the draft to the Director of Planning-Statistics and Procurement Department.

17. When posting a 5-year or 3-year management plan on PAS website or reporting it at a shareholders meeting, CEO shall obtain the approval of the Cambodia Securities Exchange (CSX) together with the approval of BOD.

4. Tentative schedule for 2022-2026

18. The tasks that the Mid-Term Planning Team shall carry out in 5 years after its establishment are:

    1) Internal approval in PAS on the 2021-2025 5-year plan,
    2) Performance monitoring for the plan during 2021-2025,
    3) Formulation of next 5-year plan (2026-2030).

19. The provisional work schedule for 5 years after establishment is as follows.

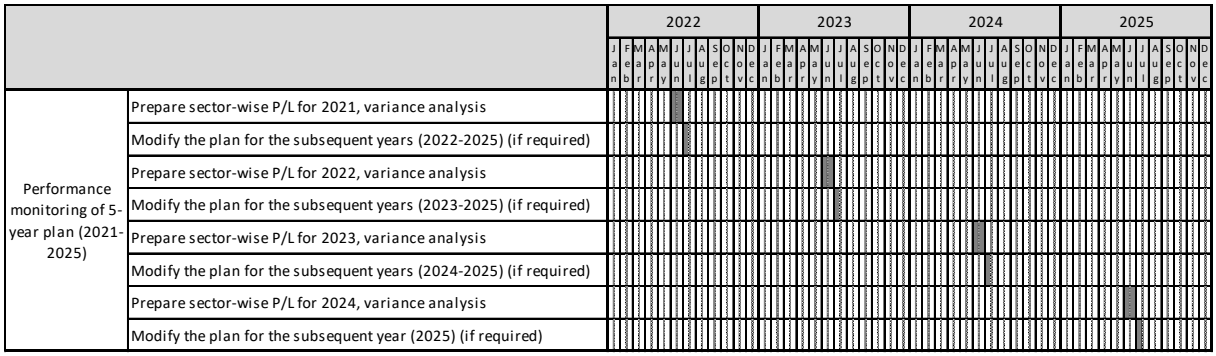
4.1 Establishment of Mid-Term Planning Team and internal approval on 5-year plan

20. The schedule from January to May 2022 is tentatively set as per the table below, assuming that the Mid-Term Planning Team will be established in February 2022 and the Team will immediately proceed with the internal approval for the 5-year plan (2021-2025).

		2022											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Establishment of Mid-Term Planning Team	Institutional approval on the roadmap												
	Establishment of Mid-Term Planning Team												
Internal approval & publicity of 5-year plan (2021-2025)	Counsel with relevant departments												
	Approval by CEO												
	Proposal to BOD												
	Posting on PAS website (if approved)												

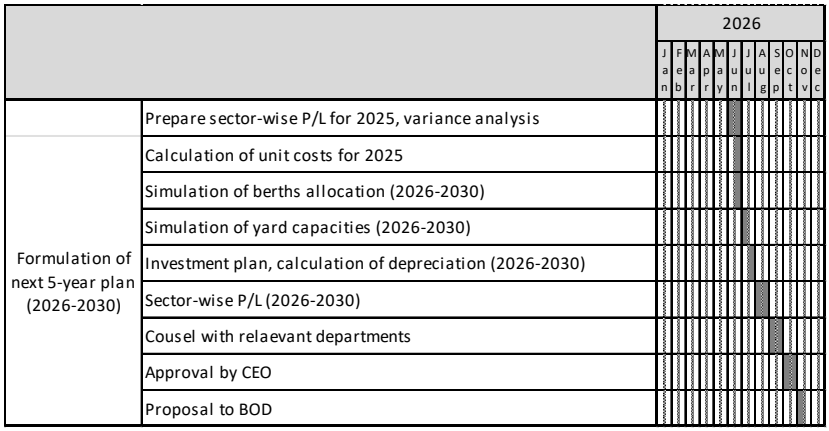
4.2 Performance monitoring of 5-year plan (2021-2025)

21. The Team shall prepare the sector-wise profit and loss statement (P/L) of the previous financial year in June/July every year from 2022 to 2025. Based on this, the Team shall analyze the variance between the plan and the actual result. The plan for the subsequent years will be revised as necessary.



4.3 Formulation of the next 5-year plan (2025-2030)

22. From June to November 2026, the Team shall formulate the next 5-year plan (plan for 2026-2030 based on the actual results of 2025) and proceed with the internal approval of it.



End

5-Year Management Plan (2021-2025)

December 2021

JICA Expert Team

Contents

List of Tables and Figures

Preamble

- This 5-year plan was formulated as the "corporate strategy" stipulated in Output 1 of PDM of JICA's technical cooperation project "The Project for Capacity Development on Container Terminal Management and Operation in Sihanoukville Port (Phase 2)".
- In the course of formulation, PAS officials and the expert team held intensive discussions, and the methods established thereby were transferred from the expert team to PAS key officials.
- This 5-year plan is expected to be used by PAS management for the following purposes:
  1) to evaluate the financial strength of PAS against the fluctuations in the med-term business environment
  2) to set proximate goals and develop mid-term corporate strategies
  3) to visualize the profitability of each business sector and diagnose how to improve weaknesses
  4) to estimate cash availability in the mid-term for investment, loan repayments, wage increase, dividends etc.
- I wish to express my sincere appreciation to PAS officials for all their cooperation extended to the expert team.

December 2021

Koichi Miyake
Leader of JICA Expert Team
President of OCD

1. Methodology

1. This 5-year plan was formulated using a managerial accounting method.

2. It should be noted that the characteristics of managerial accounting are different from those of financial accounting as follows.

Table 1-1 Comparison of characteristics between financial & managerial accounting

	Financial Accounting	Managerial Accounting
Purpose	Communication of financial position	Decision making, planning, evaluation, control
Requirement	Mandatory	Optional
Primary Audience	External (Investors, regulators, tax authorities, etc.)	Internal (Management)
Focus	Backward looking	Forward looking
Regulation /guidelines	• Generally Accepted Accounting Principles (GAAP) • International Financial Reporting Standard (IFRS) • International Accounting Standards (IAS)	None
External review	Auditors, regulations	None
Scope	Company wide	Narrow per segment, customer, service, etc. as needed
Frequency	Quarterly, Annual	As needed & ongoing

3. This 5-year plan was formulated by the following work steps.

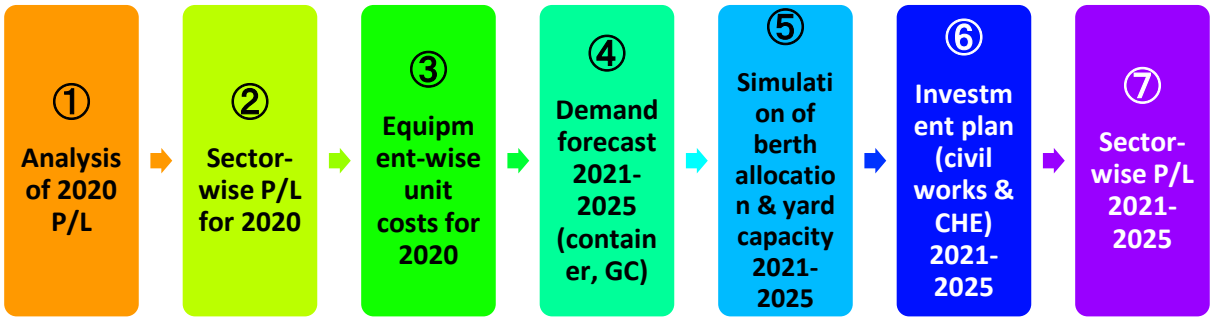


Figure 1-1 Work steps for the formulation of the 5-year plan

2. Demand forecast

2.1 Containers

4. Two extreme scenarios are assumed to prepare for the capacity crunch.

   1) High case of the F/S for NCT 2/3
   2) 15% year-on-year through 5 years

   15% YoY scenario may be meaningful from a viewpoint of crisis management.

5. TEU figures for 2020 actual and 2021-2025 forecast are as follows:

6.

Table 2-1 Demand forecast for container throughputs

('000 TEUs)

		2020	2021	2022	2023	2024	2025
F/S (High Case)	Total	642	751	816	937	1,030	1,131
	> empty	146	172	187	215	236	259
15% YoY Case	Total	642	751	864	993	1,142	1,314
	> empty	146	172	198	227	262	301

7. The forecasted figures above as well as actual figures since 2001 are illustrated in the graph below.

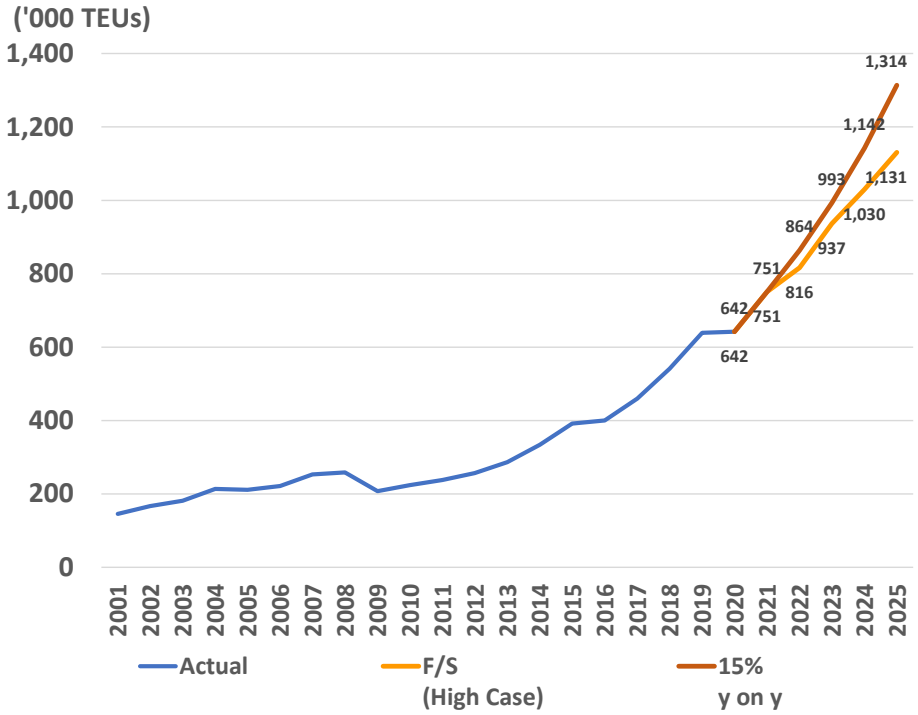


Figure 2-1 Trend of container throughput (2001-2025, actual & forecast)

2.2 General cargoes

8. A downward trend was assumed (-8% year-on-year through 5 years) taking into account that the construction works in the hinterland are declining and that the Multi-Purpose Terminal and Yard E will be converted into container stacking areas.

Table 2-2 Demand forecast for container throughput

('000 ton)

2020	2021	2022	2023	2024	2025
350	295	271	250	230	211

9. The forecasted figures above as well as actual figures since 2001 are illustrated in the graph below.

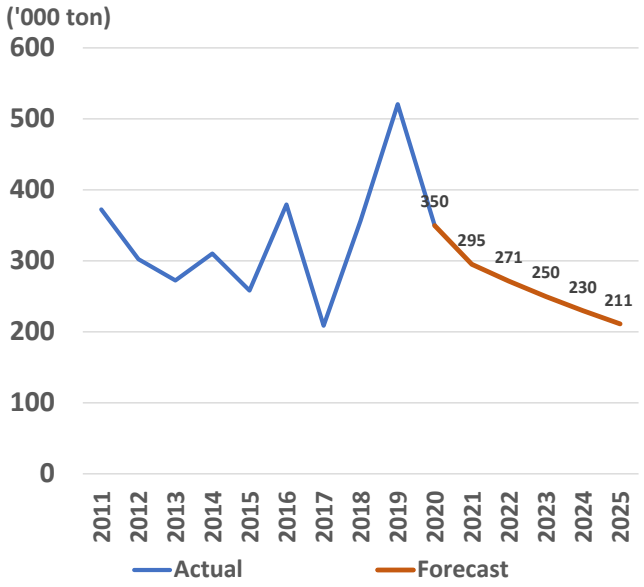


Figure 2-2 Trend of general cargo volumes (2011-2025, actual & forecast)

2.3 Gross tonnage of vessels

10. Gross tonnage of vessels calling at PAS and neighboring ports is forecasted as follows. Tonnage figures of container and general cargo vessels are forecasted in proportion to the cargo volumes forecasted for each cargo type. Revenue amounts of navigation charges for 2021-2025 are calculated based on those figures.

Table 2-3 Demand forecast for gross tonnage of vessels calling

(gross ton)

		2020	2021	2022	2023	2024	2025
F/S High Case	Container	10,188,585	11,922,944	12,959,289	14,875,736	16,349,257	17,950,701
	GC	2,765,753	2,332,083	2,098,875	1,888,987	1,700,088	1,530,080
	Passenger	1,468,597	-	734,299	1,468,597	2,202,896	2,937,194
	Tankers	2,362,044	2,716,351	3,123,803	3,592,374	4,131,230	4,750,914
	Total	16,784,979	16,971,377	18,916,265	21,825,693	24,383,471	27,168,889
15% YoY Case	Container	10,188,585	11,922,950	13,711,393	15,768,102	18,133,317	20,853,315
	GC	2,765,753	2,332,083	2,098,875	1,888,987	1,700,088	1,530,080
	Passenger	1,468,597	-	734,299	1,468,597	2,202,896	2,937,194
	Tankers	2,362,044	2,716,351	3,123,803	3,592,374	4,131,230	4,750,914
	Total	16,784,979	16,971,384	19,668,369	22,718,060	26,167,531	30,071,502

2.4 SEZ tenants

11. Rental income from SEZ is forecasted on assumption that:

1) 1 new tenant with 3 ha will locate in 2023
2) Another tenant with 2.36 ha will locate in 2025

2.5 Number of passengers

12. Number of passengers is forecasted as follows:

Table 2-4 Demand forecast for passengers

	2020	2021	2022	2023	2024	2025
Nos of passengers	17,789	0	8,895	17,789	26,684	35,578

3. Quayside capacity simulation

13. There are 2 types of capacity in a container terminal, quayside capacity and yard side capacity, and the smaller of them is regarded as the effective capacity of the container terminal. Therefore, it is necessary to examine both quayside and yard side capacities in order to check whether the terminal handling capacity is sufficient to accommodate the forecasted demand in the next 5 years.

14. In this chapter the quayside capacity is examined through the simulation of future berth windows for 2021-2025.

3.1 Current berth windows

15. To identify the baseline, the berth window chart as of July 2021 was confirmed as follows:

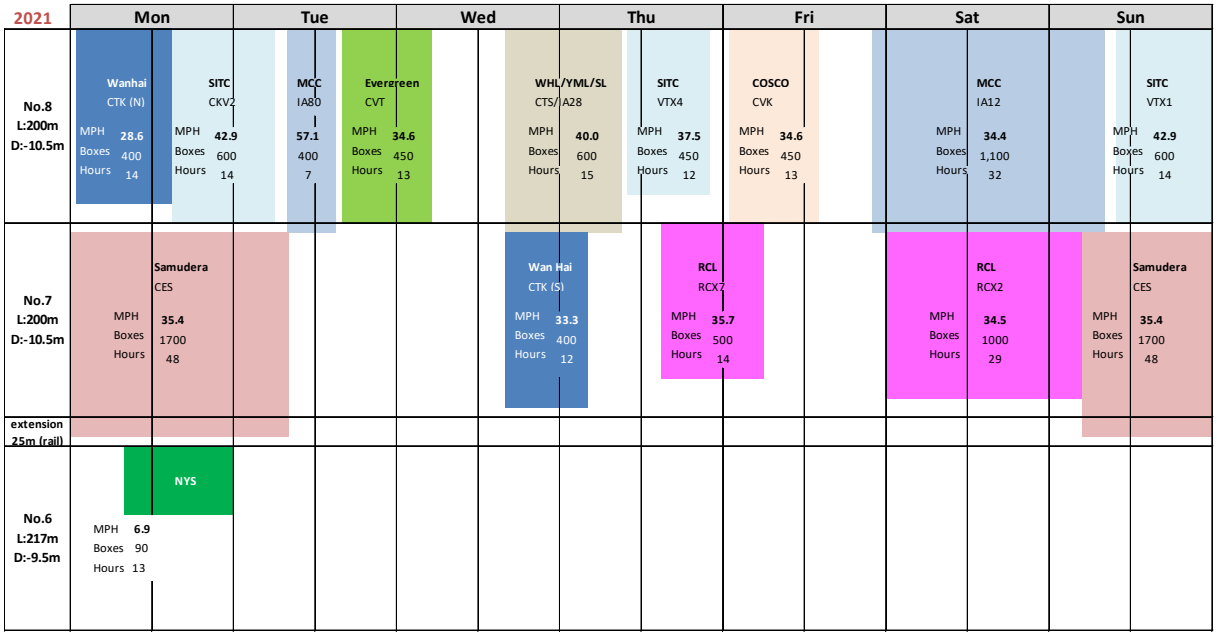


Figure 3-1 Berth window chart as of July 2021

16. The occupied berth length of each window is simply calculated based on the largest vessel deployed in each service as illustrated below.

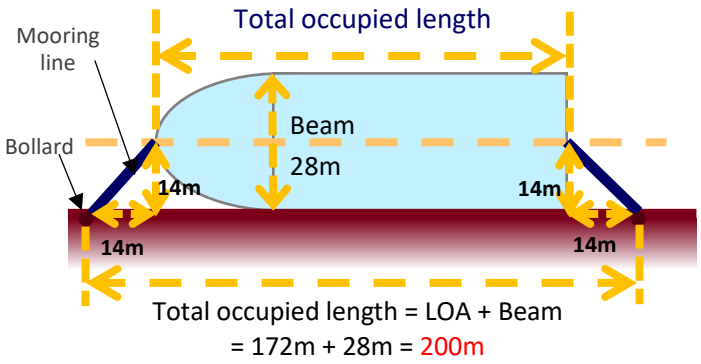


Figure 3-2 Berth window chart as of July 2021

3.2 Summary of productivity, boxes, berthing hours for F/S High Case

17. The standard gross productivity per crane is assumed for QC and mobile harbor cranes (existing model and newly purchased model) respectively as follows.

Table 3-1 Assumption of gross productivities per crane (F/S High Case)

Standard productivity		
QC	21.83	MPH
MHC (old)	10.00	MPH
MHC (new)	14.00	MPH

18. Based on the throughput figures given by the demand forecast and the standard productivities assumed above, berth windows for 2021-2025 are simulated for each shipping line's service as per the table below.

Table 3-2 Simulation of berth windows (F/S High Case)

Shipping Line	Service	2021				2022				2023				2024				2025			
		Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod
SITC	CKV2	14	591	989	42.19	14	642	1,075	45.86	14	737	1,234	52.64	14	808	1,352	57.70	14	889	1,489	63.53
	VTX4	12	443	742	36.92	12	482	806	40.13	12	553	925	46.06	12	606	1,014	50.49	12	667	1,117	55.59
	VTX1	14	591	989	42.19	14	642	1,075	45.86	14	737	1,234	52.64	14	808	1,352	57.70	14	889	1,489	63.53
RCL	RCX7	14	492	824	35.16	14	535	896	38.22	14	614	1,028	43.87	14	673	1,127	48.08	14	741	1,241	52.94
RCL/CNC	RCX2	29	985	1,648	33.95	29	1,070	1,791	36.90	29	1,228	2,056	42.36	29	1,346	2,254	46.43	29	1,482	2,481	51.11
WanHai	CTK(N)	14	394	659	28.13	14	428	717	30.57	14	491	823	35.10	14	539	902	38.47	14	593	993	42.35
	CTK(S)	12	394	659	32.82	12	428	717	35.67	12	491	823	40.95	12	539	902	44.88	12	593	993	49.41
WanHai/SL/Yang Ming	CT5 (IA12)	15	591	989	39.38	15	642	1,075	42.80	15	737	1,234	49.14	15	808	1,352	53.85	15	889	1,489	59.29
Evergreen	CVT	13	443	742	34.08	13	482	806	37.04	13	553	925	42.52	13	606	1,014	46.60	13	667	1,117	51.31
MCC (Sealand)	IA12	32	1,083	1,813	33.84	32	1,177	1,971	36.79	32	1,351	2,262	42.23	32	1,481	2,479	46.28	32	1,631	2,729	50.95
	IA80	7	394	659	56.26	7	428	717	61.15	8	491	823	61.42	9	539	902	59.84	10	593	993	59.29
COSCO	RBC2	13	443	742	34.08	13	482	806	37.04	13	553	925	42.52	13	606	1,014	46.60	13	667	1,117	51.31
Samudera	CES	31	1,081	1,810	34.87	31	1,175	1,967	37.90	31	1,349	2,258	43.50	31	1,478	2,474	47.68	31	1,627	2,724	52.50
		17	593	992	34.87	17	644	1,079	37.90	17	740	1,238	43.50	17	811	1,357	47.68	17	892	1,494	52.50
Namyuen Yong		13	89	148	6.82	13	96	161	7.41	13	111	185	8.50	13	121	203	9.32	13	133	223	10.26
Total	Weekly	250	8,605	14,405	34.42	250	9,353	15,657	37.41	251	10,736	17,972	42.77	252	11,767	19,698	46.70	253	12,955	21,687	51.21
	Yearly	13,036	448,686	751,100		13,036	487,686	816,386		13,088	559,806	937,115		13,176	615,257	1,029,941		13,192	675,523	1,130,826	

19. The result of the simulation above is that the current berthing hours will mostly be maintained until 2025 (except MCC's Tuesday), despite the increase in throughput.

3.3 Berth window simulation for F/S High Case

3.3.1 Year 2022

20. The berth window chart for 2022 is drawn on assumption that:

1) LOA of each vessel is assumed to become 10m longer than 2021
2) Berth #6 cannot be used due to the construction works of QC rail extension
3) No change in berthing hours

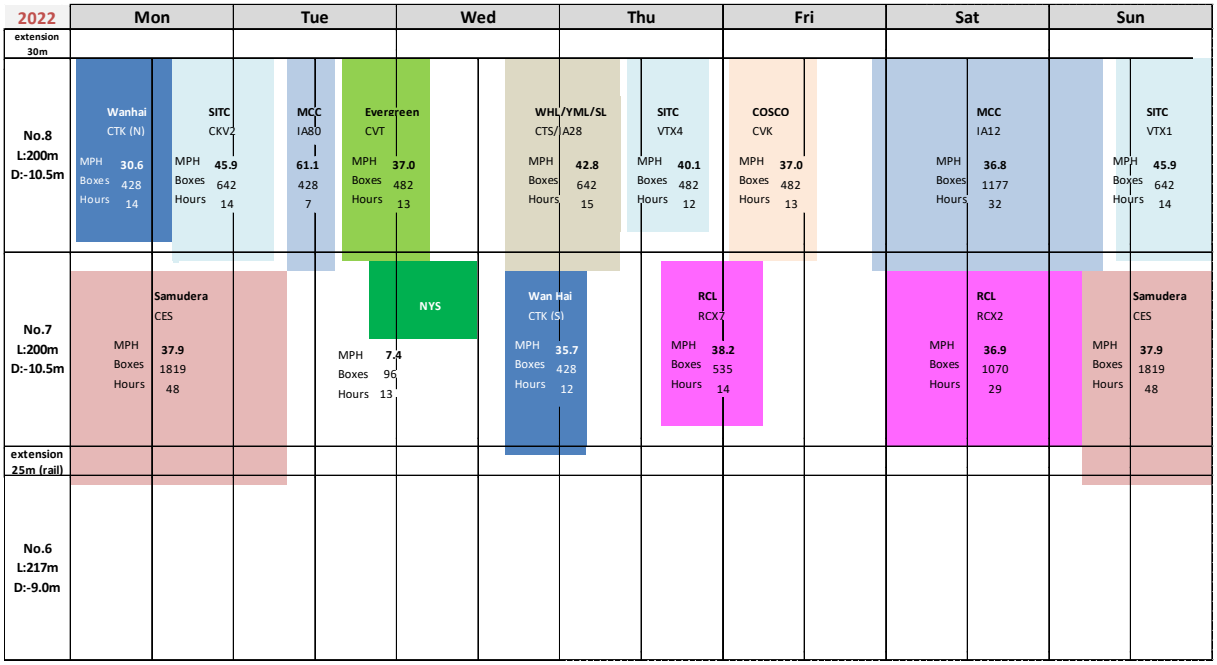


Figure 3-3 Berth window chart for 2022 (F/S High Case)

21. QCs and MHCs are allocated to each berth window as per the table below so that the working hour of each unit becomes as even as possible.

Table 3-3 Allocation of QCs & MHCs for 2022 (F/S High Case)

2022		Shipping line	WHL	SITC	MCC	Evergreen	WanHai/Se	SITC	COSCO	MCC	SITC	Total	
		Line code	CTK (N)	CKV2	IA80	CVT	CT5	VTX4	RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity	30.57	45.86	61.15	37.04	42.80	40.13	37.04	36.79	45.86	(hours)	(hours)
No.8	404	working hours	9.80	9.80	6.54	11.03	14.70			26.96	9.80	88.63	4,622
	403	working hours	9.80	9.80	6.54			7.35	11.03	26.96	9.80	81.28	4,238
	402	working hours		9.80	6.54	11.03	14.70	7.35	11.03		9.80	70.25	3,663
	401	working hours											
	S. Total	Total working hours	19.61	29.41	19.61	22.06	29.41	22.06	22.06	53.91	29.41	247.52	12,906
		berthing hours	14	14	7	13	15	12	13	32	14	134	6,987
		Shipping line	Samudera			NYY	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES				CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	54.58			7.41	35.67	38.22		36.90	54.58		
No.7	402	working hours	17.94								8.85	26.79	1,397
	401	working hours	17.94			4.41	9.80	12.25		24.51	8.85	77.76	4,055
	405	working hours	17.94				9.80	12.25		24.51	8.85	73.35	3,825
	406	working hours										0	0
	S. Total	Total working hours	48.43			4.41	19.61	24.51		49.01	26.56	172.53	8,996
		berthing hours	19			13	12.00	14		29	11	98	5,110
		Shipping line	Samudera									Total	
		Line code	CES									weekly	yearly
		Vessel productivity	10.11										
No.6	HMC 301	working hours	12.99									12.99	678
	HMC 302	working hours										0.00	0
	HMC 303	working hours										0.00	0
	HMC 304	working hours										0.00	0
	S. Total	Total working hours	12.99									12.99	678
		berthing hours	18									18.00	939

3.3.2 Year 2023

22. The berth window chart for 2023 is drawn on assumption that:

1) LOA is again enlarged for each vessel at 10m from 2022
2) Berth #6 cannot be used due to the construction works of QC rail extension
3) Berth length of #8 & #7 is extended (with dolphin & 25m rail extension)

4) Only MCC (Tuesday) extends berthing hours at 1 hour

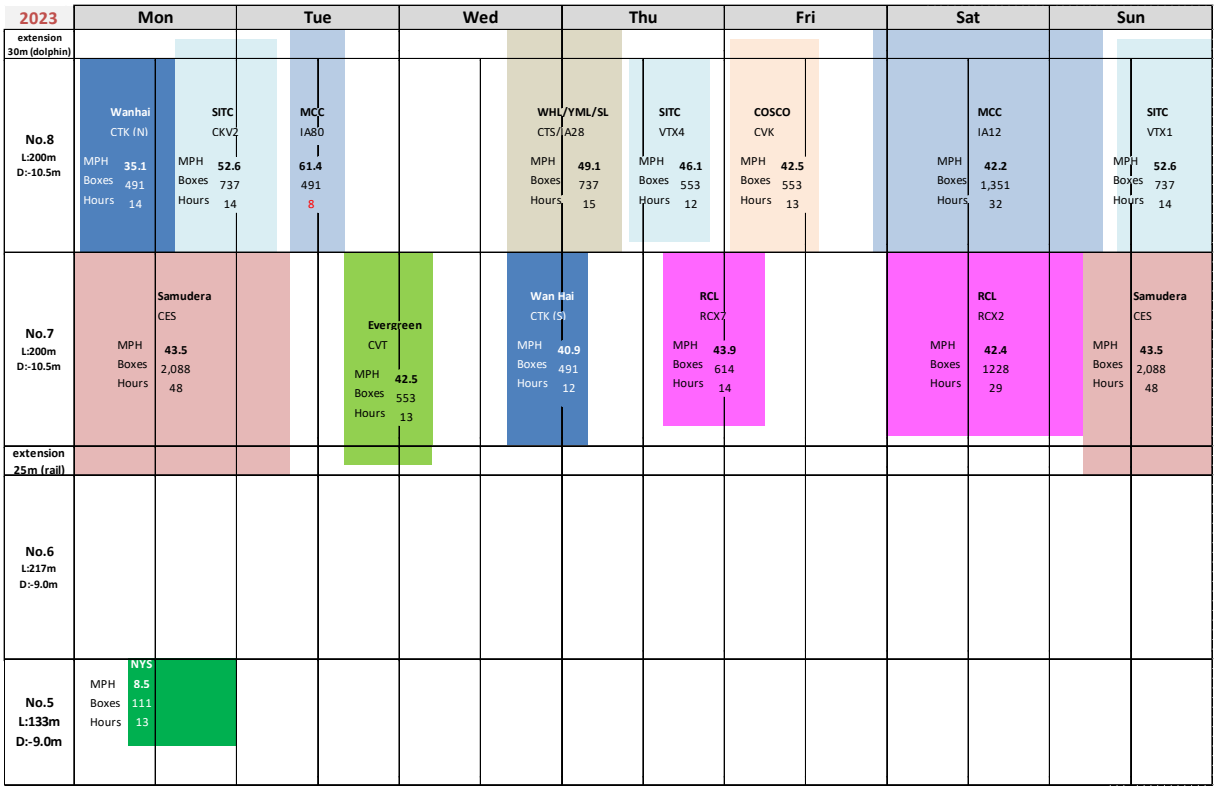


Figure 3-4 Berth window chart for 2023 (F/S High Case)

23. QCs and MHCs are allocated to each berth window as per the table below.

Table 3-4 Allocation of QCs & MHCs for 2023 (F/S High Case)

2023		Shipping line	WHL	SITC	MCC		WanHai/Se	SITC	COSCO	MCC	SITC	Total	
		Line code	CTK (N)	CKV2	IA80		CT5	VTX4	RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity	35.10	52.64	61.42		49.14	46.06	42.52	42.23	52.64	(hours)	(hours)
No.8	404	working hours	11.25	11.25	7.50		11.25	8.44	8.44	30.94	11.25	100.33	5,232
	403	working hours	11.25	11.25	7.50		11.25	8.44	8.44	30.94	11.25	100.33	5,232
	402	working hours		11.25	7.50		11.25	8.44	8.44		11.25	58.14	3,031
	401	working hours											
	S. Total	Total working hours	22.50	33.76	22.50		33.76	25.32	25.32	61.89	33.76	258.80	13,495
		berthing hours	14	14	8		15	12	13	32	14	122	6,361
		Shipping line	Samudera			Evergreen	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES			CVT	CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	43.50			42.52	40.95	43.87		42.36	43.50		
No.7	402	working hours	20.59					9.38			11.29	41.26	2,151
	401	working hours	20.59			12.66	11.25	9.38		28.13	11.29	93.30	4,865
	405	working hours	20.59			12.66	11.25	9.38		28.13	11.29	93.30	4,865
	406	working hours											
	S. Total	Total working hours	61.77			25.32	22.50	28.13		56.26	33.87	227.86	11,881
		berthing hours	31			13	12	14		29	17	116.00	6,049
		Shipping line	NYY									Total	
		Line code										weekly	yearly
		Vessel productivity	8.50										
No.5	HMC 301	working hours	2.63									2.63	137
	HMC 302	working hours											
	HMC 303	working hours	2.63									2.63	137
	HMC 304	working hours	2.63									2.63	137
	S. Total	Total working hours	7.90									7.90	412
		berthing hours	13									13.00	678

3.3.3 Year 2024

24. The berth window chart for 2024 is drawn on assumption that:

1) Berth #6 is in operation with 6th QC
2) Extended berth length at #8 & #7 is utilized
3) LOAs of SITC (Thu) & Wanhai (Mon) are again enlarged by 10m from 2022
4) Above 2 services shift to #6 due to the LOA & tight window situations
5) Other vessels will not be enlarged due to the draft limit
6) MCC (Tue) again extends berthing hours by 1 hour

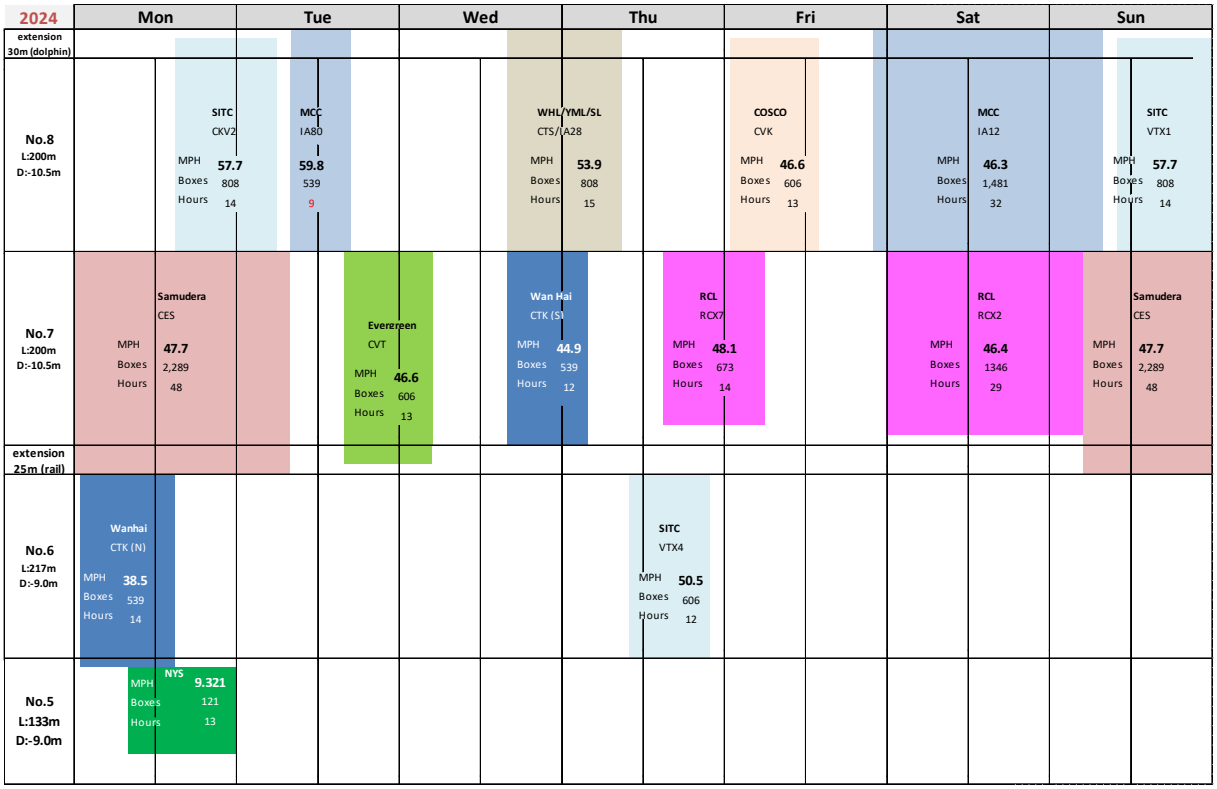


Figure 3-5 Berth window chart for 2024 (F/S High Case)

25. QCs and MHCs are allocated to each berth window as per the table below.

Table 3-5 Allocation of QCs & MHCs for 2024 (F/S High Case)

2024		Shipping line		SITC	MCC		WanHai/		COSCO	MCC	SITC	Total	
		Line code		CKV2	IA80		CT5		RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity		57.70	59.84		53.85		46.60	46.28	57.70	(hours)	(hours)
No.8	404	working hours		12.33	8.22		12.33		9.25	22.61	12.33	77.08	4,019
	403	working hours		12.33	8.22		12.33		9.25	22.61	12.33	77.08	4,019
	402	working hours		12.33					9.25	22.61	12.33	56.53	2,947
	401	working hours			8.22		12.33					20.56	1,072
	S. Total	Total working hours		37.00	24.67		37.00		27.75	67.83	37.00	231.24	12,058
		berthing hours		14	9		15		13	32	14	97	5,058
		Shipping line	Samudera			Evergreen	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES			CVT	CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	47.68			46.60	44.88	48.08		46.43	47.68		
No.7	402	working hours	22.57			9.25		10.28				42.10	2,195
	401	working hours				9.25	8.22	10.28		20.56	12.38	60.68	3,164
	405	working hours	22.57				8.22			20.56	12.38	63.72	3,323
	406	working hours	22.57			9.25	8.22	10.28		20.56	12.38	83.25	4,341
	S. Total	Total working hours	67.70			27.75	24.67	30.83		61.67	37.13	249.74	13,022
		berthing hours	31			13	12	14		29	17	116.00	6,049
		Shipping line	WHL					SITC				Total	
		Line code	CTK (N)					VTX4				weekly	yearly
		Vessel productivity	38.47					50.49					
No.6	401	working hours	12.33					9.25				21.58	1,125
	405	working hours	12.33					9.25				21.58	1,125
	406	working hours						9.25				9.25	482
	407	working hours										0.00	
	S. Total	Total working hours	24.67					27.75				52.42	2,733
		berthing hours	14					12				26.00	1,356
		Shipping line	NYY									Total	
		Line code										weekly	yearly
		Vessel productivity	9.32										
No.5	HMC 301	working hours	2.89									2.89	150
	HMC 302	working hours											
	HMC 303	working hours	2.89									2.89	150
	HMC 304	working hours	2.89									2.89	150
	S. Total	Total working hours	8.66									8.66	451
		berthing hours	13									13.00	678

3.3.4 Year 2025

26. The berth window chart for 2025 is drawn on assumption that:

1) Berth #6 is in operation with 6th QC
2) LOA enlargement stops in all services due to the draft limit
3) MCC (Tue) again extends berthing hours by 1 hour
4) Increase in throughput could be absorbed by existing berth windows by use of additional QC & MHCs

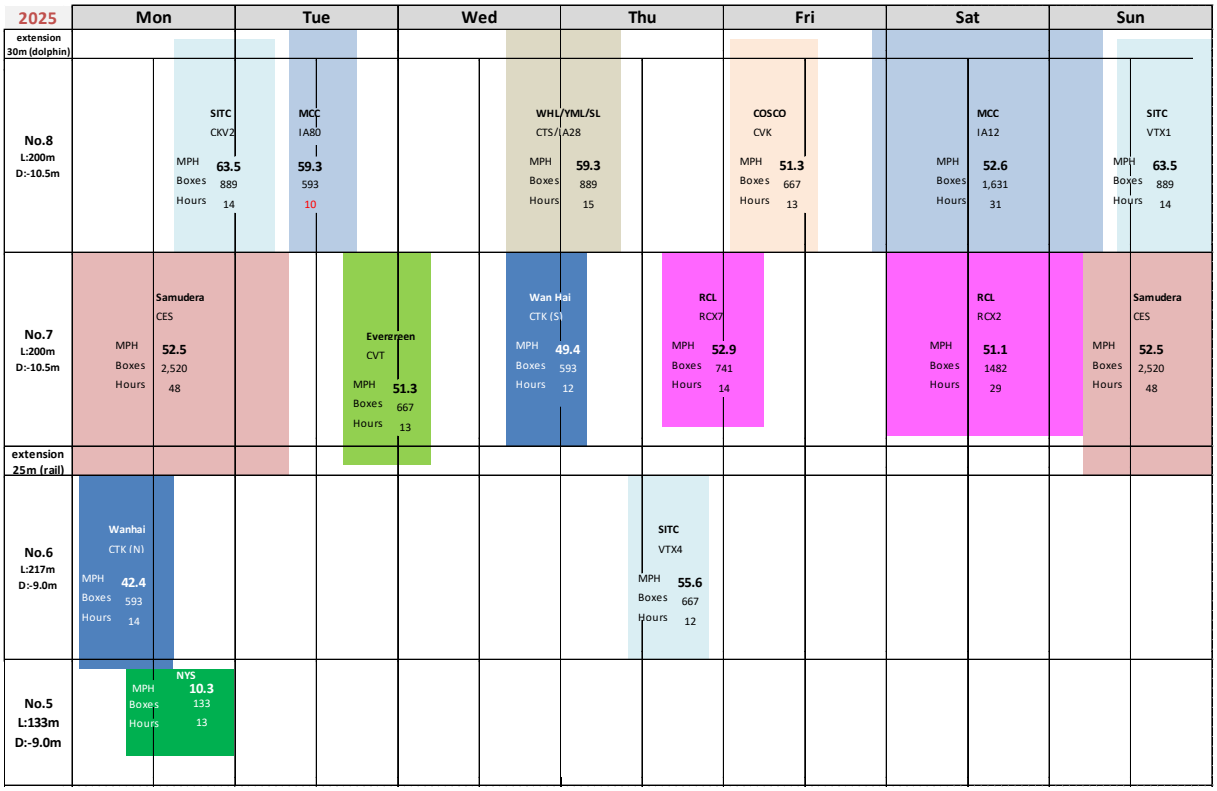


Figure 3-6 Berth window chart for 2025 (F/S High Case)

27. QCs and MHCs are allocated to each berth window as per the table below.

Table 3-6 Allocation of QCs & MHCs for 2025 (F/S High Case)

2025		Shipping line		SITC	MCC		WanHai/S		COSCO	MCC	SITC	Total	
		Line code		CKV2	IA80		CT5		RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity		63.53	59.29		59.29		51.31	50.95	63.53	(hours)	(hours)
No.8	404	working hours		13.58	9.05		13.58		10.18	24.89	13.58	84.86	4,425
	403	working hours		13.58	9.05		13.58		10.18	24.89	13.58	84.86	4,425
	402	working hours		13.58	9.05		13.58		10.18	24.89	13.58	84.86	4,425
	401	working hours										0.00	0
	S. Total	Total working hours		40.73	27.16		40.73		30.55	74.68	40.73	254.59	13,275
		berthing hours		14	10		15		13	32	14	98	5,110
		Shipping line	Samudera			Evergreen	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES			CVT	CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	52.50			51.31	49.41	52.94		51.11	52.50		
No.7	402	working hours						11.32				11.32	590
	401	working hours	24.85			10.18	9.05	11.32		22.63	13.63	91.65	4,779
	405	working hours	24.85			10.18	9.05			22.63	13.63	80.34	4,189
	406	working hours	24.85			10.18	9.05	11.32		22.63	13.63	91.65	4,779
	S. Total	Total working hours	74.54			30.55	27.16	33.95		67.89	40.88	274.96	14,337
		berthing hours	31			13	12	14		29	17	116.00	6,049
		Shipping line	WHL					SITC				Total	
		Line code	CTK (N)					VTX4				weekly	yearly
		Vessel productivity	42.35					55.59					
No.6	401	working hours	13.58									13.58	708
	405	working hours	13.58					10.18				23.76	1,239
	406	working hours						10.18				10.18	531
	407	working hours						10.18				10.18	531
	S. Total	Total working hours	27.16					30.55				57.71	3,009
		berthing hours	14					12				26.00	1,356
		Shipping line	NYY									Total	
		Line code										weekly	yearly
		Vessel productivity	10.26										
No.5	HMC 301	working hours	3.18									3.18	166
	HMC 302	working hours											
	HMC 303	working hours	3.18									3.18	166
	HMC 304	working hours	3.18									3.18	166
	S. Total	Total working hours	9.53									9.53	497
		berthing hours	13									13.00	678

3.4 Summary of productivity, boxes, berthing hours for 15% YoY Case

28. The standard gross productivities are assumed to be the same as those for F/S High Case.

Table 3-7 Assumption of gross productivities per crane (15% YoY Case)

Standard productivity		
QC	21.83	MPH
MHC (old)	10.00	MPH
MHC (new)	14.00	MPH

29. Based on the throughput figures given by the demand forecast and the standard productivities assumed above, berth windows for 2021-2025 are simulated for each shipping line's service as per the table below.

Table 3-8 Simulation of berth windows (15% YoY Case)

Shipping Line	Service	2021				2022				2023				2024				2025			
		Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod	Berthing hours	Boxes	TEUs	Vsl. Prod
SITC	CKV2	14	591	989	42.19	14	679	1,137	48.52	14	781	1,308	55.80	14	896	1,500	64.00	16	1,033	1,730	64.57
	VTX4	12	443	742	36.92	12	510	853	42.46	12	586	981	48.83	12	672	1,125	56.00	12	775	1,297	64.57
	VTX1	14	591	989	42.19	14	679	1,137	48.52	14	781	1,308	55.80	14	896	1,500	64.00	16	1,033	1,730	64.57
RCL	RCX7	14	492	824	35.16	14	566	948	40.44	14	651	1,090	46.50	14	747	1,250	53.33	14	861	1,441	61.50
RCL/CNC	RCX2	29	985	1,648	33.95	29	1,132	1,895	39.04	29	1,302	2,180	44.90	29	1,302	2,180	44.90	29	1,302	2,180	44.90
WanHai	CTK(N)	14	394	659	28.13	14	453	758	32.35	14	521	872	37.20	14	597	1,000	42.67	14	689	1,153	49.20
	CTK(S)	12	394	659	32.82	12	453	758	37.74	12	521	872	43.40	12	597	1,000	49.78	12	689	1,153	57.40
WanHai/SL/Yang	CT5 (IA12)	15	591	989	39.38	15	679	1,137	45.29	15	781	1,308	52.08	15	896	1,500	59.73	16	1,033	1,730	64.57
Evergreen	CVT	13	443	742	34.08	13	510	853	39.19	13	586	981	45.07	13	672	1,125	51.69	13	775	1,297	59.61
MCC (Sealand)	IA12	32	1,083	1,813	33.84	32	1,245	2,085	38.92	32	1,245	2,085	38.92	32	1,245	2,085	38.92	32	1,245	2,085	38.92
	IA80	7	394	659	56.26	7	453	758	64.70	7	453	758	64.70	7	453	758	64.70	7	453	758	64.70
COSCO	RBC2	13	443	742	34.08	13	510	853	39.19	13	586	981	45.07	13	672	1,125	51.69	13	775	1,297	59.61
Samudera	CES	31	1,081	1,810	34.87	31	1,243	2,081	40.10	31	1,243	2,081	40.10	31	1,243	2,081	40.10	31	1,243	2,081	40.10
		17	593	992	34.87	17	682	1,141	40.10	17	682	1,141	40.10	17	682	1,141	40.10	17	682	1,141	40.10
Namyuen Yong		13	89	148	6.82	13	102	171	7.84	13	117	196	9.01	13	134	225	10.34	13	155	259	11.92
SP Feeder										13	543	910	41.81	27	948	1,602	35.11	27	1,129	1,847	41.81
Intra Asia I														11	398	653	36.18	11	459	752	41.73
Intra Asia II																		13	719		55.31
Total	Weekly	250	8,605	14,405	34.42	250	9,896	16,565	39.58	263	11,380	19,050	43.27	288	13,051	21,848	45.31	306	15,050	25,194	49.18
	Yearly	13,036	448,686	751,100		13,036	515,989	863,765		13,714	593,387	993,330		15,058	682,365	1,142,330		15,956	784,755	1,313,679	

30. Simulation results indicate that:

1) Current berthing hours will be mostly maintained except in 2025.
2) 3 new services will be induced from 2023.

3.5 Berth window simulation for 15% YoY Case

3.5.1 Year 2022

31. The berth window chart for 2022 is drawn on assumption that:

1) LOA is enlarged by 20m from 2021 for each vessel
2) Berth #6 cannot be used due to the construction works
3) No change in berthing hours

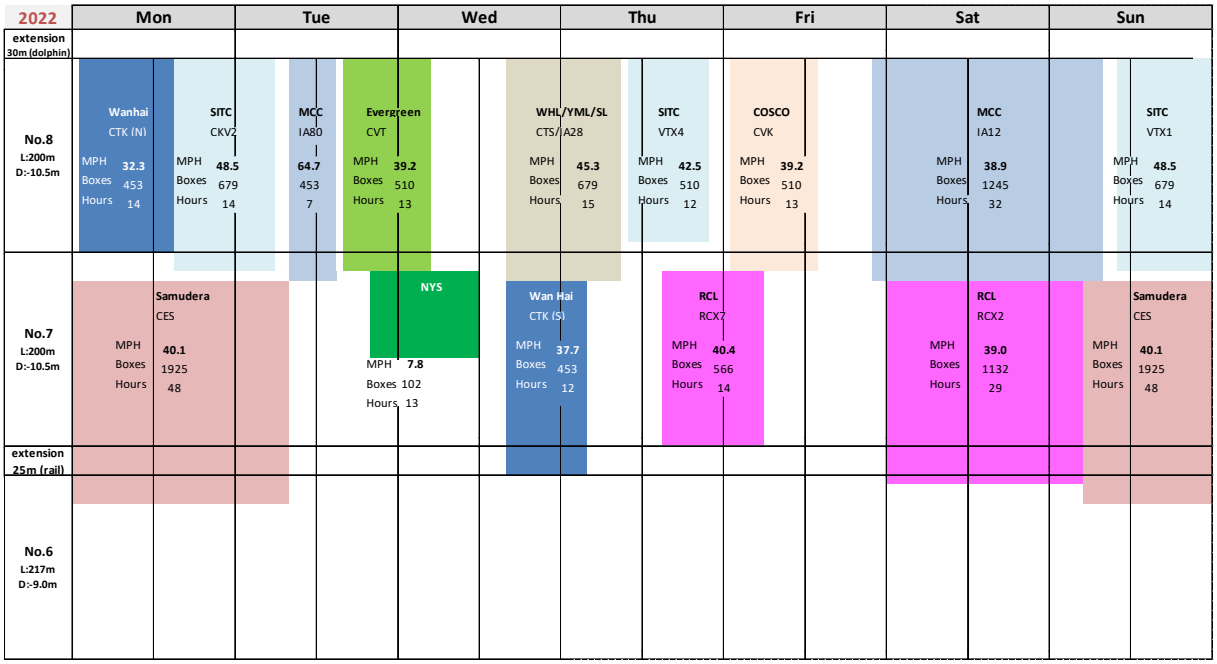


Figure 3-7 Berth window chart for 2022 (15% YoY Case)

32. QCs and MHCs are allocated to each berth window as per the table below so that the working hour of each unit becomes as even as possible.

Table 3-9 Allocation of QCs & MHCs for 2022 (15% YoY Case)

2022		Shipping line	WHL	SITC	MCC	Evergreen	WanHai/S	SITC	COSCO	MCC	SITC	Total	
		Line code	CTK (N)	CKV2	IA80	CVT	CT5	VTX4	RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity	32.35	48.52	64.70	39.19	45.29	42.46	39.19	38.92	48.52	(hours)	(hours)
No.8	404	working hours	10.37	10.37	6.91	11.67	10.37		11.67	28.52	10.37	100.26	5,228
	403	working hours	10.37	10.37	6.91		10.37	11.67		28.52	10.37	88.59	4,619
	402	working hours		10.37	6.91	11.67	10.37	11.67	11.67			62.66	3,267
	401	working hours									10.37	10.37	541
	S. Total	Total working hours	20.74	31.11	20.74	23.34	31.11	23.34	23.34	57.04	31.11	261.88	13,655
		berthing hours	14	14	7	13	15	12	13	32	14	134	6,987
		Shipping line	Samudera			NYY	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES				CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	57.74			7.84	37.74	40.44		39.04	57.74		
No.7	402	working hours	17.08			7.28					9.37	33.73	1,759
	401	working hours	17.08				10.37	12.96		25.93	9.37	75.71	3,948
	405	working hours	17.08				10.37	12.96		25.93	9.37	75.71	3,948
	406	working hours										0	0
	S. Total	Total working hours	51.24			7.28	20.74	25.93		51.86	28.10	185.15	9,654
		berthing hours	19			13	12.00	14		29	11	98	5,110
		Shipping line	Samudera									Total	
		Line code	CES									weekly	yearly
		Vessel productivity	10.69										
No.6	MHC 301	working hours	13.75									13.75	717
	MHC 302	working hours										0.00	0
	MHC 303	working hours										0.00	0
	MHC 304	working hours										0.00	0
	S. Total	Total working hours	13.75									13.75	717
		berthing hours	18									18.00	939

3.5.2 Year 2023

33. The berth window chart for 2023 is drawn on assumption that:

1) LOA enlargement cannot be accepted in all services due to Berth #6 construction works
2) Extended berth length at #8 & #7 is utilized

3) 1 new service is accepted at a vacant window on Tuesday

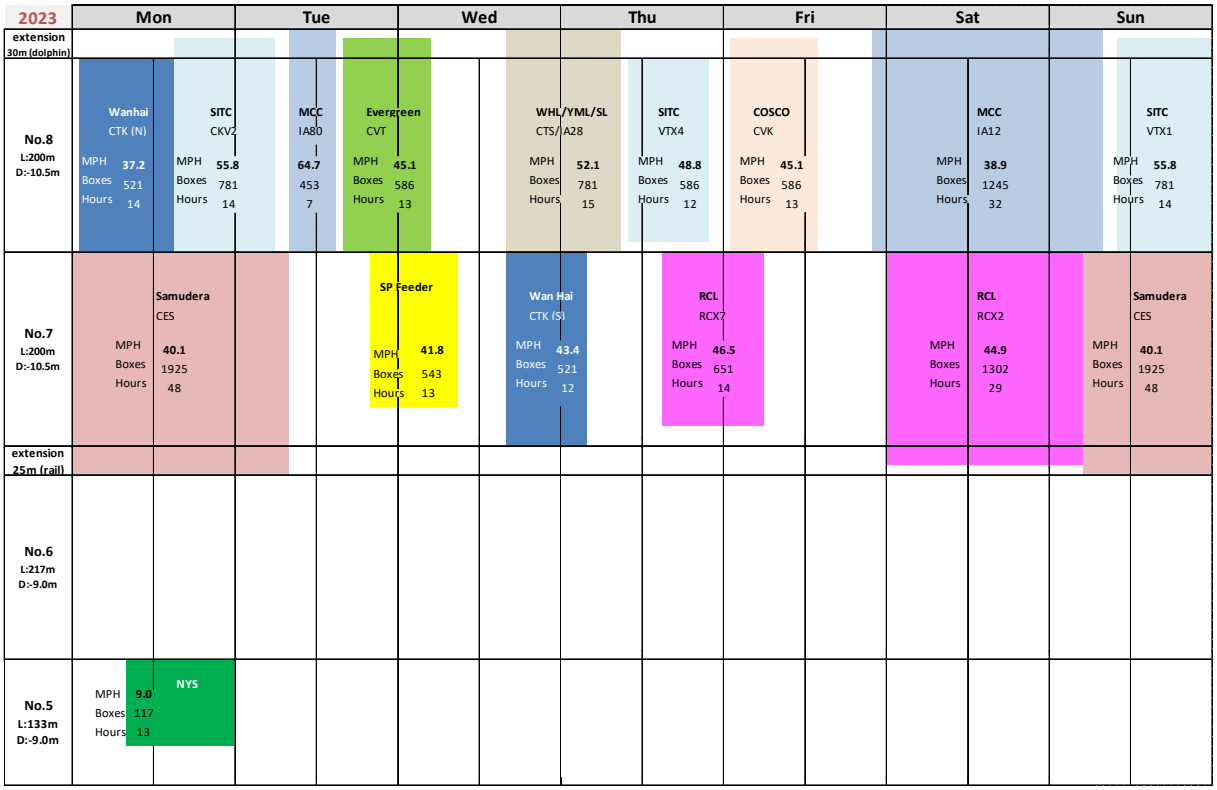


Figure 3-8 Berth window chart for 2023 (15% YoY Case)

34. QCs and MHCs are allocated to each berth window as per the table below.

Table 3-10 Allocation of QCs & MHCs for 2023 (15% YoY Case)

2023		Shipping line	WHL	SITC	MCC	Evergreen	WanHai/S	SITC	COSCO	MCC	SITC	Total	
		Line code	CTK (N)	CKV2	IA80	CVT	CT5	VTX4	RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity	37.20	55.80	64.70	45.07	52.08	48.83	45.07	38.92	55.80	(hours)	(hours)
No.8	404	working hours	11.93	11.93	6.91	8.95	11.93	8.95	8.95	28.52	11.93	109.98	5,735
	403	working hours	11.93	11.93	6.91	8.95	11.93	8.95		28.52	11.93	101.04	5,268
	402	working hours		11.93	6.91	8.95	11.93	8.95	8.95			57.61	3,004
	401	working hours							8.95		11.93	20.87	1,088
	S. Total	Total working hours	23.85	35.78	20.74	26.84	35.78	26.84	26.84	57.04	35.78	289.49	15,095
		berthing hours	14	14	7	13	15	12	13	32	14	134	6,987
		Shipping line	Samudera			SP Feeder	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES				CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	40.10			41.81	43.40	46.50		44.90	40.10		
No.7	402	working hours						9.94		19.88	15.61	45.43	2,369
	401	working hours	28.47			12.45	11.93	9.94		19.88		82.66	4,310
	405	working hours	28.47			12.45	11.93	9.94		19.88	15.61	98.27	5,124
	406	working hours											
	S. Total	Total working hours	56.94			24.89	23.85	29.82		59.64	31.22	226.36	11,803
		berthing hours	31			13	12	14		29	17	116.00	6,049
		Shipping line	NYY									Total	
		Line code										weekly	yearly
		Vessel productivity	9.01										
No.6	HMC 301	working hours	2.79									2.79	145
	HMC 302	working hours											
	HMC 303	working hours	2.79									2.79	145
	HMC 304	working hours	2.79									2.79	145
	S. Total	Total working hours	8.37									8.37	436
		berthing hours	13									13.00	678

3.5.3 Year 2024

35. The berth window chart for 2024 is drawn on assumption that:

1) Berth #6 is in operation with 6th QC
2) Extended berth length at #8 & #7 is utilized
3) LOAs of SITC (Mon) & MCC (Tue) are enlarged by 10m from 2023
4) MCC (Tue) shifts to #6 due to the LOA & tight window situations
5) Other vessels will not be enlarged due to draft limit
6) 2 new services are accepted at Berth #6 at vacant windows on Mon & Sat

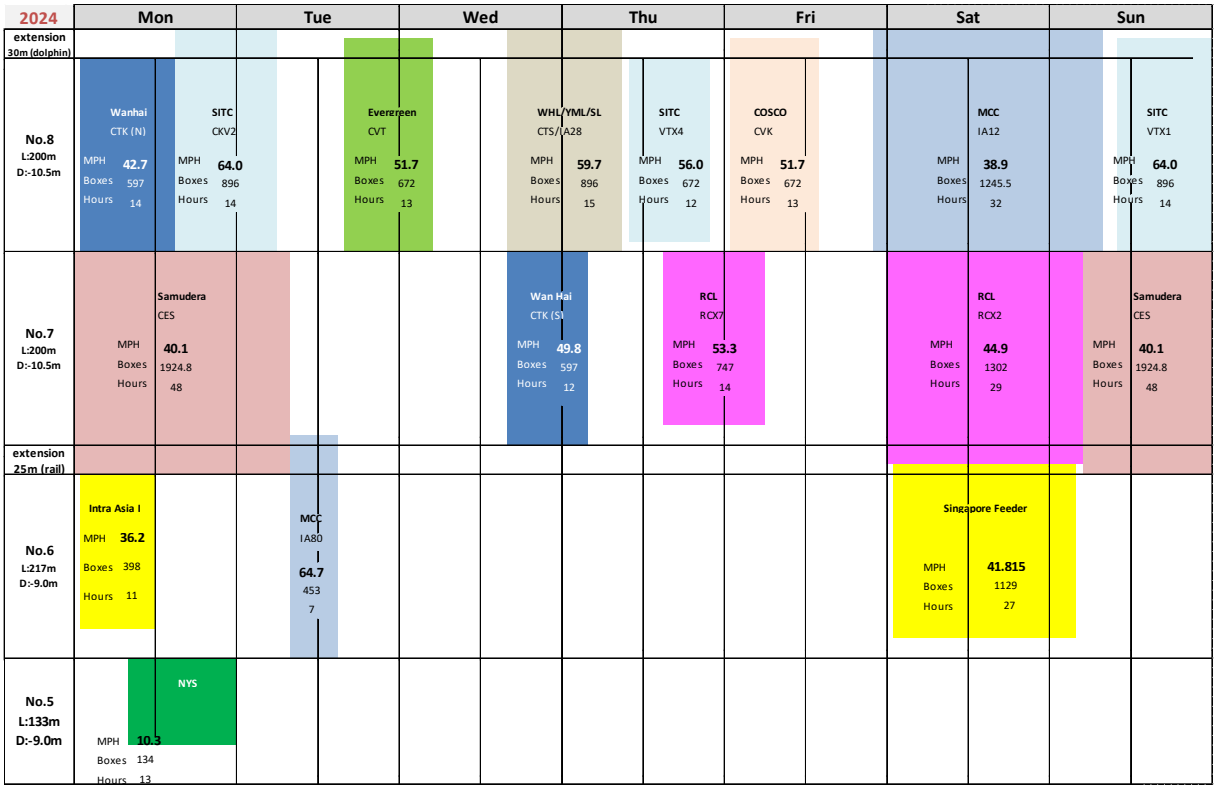


Figure 3-9 Berth window chart for 2024 (15% YoY Case)

36. QCs and MHCs are allocated to each berth window as per the table below.

Table 3-11 Allocation of QCs & MHCs for 2024 (15% YoY Case)

2024		Shipping line	WHL	SITC		Evergreen		WanHai/S	SITC	COSCO	MCC	SITC	Total	
		Line code	CTK (N)	CKV2		CVT		CT5	VTX4	RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity	42.67	64.00		51.69		59.73	56.00	51.69	38.92	64.00	(hours)	(hours)
No.8	404	working hours	13.68	13.68		10.26		13.68	10.26	10.26	28.52		100.34	5,246
	403	working hours	13.68	13.68				13.68	10.26	10.26	28.52	13.68	103.76	5,425
	402	working hours				10.26		13.68		10.26		13.68	47.88	2,503
	401	working hours		13.68		10.26			10.26			13.68	47.88	2,503
	S. Total	Total working hours	27.36	41.04		30.78		41.04	30.78	30.78	57.04	41.04	299.84	15,677
		berthing hours	14	14		13		15	12	13	32	14	127	6,640
		Shipping line	Samudera					WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES					CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	40.10					49.78	53.33		44.90	40.10		
No.7	402	working hours	28.47					9.12	11.40				48.99	2,561
	401	working hours									19.88		19.88	1,039
	405	working hours						9.12	11.40		19.88	15.61	56.01	2,928
	406	working hours	28.47					9.12	11.40		19.88	15.61	84.48	4,417
	S. Total	Total working hours	56.94					27.36	34.20		59.64	31.22	209.35	10,946
		berthing hours	31					12	14		29	17	103.00	5,385
		Shipping line	Int Asia I		MCC						SPF		Total	
		Line code			IA80								weekly	yearly
		Vessel productivity	36.17		64.70						35.11			
No.6	401	working hours	9.11		6.91						14.47		30.50	1,595
	405	working hours	9.11		6.91						14.47		30.50	1,595
	406	working hours			6.91						14.47		21.39	1,118
	407	working hours												
	S. Total	Total working hours	18.22		20.74						43.42		82.38	4,307
		berthing hours	11		7						27		45.00	2,353
		Shipping line	NYY										Total	
		Line code											weekly	yearly
		Vessel productivity	10.34											
No.5	HMC 301	working hours	3.20										3.20	167
	HMC 302	working hours												0
	HMC 303	working hours	3.20										3.20	167
	HMC 304	working hours	3.20										3.20	167
	S. Total	Total working hours	9.60										9.60	502
		berthing hours	13										13.00	680

3.5.4 Year 2025

37. The berth window chart for 2025 is drawn on assumption that:

1) Berth #6 is in operation with 6th QC
2) Extended berth length at #8 & #7 is utilized
3) LOA enlargement will stop in all services due to the draft limit
4) SITC (Thu) shifts to #6 due to the tight window situations
5) Another new service is accepted at a vacant window on Tuesday

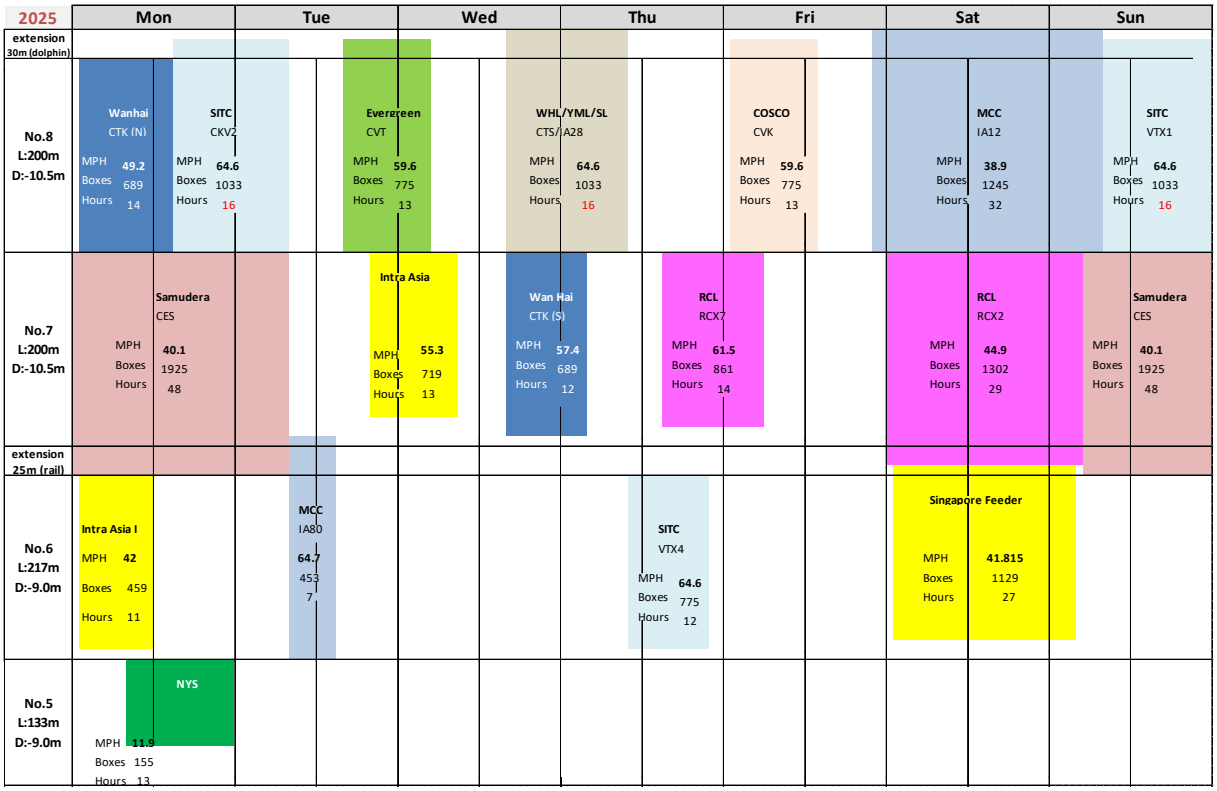


Figure 3-10 Berth window chart for 2025 (15% YoY Case)

38. QCs and MHCs are allocated to each berth window as per the table below.

Table 3-12 Allocation of QCs & MHCs for 2025 (15% YoY Case)

2025		Shipping line	WHL	SITC		Evergreen		WanHai/S		COSCO	MCC	SITC	Total	
		Line code	CTK (N)	CKV2		CVT		CT5		RBC2	IA12	VTX1	weekly	yearly
		Vessel productivity	49.20	64.57		59.61		64.57		59.61	38.92	64.57	(hours)	(hours)
No.8	404	working hours	10.52	15.77		11.83		15.77		11.83	28.52	15.77	110.02	5,737
	403	working hours	10.52	15.77		11.83		15.77		11.83	28.52	15.77	110.02	5,737
	402	working hours	10.52	15.77		11.83		15.77		11.83		15.77	81.50	4,250
	401	working hours											0.00	0
	S. Total	Total working hours	31.55	47.32		35.49		47.32		35.49	57.04	47.32	301.54	15,723
		berthing hours	14	16		13		16		13	32	16	120	6,257
		Shipping line	Samudera				Int Asia II	WHL	RCL		RCL/CNC	Samudera	Total	
		Line code	CES					CTK (S)	RCX7		RCX2	CES	weekly	yearly
		Vessel productivity	40.10				55.29	57.40	61.50		44.90	40.10		
No.7	402	working hours						10.52	13.14				23.66	1,234
	401	working hours					10.97	10.52	13.14		19.88	15.61	70.12	3,656
	405	working hours	28.47				10.97	10.52	13.14		19.88		82.98	4,327
	406	working hours	28.47				10.97				19.88	15.61	74.93	3,907
	S. Total	Total working hours	56.94				32.92	31.55	39.43		59.64	31.22	251.70	13,124
		berthing hours	31				13	12	14		29	17	116.00	6,049
		Shipping line	Int Asia I		MCC				SITC		SPF		Total	
		Line code			IA80				VTX4				weekly	yearly
		Vessel productivity	41.70		64.70				64.57		41.81			
No.6	401	working hours	10.51		6.91				11.83		10.97		40.22	2,097
	405	working hours	10.51		6.91				11.83				29.25	1,525
	406	working hours			6.91				11.83		10.97		29.72	1,550
	407	working hours									10.97			
	S. Total	Total working hours	21.01		20.74				35.49		51.71		128.95	6,724
		berthing hours	11		7				12		27		57.00	2,972
		Shipping line	NYY										Total	
		Line code											weekly	yearly
		Vessel productivity	11.92											
No.5	HMC 301	working hours	3.69										3.69	192
	HMC 302	working hours												0
	HMC 303	working hours	3.69										3.69	192
	HMC 304	working hours	3.69										3.69	192
	S. Total	Total working hours	11.07										11.07	577
		berthing hours	13										13.00	678

3.6 Working hours of each QC & MHC

39. Working hours allocated to each QC and MHC are summarized as follows.

Table 3-13 Summary of working hours of QCs and MHCs

(hours)

			2021	2022	2023	2024	2025
F/S High Case	QC	401	4,116	4,055	4,865	5,361	5,487
		402	4,094	5,060	5,183	5,142	5,015
		403	4,076	4,238	5,232	4,019	4,425
		404	4,252	4,622	5,232	4,019	4,425
		405	3,802	3,825	4,865	4,448	5,428
		406	-	-	-	4,823	5,310
	S.Total		20,339	21,799	25,376	27,813	30,090
	HMC	301	330	678	137	150	166
		302	-	-	-	-	-
		303	-	-	137	150	166
		304	-	-	137	150	166
	S.Total		330	678	412	451	497
15% YoY Case	QC	401	4,116	4,489	5,398	5,137	5,754
		402	4,094	5,026	5,373	5,064	5,483
		403	4,076	4,619	5,268	5,425	5,737
		404	4,252	5,228	5,735	5,246	5,737
		405	3,802	3,948	5,124	4,523	5,852
		406	-	-	-	5,535	5,457
	S.Total		20,339	23,309	26,898	30,931	34,019
	HMC	301	330	717	145	167	192
		302	-	-	-	-	-
		303	-	-	145	167	192
		304	-	-	145	167	192
	S.Total		330	717	436	502	577

40. The figures of working hours above will be used for the calculations in the later formulation stages such as:

1) calculations of variable costs
2) calculations of working hours of RTGs & reach stackers
3) calculations of the numbers of equipment (RTGs, reach stackers & yard trailers)

4. Yard side capacity simulation

41. In this chapter, yard side capacity is examined through the simulation on the ground slots of stacking yards and number of container handling equipment for 2021-2025.

4.1 Current yard layout

42. To identify the baseline, the yard layout as of July 2021 was confirmed as follows:

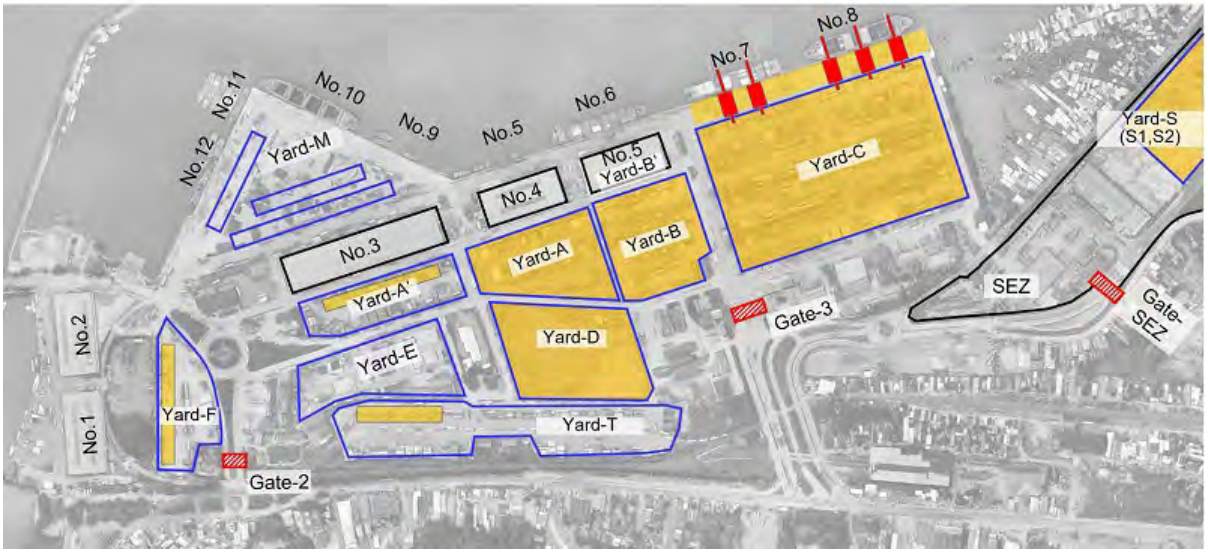


Figure 4-1 Yard layout as of July 2021

4.2 Simulation of yard capacity (2021-2025) for F/S High Case

43. Yard capacity is verified for each year from 2021-2025 by calculating the ground slots required to handle the annual throughput given by the demand forecast.

44. Annual handling capacity (TEUs) is calculated by the following formula:

Annual handling capacity (TEUs) = ground slots (TEUs)
x effective utilization ratio
x peak factor
x stacking tiers
x 365 (days) / dwell time (days)

45. Same terms are assumed for both F/S High Case and 15% YoY Case for the formula above.

Table 4-1 Assumptions for the formula terms

	2021	2022	2023	2024	2025
Effective utilization	75%	75%	75%	75%	75%
Peak factor	1.4	1.4	1.4	1.4	1.4
Stacking tiers (laden)	4.0	4.0	4.0	4.0	4.0
Stacking tiers (empty)	3.5	3.5	3.5	3.5	3.5

46. For F/S High Case, the ground slots corresponding to the annual throughput are calculated as follows.

47. Dwell times are assumed for laden and empty containers respectively. The dwell time for empty containers needs to be shortened every year to keep sufficient yard capacity to accommodate the increasing throughput.

Table 4-2 Summary of ground slots utilization (F/S High Case)

: in use

Yard				Total G.S.	2021	2022	2023	2024	2025
Ondock Ground Slots (TEUs)	Yard C (9.2ha)	laden	RTG	2,112	2,112	2,112	2,112	2,112	2,112
	Yard B (2.3ha)	laden	RTG	800	800	800	800	800	800
	Yard A (1.7ha)	laden	RTG	450	450	450	450	450	450
	Yard D (2.8ha)	laden	RTG	600	600	600	600	600	600
	Yard-T (Rail Tmnl.)	laden	RS	80	80	80	80	80	80
	Yard A' (1.3ha)	laden	RS	450	250	300	450	450	450
	Yard F (1.5ha)	laden	RS	400	210	350	400	400	400

	Yard B' (0.7ha)	laden	RTG	220				220	220
	Yard E (1.5ha)	laden	RS	350				150	350
	Multi-purpose Tmnl.	laden	RS	330		120	200	200	330
Offdock G.S. (TEUs)	Yard S1 (4ha)	empty	RS	1,100	1,100	1,100	1,100	1,100	1,100
	Yard S2 (4ha)	empty	RS	1,100		45	400	510	730
Total ground slots (TEUs)					**5,602**	**5,957**	**6,592**	**7,072**	**7,622**
Annual capacity ('000 TEUs)					**751**	**816**	**937**	**1,030**	**1,131**
Assumed dwell time	Laden (days)				5.00	5.00	5.00	5.00	5.00
	Empty (days)				8.00	**7.50**	**6.50**	**6.00**	**5.50**
Cargo handling equipment	QC				5	5	5	6	6
	RTG				16	16	21	21	21
	MHC				1	1	3	3	3
	Reach stacker				15	17	22	28	30

4.3 Simulation of yard capacity (2021-2025) for 15% YoY Case

48. For 15% YoY Case, the ground slots corresponding to the annual throughputs are calculated as follows.

49. To ensure sufficient yard capacity to accommodate the increasing throughput, the dwell times need to be shortened for empty containers every year, and laden containers in 2025 as per the figures in red font in the table below.

Table 4-3 Summary of ground slots utilization (15% YoY Case)

: in use

				Total G.S.	**2021**	**2022**	**2023**	**2024**	**2025**
Ondock Ground Slots (TEUs)	Yard C (9.2ha)	laden	RTG	2,112	2,112	2,112	2,112	2,112	2,112
	Yard B (2.3ha)	laden	RTG	800	800	800	800	800	800
	Yard A (1.7ha)	laden	RTG	450	450	450	450	450	450
	Yard D (2.8ha)	laden	RTG	600	600	600	600	600	600
	Yard-T (Rail Tmnl.)	laden	RS	80	80	80	80	80	80
	Yard A' (1.3ha)	laden	RS	450	250	300	450	450	450
	Yard F (1.5ha)	laden	RS	400	210	350	400	400	400
	Yard B' (0.7ha)	laden	RTG	220				220	220
	Yard E (1.5ha)	laden	RS	350			200	350	350
	Multi-purpose Tmnl.	laden	RS	330		200	200	330	330
Offdock G.S. (TEUs)	Yard S1 (4ha)	empty	RS	1,100	1,100	1,100	1,100	1,100	1,100
	Yard S2 (4ha)	empty	RS	1,100		200	445	605	825
Total ground slots (TEUs)					**5,602**	**6,192**	**6,837**	**7,497**	**7,717**
Annual capacity ('000 TEUs)					**751**	**864**	**994**	**1,143**	**1,314**
Assumed dwell time	Laden (days)				5.00	5.00	5.00	5.00	**4.45**
	Empty (days)				8.00	**7.00**	**6.00**	**5.00**	**4.45**
Cargo handling equipment	QC				5	5	5	6	6
	RTG				16	16	21	21	21
	MHC				1	1	3	3	3
	Reach stacker				15	18	22	30	35

4.4 Yard layout plan (2022-2025) for F/S High Case

50. Based on the yard capacity simulations, the yard layout for F/S High Case for the year 2022-2025 is illustrated.

4.4.1 Year 2022

51. The yard layout for 2022 is illustrated as follows. Approx.1/3 of the area of the Multi-Purpose Terminal is assumed to be converted into container stacking yard. Average dwell time of

empty containers needs to be shortened from the current 8.00 days to 7.50 days.

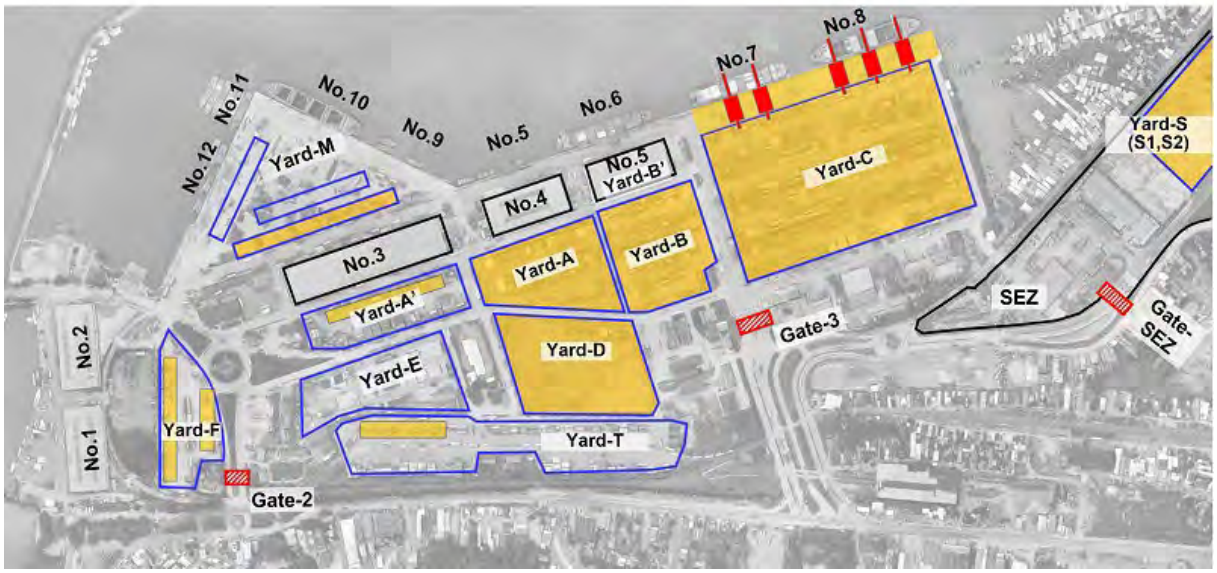


Figure 4-2 Yard layout for 2022 (F/S High Case)

4.4.2 Year 2023

52. The yard layout for 2023 is illustrated as follows. The ground slots utilization needs to be increased significantly at Yard A', F, S2 and the Multi-Purpose Terminal. Average dwell time of empty containers needs to be shortened to 6.50 days.

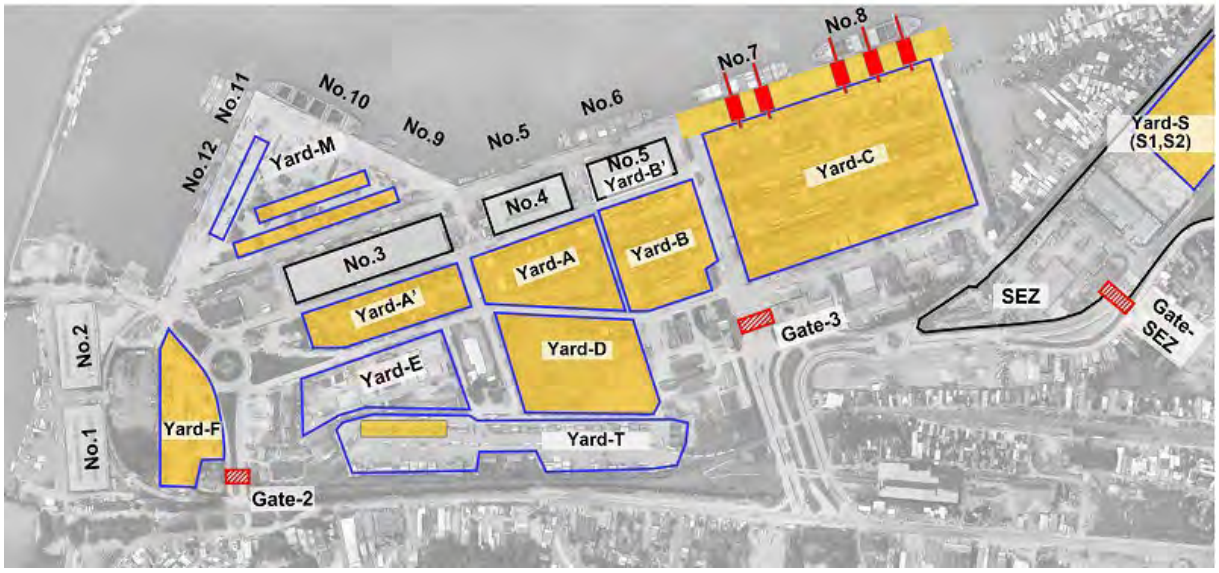


Figure 4-3 Yard layout for 2023 (F/S High Case)

4.4.3 Year 2024

53. The yard layout for 2024 is illustrated as follows. Yard B' and E need to be utilized. Average dwell time of empty containers needs to be shortened to 6.00 days.

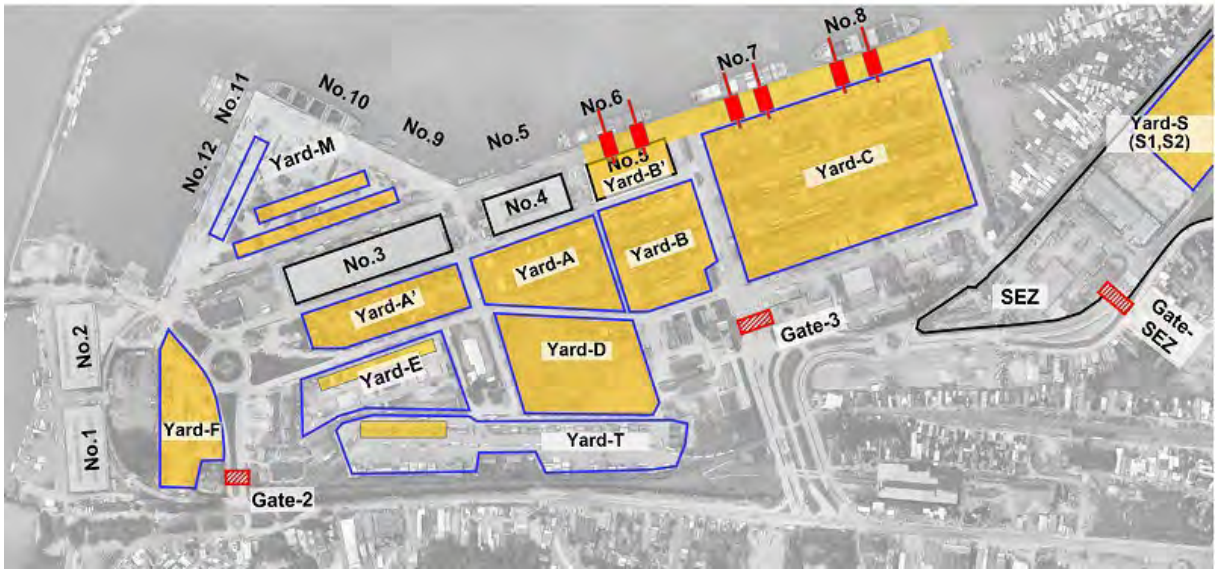


Figure 4-4 Yard layout for 2024 (F/S High Case)

4.4.4 Year 2025

54. The yard layout for 2025 is simulated as follows. The stacking yards for laden containers need to be fully utilized. Average dwell time of empty containers needs to be shortened to 5.50 days.

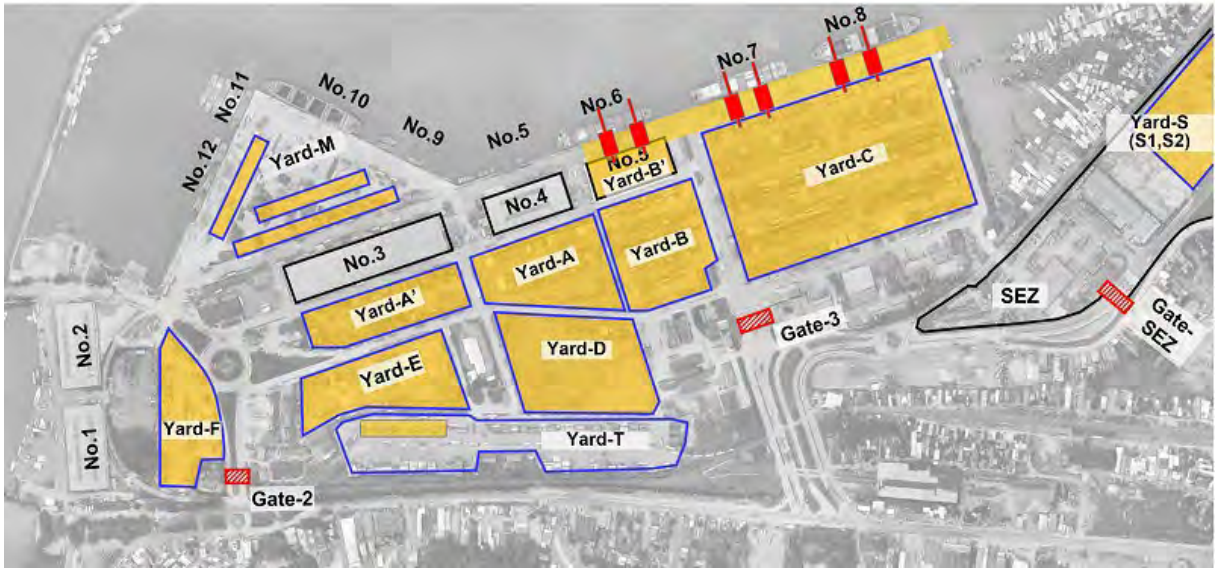


Figure 4-5 Yard layout for 2025 (F/S High Case)

4.5 Yard layout plan (2022-2025) for 15% YoY Case

55. Based on the yard capacity simulations, the yard layout for 15% YoY Case for the year 2022-2025 is illustrated.

4.5.1 Year 2022

56. The yard layout for 2022 is illustrated as follows. Approx.2/3 of the area of the Multi-Purpose Terminal is assumed to be converted into a container stacking yard, and the ground slots

utilization needs to be increased significantly at Yard A', F and S2. Average dwell time of empty containers needs to be shortened from the current 8.00 days to 7.00 days.

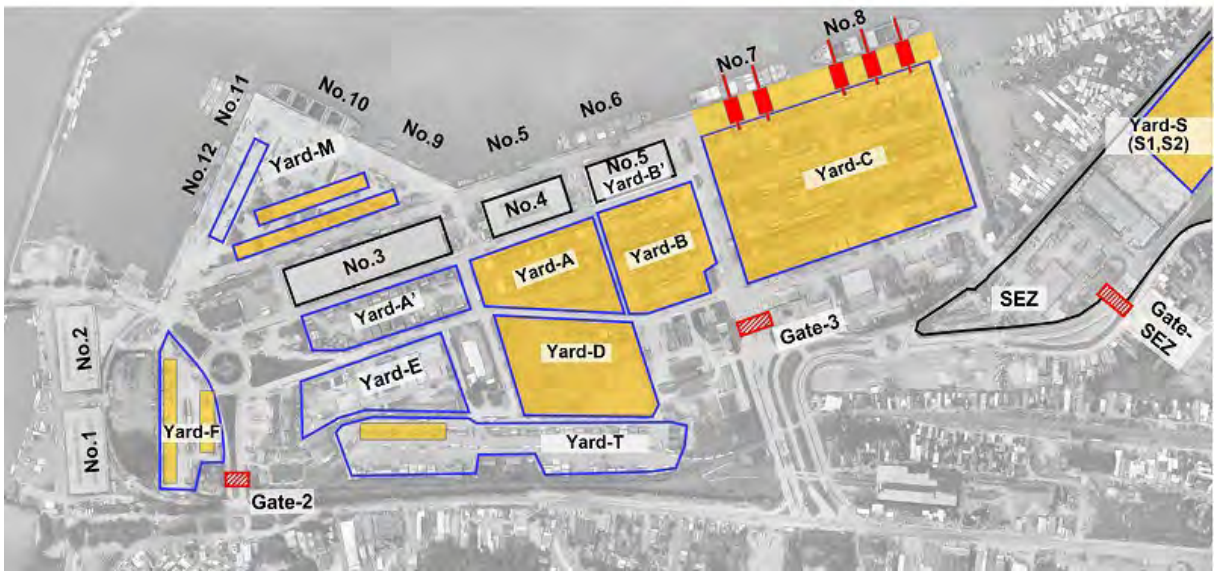


Figure 4-6 Yard layout for 2022 (15% YoY Case)

4.5.2 Year 2023

57. The yard layout for 2023 is illustrated as follows. The stacking yards for laden containers are almost fully utilized except Yard B'. Average dwell time of empty containers needs to be shortened to 6.00 days.

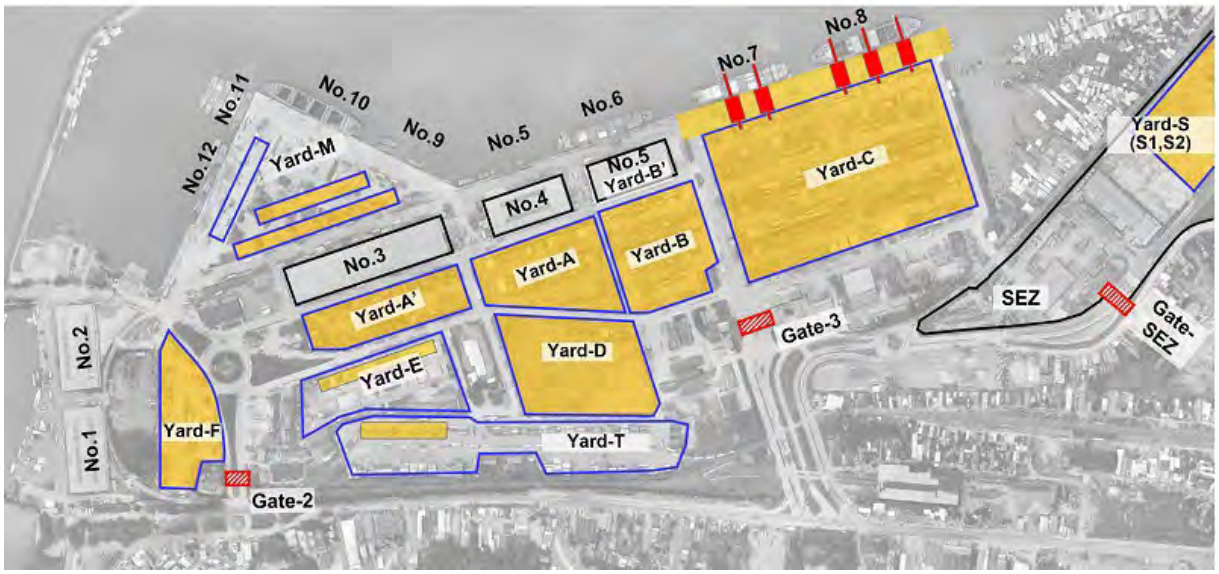


Figure 4-7 Yard layout for 2023 (15% YoY Case)

4.5.3 Year 2024

58. The yard layout for 2024 is illustrated as follows. All stacking yards for laden containers are utilized. Average dwell time of empty containers needs to be shortened to 5.00 days.

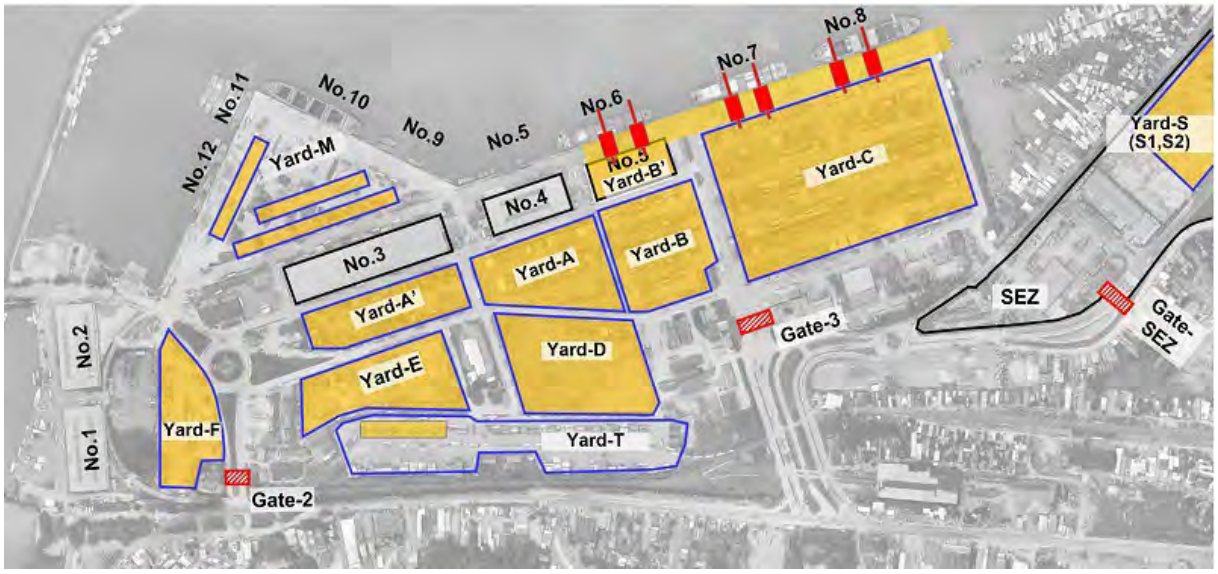


Figure 4-8 Yard layout for 2024 (15% YoY Case)

4.5.4 Year 2025

59. The yard layout for 2025 is illustrated as follows. Since the stacking yards for laden containers were already used up in full in the previous year and are still insufficient, average dwell time of laden containers needs to be shortened from the current 5.0 days to 4.45 days. Dwell time of empty containers also needs to be shortened to 4.45 days.

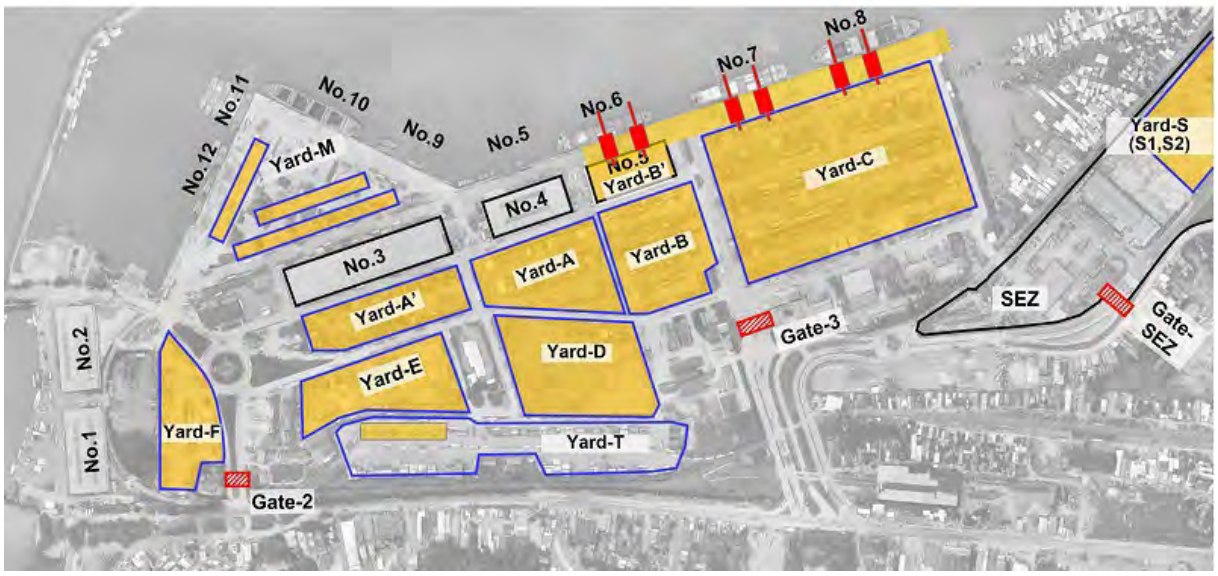


Figure 4-9 Yard layout for 2025 (15% YoY Case)

5. Investment plan

5.1 Numbers of reach stackers & yard trailers required (2021-2025)

60. As indicated in Section 3.2 and 3.3, number of reach stackers and yard trailers needs to be increased year by year, which requires a considerable investment in 5 years.

61. The required number of trailers is given by the following calculation flow.

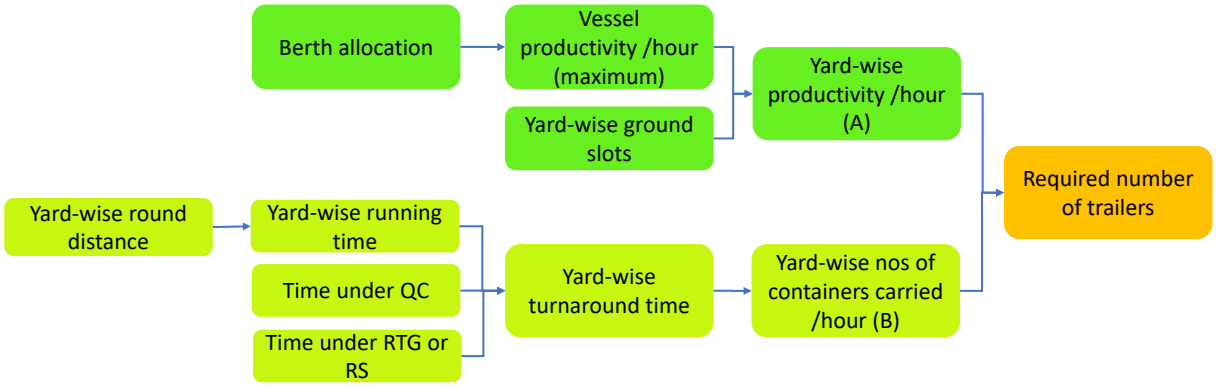


Figure 5-1 Calculation flow chart for yard trailer requirement

62. Based on the calculation flow above, the numbers of yard trailers required in 2022-2025 are calculated for F/S High Case and 15% YoY Case respectively as follows.

Table 5-1 Required number of yard trailers (F/S High Case)

F/S High Case									Current (max consition)			Current (peak)		2022			2023			2024			2025		
	Yard	Turnaround path (m)	Trailer speed (km/hr)	Running time (minutes)	Time under QC (minutes)	Time under RTG or RS (minut	**Total turnaround time (minut**	Nos of contrs carried /hr	Ground slots (TEU)	Vessel productivity (max)	Nos of trailers required (max)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)
Laden	C	1,220	14.0	5.2	5.0	6.5	**16.7**	3.6	2,112	44.9	12.5	32.1	9.0	2,112	35.6	9.9	2,112	33.5	9.3	2,112	34.3	9.6	2,112	35.0	9.8
	B	1,440	14.0	6.2	5.0	6.5	**17.7**	3.4	800	17.0	5.0	12.2	3.6	800	12.2	3.6	800	12.7	3.7	800	13.0	3.8	800	13.3	3.9
	A	1,700	14.0	7.3	5.0	6.5	**18.8**	3.2	450	9.6	3.0	6.8	2.1	450	6.8	2.1	450	7.1	2.2	450	7.3	2.3	450	7.5	2.3
	D	2,000	14.0	8.6	5.0	6.5	**20.1**	3.0	600	12.8	4.3	9.1	3.1	600	9.1	3.1	600	9.5	3.2	600	9.7	3.3	600	9.9	3.3
	T	3,000	14.0	12.9	5.0	6.5	**24.4**	2.5	80	1.7	0.7	1.2	0.5	80	1.2	0.5	80	1.3	0.5	80	1.3	0.5	80	1.3	0.5
	A'	2,360	14.0	10.1	5.0	6.5	**21.6**	2.8	250	5.3	1.9	3.8	1.4	300	4.6	1.6	450	7.1	2.6	450	7.3	2.6	450	7.5	2.7
	F	3,200	14.0	13.7	5.0	6.5	**25.2**	2.4	210	4.5	1.9	3.2	1.3	350	5.3	2.2	400	6.4	2.7	400	6.5	2.7	400	6.6	2.8
	B'	1,440	14.0	6.2	5.0	6.5	**17.7**	3.4	-	-	-	-	-		-	-		-	-	220	3.6	1.1	220	3.6	1.1
	E	2,800	14.0	12.0	5.0	6.5	**23.5**	2.6	-	-	-	-	-		-	-		-	-	150	2.4	1.0	350	5.8	2.3
	M	3,000	14.0	12.9	5.0	6.5	**24.4**	2.5	-	-	-	-	-	120	1.8	0.7	200	3.2	1.3	200	3.2	1.3	330	5.5	2.2
Empty	S1	2,800	14.0	12.0	5.0	6.5	**23.5**	2.6	1,100	23.4	9.2	16.7	6.6	1,100	16.7	6.6	1,100	17.5	6.8	1,100	17.8	7.0	1,100	18.2	7.1
	S2	3,200	14.0	13.7	5.0	6.5	**25.2**	2.4	-	-	-	-	-	45	0.7	0.3	400	6.4	2.7	510	8.3	3.5	730	12.1	5.1
								Total	5,602	119.2	38.4	85.2	27.5	5,957	100.4	30.7	6,592	104.7	35.1	7,072	114.7	38.6	7,622	126.3	43.1
															units to add	3.2		units to add	4.4		units to add	3.5		units to add	4.5
															roundup	4		roundup	5		roundup	4		roundup	5
									End 2021	38					Total	42		Total	47		Total	51		Total	56

Table 5-2 Required number of yard trailers (15% YoY Case)

15% YoY Case									Current (max consition)			Current (peak)		2022			2023			2024			2025		
	Yard	Turnaround path (m)	Trailer speed (km/hr)	Running time (minutes)	Time under QC (minutes)	Time under RTG or RS (minute	**Total turnaround time (minutes)**	Nos of contrs carried /hr	Ground slots (TEU)	Vessel productivity (max)	Nos of trailers required (max)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)	Ground slots (TEU)	Vessel productivity (peak)	Nos of trailers required (peak)
Laden	C	1,220	14	5.2	5.0	6.5	**16.7**	3.6	2,112	44.9	12.5	32.1	9.0	2,112	33.9	9.4	2,112	32.4	9.0	2,112	33.5	9.3	2,112	39.1	10.9
	B	1,440	14	6.2	5.0	6.5	**17.7**	3.4	800	17.0	5.0	12.2	3.6	800	12.8	3.8	800	12.3	3.6	800	12.7	3.7	800	14.8	4.4
	A	1,700	14	7.3	5.0	6.5	**18.8**	3.2	450	9.6	3.0	6.8	2.1	450	7.2	2.3	450	6.9	2.2	450	7.1	2.2	450	8.3	2.6
	D	2,000	14	8.6	5.0	6.5	**20.1**	3.0	600	12.8	4.3	9.1	3.1	600	9.6	3.2	600	9.2	3.1	600	9.5	3.2	600	11.1	3.7
	T	3,000	14	12.9	5.0	6.5	**24.4**	2.5	80	1.7	0.7	1.2	0.5	80	1.3	0.5	80	1.2	0.5	80	1.3	0.5	80	1.5	0.6
	A'	2,360	14	10.1	5.0	6.5	**21.6**	2.8	250	5.3	1.9	3.8	1.4	300	4.8	1.7	450	6.9	2.5	450	7.1	2.6	450	8.3	3.0
	F	3,200	14	13.7	5.0	6.5	**25.2**	2.4	210	4.5	1.9	3.2	1.3	350	5.6	2.4	400	6.1	2.6	400	6.3	2.7	400	7.4	3.1
	B'	1,440	14	6.2	5.0	6.5	**17.7**	3.4	-	-	-	-	-	-	-	-	-	0.0	0.0	220	3.5	1.0	220	4.1	1.2
	E	2,800	14	12.0	5.0	6.5	**23.5**	2.6	-	-	-	-	-	-	-	-	200	3.1	1.2	350	5.6	2.2	350	6.5	2.5
	M	3,000	14	12.9	5.0	6.5	**24.4**	2.5	-	-	-	-	-	200	3.2	1.3	200	3.1	1.2	330	5.2	2.1	330	6.1	2.5
Empty	S1	2,800	14	12.0	5.0	6.5	**23.5**	2.6	1,100	23.4	9.2	16.7	6.6	1,100	17.6	6.9	1,100	16.9	6.6	1,100	17.5	6.8	1,100	20.4	8.0
	S2	3,200	14	13.7	5.0	6.5	**25.2**	2.4	-	-	-	-	-	200	3.2	1.3	445	6.8	2.9	605	9.6	4.0	825	15.3	6.4
								Total	5,602	119.2	38.4	85.2	27.5	6,192	99.3	32.9	6,837	104.9	35.4	7,497	118.9	40.4	7,717	142.9	48.9
															units to add	5.4		units to add	2.5		units to add	5.1		units to add	8.5
															rundup	6		roundup	3		roundup	6		roundup	9
									End 2021	38					Total	44		Total	47		Total	53		Total	62

63. As to the number of RTGs and reach stackers, calculation method has not been established

at this moment, however, it may be similar to the calculation method for working hours of the same equipment as indicated in 6.2. Further studies on this methodology need to be made.

5.2 Investment plan for F/S High Case

64. Based on the required civil works and cargo handling equipment identified in the simulations on the quay side and yard side, investment through the year 2021-2025 is planned for F/S High Case through as follows.

65. The amounts of depreciation for 2021-2025 are calculated based on this plan.

Table 5-3 Investment plan for 2021-2025 (F/S High Case)

: years in use

Investment item		Cost ('000 USD)	2021	2022	2023	2024	2025
Civil works	Expansion of RTG system to Yard B & Yard A	5,790					
	Extension of QC rail on Berth #6, WH#5 demolition & Yard B' pavement	3,502					
	25m rail extension	100					
	Installation of new bollard ahead of Berth #8	579					
	Yard A' (1.3ha)	848					
	Yard E (1.5ha)	978					
	Yard F (1.5ha)	978					
		12,775					
Cargo handling equipment	5 RTGs	7,500					
	2 MHCs	9,000					
	6th QC	7,000					
	RS (2 uts)	1,000					
	RS (5 uts)	2,500					
	RS (6 uts)	3,000					
	RS (2 uts)	1,000					
	Yard trailers (22 uts)	4,400					
		35,400					
Total		**48,175**					

5.3 Investment plan for 15% YoY Case

66. Likewise, the investment for 15% YoY Case is planned as follows.

Table 5-4 Investment plan for 2021-2025 (15% YoY Case)

: years in use

Investment item		Cost ('000 USD)	2021	2022	2023	2024	2025
Civil works	Expansion of RTG system to Yard B & Yard A	5,790					
	Extension of QC rail on Berth #6, WH#5 demolition & Yard B' pavement	3,502					
	25m rail extension	100					
	Installation of new bollard ahead of Berth #8	579					
	Yard A' (1.3ha)	848					
	Yard E (1.5ha)	978					
	Yard F (1.5ha)	978					
		12,775					
Cargo handling	5 RTGs	7,500					
	2 MHCs	9,000					

equipment	6th QC	7,000					
	RS (3 uts)	1,500					
	RS (4 uts)	2,000					
	RS (8 uts)	4,000					
	RS (5 uts)	2,500					
	Yard trailers (28 uts)	5,600					
		39,100					
Total		**51,875**					

6. Assumptions for financial simulations

6.1 Estimation of revenues and expenses for 2021-2025

67. Revenues and expenses for 2021-2025 are basically calculated by multiplying the actual values for 2020 by the "explanatory variables".

68. The most appropriate explanatory variable is selected for each accounting item as summarized below.

Table 6-1 Summary of explanatory valuables used for financial simulations

Accounting item				Explanatory variable
Revenues	Stevedoring	Container		TEU
		GC		GC ton
	Lift on/off			TEU
	Storage	Container		TEU
		GC		GC ton
	Port charges for ship services			GT
	Transportation	Container		TEU
		GC		GC ton
	Rental income from SEZ			CPI
	Passenger ships			pax
	Rental fee			CPI
	Others			CPI
Expenses	Consumable	Combustible, lubricant, spare parts	Variables	working hour
			Fixed	CPI
		Warehouse supplies		CPI
		Office supplies		CPI
		Other consumables		CPI
	Repair & maintenance	Container		TEU
		GC		GC ton
		Pilot/tug		GT
		Indirect		CPI
	Depreciation	Sea port equipment		as per accounting rules
		Building & facilities		as per accounting rules
		Motor vehicles		as per accounting rules
		Others		as per accounting rules
	Salaries			CAGR
	Other expenses			CPI
	Other losses			CPI

6.2 Estimation of working hours for 2021-2025

69. Variable costs for key equipment have the largest portion in the operating expenses. Those variable costs are proportional to the working hours of the equipment. The working hours of each equipment are estimated by the following formula.

1) RTG

working hour (year N) = working hours of QCs & MHCs (year 2020)
x throughput growth ratio
x vessel productivity growth ratio

2) Reach stacker

working hour (year N) = working hours of QCs & MHCs (year 2020)
x ground slots growth ratio
x vessel productivity growth ratio

70. The terms of above formula are summarized as follows.

Table 6-2 Summary of formula terms & working hours by equipment type

1) F/S High Case

		Current	2021	2022	2023	2024	2025
Vessel productivity	MPH (gross)	34.96	34.42	37.41	42.77	46.70	51.21
Ground slots (TEUs)	RTG	3,962	3,962	3,962	3,962	4,182	4,182
	RS	1,180	1,640	1,995	2,630	2,890	3,440
Working hours (hours/year)	QC	18,517	20,339	21,799	25,376	27,813	30,621
	RTG	43,031	54,559	64,456	84,591	101,496	122,204
	RS	32,455	48,872	64,619	97,395	116,837	152,508
	HMC	1,617	1,947	2,295	5,263	5,302	5,348

2) 15% YoY Case

		Current	2021	2022	2023	2024	2025
Vessel productivity	MPH (gross)	34.96	34.42	41.82	43.27	45.31	49.18
Ground slots (TEUs)	RTG	3,962	3,962	3,962	3,962	4,182	4,182
	RS	1,180	1,640	2,230	2,875	3,315	3,535
Working hours (hours/year)	QC	18,517	20,339	23,309	26,898	30,931	34,019
	RTG	43,031	54,559	72,155	90,708	109,244	136,354
	RS	32,455	48,872	76,422	107,705	130,057	150,527
	HMC	1,617	1,947	2,334	5,287	5,353	5,428

6.3 Assumptions of USD/KHR exchange rates and CPIs

71. Exchange rates of USD/KHR and CPIs are assumed for 2021-2025 as follows.

Table 6-3 Summary of assumptions for exchange rates & CPIs

		2020	2021	2022	2023	2024	2025
Exchange rate	KHR/USD	4,045	4,100	4,100	4,100	4,100	4,100
CPI	y on y %	2.94%	3.11%	2.78%	2.99%	3.04%	3.04%

6.4 Equipment-wise unit costs

72. Unit variable costs are calculated by type of equipment or ship based on the audited financial statements for 2020 as follows.

Table 6-4 Summary of unit costs by equipment & ship type

Unit costs of equipment/boats for 2020 (USD)

		Fixed cost	Variable cost										
		Depreciation	Combustible (DO)	Lubricant oil	Spare parts				Variable Total	Unit value		variable cost /unit value	
					Equipment /ship	Generator	Tyres	S.Total					
QCs	5 units total	1,288,450	1,717,553	300,185	1,435,771	2,008,000	-	3,443,772	5,461,510	18,517	hrs	294.95	/hr/unit
RTGs	14 units total	663,418	1,419,503	145,717	883,766		80,454	964,220	2,529,439	43,031	hrs	58.78	/hr/unit
Reach stackers	15 units total	256,133	461,002	47,323	519,028		387,846	906,874	1,415,198	32,455	hrs	43.60	/hr/unit
HMCs	1 unit total	104,444	68,189	8,444	32,741		-	32,741	109,374	1,617	hrs	67.64	/hr/unit
Fork Lifts (Contr)	11 units total	33,884	197,572	20,281	46,616		17,630	64,246	282,099	641,842	TEUs	0.44	/TEU
Trailers (Contr)	34 units total	562,776	620,167	63,662	423,408		351,721	775,129	1,458,957	641,842	TEUs	2.27	/TEU
Shore cranes	8 units total	218,939	179,028	18,378	106,664		-	106,664	304,071	349,820	Tons	0.87	/ton
Fork Lifts (GC)	6 units total	22,101	66,163	6,792	70,451		9,616	80,067	153,022	349,820	Tons	0.44	/ton
Trailers (GC)	17 units total	67,095	5,647	580	17,282		14,356	31,638	37,865	349,820	Tons	0.11	/ton
Tug boats	6 ships total	323,621	1,451,759	100,981	408,006		-	408,006	1,960,746	16,784,979	GT	0.12	/GT
Pilot boat	1 ship total	7,982	102,317	9,798	953,882		-	953,882	1,065,997	16,784,979	GT	0.06	/GT
Mooring boat	1 ship total	110	15,702	1,868	162,705		-	162,705	180,276	14,422,935	GT	0.01	/GT

7. Results of financial simulations

7.1 Business sector-wise operating profits

7.1.1 F/S High Case

73. Figures and graph are shown as follows. Due to the depreciation burden, profit of the container sector is declining despite the increasing cargo volume.

Table 7-1 Summary of operating profits by business sector (F/S High Case)

('000 USD)

Year	Total	Containers	GC	SEZ	Pilot /tug	Others
2020	17,181	15,033	-3,641	-2,147	8,197	-261
2021	18,941	17,624	-3,966	-2,189	7,817	-346
2022	16,762	15,563	-4,981	-2,230	8,742	-333
2023	18,459	14,614	-4,677	-1,560	10,402	-320
2024	17,011	11,486	-5,051	-1,559	11,632	-312
2025	16,324	9,029	-5,428	-270	13,292	-299

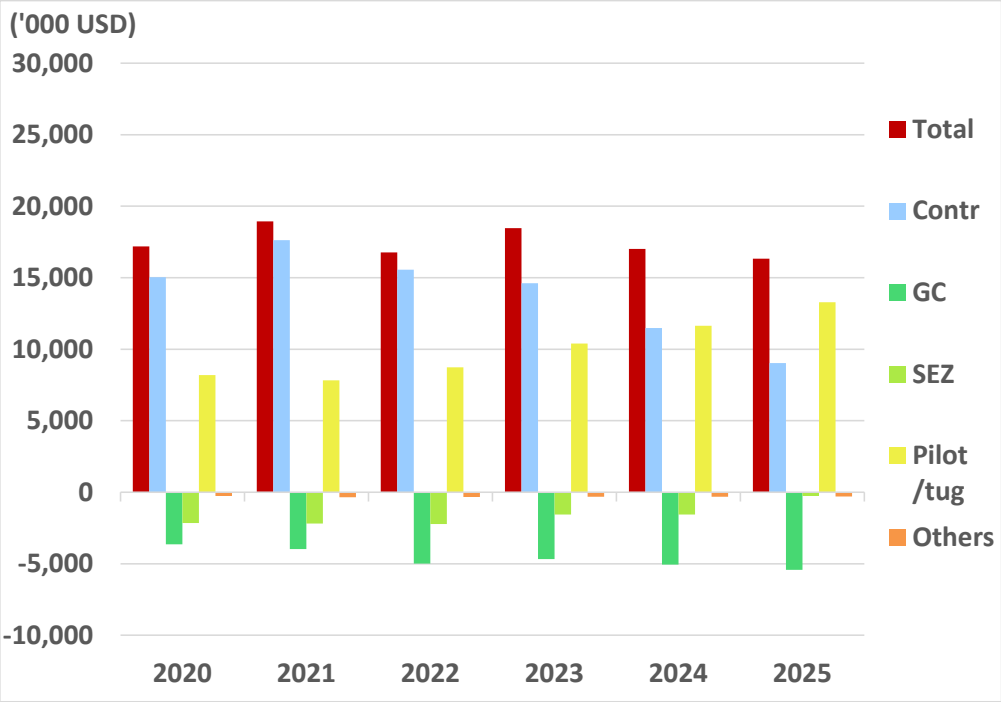


Figure 7-1 Trend of operating profits by business sector (F/S High Case)

7.1.2 15% YoY Case

74. Figures and graph are shown as follows. Due to the depreciation burden, profit of the container sector is almost flat until 2025 despite the increasing cargo volume.

Table 7-2 Summary of operating profits by business sector (15% YoY Case)

('000 USD)

Year	Total	Containers	GC	SEZ	Pilot /tug	Others
2020	17,181	15,033	-3,641	-2,147	8,197	-261
2021	18,941	17,624	-3,966	-2,189	7,817	-346
2022	18,984	17,327	-5,121	-2,227	9,336	-331
2023	21,315	16,868	-4,783	-1,553	11,101	-318
2024	23,005	16,213	-5,129	-812	13,039	-308
2025	27,218	17,644	-5,419	-247	15,533	-293

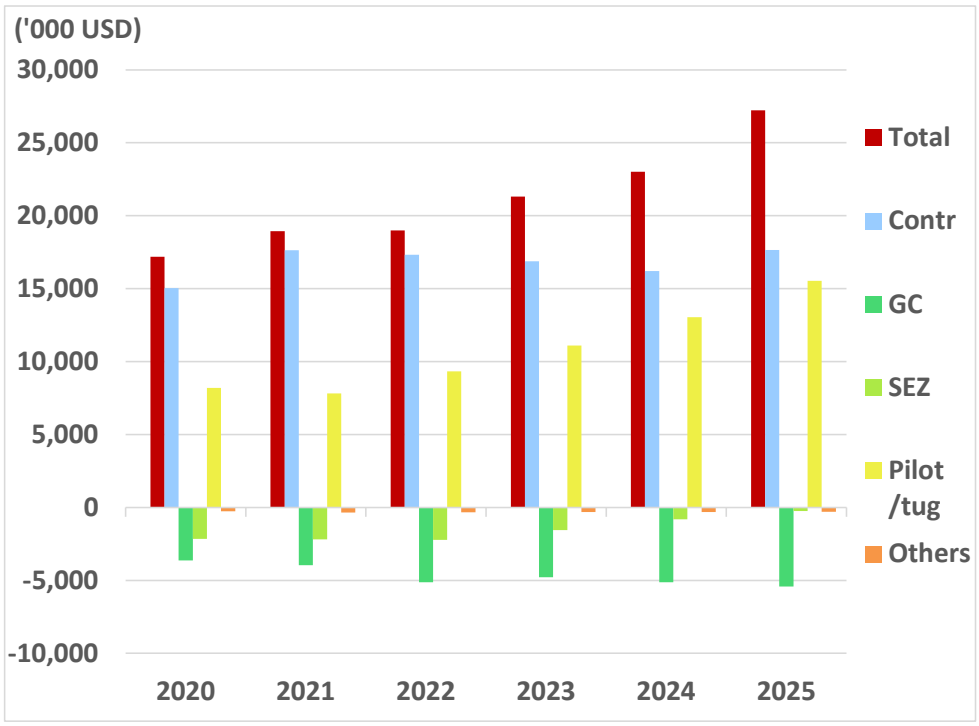


Figure 7-2 Trend of operating profits by business sector (15% YoY Case)

7.2 Business sector-wise profit & loss statements

7.2.1 Actual profit & loss statement for 2020 financial year

75. To identify the baseline, the audited profit & loss statement for 2020 financial year was analyzed and a business sector-wise profit & loss statement was prepared as follows.

Table 7-3 Business sector-wise profit & loss statement for 2021 (actual)

2020 actual (USD)

					Total	Contr	GC	SEZ	Pilot /tug	Others
Revenue				Stevedoring	35,806,759	34,340,301	1,466,319	0	0	139
				Lift on/off	20,722,318	20,722,318	0	0	0	0
				Port charges for ship services	16,708,031	0	0	0	16,708,031	0
				Storage	2,812,802	2,310,548	502,254	0	0	0
				Rental fee	282,035	0	0	0	0	282,035
				Transportation	16,023	15,222	801	0	0	0
				Rental income from SEZ	595,234	0	0	595,234	0	0
				Passenger ships	65,672	0	0	0	0	65,672
				Others	77,348	0	0	0	0	77,348
				Revenue total	**77,086,222**	**57,388,389**	**1,969,374**	**595,234**	**16,708,031**	**425,194**
Expense	**Comsumable Supplies**	Combustible expenses	Business	Cargo	520,955	442,812	78,143	0	0	0
				Maintenance	443,522	443,522	0	0	0	0
				AT	32,923	8,322	22,366	19	2,202	14
				Cont. Terminal	2,030,349	2,030,349	0	0	0	0
				Group Electric	1,678,658	1,510,792	117,506	50,360	0	0
				Remorquer	1,598,194	0	0	0	1,598,194	0
				Business S. Total	6,304,601	4,435,798	218,016	50,379	1,600,396	14
				Administration	1,196,474	890,739	30,567	9,239	259,329	6,600
				Construction	664,603	357,041	200,230	33,487	73,663	183
				Total	8,165,679	5,683,577	448,813	93,104	1,933,388	6,796
		Spare parts		SPA	7,778,444	5,363,646	358,604	68,276	1,527,547	460,371
				Tyres	861,623	852,007	9,616	0	0	0
				Total	8,640,067	6,215,653	368,220	68,276	1,527,547	460,371
		Warehouse supplies			1,702,472	0	1,702,472	0	0	0
		Oil & lubricant		Maintenance	187,359	187,359	0	0	0	0
				AT	273,331	195,401	68,472	42	9,385	30
				Cont. Terminal	19,361	19,361	0	0	0	0
				Group Electric	104,351	100,687	3,184	16	452	12
				Remorquer	139,607	0	0	0	139,607	0
				Business S. Total	724,010	502,809	71,656	58	149,445	42
				Administration	33,549	24,976	857	259	7,272	185
				Construction	121,718	65,390	36,671	6,133	13,491	34
				S. Total	879,276	593,175	109,184	6,450	170,207	260
		Office supplies			807,287	601,001	20,624	6,234	174,975	4,453
		Other consumables			459,149	341,823	11,730	3,545	99,518	2,533
		Total			**20,653,931**	**13,435,229**	**2,661,043**	**177,610**	**3,905,636**	**474,413**
	Salaries, wages & related expenses	Nos of staff: 1192	348	Container Terminal	7,436,515	7,436,515	0	0	0	0
			239	General Cargo	5,832,646	5,401,030	431,616	0	0	0
			10	SEZ	222,957	0	0	222,957	0	0
			65	Harbour Master	1,508,298	0	0	0	1,508,298	0
			47	Security	663,265	464,286	66,327	66,327	33,163	33,163
			181	Admin-HR	2,059,824	1,408,216	404,553	30,882	200,732	15,441
			16	Accounting	295,216	219,780	7,542	2,280	63,987	1,628
			13	Planning	214,694	159,833	5,485	1,658	46,534	1,184
			17	Business	277,764	206,787	7,096	2,145	60,204	1,532
			10	Internal Audit	144,535	107,602	3,693	1,116	31,327	797
			8	Marketing	182,755	127,929	18,276	18,276	9,138	9,138
			15	IT	180,316	126,221	18,032	18,032	9,016	9,016
			5	Machinery	90,644	55,630	12,570	461	19,615	2,369
			218	Technic+Constru.	3,171,830	1,946,596	439,849	16,145	686,359	82,881
				Total	**22,281,260**	**17,660,424**	**1,415,038**	**380,277**	**2,668,372**	**157,149**
	Depreciation & amortization	Property & equipment		Sea port equipment	2,678,368	2,155,472	208,888	0	314,008	0
				Buildings & port facilities	2,371,326	1,676,773	662,484	515	31,186	368
				Motor vehicles	795,619	546,264	190,798	1,229	34,504	22,824
				Computer & office equipment	348,500	305,819	4,267	1,290	36,202	921
				Technical equipment & others	918,126	869,665	31,690	40	11,676	5,055
				Land improvement	356,635	349,786	2,542	59	3,464	783
				Palettes	21,656	0	21,656	0	0	0
				Furniture & fittings	88,615	65,972	2,264	684	19,207	489
				S. Total	7,578,845	5,969,751	1,124,588	3,817	450,248	30,440
		Investment properties			1,548,113	25,323	0	1,521,660	0	1,130
		Intangible assets			264,775	264,265	51	15	432	11
		Total			**9,391,732**	**6,259,339**	**1,124,639**	**1,525,492**	**450,680**	**31,581**
	Repairs & maintenances	Subcontracted service expenses			1,623,379	1,137,936	2,697	815	481,349	582
		Computer & electronic			385,782	325,710	6,321	1,744	50,761	1,246
		CHE & admin cars			186,066	153,736	3,119	943	27,595	673
		Total			**2,195,227**	**1,617,383**	**12,136**	**3,502**	**559,705**	**2,501**
	Other expenses	Contributions and donations			1,622,693	1,208,046	41,456	12,530	351,710	8,950
		Reception and hospitality			944,623	703,244	24,133	7,294	204,742	5,210
		SEZ operating expense			590,673	0	0	590,673	0	0
		Administrative expenses			440,482	253,806	105,504	1,458	78,672	1,041
		Training, workshops and seminars			127,212	66,279	31,408	11,714	17,622	189
		Missions			294,012	158,737	44,692	24,588	65,232	762
		Publications			281,636	209,669	7,195	2,175	61,043	1,553
		Expected credit losses			364,596	364,596	0	0	0	0
		Professional and related costs			188,471	140,311	4,815	1,455	40,850	1,040
		Post services			117,595	87,546	3,004	908	25,488	649
		Utilities			153,232	88,293	36,702	507	27,368	362
		Health-care supplies			45,953	26,478	11,007	152	8,207	109
		Equipment rental			27,451	20,436	701	212	5,950	151
		Other taxes			40,408	30,083	1,032	312	8,758	223
		Other expenses			108,666	80,898	2,776	839	23,553	599
		Total			**5,347,703**	**3,438,423**	**314,427**	**654,817**	**919,196**	**20,840**
	Other losses - net				**35,624**	**26,521**	**910**	**275**	**7,721**	**196**
	Expense total				**59,905,476**	**42,355,312**	**5,610,192**	**2,741,973**	**8,511,310**	**686,689**
Operating profit					**17,180,746**	**15,033,077**	**-3,640,818**	**-2,146,739**	**8,196,721**	**-261,494**

7.2.2 F/S High Case

76. Based on the calculations of revenues and expenses, business sector-wise profit & loss statements for 2022-2025 for F/S High Case are prepared as follows.

7.2.2 (1) Year 2022

77. Business sector-wise profit & loss statement for 2022 is compiled as follows.

Table 7-4 Business sector-wise profit & loss statement for 2022 (F/S High Case)

2022 **(USD '000)**

Accounting item			Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring		44,792	43,679	1,113	0	0	0
	Lift on/off		26,358	26,358	0	0	0	0
	Storage		3,028	2,733	295	0	0	0
	Port charges for ship services		18,830	0	0	0	18,830	0
	Transportation		20	19	1	0	0	0
	Rental income from SEZ		622	0	0	622	0	0
	Passenger ships		33	0	0	0	0	33
	Rental fee		295	0	0	0	0	295
	Others		81	0	0	0	0	81
	Revenue total		**94,058**	**72,789**	**1,408**	**622**	**18,830**	**409**
Expenses	Consumable	Combustible	10,929	8,199	438	96	2,188	7
		Spare parts	11,603	8,966	359	70	1,729	478
		Others	4,541	2,215	1,799	16	504	7
	S. Total		**27,073**	**19,380**	**2,596**	**183**	**4,421**	**493**
	Salaries		**27,319**	**21,654**	**1,735**	**466**	**3,272**	**193**
	Depreciation & amortization		**14,615**	**10,428**	**1,763**	**1,519**	**868**	**37**
	Repair & maintenance		**2,661**	**2,024**	**8**	**3**	**624**	**2**
	Other expenses	SEZ ope expense	618	0	0	618	0	0
		Others	4,974	3,711	287	63	896	17
	S. Total		5,591	3,711	287	680	896	17
	Other losses (net)		37	29	1	0	7	0
	Expense total		**77,296**	**57,226**	**6,389**	**2,852**	**10,087**	**742**
Operating profit			**16,762**	**15,563**	**-4,981**	**-2,230**	**8,742**	**-333**

7.2.2 (2) Year 2023

78. Business sector-wise profit & loss statement for 2023 is compiled as follows.

Table 7-5 Business sector-wise profit & loss statement for 2023 (F/S High Case)

2023 **(USD '000)**

Accounting item		Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring	51,140	50,138	1,002	0	0	0
	Lift on/off	30,255	30,255	0	0	0	0
	Storage	2,910	2,719	191	0	0	0
	Port charges for ship services	21,726	0	0	0	21,726	0
	Transportation	23	22	1	0	0	0
	Rental income from SEZ	1,433	0	0	1,433	0	0
	Passenger ships	66	0	0	0	0	66
	Rental fee	304	0	0	0	0	304
	Others	83	0	0	0	0	83

Revenue total			**107,940**	**83,135**	**1,193**	**1,433**	**21,726**	**453**
Expenses	**Consumable**	**Combustible**	15,067	11,967	443	98	2,553	8
		Spare parts	16,030	13,086	363	72	2,017	492
		Others	5,662	3,233	1,817	17	588	7
	S. Total		**36,759**	**28,285**	**2,623**	**186**	**5,158**	**507**
	Salaries		**29,545**	**23,418**	**1,876**	**504**	**3,538**	**208**
	Depreciation & amortisation		**14,378**	**10,739**	**1,086**	**1,522**	**994**	**38**
	Rpair & maintenance		**3,001**	**2,281**	**6**	**3**	**710**	**2**
	Other expenses	**SEZ ope expense**	636	0	0	636	0	0
		Others	5,122	3,830	280	62	933	17
	S. Total		5,758	3,830	280	698	933	17
	Other losses (net)		38	30	0	0	8	0
	Expense total		**89,481**	**68,583**	**5,871**	**2,914**	**11,340**	**773**
Operating profit			**18,459**	**14,614**	**-4,677**	**-1,560**	**10,402**	**-320**

7.2.2 (3) Year 2024

79. Business sector-wise profit & loss statement for 2024 is compiled as follows.

Table 7-6 Business sector-wise profit & loss statement for 2024 (F/S High Case)

2024 **(USD '000)**

Accounting item			Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	**Stevedoring**		56,006	55,105	901	0	0	0
	Lift on/off		33,252	33,252	0	0	0	0
	Storage		2,860	2,759	101	0	0	0
	Port charges for ship services		24,272	0	0	0	24,272	0
	Transportation		25	24	0	0	0	0
	Rental income from SEZ		1,476	0	0	1,476	0	0
	Passenger ships		99	0	0	0	0	99
	Rental fee		313	0	0	0	0	313
	Others		86	0	0	0	0	86
	Revenue total		**117,573**	**91,140**	**1,003**	**661**	**24,272**	**497**
Expenses	**Consumable**	**Combustible**	18,565	15,106	448	100	2,903	8
		Spare parts	19,761	16,519	368	73	2,294	507
		Others	6,616	4,081	1,842	17	668	8
	S. Total		**44,942**	**35,706**	**2,658**	**191**	**5,864**	**523**
	Salaries		**31,963**	**25,335**	**2,030**	**546**	**3,828**	**225**
	Depreciation & amortization		**15,224**	**12,159**	**1,084**	**762**	**1,177**	**42**
	Repair & maintenance		**3,276**	**2,480**	**5**	**3**	**786**	**2**
	Other expenses	**SEZ ope expense**	655	0	0	655	0	0
		Others	5,278	3,944	278	62	977	18
	S. Total		5,933	3,944	278	718	977	18
	Other losses (net)		40	31	0	0	8	0
	Expense total		**101,378**	**79,654**	**6,054**	**2,219**	**12,640**	**810**
Operating profit			**17,011**	**11,486**	**-5,051**	**-1,559**	**11,632**	**-312**

7.2.2 (4) Year 2025

80. Business sector-wise profit & loss statement for 2025 is compiled as follows.

Table 7-7 Business sector-wise profit & loss statement for 2025 (F/S High Case)

2025 (USD '000)

Accounting item			Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring		61,314	60,502	811	0	0	0
	Lift on/off		36,509	36,509	0	0	0	0
	Storage		2,782	2,776	5	0	0	0
	Port charges for ship services		27,044	0	0	0	27,044	0
	Transportation		27	27	0	0	0	0
	Rental income from SEZ		2,144	0	0	2,144	0	0
	Passenger ships		131	0	0	0	0	131
	Rental fee		322	0	0	0	0	322
	Others		88	0	0	0	0	88
Revenue total			**130,363**	**99,815**	**817**	**2,144**	**27,044**	**542**
Expenses	Consumable	Combustible	22,804	18,943	455	103	3,295	8
		Spare parts	24,290	20,714	373	75	2,604	523
		Others	7,771	5,118	1,869	18	758	8
	S. Total		**54,864**	**44,775**	**2,697**	**196**	**6,658**	**539**
	Salaries		**34,591**	**27,417**	**2,197**	**590**	**4,143**	**244**
	Depreciation & amortization		**14,856**	**11,907**	**1,071**	**758**	**1,081**	**39**
	Repair & maintenance		**3,574**	**2,696**	**4**	**3**	**869**	**2**
	Other expenses	SEZ ope expense	675	0	0	675	0	0
		Others	5,438	4,060	276	63	1,021	18
	S. Total		6,114	4,060	276	738	1,021	18
	Other losses (net)		41	32	0	0	9	0
Expense total			**114,039**	**90,887**	**6,246**	**2,285**	**13,779**	**842**
Operating profit			**16,324**	**9,029**	**-5,428**	**-270**	**13,292**	**-299**

7.2.3 15% YoY Case

81. Likewise, business sector-wise profit & loss statements for 2022-2025 for 15% YoY Case are prepared as follows.

7.2.3 (1) Year 2022

82. Business sector-wise profit & loss statement for 2022 is compiled as follows.

Table 7-8 Business sector-wise profit & loss statement for 2022 (15% YoY Case)

2022 (USD '000)

Accounting item		Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring	47,327	46,214	1,113	0	0	0
	Lift on/off	27,887	27,887	0	0	0	0
	Storage	2,830	2,699	131	0	0	0
	Port charges for ship services	19,578	0	0	0	19,578	0
	Transportation	21	20	1	0	0	0
	Rental income from SEZ	622	0	0	622	0	0
	Passenger ships	33	0	0	0	0	33

	Rental fee		295	0	0	0	0	295
	Others		81	0	0	0	0	81
Revenue total			**98,675**	**76,821**	**1,245**	**622**	**19,578**	**409**
Expenses	Consumable	Combustible	11,879	9,078	437	96	2,260	7
		Spare parts	12,620	9,927	358	69	1,787	478
		Others	4,791	2,453	1,795	16	520	7
	S. Total		**29,290**	**21,458**	**2,590**	**182**	**4,568**	**492**
	Salaries		**27,319**	**21,654**	**1,735**	**466**	**3,272**	**193**
	Depreciation & amortization		**14,675**	**10,501**	**1,756**	**1,518**	**863**	**36**
	Repair & maintenance		**2,778**	**2,122**	**6**	**3**	**644**	**2**
	Other expenses	SEZ ope expense	618	0	0	618	0	0
		Others	4,974	3,730	278	61	889	16
	S. Total		5,591	3,730	278	679	889	16
	Other losses (net)		37	29	0	0	7	0
Expense total			**79,690**	**59,493**	**6,366**	**2,849**	**10,242**	**740**
Operating profit			**18,984**	**17,327**	**-5,121**	**-2,227**	**9,336**	**-331**

7.2.3 (2) Year 2023

83. Business sector-wise profit & loss statement for 2023 is compiled as follows.

Table 7-9 Business sector-wise profit & loss statement for 2023 (15% YoY Case)

2023 (USD '000)

Accounting item			Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring		54,148	53,146	1,002	0	0	0
	Lift on/off		32,070	32,070	0	0	0	0
	Storage		2,728	2,661	68	0	0	0
	Port charges for ship services		22,614	0	0	0	22,614	0
	Transportation		24	24	1	0	0	0
	Rental income from SEZ		1,433	0	0	1,433	0	0
	Passenger ships		66	0	0	0	0	66
	Rental fee		304	0	0	0	0	304
	Others		83	0	0	0	0	83
Revenue total			**113,470**	**87,900**	**1,070**	**1,433**	**22,614**	**453**
Expenses	Consumable	Combustible	16,154	12,965	442	98	2,641	7
		Spare parts	17,191	14,178	362	71	2,088	492
		Others	5,949	3,503	1,814	17	608	7
	S. Total		**39,294**	**30,646**	**2,618**	**186**	**5,337**	**507**
	Salaries		**29,545**	**23,418**	**1,876**	**504**	**3,538**	**208**
	Depreciation & amortization		**14,378**	**10,753**	**1,080**	**1,521**	**986**	**37**
	Repair & maintenance		**3,140**	**2,397**	**5**	**3**	**734**	**2**
	Other expenses	SEZ ope expense	636	0	0	636	0	0
		Others	5,122	3,847	273	61	924	16
	S. Total		5,758	3,847	273	697	924	16
	Other losses (net)		38	30	0	0	8	0
Expense total			**92,154**	**71,092**	**5,854**	**2,911**	**11,528**	**771**
Operating profit			**21,315**	**16,868**	**-4,783**	**-1,553**	**11,101**	**-318**

7.2.3 (3) Year 2024

84. Business sector-wise profit & loss statement for 2024 is compiled as follows.

Table 7-10 Business sector-wise profit & loss statement for 2024 (15% YoY Case)

2024 (USD '000)

Accounting item			Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring		62,019	61,118	901	0	0	0
	Lift on/off		36,881	36,881	0	0	0	0
	Storage		2,555	2,550	6	0	0	0
	Port charges for ship services		26,048	0	0	0	26,048	0
	Transportation		28	27	0	0	0	0
	Rental income from SEZ		1,476	0	0	1,476	0	0
	Passenger ships		99	0	0	0	0	99
	Rental fee		313	0	0	0	0	313
	Others		86	0	0	0	0	86
	Revenue total		**129,505**	**100,575**	**908**	**1,476**	**26,048**	**497**
Expenses	Consumable	Combustible	20,603	16,962	448	100	3,085	8
		Spare parts	21,933	18,549	367	72	2,439	506
		Others	7,156	4,582	1,839	17	710	8
		S. Total	**49,693**	**40,093**	**2,654**	**190**	**6,235**	**522**
	Salaries		**31,963**	**25,335**	**2,030**	**546**	**3,828**	**225**
	Depreciation & amortization		**15,317**	**12,280**	**1,078**	**760**	**1,159**	**40**
	Repair & maintenance		**3,554**	**2,711**	**4**	**3**	**834**	**2**
	Other expenses	SEZ ope expense	655	0	0	655	0	0
		Others	5,278	3,970	271	60	960	16
		S. Total	5,933	3,970	271	716	960	16
	Other losses (net)		40	31	0	0	8	0
	Expense total		**106,500**	**84,421**	**6,037**	**2,214**	**13,024**	**805**

7.2.3 (4) Year 2025

85. Business sector-wise profit & loss statement for 2025 is compiled as follows.

Table 7-11 Business sector-wise profit & loss statement for 2025 (15% YoY Case)

2025 (USD '000)

Accounting item		Total	Contr	GC	SEZ	Pilot /tug	Others
Revenues	Stevedoring	71,097	70,285	811	0	0	0
	Lift on/off	42,413	42,413	0	0	0	0
	Storage	2,615	2,610	5	0	0	0
	Port charges for ship services	29,934	0	0	0	29,934	0
	Transportation	32	31	0	0	0	0
	Rental income from SEZ	2,144	0	0	2,144	0	0
	Passenger ships	131	0	0	0	0	131
	Rental fee	322	0	0	0	0	322
	Others	88	0	0	0	0	88
	Revenue total	**148,777**	**115,339**	**817**	**2,144**	**29,934**	**542**

Expenses	Consumable	Combustible	25,735	21,568	455	102	3,602	8
		Spare parts	27,401	23,585	373	74	2,847	521
		Others	8,549	5,827	1,868	17	829	8
	S. Total		**61,684**	**50,980**	**2,695**	**194**	**7,278**	**537**
	Salaries		**34,591**	**27,417**	**2,197**	**590**	**4,143**	**244**
	Depreciation & amortization		**15,103**	**12,187**	**1,068**	**755**	**1,055**	**37**
	Repair & maintenance		**4,026**	**3,072**	**3**	**2**	**947**	**2**
	Other expenses	SEZ ope expense	675	0	0	675	0	0
		Others	5,438	4,097	273	60	992	16
	S. Total		6,114	4,097	273	735	992	16
	Other losses (net)		41	32	0	0	8	0
Expense total			**121,559**	**97,785**	**6,236**	**2,277**	**14,423**	**836**
Operating profit			**27,218**	**17,644**	**-5,419**	**-247**	**15,533**	**-293**

7.3 Balance sheets

86. Balance sheets for each year-end are compiled based on the amounts of revenues, expenses and operating profits in the P/Ls prepared in section 7.2. Balance sheets for F/S High Case and 15% YoY Case are summarized in Table 7-12 and Table 7-13 respectively.

Table 7-12 Balance sheets for the year-ends of 2020-2025 (F/S High Case)

(KHR mil)

	2020	2021	2022	2023	2024	2025
Asset	**1,389,843**	**1,407,654**	**1,433,967**	**1,519,227**	**1,599,375**	**1,588,861**
Non-current assets	**1,194,878**	**1,199,786**	**1,212,049**	**1,267,048**	**1,339,226**	**1,309,148**
Property and equipment	915,369	921,964	929,969	989,359	1,059,806	1,034,776
Investment properties	273,835	271,112	276,862	273,964	277,258	273,675
Intangible assets	5,674	6,711	5,218	3,725	2,161	697
Loans to employees	0	0	0	0	0	0
Current assets	**194,964**	**207,868**	**221,918**	**252,179**	**260,149**	**279,713**
Loans to employees	1,228	0	0	0	0	0
Inventories	23,853	26,926	29,076	40,243	49,678	61,112
Trade and other receivables	34,615	39,695	35,128	38,685	35,651	34,210
Short-term bank deposits	104,527	100,338	99,449	122,659	124,344	131,249
Cash and cash equivalents	30,741	40,909	58,265	50,592	50,476	53,142
Equity	**702,361**	**769,010**	**782,662**	**805,316**	**825,965**	**846,288**
Share capital and share premium	518,018	518,018	518,018	518,018	518,018	518,018
Reserves	29,059	31,720	34,671	37,253	40,736	44,018
Retained earnings	155,284	219,272	229,974	250,045	267,211	284,252
Liabilities	**687,481**	**638,644**	**651,305**	**713,911**	**773,410**	**742,572**
Non-current liabilities	**606,942**	**557,359**	**567,825**	**614,843**	**666,351**	**632,420**
Guaranteed dividend payable	0	0	0	0	0	0
Borrowings	502,344	448,305	451,165	489,087	531,442	485,296
Retirement benefit obligations	78,533	79,415	86,431	93,406	100,997	109,126
Seniority payment obligations	983	728	843	1,234	1,789	2,572
Deferred income	5,406	5,340	5,160	5,224	5,287	5,720
Deferred tax liabilities	19,676	23,571	24,226	25,891	26,836	29,707
Current liabilities	**80,539**	**81,285**	**83,481**	**99,068**	**107,059**	**110,152**
Guaranteed dividend payable	0	0	0	0	0	0
Borrowing	37,602	33,625	33,839	36,684	39,860	36,399
Retirement benefit obligations	7,949	8,139	8,139	8,796	9,511	10,276
Seniority payment obligations	3,126	920	901	1,132	1,423	1,788
Deferred income	133	178	172	174	176	191
Trade and other payables	24,121	28,878	27,935	31,067	34,935	40,408
Income tax liabilities	7,607	9,546	12,494	21,215	21,153	21,090
Equity and Liabilities	**1,389,843**	**1,407,654**	**1,433,967**	**1,519,227**	**1,599,375**	**1,588,861**

Table 7-13 Balance sheets for the year-ends of 2020-2025 (15% YoY Case)

(KHR mil)

	2020	2021	2022	2023	2024	2025
Asset	**1,389,843**	**1,407,654**	**1,462,097**	**1,541,145**	**1,649,376**	**1,735,862**
Non-current assets	**1,194,878**	**1,199,786**	**1,215,712**	**1,267,567**	**1,345,813**	**1,325,192**
Property and equipment	915,369	921,964	933,632	989,878	1,066,393	1,050,820
Investment properties	273,835	271,112	276,862	273,964	277,258	273,675
Intangible assets	5,674	6,711	5,218	3,725	2,161	697
Loans to employees	0	0	0	0	0	0
Current assets	**194,964**	**207,868**	**246,385**	**273,578**	**303,563**	**410,669**
Loans to employees	1,228	0	0	0	0	0
Inventories	23,853	26,926	29,076	40,243	49,678	61,112
Trade and other receivables	34,615	39,695	39,786	44,671	48,211	57,042
Short-term bank deposits	104,527	100,338	112,636	141,641	168,152	218,846
Cash and cash equivalents	30,741	40,909	62,322	44,089	32,022	65,761
Equity	**702,361**	**769,010**	**791,258**	**826,222**	**873,966**	**943,321**
Share capital and share premium	518,018	518,018	518,018	518,018	518,018	518,018
Reserves	29,059	31,720	34,671	38,113	42,827	48,819
Retained earnings	155,284	219,272	238,569	270,091	313,121	376,485
Liabilities	**687,481**	**638,644**	**670,839**	**714,923**	**775,410**	**792,541**
Non-current liabilities	**606,942**	**557,359**	**585,448**	**614,533**	**665,827**	**675,554**
Guaranteed dividend payable	0	0	0	0	0	0
Borrowings	502,344	448,305	468,803	488,808	530,766	528,247
Retirement benefit obligations	78,533	79,415	86,431	93,406	100,997	109,126
Seniority payment obligations	983	728	843	1,234	1,789	2,572
Deferred income	5,406	5,340	5,145	5,193	5,439	5,903
Deferred tax liabilities	19,676	23,571	24,226	25,891	26,836	29,707
Current liabilities	**80,539**	**81,285**	**85,391**	**100,390**	**109,583**	**116,986**
Guaranteed dividend payable	0	0	0	0	0	0
Borrowing	37,602	33,625	35,162	36,663	39,810	39,621
Retirement benefit obligations	7,949	8,139	8,139	8,796	9,511	10,276
Seniority payment obligations	3,126	920	901	1,132	1,423	1,788
Deferred income	133	178	172	173	181	197
Trade and other payables	24,121	28,878	28,523	32,408	37,338	43,682
Income tax liabilities	7,607	9,546	12,494	21,218	21,320	21,422
Equity and Liabilities	**1,389,843**	**1,407,654**	**1,462,097**	**1,541,145**	**1,649,376**	**1,735,862**

7.4 ROE and ROA

87. Based on the balance sheets compiled above, Return on Equity (ROE) and Return on Assets (ROA) are calculated as shown in Table 7-14.

Table 7-14 ROE and ROA for 2021-2025

		2021	2022	2023	2024	2025
F/S High Case	Profit before tax	46,856	41,282	51,012	48,606	46,558
	Total Equity	769,010	782,662	805,316	825,965	846,288
	Total Assets	1,407,654	1,433,967	1,519,227	1,599,375	1,588,861
	ROE	**6.09%**	**5.27%**	**6.33%**	**5.88%**	**5.50%**
	ROA	**3.33%**	**2.88%**	**3.36%**	**3.04%**	**2.93%**
15% YoY Case	Profit before tax	46,856	49,879	63,325	75,867	95,743
	Total Equity	769,010	791,258	826,222	873,966	943,321
	Total Assets	1,407,654	1,462,097	1,541,145	1,649,376	1,735,862
	ROE	**6.09%**	**6.30%**	**7.66%**	**8.68%**	**10.15%**
	ROA	**3.33%**	**3.41%**	**4.11%**	**4.60%**	**5.52%**

88. The trends of the estimated ROE and ROA values for the year 2021-2025 are indicated in

Figure 7-3 together with the actual values for the year 2015-2020. In F/S High Case, values of both ROE and ROA will be almost flat during the next 5 years, while the same will increase significantly in 15% YoY Case.

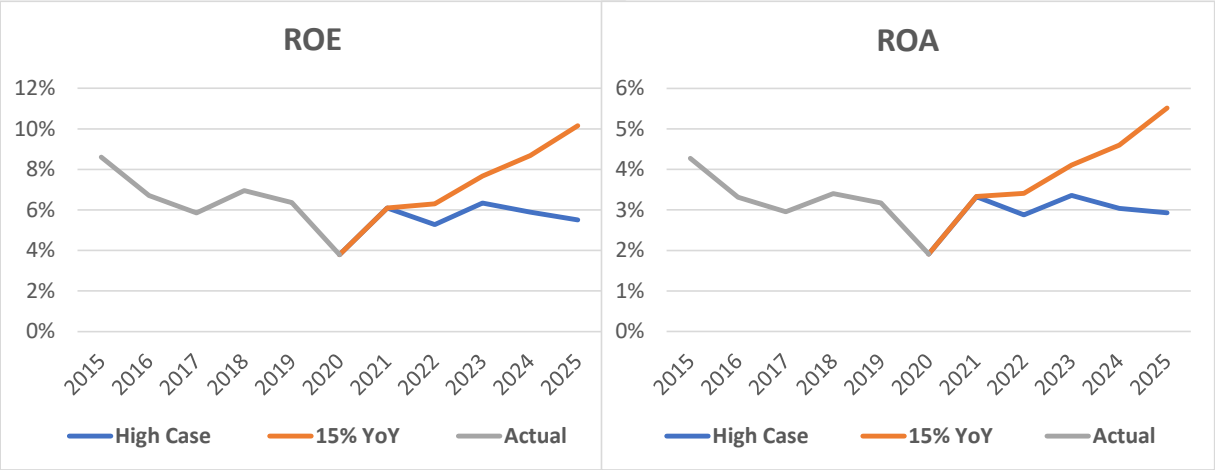


Figure 7-3 Trends of ROE and ROA (2015-2025)

End

C. Container Management System (CTMS) Extended Usage Manual

CONTAINER
MANAGEMENT SYSTEM (CTMS)
EXTENDED USAGE MANUAL
FOR
SIHANOUKVILLE AUTONOMOUS PORT(PAS)

December 2021

JICA Expert Team

List of Abbreviations and Terminology

Abbreviation	Description
ATD	Actual Time of Departure
CFS	Container Freight Station
CHE	Container Handling Equipment, such as QGC, RTG, RS
CTMS	Container Terminal Management System. The name of the Terminal Operation System (TOS) for PAS
CTOD	Container Terminal Operation Department of PAS
CY	Container Yard
EDI	Electronic Data Interchange
EIR	Equipment Interchange Receipt. EIR is issued by the container terminal to show a container is received from / delivered to a customer.
ETA/ETD	Estimated Time of Arrival / Estimated Time of Departure
GCOD	General Cargo Operation Department of PAS
HMSD	Harbor Master & Security Department of PAS
ID	Identification
KPI	Key Performance Indicator
OOG	Out of Gauge
PAS	Sihanoukville Autonomous Port
PDF	Portable Document Format. The name of the form of the document.
QGC	Quay Gantry Crane
QR code	Quick Response code. A machine-readable code consisting of an array of black and white squares
RS	Reach Stacker
RTG	Rubber Tired Gantry Crane
RHO	Reefer / Hazardous /Out of Gauge
SOP	Standard Operation Procedure
SQL	Structured Query Language
SWSS	Single Window Service System. One of the systems used in PAS.
TDR	Terminal Departure Report
TEU	Twenty-foot Equivalent Unit.
UN/EDIFACT	United Nations/Electronic Data Interchange for Administration, Commerce and Transport.
UPS	Uninterrupted Power Supply
MDT	Mobile Data Terminal. MDT is a PC, which installed on the cabin of QGC, RTG, and Reach Stacker and use as a devices for CTMS.

CONTENTS

1. OVERVIEW

This document describes how to obtain the valuable information for PAS including the KPI using the CTMS raw data. These methods are actually used by the Team in order to examine the activities of container movements in PAS and to prepare materials for workshops during the project

2. INFORMATION OF CTMS

The following CTMS data can be used to get the information.

2.1. Container History Table (cHistory)

Most of the statistical data can be obtained from the Container History Data. The following table shows the major items used for getting the statistical data from cHistory. Records of this table will not be deleted and kept in the database.

Table 2-1 Major Items of cHistory Table

Item Name	Data Type	Description
ActTime	timestamp	Date and time of the activity
ActCode	Char(3)	Activity code (refer to the table Table 2-2)
CntnrNo	Char(12)	Container number
InActTime	timestamp	Date and time of gate receiving data entry for receiving or data entry at the quay for discharging
InStckTime	timestamp	Date and time when the container is stacked in the yard for receiving or for discharging
OutRecTime	timestamp	Date and time of gate delivery data entry for delivery
OutUnstckTime	timestamp	Date and time when the container is picked up at the yard for delivery or for loading
OutActTime	timestamp	Date and time of gate out delivery data entry for delivery or of loading entry at the quay for loading
XIE	Char(1)	X: Export, I: Import, E: Empty
CntnrSiz	Char(2)	Container size (20/40/45)
CntnrTyp	Char(2)	Container type code
CntnrHgh	Char(2)	Container height code
LPortCd	Char(5)	Loading port code
DPortCd	Char(5)	Discharging port code
FullEmpty	Char(1)	Full or empty (F: Full, E: Empty)
CntnrLine	Char(5)	Shipping line code
RHO	Char(2)	Reefer(R)/Hazardous(H)/OOG(O) R/H/O/RH/HO
CntnrGW	Int	Container gross weight in kg
ChassNo	Char(10)	Truck ID for hauliers' truck
DlGCNo	Char(2)	QGC number from/to which the container is discharged/loaded

Table 2-2 Activity Code

Activity Code	Description
0CN	Change of container number
0CS	Change of container size
0CV	Change of the vessel code
1DV	Devanning
1EX	Change of base status from Empty to Export
1GD	Gate delivery
1GR	Gate receiving
1IE	Change of base status from Import to Empty
1IX	Change of base status from Import to Export
1LD	Ship loading
1UL	Ship unloading
1VN	Vanning
9DV	Cancel of devanning
9EX	Cancel of base status change from Empty to Export
9GD	Cancel of gate delivery
9GR	Cancel of gate receiving
9IE	Cancel of base status change from Import to Empty
9IX	Cancel of base status change from Import to Export
9LD	Cancel of ship loading
9UL	Cancel of ship unloading

2.2. Work Instruction History Table (yWkInstHist)

The yWkInstHist table keeps the history data of work instructions transmitted to the Mobile Data Terminal (MDT) installed on the Container Handling equipment. This table is kept only for few months and deleted periodically. The following table shows the major items used for getting the statistical data.

Table 2-3 Major Items of yWkInstHist Table

Item Name	Data Type	Description
EquipTyp	Char(1)	Type of equipment. ‘T’: RTG, ‘L’: Reach Stacker
WorkKind	Char(2)	Type of container handling: ‘ R’: Receiving, ‘ D’: Delivery, ‘UL’: Unloading, ‘ L’: Loading, ‘TU’: OnceLand
YLocExtFm	Char(8)	From Yard Location (work instruction)
YLocExtTo	Char(8)	To Yard Location (work instruction)
RcvTime	datetime	Date and time of receiving instruction
CmpTime	datetime	Date and time of completion of the movement
YLocExtCmp	Char(8)	Result of the Yard Location (To)
SelectingEqNo	Char(5)	Equipment number whose operator selected the instruction

2.3. Container Inventory Data (cCntnrInfo)

The container inventory of the yard can be picked up from the cCntnrInfo table. The following table shows the major items for cCntnrInfo.

Table 2-4 Major Items of cCntnrInfo Table

Item Name	Data Type	Description
CntnrNo	Char(12)	Container number
XIE	Char(1)	X: Export, I: Import, E: Empty
CStckFlg	Char(1)	1: Stacked in the yard
CntnrSiz	Char(2)	Container size (20/40/45)
CntnrTyp	Char(2)	Container type code
CntnrHgh	Char(2)	Container height code
CntnrLine	Char(5)	Shipping line of the container
LPortCd	Char(5)	Loading port code
FullEmpty	Char(1)	F: Full container, E: Empty container
YLocExt	Char(8)	Yard Location (External)
InActTime	datetime	Date and time of received or discharged
Consignee	Char(50)	Consignee name
GoodDscrpt	Char(30)	Description of goods stored in the container

2.4. Vessel Schedule Data (cSchedule)

The vessel schedule and the history of vessel calls can be picked up from the cSchedule table. The following table shows the major items for cSchedule.

Table 2-5 Major Items of cCntnrInfo Table

Item Name	Data Type	Description
VslCode	Char(5)	Vessel Code
VoyCtrl	Char(8)	Voyage Control Number. It is automatically given by the system whenever the schedule is registered.
ExVoyage	Char(6)	Voyage number for outgoing voyage
ImpVoyage	Char(6)	Voyage number for incoming voyage
VslLine	Char(5)	Shipping line of the vessel
DRouteCode	Char(10)	Vessel route (service) code for outgoing voyage
LRouteCode	Char(10)	Vessel route (service) code for outgoing voyage
ETA	datetime	Estimated date and time of arrival of the vessel
ETB	datetime	Estimated date and time of berthing of the vessel
ETD	datetime	Estimated date and time of departure of the vessel
ATA	datetime	Actual date and time of arrival of the vessel
ATB	Datetime	Actual date and time of berthing of the vessel
ATD	datetime	Actual date and time of departure of the vessel
BerthPlace	Char(4)	Berth Number

3. CTMS DATA USAGE IN THE PROJECT

3.1. Usage of the raw data of Microsoft SQL Server

(1) Preparation before using the raw data of TOS

CTMS raw data can be obtained by using utilities provided by MS SQL Server. However, the actual TOS database shall not be used directory for this purpose. The database must be re-generated in the other PC as a different instance by restoring the CTMS backup data. This is because the reference to the raw data of live database may affect the performance of the TOS application software, or it may damage the database data by accident or some mistake.
The database can be restored from the CTMS backup data using the SQL Server Management Studio, database > task > Restore > Database function.

(2) SQL command

SQL command is used to get the data from the TOS database. The typical commands to get the data is shown below. Words in capital letters are the keywords for SQL server.

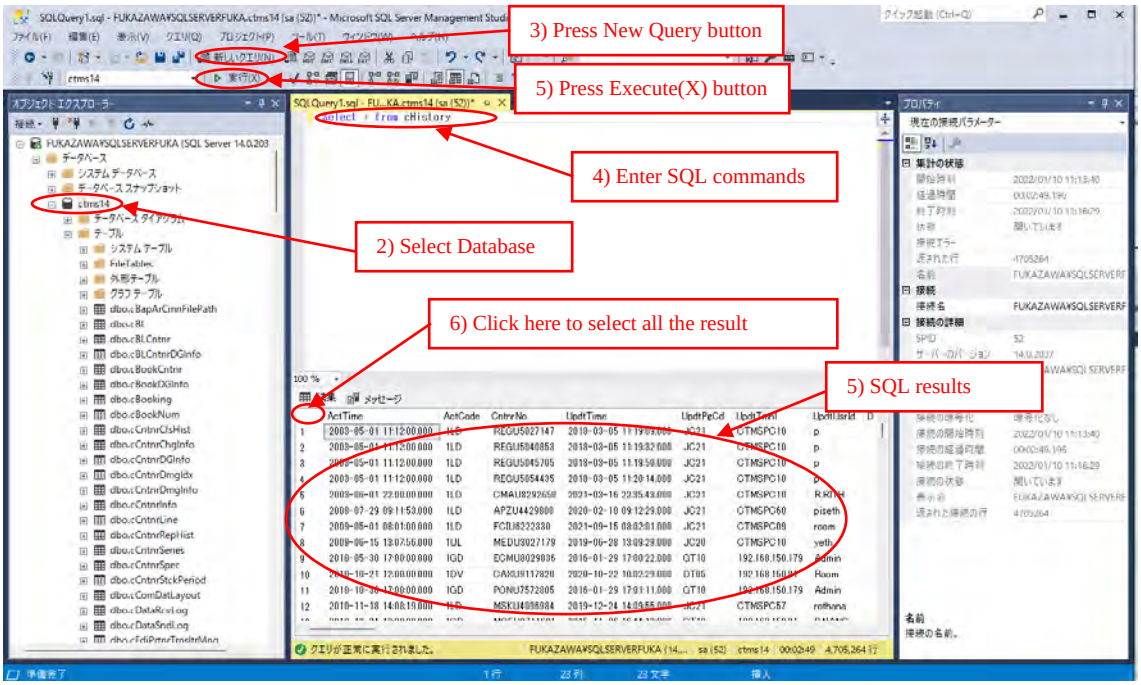
a. Get the item values
SELECT (items) FROM (table) WHERE (condition) ORDER BY (items)

where (items): Items of the table. Commas are used to separate multiple items.
'*' shows all the items of the table.
(table): Table name.
(condition): Data select conditions. E.g. (Cntnrsiz = '20' and Cntnrtyp = 'RF'), etc.

b. Get the summary of the tables
SELECT (items), COUNT(*) FROM (table) where (condition) WHERE (condition)
GROUP BY (items) ORDER BY (items)

where COUNT(*):the summary of the value grouped by the items in GROUP BY clause.
(items): Items of the table. Commas are used to separate multiple items.
(table): Table name.
(condition): Data select conditions

c. Sample screen of SQL Server Management Studio for SQL command



Procedure:

1) Open Server Management Studio (login is required with password for database)

2) Select Database by the mouse click

3) Press New Query button, then the entry screen of SQL is shown.

4) Enter the SQL command

5) Press Execute(X) button, then the result is shown on the window below.
The result can be copied by pressing the area (6)), then pasted in Excel file, etc.

7) The SQL program can be stored in any file.
The file can be reloaded by selecting file menu > open

3.2. List of the SQL programs used in this project

Table 3-1 List of Major SQL Programs Developed

Type	Program Name	Description
KPI Calculation	TurnAroundRec	Calculate KPI of turnaround time for export full receiving (from gate-in to the yard)
	TurnAroundDel1	Calculate KPI of turnaround time for import full delivery (from gate-in to the yard)
	TurnAroundDel2	Calculate KPI of turnaround time for import full delivery (from yard to gate-out)
Statistical Ratio	SizeRatio	Calculate ratio between size
	FullEmpRatio	Calculate ratio between full/empty
	RHORatio	Calculate ratio among standard/reefer/hazardous/OOG
Inventory & Long Stay	InventoryByLine	Calculate empty container inventory summary by line
	InventoryByArea	Calculate inventory summary by area
	LongStay	Calculate inventory of Long Stay containers
Throughput	VslByMonth	Calculate monthly vessel load/discharge containers
Gate Statistics	GateInExpByHour	Calculate recap of gate receiving requests by full/empty per hour
	GateInImpByHour	Calculate recap of gate delivery request by full/empty per hour
RTG Work	RTGWkByHour	List up completed works for each RTG
Simulation	DelHour	Calculate recap of container delivery per hour per day
	RecHour	Calculate recap of container delivery per hour per day
	DelPattern	Calculate delivery pattern (# of container delivery per day) since vessel departure
	RecPatternFull	Calculate full receiving pattern (# of full container receiving per day) until vessel arrival
	ULLportStat	Calculate statistics of discharging containers by loading port
	LDDportStat	Calculate statistics of loading containers by discharging port
	VslRHOSum	Calculate summary of load/discharge container by RHO
Others	VesselCall	Calculate number of calls for each vessel per year
	VslProdQGC	Calculate number of load/discharge containers per hour per QGC
	VanDevan	Calculate number of container vanned/devanned of the year

3.3. Details of the Programs

3.3.1. KPI

(1) TurnAroundRec

a. Overview

This SQL pickups the container number, size, and turnaround time (from the in-date reception to the yard stack) for export full containers received in November 2021.

b. SQL Statement

```
SELECT    CntnrNo, CntnrSiz, InActTime, InStckTime,
          DATEDIFF(MINUTE, InActTime, InStckTime) TRTime
FROM      cHistory
WHERE     ActCode = '1GR'  AND                    /* for receiving */
          FullEmpty = 'F' AND              /* only for full conitaner */
          ChassNo <> ' ' AND               /* exclude rail to yard */
          DATEDIFF(MINUTE, OutRecTime, OutUnstckTime > 0 AND
                                           /* avoid irregular case */
          DATEDIFF(MINUTE, OutRecTime, OutUnstckTime < 1440 AND
                                           /* avoid irregular case */
          CONVERT(VARCHAR(6),InActTime, 112) = '202111'
ORDER BY  ACTTIME
```

c. Explanation:

Element	Explanation
DATEDIFF(MINUTE, a, b) TRTime	Function to calculate difference of the item value between item a and item b in minutes. The result is named as is 'TRTime'
CONVERT(VARCHAR(6), a, 112)	Function to convert item a of datetime type item to format 112 (YYYYMM) in varchar(6) time value.

(2) TurnAroundDel1

a. Overview

This SQL pickups the container number, size, and turnaround time (from the gate-in reception to the pickup of delivery container in the yard) for import full containers delivered in November 2021.

b. SQL Statement

```
SELECT    CntnrNo, CntnrSiz, OutRecTime, OutUnstckTime,
          DATEDIFF(MINUTE, OutRecTime, OutUnstckTime) TRTime1
          FROM  cHistory
          WHERE ActCode = '1GR'  AND       /* for delivery */
          FullEmpty = 'F' AND              /* only for full container */
          ChassNo <> ' ' AND               /* exclude yard to rail */
          DATEDIFF(MINUTE, OutRecTime, OutUnstckTime > 0 AND
                                           /* avoid irregular case */
          DATEDIFF(MINUTE, OutRecTime, OutUnstckTime < 1440 AND
                                           /* avoid irregular case */
          CONVERT(VARCHAR(6), OutUnstckTime, 112) = '202111'
ORDER BY  ACTTIME
```

(3) TurnAroundDel2

a. Overview

This SQL pickups the container number, size, and turnaround time (from the pickup of delivery container in the yard to the gate out) for import full containers delivered in November 2021.

b. SQL Statement

```
SELECT      CntnrNo, CntnrSiz, OutUnstckTime, OutActTime,
            DATEDIFF(MINUTE, OutUnstckTime, OutActTime) TRTime2
FROM        cHistory
WHERE       ActCode = '1GR'  AND                    /* for delivery */
            FullEmpty = 'F' AND                     /* only for full container */
            ChassNo <> ' ' AND                      /* exclude yard to rail */
            DATEDIFF(MINUTE, OutUnstckTime, OutActTime > 0 AND
                                                    /* avoid irregular case */
            DATEDIFF(MINUTE, OutUnstckTime, OutActTime < 1440 AND
                                                    /* avoid irregular case */
            CONVERT(VARCHAR(6),OutActTime, 112) = '202111'
            ORDER BY      ACTTIME
```

3.3.2. Statistical ration

(1) SizeRatio

a. Overview

This SQL shows the summary of containers loaded and discharged in 2021 for each container size. It is used to assume the ratio among container size (20/40/45).

b. SQL Statement

```
SELECT      CntnrSiz, COUNT (*)
FROM        cHistory
WHERE       YEAR(ActTime) = '2021'
GROUP BY    CntnrSiz
ORDER BY    CntnrSiz
```

(2) FullEmpRatio

a. Overview

This SQL shows the summary of containers loaded and discharged in 2021 for each activity, container size, and full or empty. It is used to assume the ratio between full or empty.

b. SQL Statement

```
SELECT      ActCode, CntnrSiz, FullEmpty, COUNT (*)
FROM        cHistory
WHERE       (ActCode = '1UL' OR ActCode = '1LD) AND
            YEAR(ActTime) = '2021'              /* Functions to return Year */
GROUP BY    ActCode, CntnrSiz, FullEmpty
ORDER BY    ActCode, CntnrSiz, FullEmpty
```

(3) RHORatio

a. Overview

This SQL shows the summary of containers loaded and discharged in 2021 for each activity, container size, full or empty, and RHO. It is used to assume the ratio among RHO.

b. SQL Statement

```
SELECT      ActCode, CntnrSiz, FullEmpty, RHO, COUNT (*)
FROM        cHistory
WHERE       (ActCode = '1UL' OR ActCode = '1LD) AND
            YEAR(ActTime) = '2021'              /* Functions to return Year */
```

```
GROUP BY    ActCode, CntnrSiz, FullEmpty, RHO
ORDER BY    ActCode, CntnrSiz, FullEmpty, RHO
```

3.3.3. Inventory & long stay

(1) EmptyInventoryByLine

a. Overview

This SQL shows the summary of empty containers stacked in the yard for each shipping line and container size.

b. SQL Statement

```
SELECT      CntnrLine, CntnrSiz, COUNT (*)
FROM        cCntnrInfo
WHERE       cStckFlg = '1' AND
            (XIE = 'E' OR FullEmpty = 'E')
GROUP BY    CntnrLine, CntnrSiz
ORDER BY    CntnrLine, CntnrSiz
```

(2) InventoryByArea

a. Overview

This SQL shows the summary of containers stacked in the yard for each area code, XIE, full or empty, and size.

b. SQL Statement

```
SELECT      SUBSTRING (YlocExt, 1. 2), XIE, FullEmpty,  CntnrSiz, COUNT (*)
FROM        cCntnrInfo
WHERE       cStckFlg = '1' AND
            SUBSTrING(YlocExt, 1, 1) <> '@'
            /* to eliminate containers which have requested for delivery or loading */
GROUP BY    SUBSTRING (YlocExt, 1. 2), XIE, FullEmpty,  CntnrSiz
ORDER BY    SUBSTRING (YlocExt, 1. 2), XIE, FullEmpty,  CntnrSiz
```

c. Explanation:

Element	Explanation
SUBSTRING (item, 1, 2)	Function to pickup substring from the item of the first character to 2nd character.

(3) LongStay

a. Overview

This SQL shows the summary of containers, which stay in the yard for equal to or more than 120 days.

b. SQL Statement

```
SELECT      XIE, FullEmpty,  CntnrSiz, COUNT (*)
FROM        cCntnrInfo
WHERE       cStckFlg = '1' AND
            DATEDIFF(DAY, InActTime, GetDate()) >=120
GROUP BY    XIE, FullEmpty,  CntnrSiz
ORDER BY    XIE, FullEmpty,  CntnrSiz
```

c. Explanation:

Element	Explanation
DATEDIFF(DAY, a, b)	Function to calculate the date difference between a and b.

3.3.4. Throughput

(1) VslByMonth

a. Overview

This SQL shows the monthly summary of containers loaded and discharged for each since the year 2021. Number of cancellation (Actcode = 9UL or 9LD) shall be subtracted from number of load/discharge (Actcode = 1UL or 1LD) manually.

b. SQL Statement

```
SELECT      YEAR(ActTiem), Month(ActTime), ActCode, CntnrSiz, COUNT (*)
FROM        cHistory
WHERE       ActCode IN ('1UL', '1LD', '9UL', '9LD')  AND YEAR(ActTime) > '2019'
GROUP BY    YEAR(ActTiem), Month(ActTime), ActCode, CntnrSiz
ORDER BY    YEAR(ActTiem), Month(ActTime), ActCode, CntnrSiz
```

3.3.5. Gate statistics

(1) GateInExpByHour

a. Overview

This SQL shows the hourly summary of export containers received at the gate on 2021/10/29.

b. SQL Statement

```
SELECT      ActCode, DATEPART(HOUR, InActTime), COUNT (*)
FROM        cHistory
WHERE       XIE = 'X' AND ChassNo <> ' ' AND
            CONVERT(VERCAHR(8), InActTime, 112) = '20211029' AND
GROUP BY    ActCode, DATEPART(HOUR, InActTime)
ORDER BY    ActCode, DATEPART(HOUR, InActTime)
```

c. Explanation:

Element	Explanation
DATEPART(HOUR, (item))	Function to pickup Hour part from the item of datetime type

(2) GateInImpByHour

a. Overview

This SQL shows the hourly summary of export containers received at the gate on 2021/10/29.

b. SQL Statement

```
SELECT      ActCode, DATEPART(HOUR, OutRecTime), COUNT (*)
FROM        cHistory
WHERE       XIE = 'I' AND
            CONVERT(VERCAHR(8), OutRecTime, 112) = '20211029' AND
GROUP BY    ActCode, DATEPART(HOUR, OutRecTime)
ORDER BY    ActCode, DATEPART(HOUR, OutRecTime)
```

3.3.6. RTG analysis

(1) RTGWkByHour

a. Overview

This SQL shows the hourly summary of export containers received at the gate on 2021/10/29.

b. SQL Statement

```
SELECT      WorkKind, DATEPART(HOUR, CmpTime), SelectingEqNo, COUNT (*)
FROM        yWkInstHist
WHERE       WorkKind <> ‘ ‘ AND
            EquipTyp = ‘T’
GROUP BY    WorkKind. DATEPART(HOUR, CmpTime), SelectingEqNo
ORDER BY    WorkKind. DATEPART(HOUR, CmpTime), SelectingEqNo
```

3.3.7. Basic data for simulation

(1) DelHour

a. Overview

This SQL shows the hourly summary of import containers delivered at the gate on Saturday in 2021.

b. SQL Statement

```
SELECT      ActCode, DATEPART(HOUR, OutRecTime), COUNT (*)
FROM        cHistory
WHERE       ActCode = ‘1GD’ AND
            FullEmpty = ‘F’ AND
            YEAR(OutRecTime) = ‘2021’ AND
            ChassNo <> ‘ ‘ AND
            DATEPART(WEEKDAY, OutRecTime) = 7
GROUP BY    ActCode, DATEPART(HOUR, OutRecTime)
ORDER BY    ActCode, DATEPART(HOUR, OutRecTime)
```

c. Explanation

Element	Explanation
DATEPART(WEEKDAY, (item))	Function to Return the day of the week for the item of datetime type. The value to be returned; 1: Sunday, 2: Monday, 3: Tuesday, 4: Wednesday, 5: Thursday, 6: Friday, 7: Saturday

(2) RecHour

a. Overview

This SQL shows the hourly summary of export containers received at the gate on Friday in 2021.

b. SQL Statement

```
SELECT      ActCode, DATEPART(HOUR, InActTime), COUNT (*)
FROM        cHistory
WHERE       ActCode = ‘1GR’ AND
            FullEmpty = ‘F’ AND
            YEAR(InActTime) = ‘2021’ AND
            ChassNo <> ‘ ‘ AND
            DATEPART(WEEKDAY, InActTime) = 6
GROUP BY    ActCode, DATEPART(HOUR, InActTime)
ORDER BY    ActCode, DATEPART(HOUR, InActTime)
```

(3) DelPattern

a. Overview

This SQL shows the daily summary of import containers for the selected vessel, which are delivered at the gate for each number days after the vessel arrival. In the following example, the

vessel, whose VoyCtrl = ‘007813’ and arrived on 2021/11/01, is selected to get the delivery pattern.

b. SQL Statement

```
SELECT      VslCode, VotCtrl, DATEDIFF(DAY, ‘2021.11.01’, OutActTime), COUNT (*)
FROM        cHistory
WHERE       ActCode = ‘1GD’ AND
            VoyCtrl = ‘007813’
GROUP BY    VslCode, VotCtrl, DATEDIFF(DAY, ‘2021.11.01’, OutActTime)
ORDER BY    VslCode, VotCtrl, DATEDIFF(DAY, ‘2021.11.01’, OutActTime)
```

(4) RecPatternFull

a. Overview

This SQL shows the daily summary of export full containers, which are received for the selected vessel at the gate for each number days before the vessel arrival. In the following example, the vessel, whose VoyCtrl = ‘007813’ and arrived on 2021/11/01, is selected to get the receiving pattern.

b. SQL Statement

```
SELECT      VslCode, VotCtrl, DATEDIFF(DAY, InActTime , ‘2021.11.01’), COUNT (*)
FROM        cHistory
WHERE       ActCode = ‘1GR’   AND
            VoyCtrl = ‘007813’ AND
            Full Empty = ‘F’
GROUP BY    VslCode, VotCtrl, DATEDIFF(DAY, InActTime , ‘2021.11.01’)
ORDER BY    VslCode, VotCtrl, DATEDIFF(DAY, InActTime , ‘2021.11.01’)
```

(5) ULLportStat

a. Overview

This SQL shows the summary of discharged containers for each loading port, full or empty, and container size by vessel, which arrived in 2021.

b. SQL Statement

```
SELECT      VslCode, VotCtrl, LPortCd, FullEmpty, CntnrSiz, COUNT (*)
FROM        cHistory
WHERE       ActCode = ‘1UL’   AND
            YEAR(ActTime) = ‘2021’ AND
GROUP BY    VslCode, VotCtrl, LportCd, FullEmpty, CntnrSiz
ORDER BY    VslCode, VotCtrl, LportCd, FullEmpty, CntnrSiz
```

(6) LDDportStat

a. Overview

This SQL shows the summary of loaded containers for each discharging port, full or empty, and container size by vessel, which arrived in 2021.

b. SQL Statement

```
SELECT      VslCode, VotCtrl, DportCd, FullEmpty, CntnrSiz, COUNT (*)
FROM        cHistory
WHERE       ActCode = ‘1LD’   AND
            YEAR(ActTime) = ‘2021’
```

```
GROUP BY    VslCode, VotCtrl, DportCd, FullEmpty, CntnrSiz
ORDER BY    VslCode, VotCtrl, DportCd, FullEmpty, CntnrSiz
```

(7) VslRHOSum

a. Overview

This SQL shows the summary of load/discharge container for each full or empty, and RHO for the vessels, which arrived in 2021.

b. SQL Statement

```
SELECT      VslCode, VotCtrl, FullEmpty, RHO, COUNT (*)
FROM        cHistory
WHERE       (ActCode = '1UL' OR ActCode = '1LD')   AND
            YEAR(ActTime) = '2021'
GROUP BY    VslCode, VotCtrl, FullEmpty, RHO
ORDER BY    VslCode, VotCtrl, FullEmpty, RHO
```

3.3.8. Others

(1) VesselCall

a. Overview

This SQL shows the summary of vessel calls for each vessel in 2021.

b. SQL Statement

```
SELECT      VslCode, COUNT (*)
FROM        cSchedule
WHERE       YEAR(ATA) = '2021'
GROUP BY    VslCode
ORDER BY    VslCode
```

(2) VslProdQGC

a. Overview

This SQL shows the hourly summary of discharged/loaded containers by QGC on the specified day.

b. SQL Statement

```
SELECT      DATEPART(HOUR, ActTime), DlGcNo, ActCode, VslCode, COUNT(*)
FROM        cHistory
WHERE       (ActCode = '1LD' OR ActCode = '1UL') AND
            CONVERT(VARCHAR(8), ActTime, 112) = '20121101'
GROUP BY    DATEPART(HOUR, ActTime), DlGcNo, ActCode, VslCode
ORDER BY    DATEPART(HOUR, ActTime), DlGcNo, ActCode, VslCode
```

(3) VanDevan

a. Overview

This SQL shows the monthly summary of van/de-van containers from 2019 to 2021.

b. SQL Statement

```
SELECT      YEAR(ActTime), MONTH(ActTime), COUNT(*)
FROM        cHistory
WHERE       (ActCode = '1VN' OR ActCode = '1DV') AND
            YEAR(ActTime) >= '2018'
```

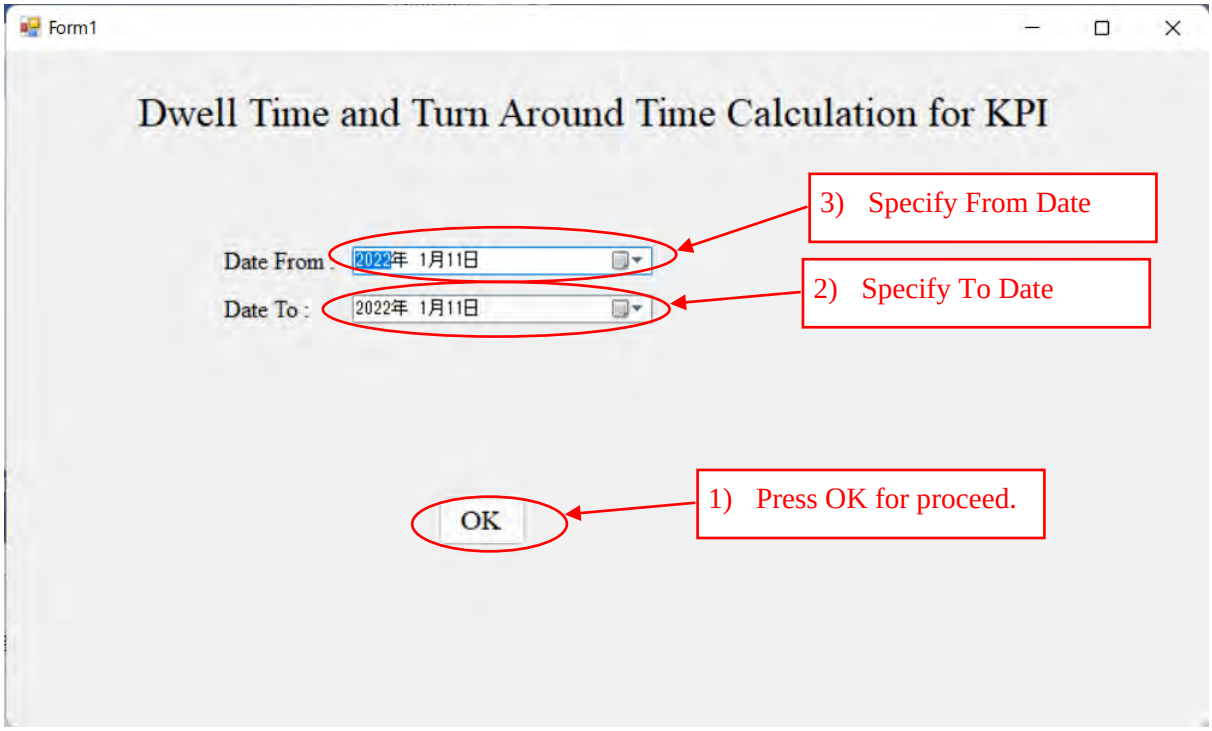
```
GROUP BY    YEAR(ActTime), MONTH(ActTime)
ORDER BY    YEAR(ActTime), MONTH(ActTime)
```

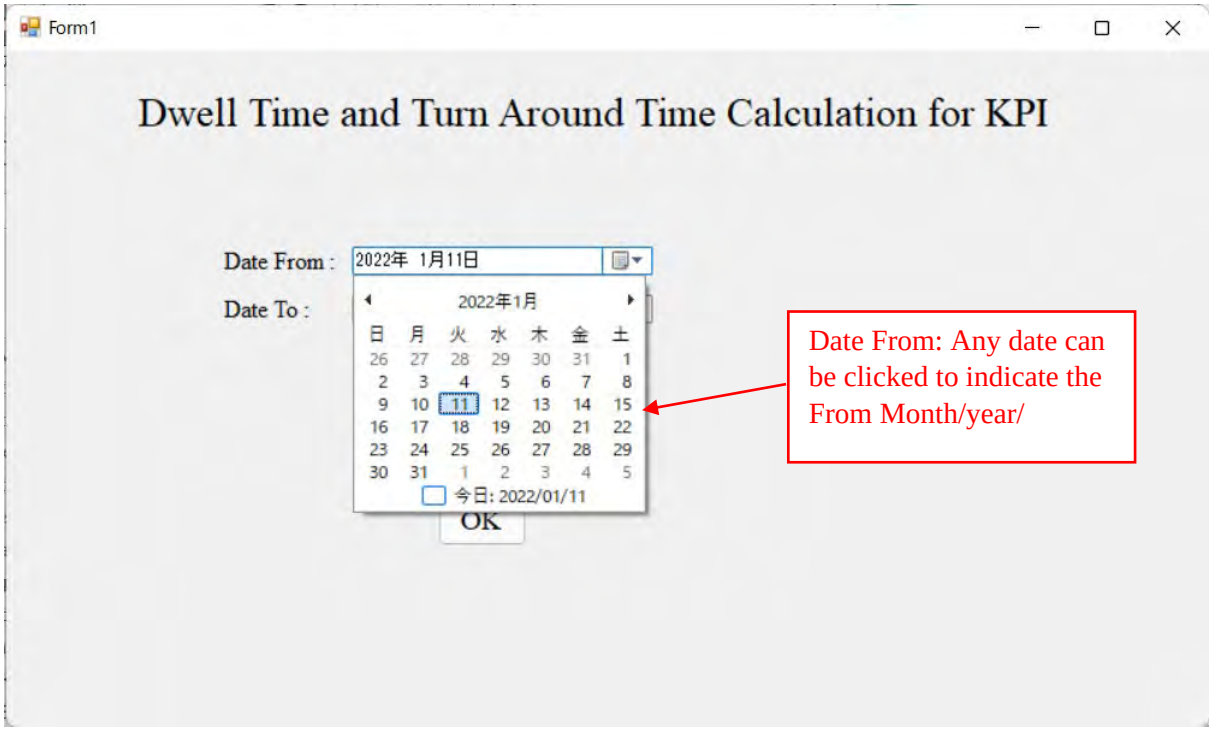
3.4. The Proggram to obtain KPI information

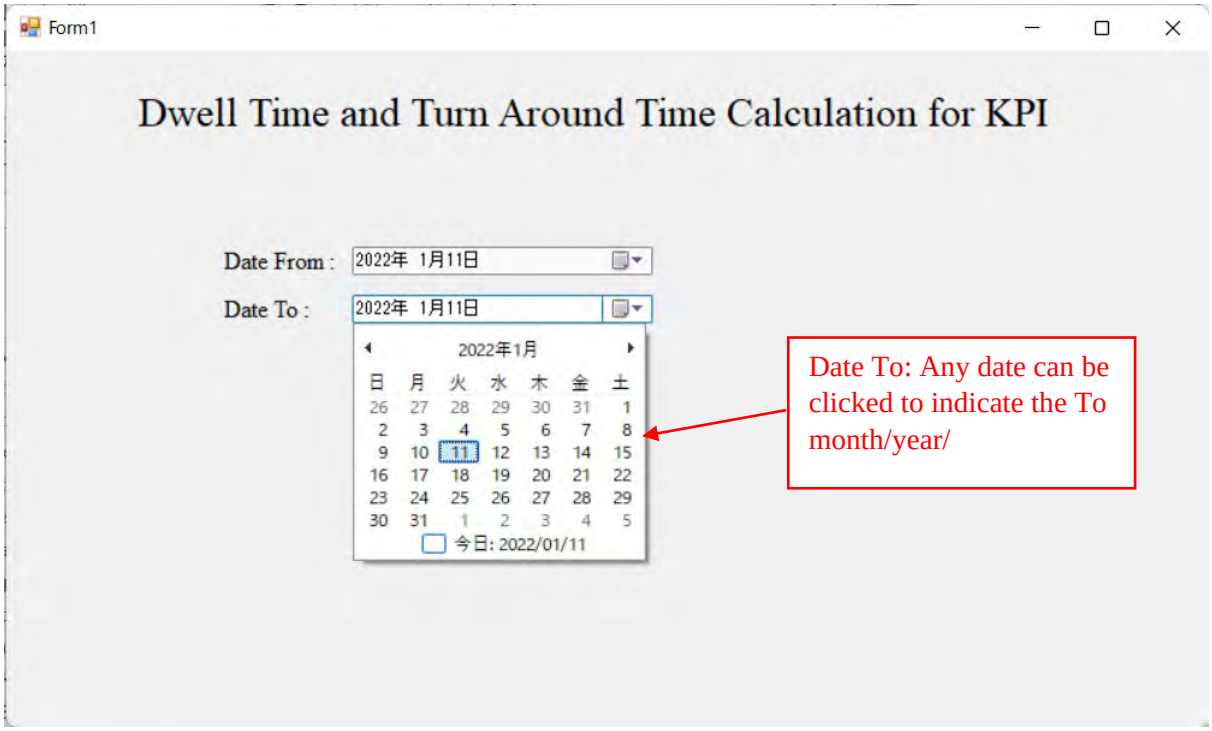
(1) Overview

The Team developed the program to calculate the KPI value of Container Dwell Time and Trailer Turnaround Time using CTMS database and output them in CSV file. The program allows a user to specify the period of calculation from the screen.

(2) How to run the program







(3) Output

The CSV file name work.csv is generated in the directory where the program executable file is stored. If the file exists, the new record is added to the existing file.

a. Dwell Time
The dwell time for import and export containers are calculated for each month. Number of containers, the summary of days, and the average days are shown in the file below.

b. Turnaround Time
The turnaround time for import and export containers are calculated for each month. Number of containers, the summary of hours, and the average hours are shown in the file below.

H20

	A	B	C	D	E	F
1	Dwell Time (days) of import/export containers (from 2021/9 to 2021/11)					
2	Month	Title	Imp Emp	Imp Full	Exp Emp	Exp Full
3	2021/9	# cases	3409	15582	5953	12366
4		TTL Dwell	10900	66107	49914	65849
5		Average	3.2	4.24	8.38	5.33
6	2021/10	# cases	2802	15055	6355	10187
7		TTL Dwell	13912	80800	59070	71597
8		Average	4.97	5.37	9.3	7.03
9	2021/11	# cases	2194	16211	6234	10860
10		TTL Dwell	14848	80893	58761	109814
11		Average	6.77	4.99	9.43	10.11
12	Turn Around Time (minutes) of trailers (from 2021/9 to 2021/11)					
13	Month	title	Exp Rec	Imp Del	Imp Del	
14			(In-Yard)	(In-Yard)	(Yard-Out)	
15	2021/9	# Cases	13154	15532	14834	
16		Total	300873	461945	3075553	
17		Average	22.87	29.74	207.33	
18	2021/10	# Cases	10660	14951	14360	
19		Total	238509	471888	2662783	
20		Average	22.37	31.56	185.43	
21	2021/11	# Cases	10718	16113	15451	
22		Total	250638	473120	3056951	
23		Average	23.38	29.36	197.85	
24						

D. Proposals for Improving the Efficiency and Safety of Container Handling Operation

PROPOSALS FOR IMPROVING THE EFFICIENCY AND SAFETY OF CONTAINER HANDLING OPERATION FOR SIHANOUKVILLE AUTONOMOUS PORT (PAS)

December 2021

JICA Expert Team

List of Abbreviations and Terminology

Abbreviation	Description
ATD	Actual Time of Departure
CFS	Container Freight Station
CHE	Container Handling Equipment, such as QGC, RTG, RS
CTMS	Container Terminal Management System. The name of the Terminal Operation System (TOS) for PAS
CTOD	Container Terminal Operation Department of PAS
CY	Container Yard
EDI	Electronic Data Interchange
EIR	Equipment Interchange Receipt. EIR is issued by the container terminal to show a container is received from / delivered to a customer.
ETA/ETD	Estimated Time of Arrival / Estimated Time of Departure
GCOD	General Cargo Operation Department of PAS
HMSD	Harbor Master & Security Department of PAS
ID	Identification
KPI	Key Performance Indicator
OOG	Out of Gauge
PAS	Sihanoukville Autonomous Port
PDF	Portable Document Format. The name of the form of the document.
QGC	Quay Gantry Crane
QR code	Quick Response code. A machine-readable code consisting of an array of black and white squares
RS	Reach Stacker
RTG	Rubber Tired Gantry Crane
SOP	Standard Operation Procedure
SQL	Structured Query Language
SWSS	Single Window Service System. One of the systems used in PAS.
TDR	Terminal Departure Report
TEU	Twenty-foot Equivalent Unit.
UN/EDIFACT	United Nations/Electronic Data Interchange for Administration, Commerce and Transport.
UPS	Uninterrupted Power Supply
MDT	Mobile Data Terminal. MDT is a PC, which installed on the cabin of QGC, RTG, and Reach Stacker and use as a device for CTMS.

CONTENTS

1. OVERVIEW

This document shows all the proposals which was presented at the workshops conducted during the project.

2. WORKSHOPS AND PROPOSALS

The following list show the workshops conducted for output2 and their titles / Topics.

Visit	Title	Topics
2	Issues concerning Container Handling Operation in Vessel Operation	- Lashing team/tool for lashing - Empty container handling - Mobile Harbor Crane handling - Maintenance of CHE
	SOP for Lashing Team and Traffic Flow of Trailers inside the Port	- Lashing team - Traffic flow for trailers
3	Comparison of Productivity between Gate and Yard (RTG) using CTMS data (7/2 – 7/8)	- Findings by the statistical data for gate-in moves and container moves in RTG area
	The Role of Control Center and the Current Issues	- Improvement of Control Center
	Issues concerning Vessel Operation and SOP for RTG Operators	- Issues in Vessel Operation - Operational procedure for RTG operator
4	Observation of Container Handling at Site - Issued and Countermeasures	- Vessel operation (Kobe vs Sihanoukville) - Traffic control during the congestion in the yard - Traffic flow at the quay, hatch cover operation, etc.
5	Follow up of baseline survey and the simulation on weekly container handling based on the berth schedule	- Simulation of container movements in the yard based on the planned berth schedule using Excel
6	Follow up of baseline survey/SOP for Containers Terminal Operation Dept. (Vessel Related Operation)	- Discharging of OOG containers
	Observation of General Cargo Operation and Terminal at Sist - Issues and Countermeasures	- Improve cargo storage, safety wears, organized workspace, improve lifting work, supervisor, improve cargo handling efficiency, sand/gravel, etc.
-	Proposal on new system to assist trailers in identifying the right position at the quay during vessel operation	- System to assist trailers in identifying the right position at quay

3. SUMMARY OF PROPOSAL

The following table show the proposals classified by the category

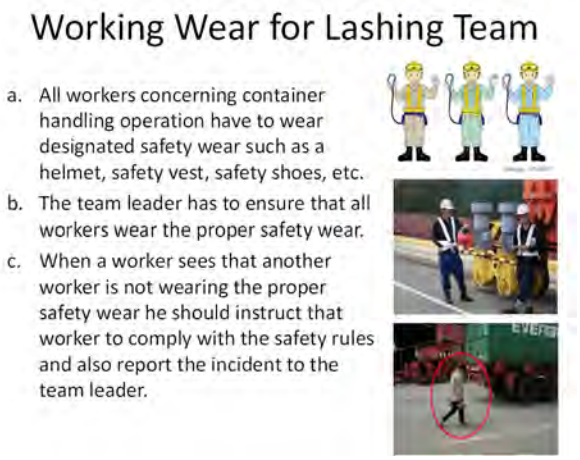
Category 1	Category 2	Proposals
Container Handling	Lashing Team	- Working Wear - Stacking Corn Operation - Deckman - Container Lock/Unlock bar - Meeting - Preparation of the work - Work as a team - Comparison with operation in Kobe by video - Distribution of work lists - Hand signals - Motorcycles in the yard
	Vessel Operation	- Trailer assist system to stop at the right position - Mobile Harbor Crane operation - Shape of yard trailers - Travel by QGC
	Empty Container	- Number of yard trailers - Empty container handling - Empty container yard
	OOG Container	- OOG container handling - Stacking yard for OOG containers
Control Center		- Role of Control Center - Control of waiting area in case of congestion - Stacking yard of long stay containers
Traffic Flow		- Traffic flow of trailers in the yard - Traffic flow of trailers at the quayside - The place for hatch covers
Maintenance Work		- A lot of equipment to be repaired - Maintenance during the operation - Control by control center - Toolbox for maintenance team
CTMS Data Usage		- Using historical data - Simulation based on the planned berth window
General Cargo Operation		- Cargo storage shall be improved - Working wear for safety - Keep workspace organized for efficiency and safety - Lifting work must be improved - Supervisors shall be stationed - Cargo handling must be efficient - Obstacles shall be eliminated from the logistic berth

4. DETAILS OF THE PROPOSALS

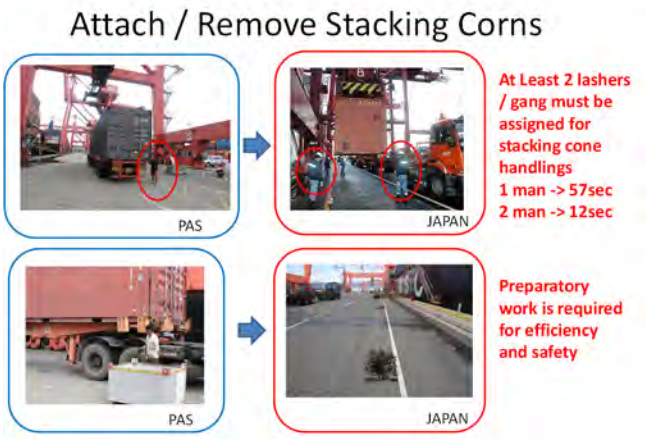
4.1. Container Handling

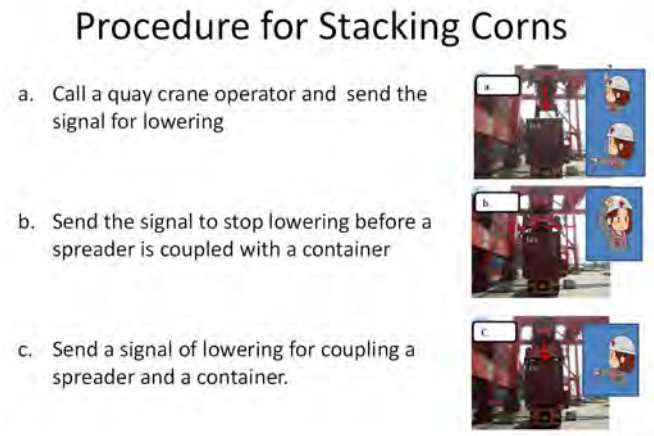
(1) Lashing Team

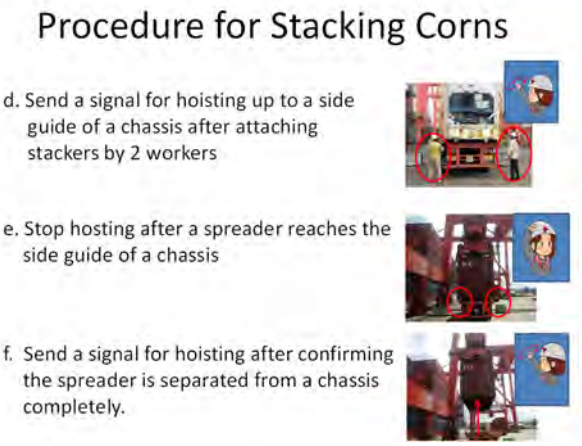
a. Working wear



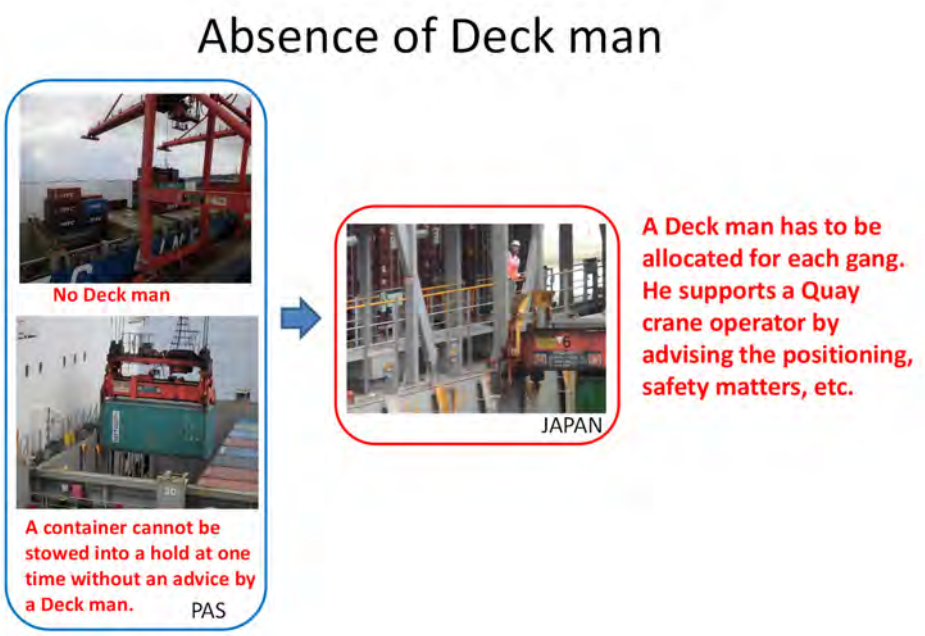
b. Operation of stacking corn



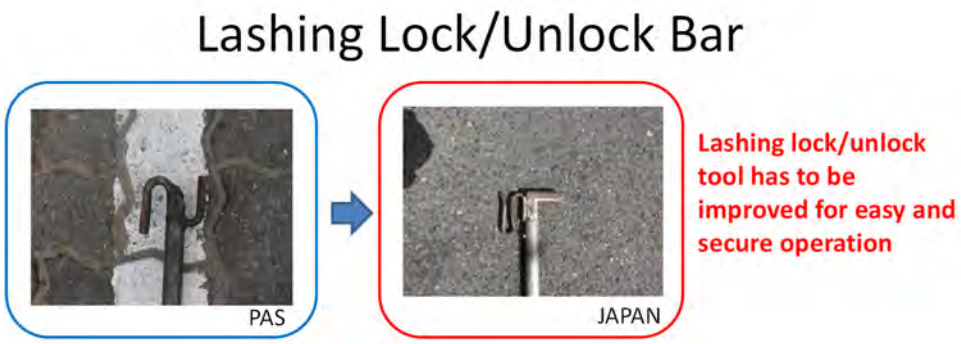


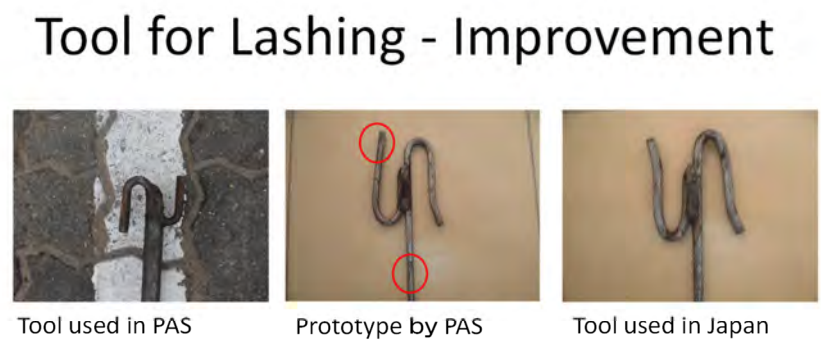


c. Deckman



d. Container lock/unlock bar





a. JICA proposed that the tool be improved (During the 2nd dispatch)
b. PAS started a project to improve the tool
c. JICA brought the tool from Japan and discussed its feature with PAS team. The Prototype is almost satisfactory but (1) the shape of the tool should be improved and (2) a thicker rod should be adopted for better durability

e. Meeting

Meeting before the operation

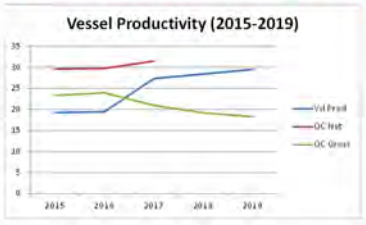
a. To share matters requiring attention related to container handling operations.
b. To inform members of the gang structure and their roles. The person responsible for lashing work shall confirm the allocation of workers during the operation.
c. Lashing Team not only conducts the works to be done but also support operators of Quay Crane by signaling

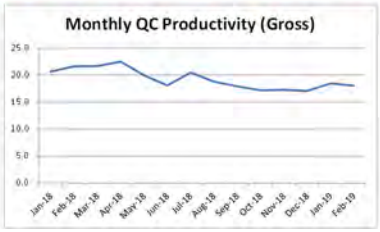
f. Preparation for the work

Organizing Work in Vessel Operation

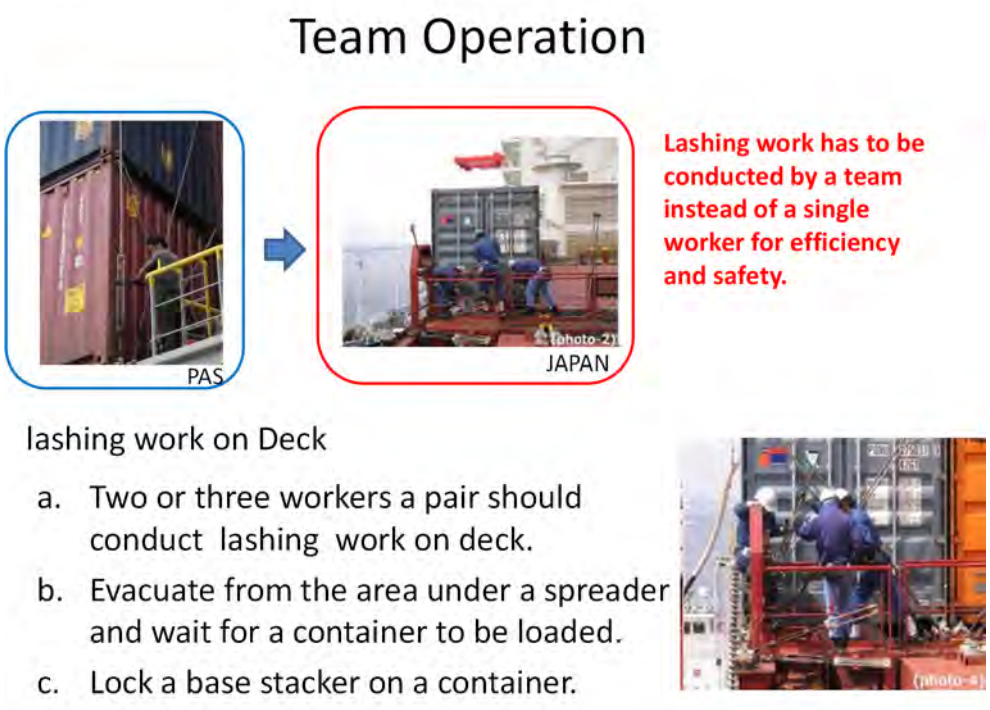
It takes about 30 minutes to begin operations even if All the members of lashing team are ready.
1) The gang boss arrived 15 minutes after the lashing team arrives.
2) He explains the unlashing procedure, then lashers started boarding on the vessel
3) 2 lashers start unlashing onboard while others just wait they are finished.

QC productivity used to be nearly 25 box/hr in gross but it is now less than 20 box/hr → Too much idle time between operation





g. Work as a team



h. Comparison with operation in Kobe by video

(1) Container Handling Operation in Kobe #1

1) Gang Structure : QC operator x 1, Signal man x 1, Lasher (on board x 4, under QC x 2, including lasher boss), trailer x 3-4, tally man x 1
2) Quayside area is clear. Lashers do not stay here when an operation of attaching/removing stackers is not required.
3) The QC operator smoothly (silently) links a container with a spreader. This prevents causing damage to the spreader or the container.
4) A signal man is always allocated for confirming the correct container is loaded/unloaded to/from the correct stowage location. He also sends a signal to the QC operator for inserting the container below the hatch.

(2) Container Handling Operation in Kobe #2

1) QC operator gradually reduces speed lowering the spreader as it approaches the container, then insert the twist lock after stopping it once.
2) Flipper operation is not done on a vessel but on the ground in order to prevent contact with the vessel facilities or the container.
3) Strong impact should not be given to the spreader

(3) Container Handling Operation in Sihanoukeville

1) These area motorcycles, cabin, etc. around the working area at the quayside.
2) A QC operator starts lowering the spreader on a container before a adjusting its position to the position of the container.
3) Position of a yard trailer is not adjusted properly when it stops.
4) The container handling operation is conducted without a signal man. QC operator sometimes has difficulty in adjusting the spreader to fit in the cell guide of a vessel and may stow a container in the wrong position.

(4) Attaching / Removing stackers in vessel operation

Video of removing stackers for discharged container

By one lasher :	By two lashers :
30 seconds	15 seconds

Recommendation:
Attaching/Removing stackers must be done

1) By at least two lashers all times
2) Quickly in order to reduce the time to 10 seconds.

i. Distribution of work lists

Recommendation:

1) The lashing operation can be started when the team members are ready; operational documents must be delivered to all the workers 30 minutes before the operation start time. Required documents are as follows: working schedule, bay plan sheet, schematic plan (only for the QC operator and a signal man). They should be also delivered to the control center.

Working Schedule

Bay Plan Sheet

Schematic Plan

j. Hand signal

(1) Basis of Signaling

a. Call : Raise your hand
b. Location: Indicate by pointing
c. Hoisting : Raise your hand and rotate your arm
d. Lowering: Extend your hand and gradually lower and raise it as required
e. Stop: Raise your hand and make a fist
f. Emergency Stop: Raise both hands and flap your arms

(2) Rules in Signaling

a. If the signal man is absent, a substitute will be assigned.
b. Multiple signal men are prohibited in order to avoid confusion.

k. Motorcycles in container yard

Transportation to a vessel

a. The lashing team has to walk from the rest area to a Vessel (Quayside); the use of motorcycles is prohibited.
b. Parking bicycles or motorcycles under quay cranes is prohibited in order to avoid accidents, and to secure sufficient space for safe vessel operation, etc.
c. Team members who find someone driving or parking such vehicles should instruct them to comply with the rules.
d. Cases of emergency will be discussed later from the aspect of safety.

(2) Vessel Operation

a. Trailer assist system to stop at the right position

Current Vessel Operation in PAS

It currently takes a long time to load or pick up a container because the trailer stops at a different position under the QC each time.

We believe a new system which accurately indicates the correct stopping position should be introduced.

Example of the port of Kobe

Container handling efficiency at the port of Kobe was adversely affected by the different stop position of yard trailers each time they loaded or picked up containers. At that time, Kobe used similar marks as the ones used in PAS.

Improvement Measure (1/2)

They installed a Monitor under the Quay Crane to show the centre position of the yard trailer.

It greatly improved the quayside container handling performance at the port of Kobe.

The trailer driver is able to adjust the trailer position by confirming the correct position on the monitor screen.

Improvement Measure (2/2)

The Monitor shows the centre position of the yard trailer.

A camera to monitor the movements of yard trailers was placed here.

b. Mobile Harbor Crane Operation

Usage of Heave Line

Heave Line (Control Line) has to be implemented to stabilize the movement. It will reduce the container handling time by at least 10 second for each move.

Wharf Operation by Mobile Harbor Crane

Crane has to wait until a Reach Stacker stacks container on a trailer due to the narrow space around wharf area.

1) Remove unnecessary equipment, vehicles, etc. from the wharf area
2) Move the transfer point between a Reach Stacker and a trailer backward in order to keep enough space for a mobile harbor crane. Mobile harbor crane needs not wait for a trailer receiving / delivering a container.

It will reduce the container handling time by about 30 second for each move.

By implementing both (1) and (2), 20 moves/h -> more than 25 moves/h

c. Shape of yard trailers

Shape of Trailers which lowers the productivity


A : Single Side Guide


B : Single Side Guide


C : Dual Side Guide

Trailer Type should be unified to B

Issues on using Type C trailers : **it took 30sec more for loading**






d. Travel by QGC

Quay Crane moves slowly between hatches

Issues in Vessel Operation

☆ Quay Cranes are slow in start travelling to the next vessel bay after finishing the operation of a vessel bay

Does it take time to confirm the safety of several workers?

Does it take time to contact a Gang boss or quay crane leader?

Is there any special procedure required when a crane starts travelling?

(3) Empty Container

a. Number of yard trailers for empty discharging

(1) Summary

A Quay Crane often waits for the arrival of yard trailers. It usually happens for empty container load/discharge.

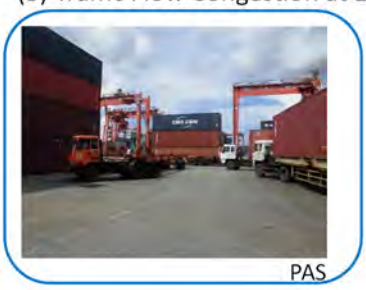
4 yard trailers have to be deployed for each gang instead of 3. Most of the Japanese container terminals deploy 4 yard trailers per gang.

(2) Reach Stacker / Top Lifter

Top Lifter is faster than Reach Stacker.

	R/S	T/L
Tier 1 :	69sec	45sec
Tier 2 :	62sec	42sec
Tier 3 :	68sec	48sec
Tier 4 :	99sec	48sec

(3) Traffic Flow Congestion at Empty Area



Trailers bound for quayside could not proceed because the area was full of trailers. Traffic flow may have to be aligned for each gang.

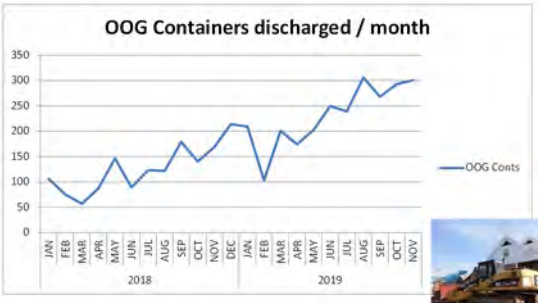
(4) Loading from Operator mixed area

Container was loaded from the middle of the stack. Loading empty containers from these areas should be avoided or the area should be shuffled prior to the vessel operation.
Introducing RTG in empty area may be another solution for it.

(4) OOG Container

a. OOG container handling

(1) Handling Volume



- Quantity of OOG container discharged is increasing

(2) Discharge Operation

Wait 20 min for the chain arrival

Also waiting for the arrival of the proper tool

Chain attached

No signal man to support QC operator

It took 5 min for unloading
(2.5 min for standard containers)

It took 1 min more for removing the chain.

Inefficiency of discharging OOG containers is one of the reasons to decrease the QC productivity.

The other type : wires Partly damaged.

Is 8 ton hook good enough?

Attachment used in Kobe Terminal.
Less vibration, up to 2 meters over height.

Lock/unlock is done by the rope.
The hydraulic type is also available

How about getting this type of attachment for OOG containers ?

Keep it on chassis while unused.
It can be carried by the trailer

b. Stacking yard for OOG containers

- Issues
  - Danger to handle cargo on the main traffic flow
  - It may stop the traffic of trailers (it may also affect gate flow)
- Proposal
  - Relocate OOG stacking area
    - For safety: Away from the access road
    - For efficient operation: Cranes, workers, and tools are located near
  - Utilize the current OOG area as trailer waiting area for controlling incoming trailers in yard lanes of RTG area

4.2. Control Center

(1) Role pf Control Center

1. Overview of Control Center

(1) The roles
a. The Operation Planning
b. The Operation Control
c. Information Sharing and Adjustment of Requirement among the departments


(2) The Information sharing and Adjustment of requirement among the department
a. Yard controllers, Yard planners
b. Vessel planners
c. Shipping Line Agencies
d. Import/Export Documentation
e. Gate
f. Operators for Cargo Handling Machines
g. Vessel Stevedore
h. Maintenance Team
i. Reefer Team




(3) The Operation Planning
a. Gang Arrangement Order for Next day
b. Yard Slot Allocation for Import and Export
c. Planning of Shifting and Marshalling



(4) The Operation Control
a. The preparation for Vessel operations
b. RTG control and management
c. Gate control
d. Trailer control
e. Trouble handling on the operations

2. Current Issues in PAS

(1) The unclear responsibility of the operation
a. RTG not following job orders by Control Center
b. RTG not competing job order by CTMS

=> <u>The operation efficiency is deteriorated as well as the system utilization.</u>

(2) The lack of Information Management
a. Maintenance work plan for machines
b. Vessels ETA update

=> <u>The above information must be updated with Control Center at any time in order for a smooth start of the operation and trouble shooting to be carried away.</u>

(3) No Gang Arrangement Order available
a. Currently the only reference information for the operation available.

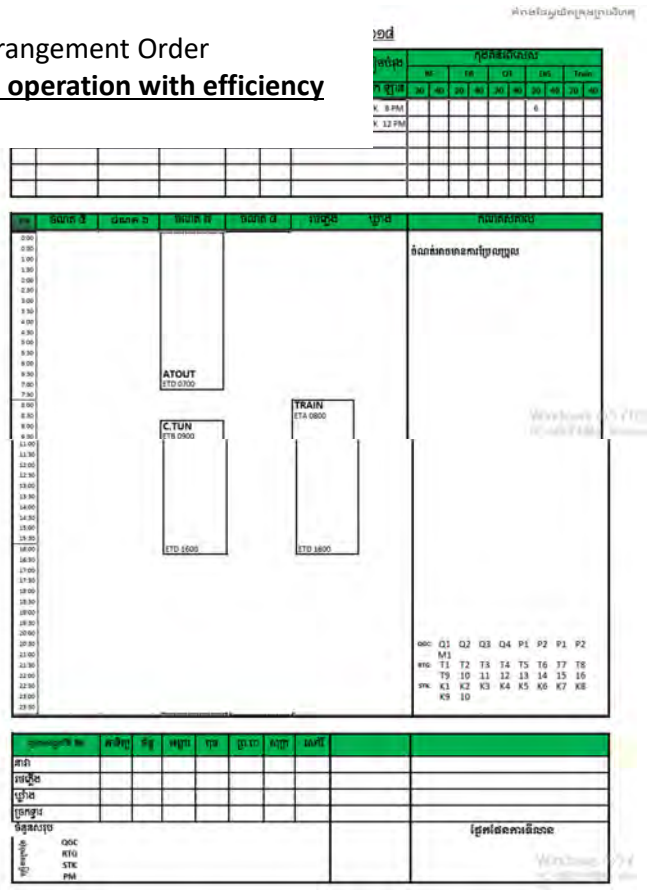
=> <u>The container vessel operation is all about PREPARATION. How well you can prepare with good forecasts dictates the performance and the productivity of the operation!</u>

3. Possible Approaches to the Issues

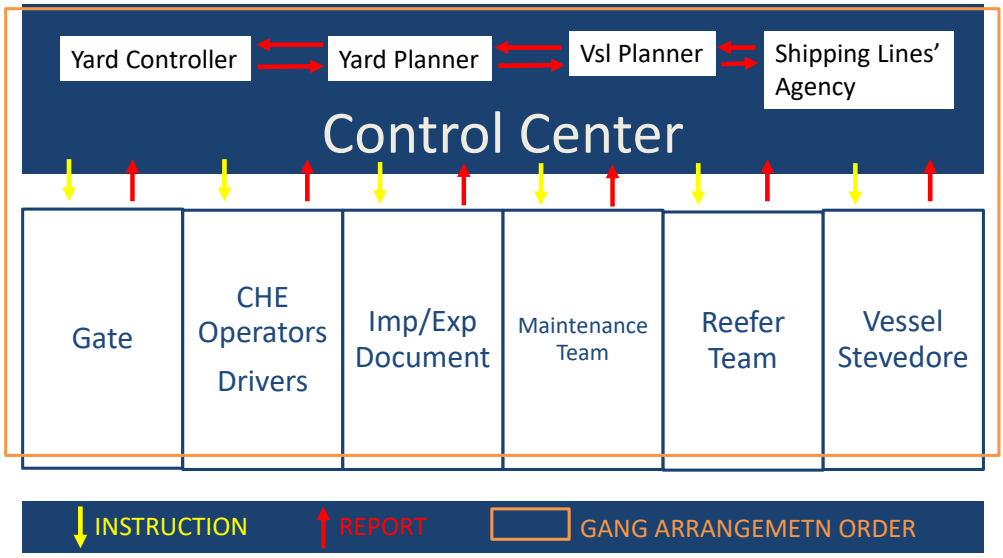
(1) The review on the responsibility for the operation control
=><u>Strictly follow the instruction by Control Center</u>

(2) Establish the Information sharing system + Reporting Line
=><u>To correct as much information to examine the need of users(shipping lines) and yard status</u>

(2) The introduction of Gang Arrangement Order
=><u>For more stabilized daily operation with efficiency and safety</u>

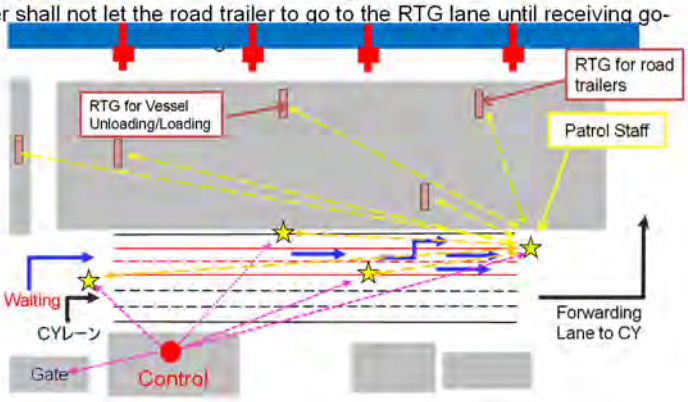


Role of the Control Center



(2) Control of waiting area in case of congestion

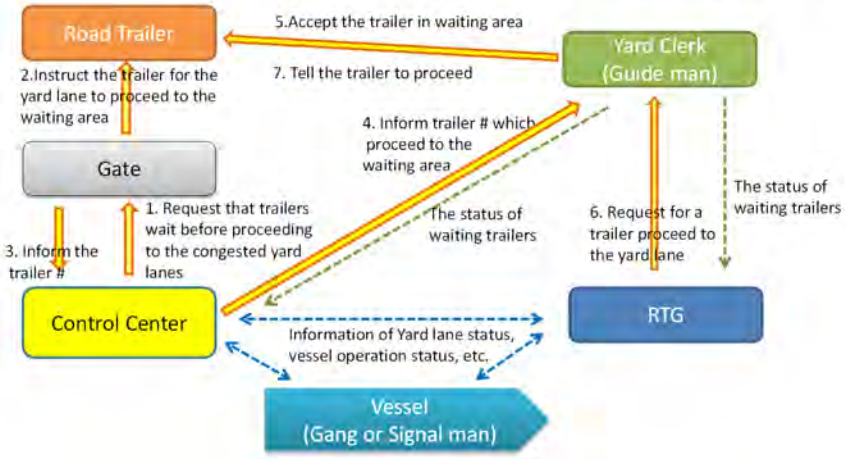
1. A controller share the information of vessel operation RTGs among gate clerks and patrollers over the radio.
2. A gate clerk communicates with patrollers when road trailers come to the gate.
3. A gate clerk gives an instruction to drivers to wait at the designated area.
4. A patroller give an announcement to RTGs whether they are ready for a road trailer or not.
5. When ready, a patroller let the road trailer to go to the RTG lane.
6. A patroller shall not let the road trailer to go to the RTG lane until receiving go-sign from



Traffic Flow Control inside the Yard Lane

Recommendation:

Implement a system to control outside trailers entering C Yard to avoid congestion inside lanes (reduce number of trailers entering inside the lane).



(3) Stacking yard for long stay containers

Remove long staying containers from C Yard

About 40 containers, which have stayed in PAS for more than 180 days, are stacked in C Yard. Some more containers are also stacked in A, B Yard

Recommendation:

Those containers should be evacuated from C, A, B yard.

4.3. Traffic Flow

(1) Traffic flow of trailers in the yard

☆Short cut (Yellow line) should be prohibited

⇩

Minimize the moves crossing RTG runway for improving the efficiency and safety

(2) Between Container Berths and Empty Yard

☆Unify the traffic route and prohibit short cuts

⇩

This will improve the efficiency of Reach Stacker/RTG operation and reduces the traffic congestion in the empty yard

(3) Between New Container Berth and Empty Yard

☆ Unify the traffic route and prohibit short cuts

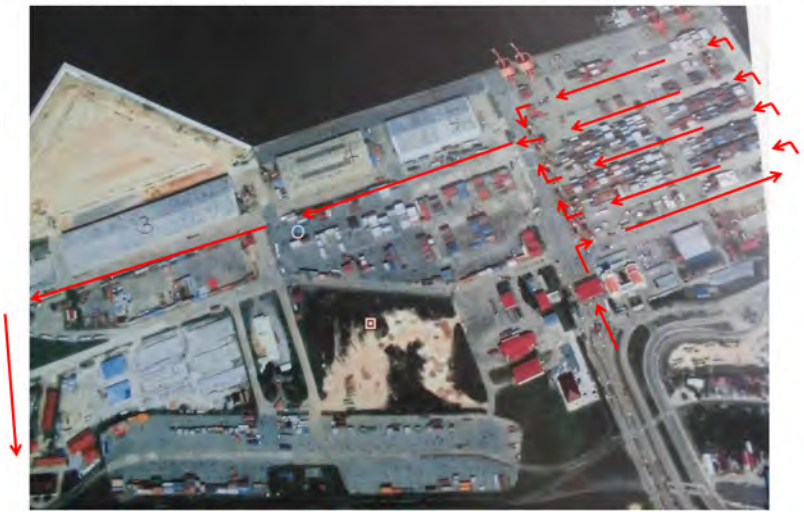
⇩

This will improves the efficiency of Reach Stacker and RTG operation and reduces the traffic congestion in the empty yard

(4) Rail Discharge to the Yard

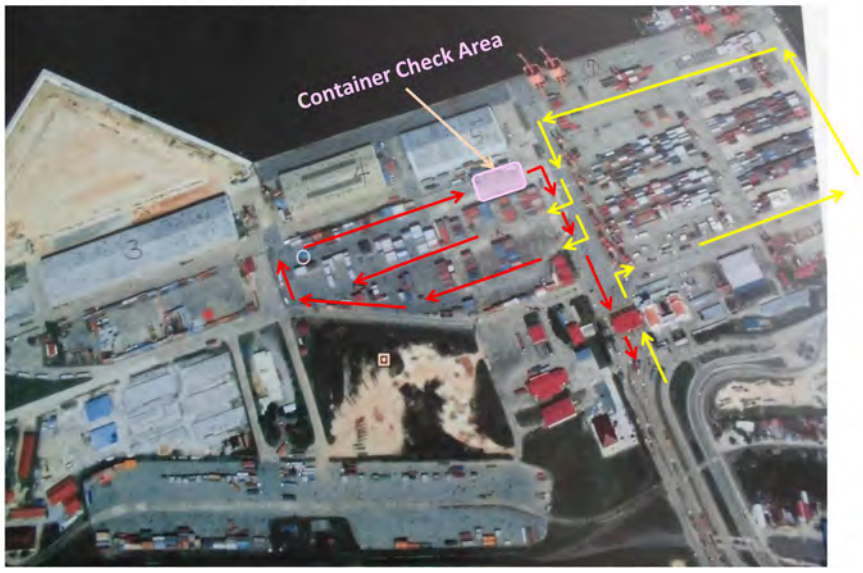
Traffic Flow of Hauliers Trailers

(1) Receiving of Export Container : From SEZ/ICD with Customs Seal



(2) Receiving of Export Container : Customs Clearance in SHV

(3) Delivery of Empty Container



(4) Delivery of Empty Container : Proposal for improvement

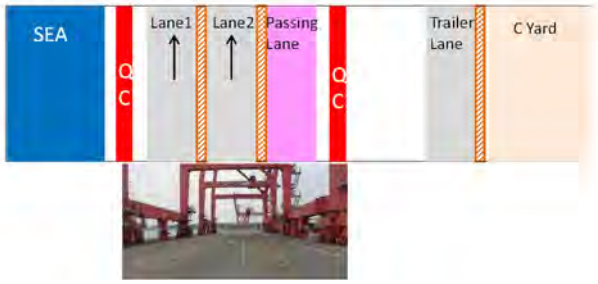
(6) Delivery of Import Container : Proposal for improvement

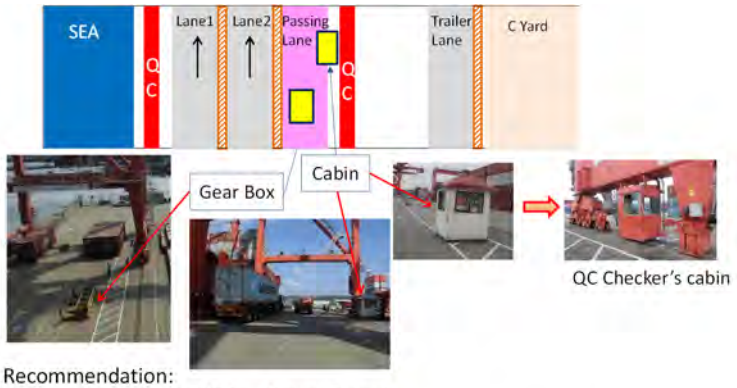
(2) Traffic flow of trailers at the quayside

Traffic flow of yard trailers at the quay side

In vessel operation, the traffic flow of yard trailers is not ditermined and yard trailers often travel within RTG travelling path or the container stacking yard.

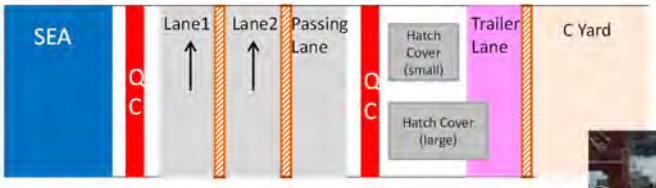
(1) A passing lane under QC does not function due to the existence of cabin, gear box, container, etc.





Recommendation:
The passing lane should be always cleared.
1) The quayside cabin should be removed -> Use a QC checker's cabin instead
2) The gear box, containers, etc. should not be stowed on the lane

(2) The Trailer lane outside QC is not always available

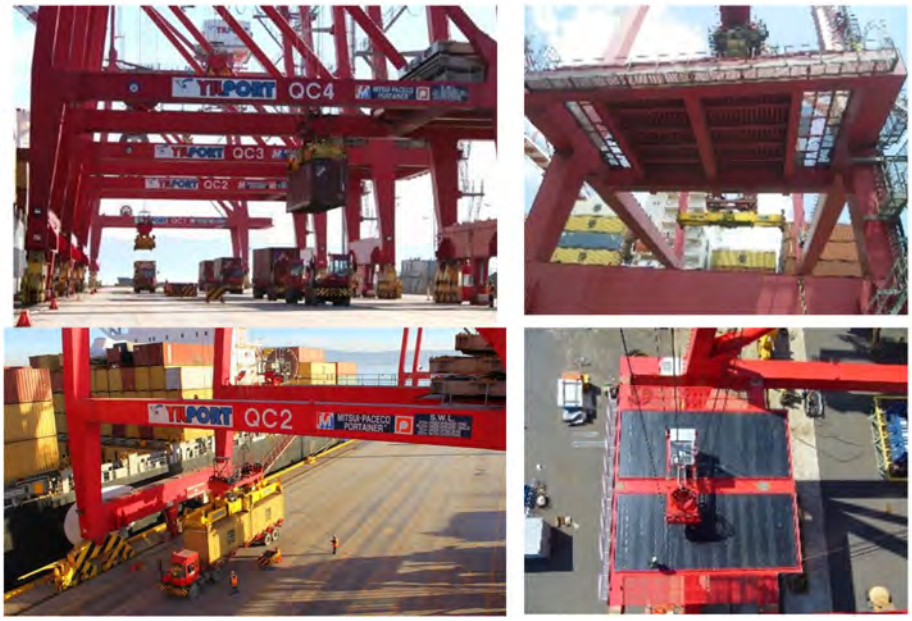


Observation:
1) Hatch covers are unloaded around a back reach area of QC, but they may block the trailer lane when a vessel has large hatch covers.
2) When the lane is blocked, yard trailers travels through the transfer lane within the C yard which increases the congestion of trailers inside the C yard.

(3) The place for hatch covers

Recommendation:

1) Add the stage on QC to place hatch covers of vessels.



4.4. Maintenance Work

(1) A lot of Equipment to be Repaired

Equipment to be repaired (one day in last week)
- **Quay Crane : 0/4 (Spares of the quay carne spreader is broken)**
- **RTG : 8/16**
- **Reach Stacker : 7/9**
- **Yard Trailers : 2/24**

(2) Maintenance Work during the Operation

PAS

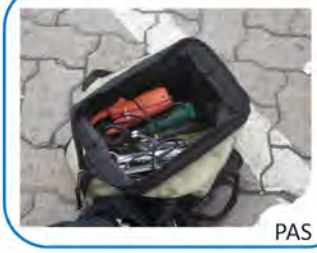
Bolts of a quay crane spreader is tightened by stopping the vessel operation.
It should be done during a rest time or non-working hours.

(3) Communication ?

PAS

One of the flipper was missing from the quay crane spreader. It has not been repaired yet. The yard operation team at the control center was not informed of it. These information has to be shared among the control center and the vessel planners.

(4) Tool Box



PAS

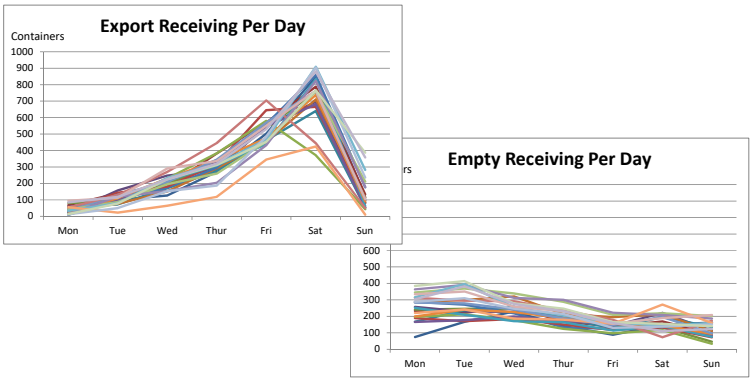
All tolls, welding machine, generator, compressor, etc. are stored in the car

4.5. CTMS Data Usage

(1) Using historical data

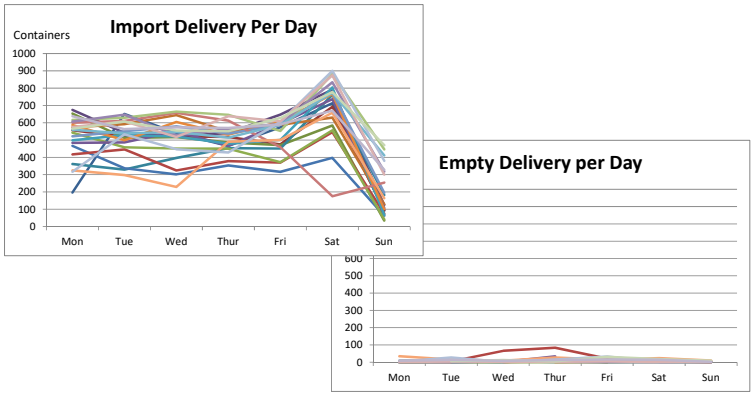
Pattern of gate moves

1) Weekly pattern of gate moves : Jan – Jun 2019 (receiving)



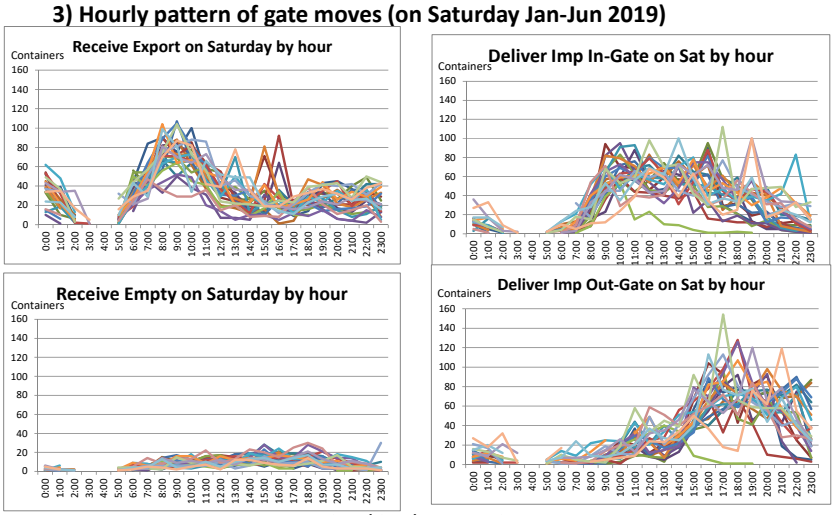
- Largest amount of export containers arrive on Saturday
- Certain amount of empty containers arrive every day, but more empty containers arrive on Monday and Tuesday than the other days of the week.

2) Weekly pattern of gate moves : Jan – Jun 2019 (Delivery)



- Import deliveries occur every day but particularly on Saturday.
- Only few empties are delivered each day.

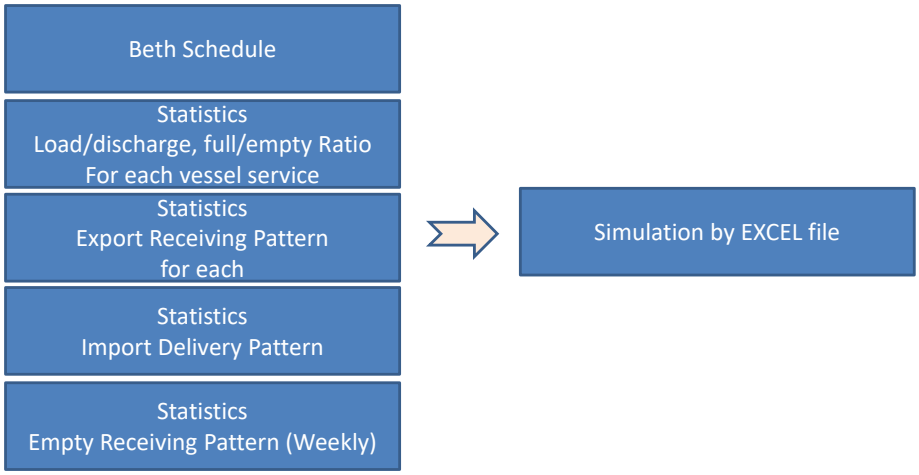
3) Hourly pattern of gate moves (on Saturday Jan-Jun 2019)



- More exports are received in the morning.
- More import delivery In-Gate occur in the morning and early afternoon.
- More import delivery Out-Gate occur in the late afternoon to the evening.

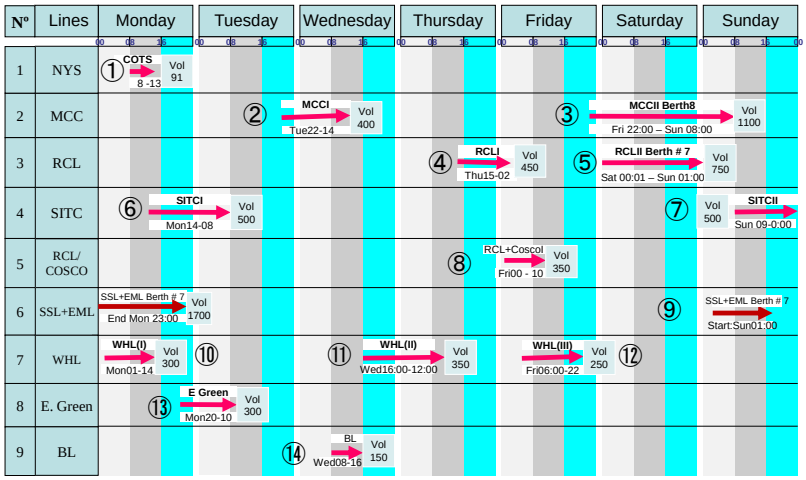
(2) Simulation based on the planned berth window

1) Overview



- The simulation is a tool for predicting the volume of daily movement transactions based on the future berth schedule
- The simulation is conducted to check if it matches the actual result.

2) Berth Schedule



3) Load/Discharge Ratio (from April to June)

			Moves		Unload		Load		Unload		Load	
			Sched	Actual	Empty	Full	Empty	Full	Empty	Full	Empty	Full
①	NYS	Mon	91	93	0%	53%	47%	0%	0	48	43	0
②	MCC	Tue-Wed	400	466	9%	82%	9%	0%	36	328	36	0
③		Fri-Sun	1,100	992	4%	41%	3%	52%	40	451	36	572
④	RCL	Thr-Fri	450	457	0%	60%	40%	0%	0	270	180	0
⑤		Sat-Sun	750	688	3%	43%	5%	48%	21	326	41	362
⑥	SITC	Mon-Tue	500	463	0%	62%	28%	9%	0	311	142	47
⑦		Sun	500	516	0%	55%	45%	0%	0	275	225	0
⑧	RCL/COSCO	Fri	350	606	0%	65%	30%	5%	0	228	104	17
⑨	SSL/EML	Sun-Mon	1,700	1,641	0%	47%	6%	47%	0	799	102	799
⑩	WHL	Mon	300	388	0%	90%	10%	0%	0	270	30	0
⑪		Wed-Thur	350	303	0%	19%	37%	45%	0	65	128	157
⑫		Fri	250	356	0%	62%	31%	7%	0	154	78	19
⑬	E Green	Mon-Tue	300	419	0%	52%	39%	9%	0	156	116	28
⑭	BL	Wed	150	125	0%	50%	50%	0%	0	75	75	0

- Unload/load and empty/full ratio is calculated from the records from Apr. to June
- # of load/unload containers are calculated from the ratio and the scheduled moves

4) Receiving Pattern of export full containers (from April to June)

			Moves	Qty	Export Receiving pattern											
					-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1
①	NYS	Mon	91	0	-	-	-	-	-	-	-	-	-	-	-	-
②	MCC	Tue-Wed	400	0	-	-	-	-	-	-	-	-	-	-	-	-
③		Fri-Sun	1,100	572						3%	5%	8%	14%	29%	35%	6%
④	RCL	Thr-Fri	450	0	-	-	-	-	-	-	-	-	-	-	-	-
⑤		Sat-Sun	750	362						1%	3%	8%	13%	28%	43%	3%
⑥	SITC	Mon-Tue	500	47					5%	7%	12%	18%	21%	32%	5%	
⑦		Sun	500	0	-	-	-	-	-	-	-	-	-	-	-	-
⑧	RCL/COSCO	Fri	350	17					1%	1%	6%	27%	34%	26%	4%	
⑨	SSL/EML	Sun-Mon	1,700	799				1%	3%	7%	11%	17%	23%	26%	10%	
⑩	WHL	Mon	300	0	-	-	-	-	-	-	-	-	-	-	-	-
⑪		Wed-Thur	350	157					1%	4%	6%	18%	42%	25%	2%	
⑫		Fri	250	19						7%	5%	15%	38%	23%	12%	
⑬	E Green	Mon-Tue	300	28				1%	8%	12%	34%	31%	12%	3%		
⑭	BL	Wed	150	0	-	-	-	-	-	-	-	-	-	-	-	-

3) Receiving /delivery Pattern of empty containers (from April to June)

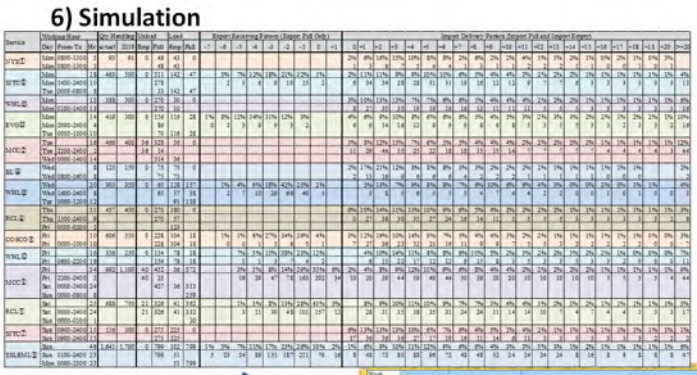
Average Empty Receiving/Delivery per day

	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Rec-Del	19%	21%	17%	14%	10%	10%	9%

5) Delivery Pattern of import (empty and full) containers (from April to June)

			Moves	Qty	Import Delivery pattern										
					0	1	2	3	4	5	6	7	8	9	10
①	NYS	Mon	91	48		2%	6%	16%	15%	10%	8%	8%	2%	6%	2%
②	MCC	Tue-Wed	400	364	3%	8%	12%	15%	7%	6%	5%	5%	4%	4%	4%
③		Fri-Sun	1,100	491	2%	4%	8%	9%	12%	10%	9%	6%	8%	4%	4%
④	RCL	Thr-Fri	450	270		10%	14%	11%	13%	10%	9%	6%	5%	4%	2%
⑤		Sat-Sun	750	347		8%	9%	10%	11%	10%	9%	7%	7%	3%	4%
⑥	SITC	Mon-Tue	500	311	2%	11%	11%	9%	9%	10%	10%	6%	5%	4%	4%
⑦		Sun	500	275	6%	13%	13%	13%	10%	6%	7%	6%	4%	5%	2%
⑧	RCL/COSCO	Fri	350	228	3%	12%	16%	10%	14%	9%	7%	5%	4%	4%	3%
⑨	SSL/EML	Sun-Mon	1,700	799	1%	6%	9%	10%	11%	12%	9%	6%	6%	4%	3%
⑩	WHL	Mon	300	270	3%	10%	13%	13%	7%	7%	6%	6%	5%	4%	4%
⑪		Wed-Thur	350	65		5%	13%	7%	9%	8%	8%	7%	6%	10%	6%
⑫		Fri	250	154		4%	10%	14%	11%	8%	8%	6%	10%	5%	2%
⑬	E Green	Mon-Tue	300	156	4%	6%	9%	10%	8%	6%	6%	6%	5%	4%	5%
⑭	BL	Wed	150	75	2%	17%	21%	12%	8%	8%	8%	5%	3%	2%	2%
					11	12	13	14	15	16	17	18	19	20	>20
①	NYS	Mon	91	48	2%	4%	5%	5%	2%	1%	0%	2%	1%	0%	3%
②	MCC	Tue-Wed	400	364	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	12%
③		Fri-Sun	1100	491	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	9%
④	RCL	Thr-Fri	450	270	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	3%
⑤		Sat-Sun	750	347	4%	3%	2%	1%	2%	1%	1%	1%	1%	1%	5%
⑥	SITC	Mon-Tue	500	311	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%	4%
⑦		Sun	500	275	4%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
⑧	RCL/COSCO	Fri	350	228	2%	2%	1%	1%	1%	1%	1%	1%	0%	0%	3%
⑨	SSL/EML	Sun-Mon	1700	799	3%	3%	3%	1%	2%	1%	1%	1%	1%	1%	6%
⑩	WHL	Mon	300	270	4%	2%	2%	2%	1%	1%	1%	1%	1%	1%	6%
⑪		Wed-Thur	350	65	6%	4%	3%	0%	0%	2%	0%	1%	1%	0%	4%
⑫		Fri	250	154	3%	2%	2%	3%	2%	2%	1%	0%	0%	0%	7%
⑬	E Green	Mon-Tue	300	156	3%	2%	3%	3%	2%	2%	1%	2%	2%	1%	10%
⑭	BL	Wed	150	75	2%	2%	1%	1%	1%	1%	1%	1%	0%	0%	2%

6) Simulation



Statistical data is copied&pasted onto the excel file for simulation and summarized

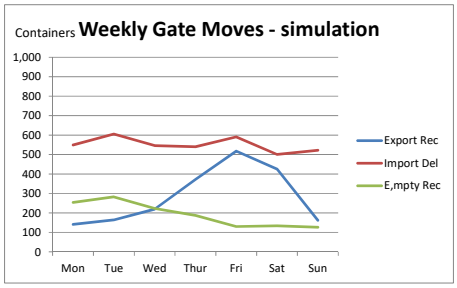
7) Simulation Result (comparison with the actual data)

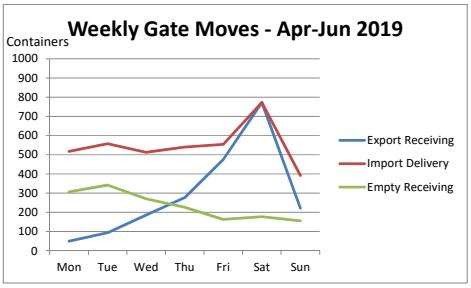
		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Moves	Export Rec	141	164	219	372	518	425	162	2,001
	Import Del	549	605	546	540	591	501	522	3,854
	Empty Rec	254	282	223	187	130	134	126	1,336
	Unload	682	153	454	270	447	774	1,074	3,854
	Load	1,112	144	186	267	341	722	565	3,337
Inventory	Import	3,850	3,418	3,375	3,148	3,044	3,358	3,951	
	Export	376	599	812	1,135	1,353	1,383	1,311	
	Empty	1,223	1,302	1,345	1,314	1,403	1,210	1,005	

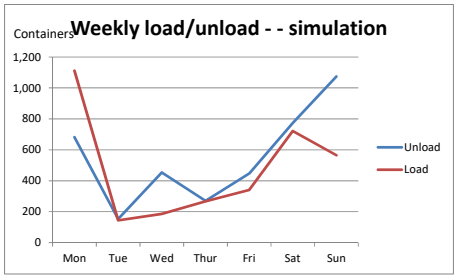
Actual moves from April to June 2019

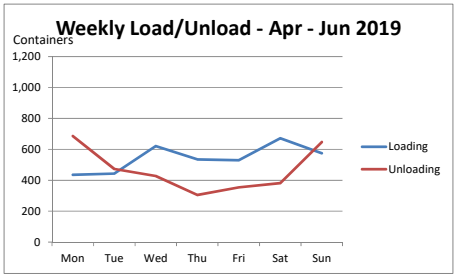
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Export Receiving	51	94	186	277	475	773	222	2,076
Import Delivery	518	557	513	541	554	772	392	3,847
Empty Receiving	307	342	270	227	163	178	156	1,642
Unloading	435	443	621	535	529	671	575	3,810
Loading	686	474	428	305	354	382	647	3,276

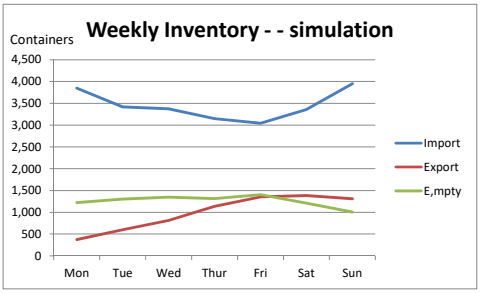
- The simulation results of weekly movements summary well matches the actual results











Actual Inventory

	7/1(Mon)	7/14(Sun)
Import	4,866	5,603
Imp 18%less	3,990	4,594
Export	3,024	2,075
Empty	3,464	3,769

The simulation assumes all the import containers are delivered in 20 days after discharge but 18% of Import containers stay more than 20 days in reality

- Why do so many export containers remain in the yard ? (due to delay in berthing?)
- Number of empty containers depends on the policy of shipping lines.
  1,336 empties are received in simulation per week (this is equal to the number of empties loaded weekly) but in reality 1,590 were received (received – delivered) in average.

8) What happens If all imports are delivered in 10 days after vessel discharge?

Service	Working Hour		Qty Handling		Import Delivery Pattern (Import Full and Import Empty)									
	Day	From-To	Hr	actual	2019	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
NYS①	Mon	0800-1300	5	93	91	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Mon	0800-1300	5			2	5	10	7	7	5	5	3	2	1	1
SITC⑥	Mon		18	463	500	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Mon	1400-2400	10			16	31	62	47	47	31	31	16	16	9	5
	Tue	0000-0800	8													
WHL⑩	Mon		13	388	300	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Mon	0100-1400	13			14	27	54	41	40	27	27	14	13	8	5
EVG⑬	Mon		14	419	300	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Mon	2000-2400	4			8	16	31	23	23	16	15	8	8	5	3
	Tue	0000-1000	10													
MCC②	Tue		16	466	400	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Tue	2200-2400	2			18	36	73	55	55	37	36	18	18	11	7
	Wed	0000-1400	14													
BL⑭	Wed		8	125	150	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Wed	0800-1600	8			4	8	15	11	11	8	7	4	4	2	1
WHL①	Wed		20	303	350	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Wed	1600-2400	8			3	7	13	10	10	7	6	3	3	2	1
	Tur	0000-1200	12													
RCL④	Thu		11	457	450	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Thu	1500-2400	9			14	27	54	41	40	27	27	14	13	8	5
	Fri	0000-0200	2													
COSCO⑧	Fri		10	606	350	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Fri	0000-1000	10			11	23	46	34	34	23	23	11	11	7	5
WHL⑫	Fri		16	356	250	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Fri	0600-2200	16			8	15	31	23	23	15	15	8	8	5	3
MCC③	Fri		34	992	1,100	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Fri	2200-2400	2			25	49	98	74	74	49	49	25	24	15	10
	Sat	0000-2400	24													
	Sun	0000-0800	8													
RCL⑤	Sat		25	688	750	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Sat	0000-2400	24			17	35	70	52	52	35	35	17	17	10	7
	Sun	0000-0100	1													
SITC⑦	Sun	0900-2400	15	516	500	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Sun	0900-2400	15			14	28	55	41	41	28	27	14	14	8	5
SSLEML⑨	Sun		46	1,641	1,700	5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%
	Sun	0100-2400	23			40	80	159	120	120	80	80	40	40	24	16
	Mon	0000-2300	23													

Average Import Dell Time = 4.87 days

Import Delivery Pattern (Import Full and Import Empty)										
0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
5%	10%	20%	15%	15%	10%	10%	5%	5%	3%	2%

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Moves	Export Rec	141	164	219	372	518	425	162	2,001
	Import Del	563	630	596	549	402	490	544	3,774
	E,mpty Rec	254	282	223	187	130	134	126	1,336
	Unload	682	153	454	270	447	774	1,074	3,854
	Load	1,112	144	186	267	341	722	565	3,337
Inventory	Import	3,201	2,738	2,667	2,440	2,612	2,927	3,488	
	Export	376	599	812	1,135	1,353	1,383	1,311	
	Empty	1,223	1,302	1,345	1,314	1,403	1,210	1,005	

- The simulation is conducted just by changing the import delivery pattern

9) What happens If all imports are delivered in 10 days after vessel discharge?
- Result of the simulation

Number of moves for import delivery

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Current	549	605	546	540	591	501	522	3,854
Improved	563	630	596	549	402	490	544	3,774
Percentage	103%	104%	109%	102%	68%	98%	104%	98%

Inventory of Import Containers

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Average
Current	3,850	3,418	3,375	3,148	3,044	3,358	3,951	3,449
Improved	3,201	2,738	2,667	2,440	2,612	2,927	3,488	2,868
Percentage	83%	80%	79%	78%	86%	87%	88%	83%

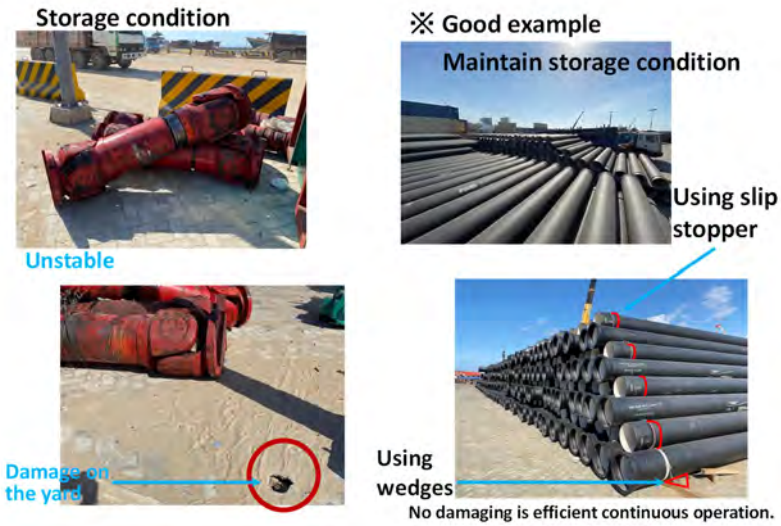
If all import containers are delivered within 10 days after vessel discharge;

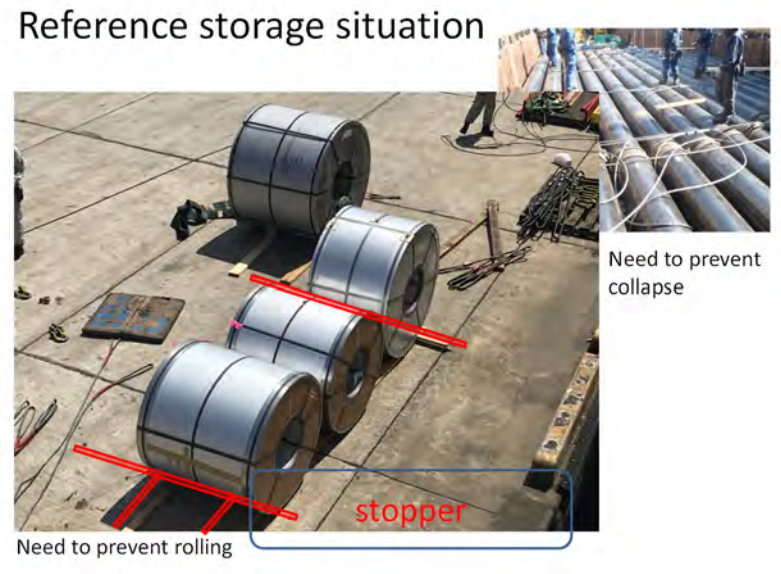
- Weekly moves of import delivery will be almost the same
- Import container inventory will be reduced by 17%

Let's find out and implement measures to shorten the dwell time of import containers

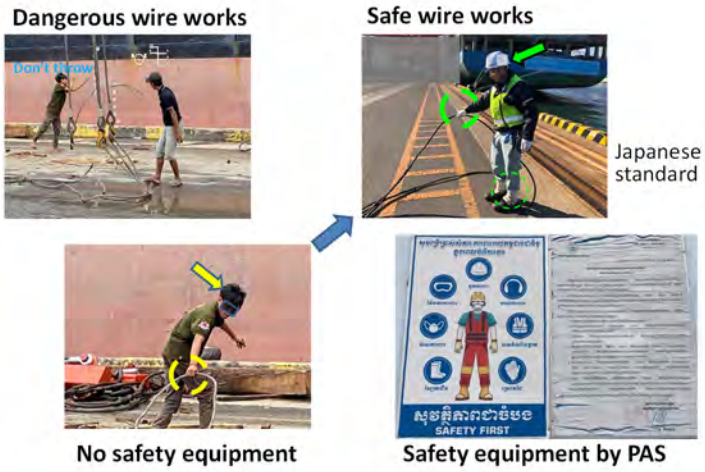
4.6. General Cargo Operation

(1) Cargo storage shall be improved

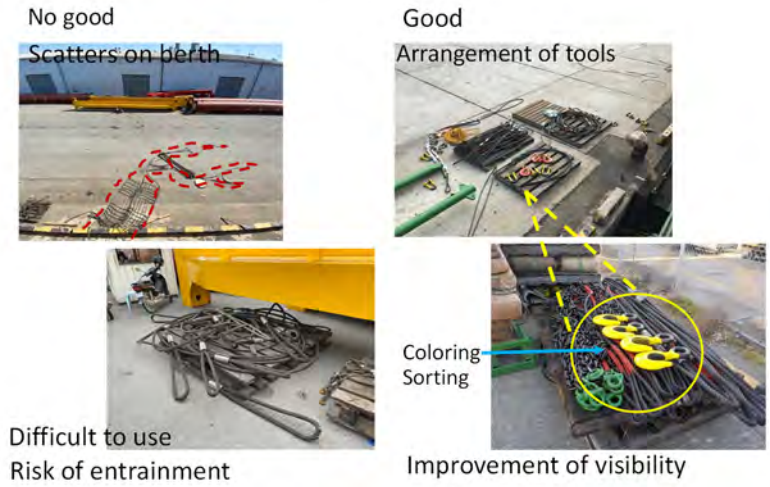




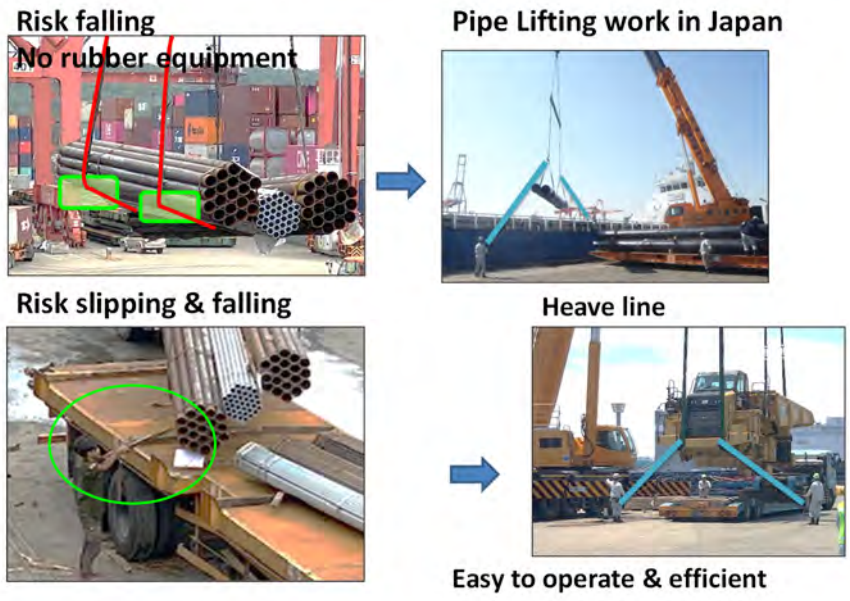
(2) Working wear for safety



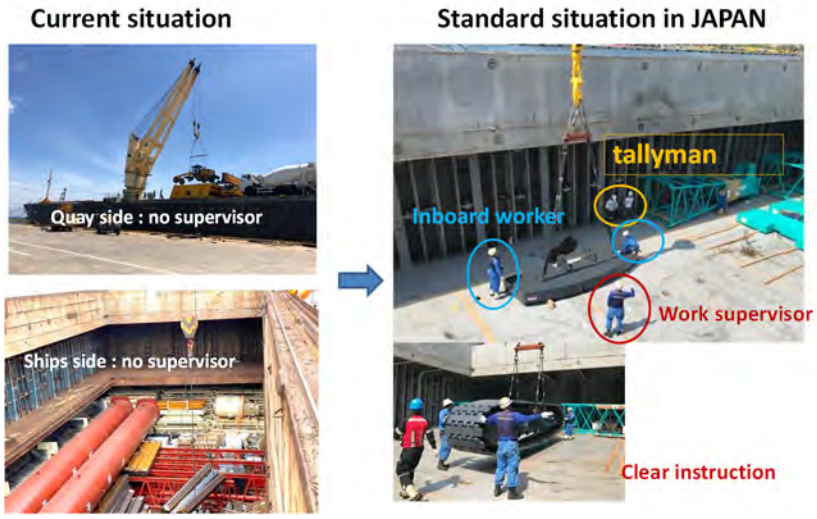
(3) Keep workspace organized for efficiency and safety



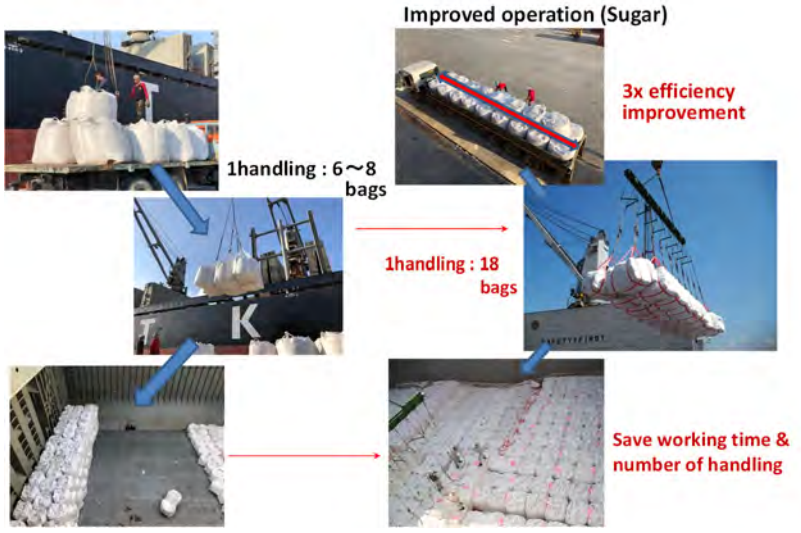
(4) Lifting work must be improved



(5) Supervisors shall be stationed



(6) Cargo handling must be efficient



(7) Obstacles shall be eliminated from the logistic berth

E. Guideline for Entry and Exit Control

A Guideline for Entry and Exit Control (Stage 1)

Container Terminal of the Sihanoukville Autonomous Port

December 2018

JICA Expert Team

Contents

1. Background

Due to the unloading and loading works of containers for container ships, Customs brokers enter and exit the port for the purpose of customs clearance procedures, especially on Thursday and Friday. They frequently enter and exit the port through Gate 2, Gate 3 and the passage next to PAS Administration Offices by motorcycle or car. This situation is rarely observed at other container terminals.

Allowing motorcycles and cars other than container trailers to freely enter the container terminal might increase the risk of traffic accidents and affect the efficiency of container operation. The passage roads in the container terminal are not public roads and container trailers should have priority over motorcycles and cars. In the container terminal, the motorcycles cross in front of container trailers passing through Gate 3 and some motorcycle drivers give a honk which is stressful for container trailer drivers.

Therefore, strengthening of entry/exit control for motorcycles and cars entering the port and prohibiting them from using the passage road in the terminal is essential.

2. Purpose

The purpose of this guideline is to prescribe an operation plan of entry/exit control at Gate 3 and the Passage next to PAS office in order to strengthen entry/exit operation as Stage 1.
（In Stage 2, a guideline for entry/exit control at the container yard will be prepared.）

3. Survey to grasp the Present Status of Motorcycles and Cars entering the Port

The JICA expert team (The Team) surveyed the number of motorcycles and cars other than container trailers entering the port through the three access routes mentioned above in order to grasp the present status. The number of motorcycles and cars entering the port were counted every 30 minutes and in total 6 hours a day on Thursday and Friday on March 23rd, 24th, and August 23rd, 24th, 30th and 31st, 2018.
Details and results of the surveys are described below.

3.1. Survey Points

Source: JICA Expert Team

3.2. Survey Method

Place	Gate 2	Gate 3	Passage next to PAS office
JICA Expert Team	2	1	1
		1	
PAS Staff	1	1	1
Survey Status	 	 	 

Source: JICA Expert Team

3.3. Survey Result

The average number of motorcycles entering the port was 1,371 per day in the five days surveyed. There are 136 registered Customs brokers' motorcycles and thus each motorcycle entered the port about 10 times a day on average (about 1.7 times per hour).

No.	Date	Day of Week	Number of Motorcycles Entering to the Port	Number of Registered Motorcycles	Number of entry times
1	Mar. 24, 2018	Thu.	1,631	136	**12.0**
2	Mar. 25, 2018	Fri.	(1,242 + a)		**9.9 + x**
3	Aug. 23, 2018	Thu.	1.086		**8.0**
4	Aug. 24, 2018	Fri.	1.296		**9.6**
5	Aug. 30, 2018	Thu.	1,401		**10.3**
6	Aug. 31, 2018	Fri.	1,440		**10.6**
	Average (5 days)	(5 days)	**1,371**	**136**	**10.1**

The number of cars which entered the port during the survey is as follows.

Date	Number of Cars
August 23, 2018	383
August 24, 2018	464
August 30, 2018	557
August 31, 2018	468
Average	466

3.4. Analysis of the Results

- The proportion of motorcycles and cars entering from Gate 2, 3 and the Passage is shown in the table below.

	Gate 2	Gate 3	Passage
Motorcycles	53%	20%	27%
Cars	61%	0.5%	38%

- 20% of motorcycles pass through Gate 3 which is basically a dedicated gate for container trailers.
- 74% of motorcycles passing through Gate 2, Gate 3 and Passage belong to Customs brokers.
- The number of motorcycles which entered through Gate 3, where only Container trailers can pass for Gate-in /out, was 67 units/day (11 units/ hour) on average and in total 269 units for 4 days.
- Customs brokers used not only motorcycles but also cars when coming to Customs for customs clearance.
- Motorcycles and cars passing through Gate 3 pose a risk of traffic accidents with container trailers.

It is possible that container handling operations could be delayed due to traffic accidents.

4. Implementation procedure of Entry/Exit Control at Gate 3 and Passage

Phase I: Prohibition of entry or exit of motorcycles from Gate 3

- Implementation Department: Port Security Office
- Implementation Details: Motorcycles and Cars are strictly prohibited from entering the port through Gate 3.

Phase 2: Prohibition of entry or exit of motorcycles from the Passage next to PAS office.

- Implementation Department: Port Security Office
- Implementation Details: Vehicles except cars and motorcycles of PAS employees are strictly prohibited from entering the port through the Passage next to PAS office. (Cars of PAS employees shall be parked at the designated parking area inside CT and shall be given official clearance to pass through the Passage.)

5. Guidelines of Entry/Exit control of Motorcycles and Cars from Gate 3 and the Passage next to PAS Office

5.1. Guidelines for entry and exit of motorcycles and cars

Motorcycles and cars should enter the port in accordance with the following guidelines.

- Motorcycles and Cars are strictly prohibited to enter the port through Gate 3.
- Customs broker have to enter and leave from Gate 2, and use the traffic routes prescribed and authorized by PAS.
- Vehicles except cars and motorcycles of PAS employees are strictly prohibited from entering the port through the Passage next to PAS office.
- Cars of PAS employees shall be parked at the designated parking area inside CT and shall be given official clearance to pass through the Passage.

<**Guidelines for entry and exit of motorcycles and cars**>

	Entry/Exit to the Port			Access roads
Target vehicle	Gate 3	Passage next to PAS Office	Gate 2	Access roads in the Port/Terminal
Motorcycles	Prohibited	Prohibited	**Allowed**	Only authorized access roads shall be used
Cars	Prohibited	Prohibited	**Allowed**	Only authorized access roads shall be used
Employee's Cars	Prohibited	**Allowed**	**Allowed**	Only authorized access roads shall be used

5.2. Installation of "Traffic control signboard"

Signboards to be installed on the outside and inside entrances of Gate 3 and the Passage next to PAS office to regulate traffic root of motorcycles and cars are depicted below and should be erected in places where drivers can easily see them.

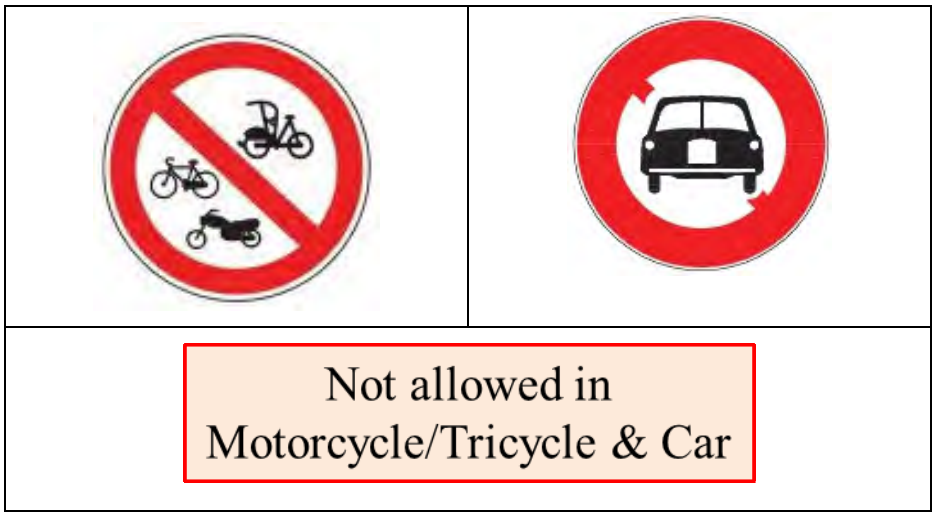
1) Installation location

- Inside and outside entrance of Gate 3
- Inside and outside of the Passage next to the PAS office
- Entrance of traffic regulation place of passage in the port

2) Traffic signboard to be installed in the port

The following **signboard** should be installed at the outside & inside entrances of Gate 3 and the Passage next to PAS office.

(Traffic signboard in the Port)



Attachment: "Announcement On Traffic limitation for using entry-exit gate in PAS of Broker Agencies that process the formalities and import-export clearance" (Preah Sihanouk Province, September 27, 2018)

Unofficial Translation

Kingdom of Cambodia
Nation Religion King

Sihanoukville Autonomous Port
No: 025 Announcement. PAS.Admin-HR

Preah Sihanouk Province, September 27, 2018

Announcement
On
Traffic limitation for using entry-exit gate in PAS of
Broker Agencies that process the formalities and import-export clearance

PAS is pleased to inform ladies-gentleman, all chief of companies, staff and brokers that process the formalities and import-export clearance that: in order to boost the service quality of PAS as well as avoiding traffic congestion and impact to the container handling, loading-discharge operation also safety for all staffs and brokers who process the formalities and import-export clearance with PAS, has set the traffic limitation for using entry-exit gate as follows:

1. Do not allow all kind of vehicles (cars and motor cycles) to pass through gate No.3 (This gate is used for container trucks only.)
2. Allow to use gate No.2 in the purpose of process the clearance with customs officers, Camcontrol officers and other works in container terminal operation area.
3. Allow to use passage of PAS administration building in case of process the clearance with PAS, but brokers shall not drive to container terminal operation area in order to prevent the impact on container operation and accidents.

As having mentioned above, PAS strongly hope that all staffs and broker agencies that process the formalities and import-export clearance with PAS kindly understand and undertake to carry out this announcement with high efficiency from the date of the announcement.

Delegate of the Royal Government of Cambodia
In charge as Chairman& CEO

Signature and organization seal
Lou Kim Chhun

Cc to:
- Deputy Director Generals
"To be aware"
- All departments of PAS
"To announce"
- All broker agencies
"To collaborate and implement"
- File-Chronology

Source: PAS

Attachment: ” Announcement on Preparation of Traffic Management in Port Autonomous Sihanoukville of Container Trailers” (Preah Sihanouk Province,Date: 05 October 2018)

Unofficial Translation

Kingdom of Cambodia
Nation Religion King

Port Autonomous Sihanoukville
Department of Harbor Master
Security & Safety Office

Preah Sihanouk Province,Date: 05 October 2018

Announcement
On
Preparation of Traffic Management in Port Autonomous Sihanoukville Of Container Trailers

The Security Office pleased informs to the Ladies/Gentlemen was Director Manager of the Container Trailer and Drivers for Container Trailers clearance that: To avoid congestion on the entrance to the Container Terminal (Gate 3), the Security Office will Determine to the Container Terminal entrance (Gate 3) and the Port Autonomous Sihanoukville (PAS) as follows:

1. Do not allowed container Trailer have not a complete document get in for waiting or Park along the Container Terminal Lanes (Gate 3).
2. Do not allowed Trailer drivers to get off their Trailer when they are in line on the Container Terminal Lanes (Gate 3).
3. All Container Trailers (Empty Trailer) can be use the Opposite road along Gate2 to Gate3 (outside the PAS) from 7: 00-12: 00 every Saturdays when needed enter to the PAS..
4. Do not allow any activities which interferes to Procedures on the of Container Terminal Entrance (Gate 3) (for Seal Scanning or documents delivery between brokers to the drivers) ect.
5. Not to allowed Container Trailer (empty Trailer) take sleep in the PAS.
6. Do not allow container Trailer have only Truck Head stay in the PAS.
7. Do not allow chassis without truck-head stay in PAS
8. The Security Office will punish/fines hardly to those Container Trailer which do not comply with the announcement above.

As having mentioned above, Security Office strongly hope that Ladies/Gentlemen was directors , Managers for all of Container Trailers and Drivers be kindly understand and Undertake to carry out this announcement with high efficiency from the date of announcement .

Security Office

F. Rail Yard Operation Plan

Rail Yard Operation Plan

Container Terminal of the Sihanoukville Port

December 2019

JICA Expert Team

Contents

Preface

This operation plan defines the operation plan such as container handling, storage of long-term storage containers and transport routes of Yard/Road trailers at the rail yard.
In formulating this operation plan, the current status of cargo handling, storage containers in the yard, and transportation status of Yard/Road trailers with export and import containers are investigated and reflected in this operation plan.
In the future, in order to carry out cargo handling at the rail yard based on this operation plan, it is necessary to formulate a trial plan of the operation plan, explain it to top management and related departments, and obtain agreement. After obtaining an agreement, the trial operation to load and unload containers at the rail yard should be performed.

1. Utilization of rail terminal

1.1. Introduction

From the current survey of the container yard at Sihanoukville Port and the forecast of future container handling demand, it is clear that the container storage capacity as a port will be insufficient in the near future. For this reason, even if in the rail yard, after examining the current cargo handling situation, utilization corresponding to the annual handling volume of 800,000 TEUs at the Sihanoukville Port is required.

1.2. Current situation of the Rail Yard

Handling situation on export and import containers and roles of the related organizations in the rail yard are shown below.

1) Current situation of container handling in the rail yard

The current state of cargo handling for import and export containers between the Sihanoukville Port and the Phnom Penh ICD is shown below.

Export containers are carried by train once or twice daily from the Phnom Penh ICD. The maximum number of export containers per train is about 50. (The maximum number of transport containers is determined by the number of Wagons.)

Up to 50 imported containers are unloaded at the Sihanoukville Port and transported to Phnom Penh.

2) Roles of related organizations in the rail yards

Table1.2-1 shows the “Roles of related organizations in the Rail Yard”.

Table 1.2-1 Roles of related organizations in the Rail Yard

1. Export Containers

Flow of Containers : Phnom Penh ICD ⇒ PAS Rail Yard ⇒ X-Ray ⇒ CY ⇒ Vessel Loading

Export Containers	Train information and Container Data	Receive and Confirmation of Train and Container Data	Custom Clearance	Work indication of Lift-off and store in Rail Yard	X-Ray examination	Lift-on to the Tractor and Shift from Rail Yard to CY	Vessel Loading
JOB Scope	Estimated time of Departure of PP and Arrival at SHV, and Container Data and others	PAS Control Center PAS CT Operation Dept. PAS Common Email Holder		Lift-off from Train and Store in Rail Yard		Lift-on to Yard trailer and shift to CY	
Control Party	Phnom Penh ICD (Royal Railway Co.)			PAS Control Center PAS CT Operation Dept.	Required for ALL Containers	PAS Control Center	PAS Vessel Planner

2. Import Containers

Flow of Containers : Vessel Discharging ⇒ PAS CY ⇒ X-Ray ⇒ Railway Yard ⇒ Phnom Penh ICD

Import Containers	Container Data	Lift-on to Yard trailer and transportation to RY	X-Ray examination	Custom Clearance	Work indication of Lift-on to Train carriage	Train information	Arrival Confirmation
JOB Scope	**1.** Shipping Lines (Vessel Operator) provide "Discharging Container List " to specify containers to PP via train and to stop at SHV to PAS Global Inbox, **2.** PAS Document Clerk convert it to CTMS, **3.** PAS concerned parties such as VSL Planner, Control Center, Tally Man, Gang Boss and others can get the Container information via CTMS application.					Estimated time of Departure of SHV and Arrival at PP ICD	Confirmation of Arrival at PP ICD
Control Party	CT Operation Center (PAS)	CT Operation	100% Necessary, at either PP or SHV at least one place		Control Center	Royal Railway, Sihanoukville Office	Royal Railway of Phnom Penh

Source: The email from Phnom Pen Dry Port that shows the container data written by EXCEL about the containers loaded on train from the Sihanoukbille Port, departure time from the Sihanoukbille Port and arrival time at Phnom Penh of train

1.3. Utilization of Rail Yard

The positional relationship between the rail yard and other related facilities is shown in Figure 1.2-1.

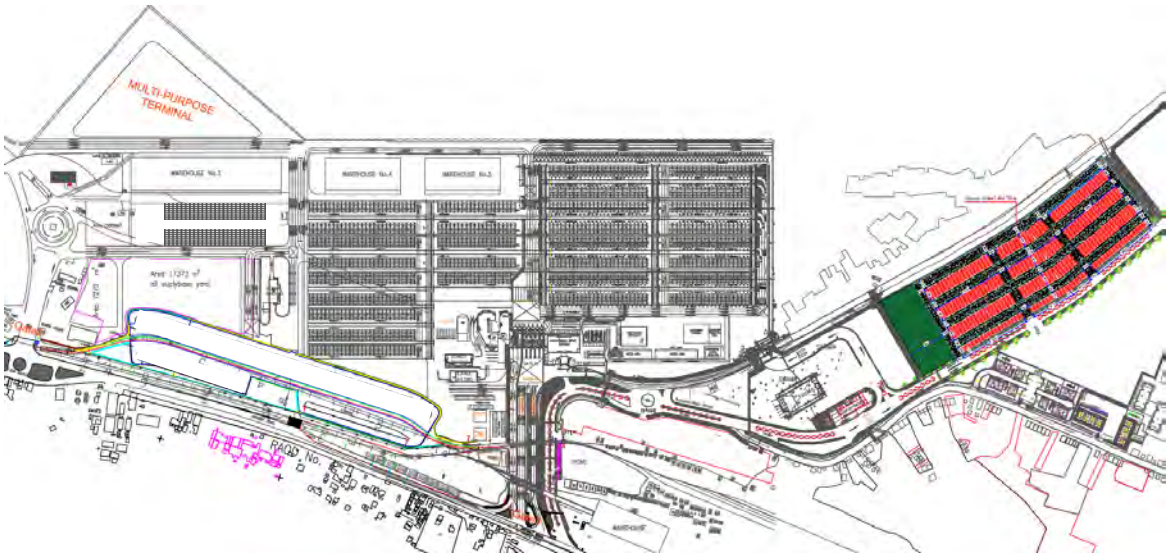


Figure 1.2-1 Positional relationship between the rail yard and other related facilities

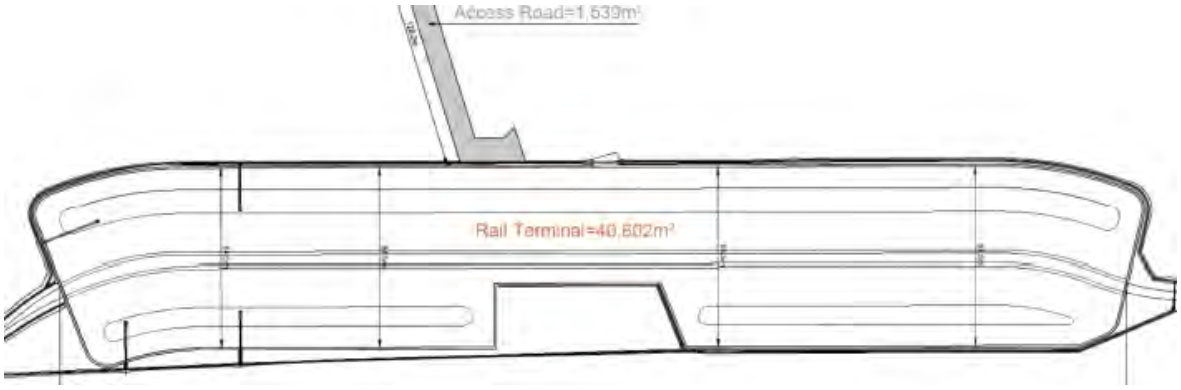


Figure 1.2-1 Rail Yard

2. Container handling in the rail yard

2.1. Container storage layout and storage capacity

2.1.1. Storage layout and cargo handling equipment

1) Storage Layout

The container storage layout in the rail yard is shown in Figure 2.1-1.
Long-stayed containers should be stored in the rail yard.

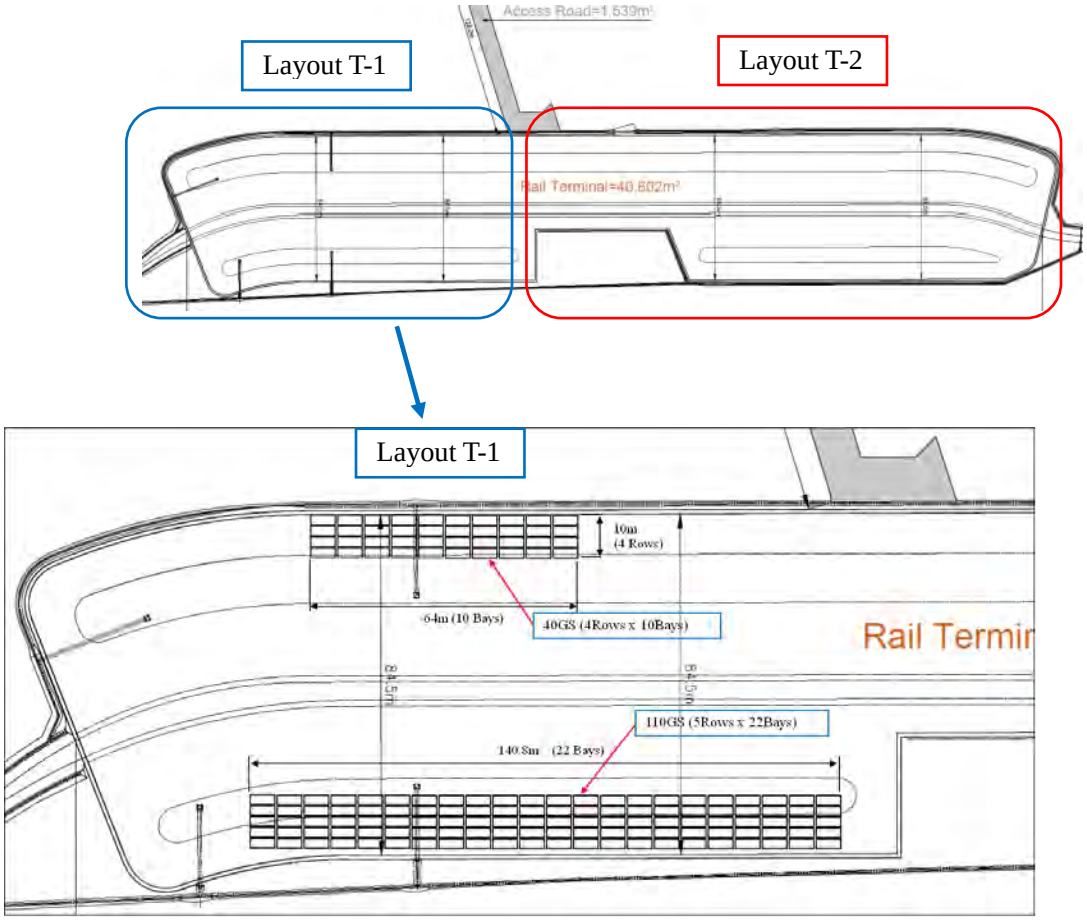


Figure 2.1-1 Container storage layout in the rail yard (long-stay storage container)

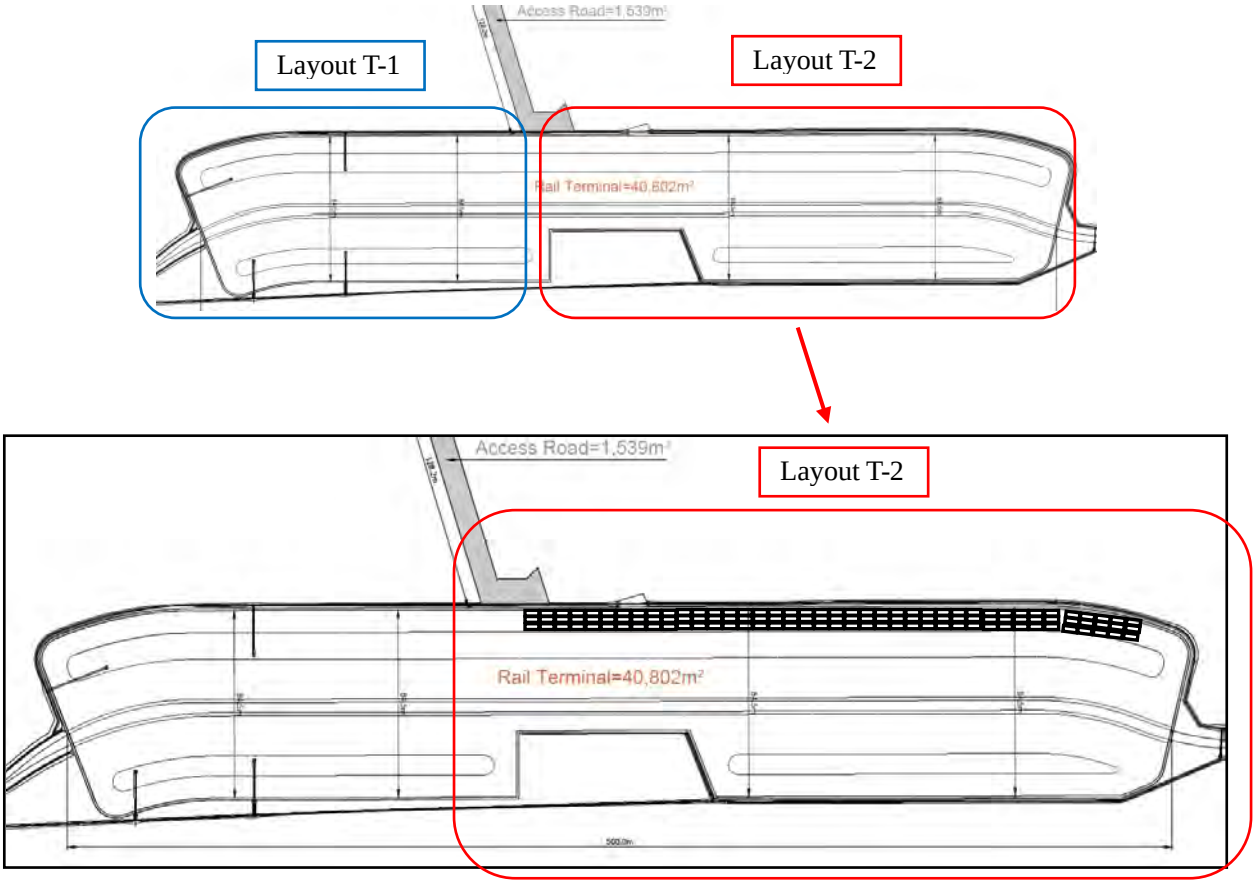


Figure 2.1-2 Container storage layout in the rail yard (container temporary storage)
Temporary storage place for import and export containers
(or temporary storage place for empty containers)

Storage capacity of containers in the railway yard is shown in Table 2.1-1.

Table 2.1-1 Container storage layout in rail yard

Item	unit	Storage area for Long-stay containers	Temporary storage area for Export/Import containers
Area of Rail Yard	m3	About 35,500m^3	
Ground Slot	TEU	150	120
Break-down of Ground Slot	TEU	5x22+4x10 = 150	3x40 = 120
No. of Tier	tier	4	4
Storage capacity	TEU	600	480

According to the storage period and the number of containers in 2018, shown in Table 2.1-2, the number of long-stay storage containers in the rail yard is 441 TEUs for one month or more and 347 TEUs for one year or more.

The number of long-stay storage containers in the rail yard layout which newly studied is Ground Slot 150 (600 TEUs with 4 stacks), and it can be stored enough even if the annual handling volume is 800,000 TEUs per year.

It is necessary that PAS creates a "long-term storage container storage regulation" (Regulation making) that allows the storage period in the container terminal to be two months, and for containers with longer storage periods to be sold by customs.

2) Actual status of long-term staying containers (data as of June 2018)

Actual status of long-term staying containers stored in Sihanoukville Port Container Terminal is shown below. The storage period and number of long-stay containers stored in the terminal as of June 2018 are shown in Table 2.2-2.

Table 2.1-2 Storage period and number of long-stay containers stored in the terminal (as of June 2018)

Storage Area		More than 60 days					More than 90 days					More than 120 days					More than 365 days				
Area	Name of Place Handling	20	40	45	Total	TEU	20	40	45	Total	TEU	20	40	45	Total	TEU	20	40	45	Total	TEU
C	RTG	12	43	2	57	103	11	36	2	49	88	8	29	1	38	68	5	15		20	35
A	Reach Stacker	9	2	0	11	13	8	1		9	10	8			8	8	8			8	8
B	Reach Stacker	5	10	2	17	30	5	10	2	17	30	4	5	2	11	19	3	4	2	9	16
TA,TB,TC	Rail Yard		4	1	5	10		4	1	5	10		4	1	5	10		4	1	5	10
LO	Rail Yard (Dead	49	96	7	152	257	49	96	7	152	257	49	96	7	152	257	48	95	6	149	252
MM	Reapair Area	1	2		3	5	1	2		3	5	1	1		2	3	1	1		2	3
QA	Wharf	4	1		5	6	4	1		5	6	4	1		5	6	4	1		5	6
W	Warehouse	8	4		12	16	8	4		12	16	8	4		12	16	8	4		12	16
Others			1		1	2		1		1	2		1		1	2		1			2
Total number of Long-stay containers						**441**					**423**					**389**					**347**

3) Cargo Handling Equipment

The cargo handling equipment used for container handling in the rail yard is a reach stacker.

The cargo handling equipment used in the rail yard is shown in Table 2.1-3.

The number of Reach Stackers used in the rail yad is determined according to the container handling status such as the number of yard chassis applied.

The staff for cargo handling in the rail yard is shown in Table 2.1-4.

Table 2.1-3 Cargo Handling Equipment in the rail yard

Name of Storage yard	Cargo Handling Equipment	Number of equipment	Capacity/Specifications
Rail yard	Reach Stacker	2 – 3 units	For laden container handling

Table 2.1-4 Staff for cargo handling (Clerk and driver, etc.) in the rail yard

Name of Storage yard	Staff of CT Operation Dept.	Number of equipment	Capacity/Specifications
Tard T (Rail Yard)	Clerk	1 person/Reach Stacker	Every 8 Hours
Tard T (Rail Yard)	Driver	1 person/Reach Stacker	Every 8 Hours

2.1.2. Storage Capacity in the rail yard

1) Storage capacity in the rail yard

Storage capacity in the rail yard is shown in Table 2.1.2-1.

Table 2.1.2-1 Storage capacity in the rail yard

Item	unit	Storage area for Long-stay containers	Temporary storage area for Export/Import containers
Area	M^2	About 35,500	
Ground Slot	TEU	150	120
Break-down of Ground Slot	TEU	5x22+4x19 = 150	3Rows x 40Bays = 120
No. of Stacks	tier	4	4
Amount of Storage	TEU	600	480
Yard Productivity		1.0	1.0
Dwell Time	day	2 months x 30	5 days
Days of a year		365	365
Annual Sustainable Storage Volume	TEUs	3,650	35,040

- The dwell time of a container stocked in the rail yard will be set within maximum 1 year.
- When the dwell time of a container is over a year, it should be disposed, sold or moved to other storage area outside of the Port in consultation with related organizations/departments such as the Custom in advance in accordance with newly established internal regulations.

  The storage regulations of temporary storage of export and import containers and long-stay containers in the rail yard should be created and announced. (It will should be reflected to SOPs (“Standard Operation Procedures”) of Container Terminal Operation Department and be one of them.)

2.2. Cargo handling rules in the rail yard

2.2.1. Cargo handling works and the related departments/organizations

1) Cargo handling work at the railway yard

Types of cargo handling and work contents

The cargo handling works (Type of Cargo Handling and Work Contents) at the rail yard is shown in Table 2.2.1-1

Table 2.2.1-1 Cargo handling work (Type of Cargo Handling and Work Contents) at the rail yard

No.	Work	Contents of Work	Department / institution in charge
1	Information Exchange of Export/Import containers	Notice of quantity and container information of import / export containers	Operation staff of PAS and Royal
2	Work instructions of Lift-on/off of containers to/from train-chassis	Work instructions of Lift-on/off of Export and Import containers to/from train-chassis Work instructions of Gate-in/out of Import/Export containers of by Yard-trailers	CTMS Group of CTOD of PAS
3	Lift-off/on form/to Train-chassis	Lift-off of containers from Train-chassis and Yard/Road-trailers Lift-on of containers to Train-chassis and Yard/Road-trailers	CT Operation Dept. of PAS
4	Confirmation of container data and train-carriage No. before lift-off/on from/to train-chassis of Export/Import containers	Confirmation of container (container data) and train-carriage No. before lift-off from train-chassis Confirmation of container (container data) and train-carriage No. after lift-on to train-chassis	Royal Railway
5	Work instructions of Export/Import of long-stay containers	Work instructions of Gate-out/in of containers from/to Rail Yard	CTMS Group of CTOD of PAS
6	Export/Import works of long-stay containers	Work of Lift-on/off of long-stay containers at designated stocked location for Gate-out/in from/to Rail Yard	CT Operation Dept. of PAS
7	Open/Close of two gates of Railway Yard	Gate open and close of two gate of Railway Yard in morning and evening and security monitoring with CCD cameras	Port Security Office
8	X-ray testing of Import containers to Phnom Penh	X-ray testing of Import containers to Phnom Penh according to the USA government	Port Security Office

Remarks: CTOD: Container Terminal Operation Department of PAS

CTMS: Container Terminal Management System, CT: Container Terminal

2) Related departments/organization in charge of cargo handling work

The related departments/organizations in charge of cargo handling works in the rail yard are shown in Table 2.2-1.

Table 2.2-1 Related departments/organizations in charge of cargo handling work in the rail yard

No.	Related departments/organization	Scope of work	Remarks
1	Port Security Office	➢Security matters, ➢Opening and closing of two gates	1) Inspection of nuclear materials and related products under US request 2) Installation and management of gamma ray detection device 3) Check of contents of container when trailer enters and exits the gate
2	Container Terminal Operation Department (Yard planner, Reach Stacker Driver, Rail yard clerk)	➢Lift-on/off works of Export/Import containers ➢Cargo handling operation and storage works of empty and long-stay containers	
3	Royal Railway Co. Ltd.	➢Confirmation of Pick-up and delivery of Export/Import containers between Phnom Penh and Sihanoukville ➢Information of container data and chassis No. and departure/arrival time of train.	1) Information exchange of container data, chassis No. and departure/arrival time of train between Phnom Penh ICD and CT Operation Dept. of PAS
4	Customs brokers		
5	Custom	Please explain the Customs clearance procedure for transport to Phnom Penh"? How is customs clearance of export containers from Phnom Penh carried out?	

2.2.2. Import/export procedures and security inspection regulations on the Rail Yard

1) Export/import procedures for import/export containers on the rail yard (relationship with CTMS)

Rail Yard における輸出入コンテナの搬出入手続き（CTMS との関係）

Nak san, Mr. Thay Mengley san,

Please write the necessary matters to be specified in your SOP about " Export/import procedures for import/export containers on the rail yard (relationship with CTMS)" .

a.
b.
c.
d.
e.
f.

2) Security inspection regulations (Port Security Office matter)

There are two gates in the rail yard, and each gate is equipped with X-ray inspection equipment that inspects nuclear equipment and so on, which have been installed in 2018 in accordance with the requirement of the United States.

Container X-ray inspection will be performed at the discretion of customs.

Currently, the X-ray inspection is applied to 10-15% of the number of import / export containers.

In addition, each Gate has a cantilever-type Raise/Horizontal-Open/Close bar, and the staff of the Port Security Office opens the bar every morning while checking on the Gate monitor installed in the Port Security Office. Also, each gate is to be closed in a similar manner.

2.3. Transport routes for Yard/Road trailers to and from the Rail Yard

The Positional relationship between CY and Rail Yard is shown in Figure 2.3-1.

The location of Rail Yard and the gates are shown in Figure 2.3-2.

The storage area for Long-stay containers and Temporary stocked containers in Rail Yard is shown in Figure 2.3-3.

There are two gates in the rail yard, and each gate is equipped with X-ray inspection equipment that inspects nuclear equipment and so on, which have been installed in 2018 in accordance with the requirement of the United States.

Container X-ray inspection will be performed at the discretion of customs.

Currently, the X-ray inspection is applied to 10-15% of the number of import / export containers.

Figure 2.3-1 Positional relationship between CY and Rail Yard

Figure 2.3-2 Location of Rail Yard

Figure 2.3-3 Storage area for Long-stay containers and Temporary stocked containers in Rail Yard

Yard-trailer transport routes between the Rail Yard (RY) and -Berth 7 & 8 (Transport routes for Export/import containers) are stipulated below.

1) Transportation route for Export containers from Berth 7, 8 to Rail Yard

The transportation route for Export containers from Berth 7, 8 to Rail Yard is shown in Figure 2.3-4.

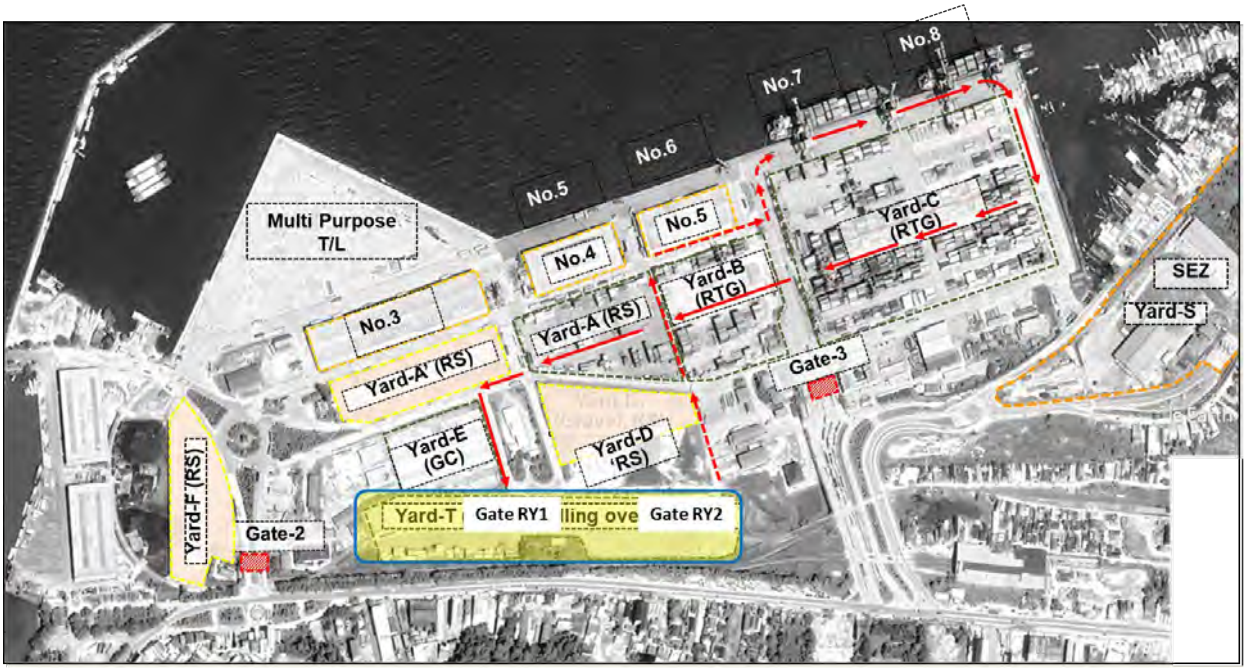


Figure 2.3-4 Transportation route for Export containers from Berth 7, 8 to Rail Yard

2) Transportation route for Import containers from Rail Yard to Berth 7, 8

The transportation route for Import containers from Rail Yard to Berth 7, 8 is shown in Figure 2.3-5.

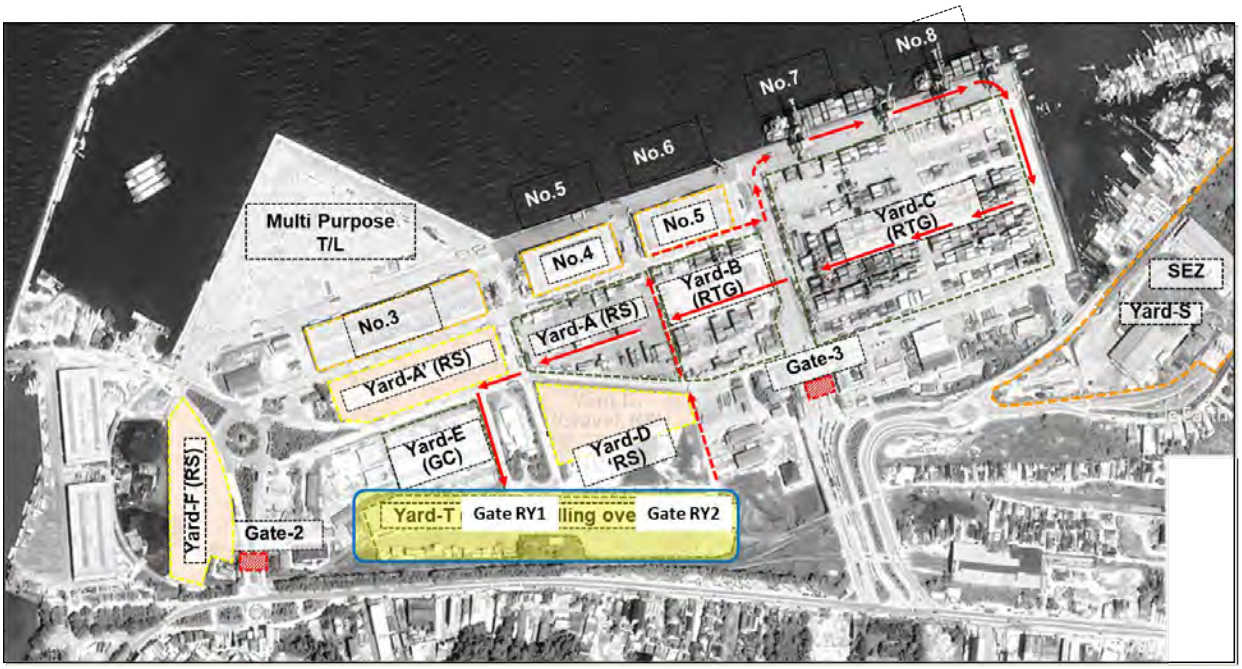


Figure 2.3-5 Transportation route for Import containers from Rail Yard to Berth 7, 8

3) Transportation routes for Export/Import containers between the Railway Yard (RY) and Lanes temporarily stocked in Yard C

(Transport routes for Export/import containers)

3-1) Transportation routes for Export containers from the Railway Yard (RY) to Lanes temporarily stocked in Yard C

The transportation routes for Export containers from the Railway Yard (RY) to Lanes temporarily stocked in Yard C is shown in Figure 2.3-6.

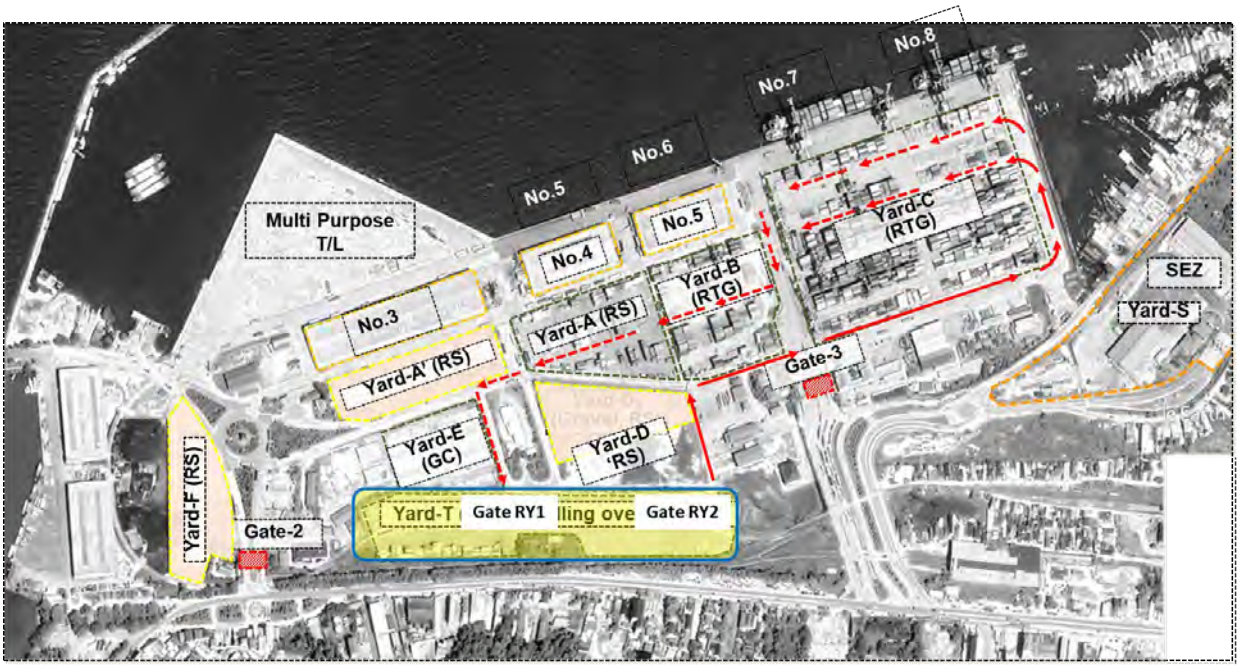


Figure 2.3-6 Road-trailer transport routes between the Railway Yard (Yard T) and Yard C, B

3-2) Transportation routes for Import containers from Lanes temporarily stocked in Yard C to the Railway Yard (RY)

The transportation routes for Import containers from Lanes temporarily stocked in Yard C to the Railway Yard (RY) is shown in Figure 2.3-7.

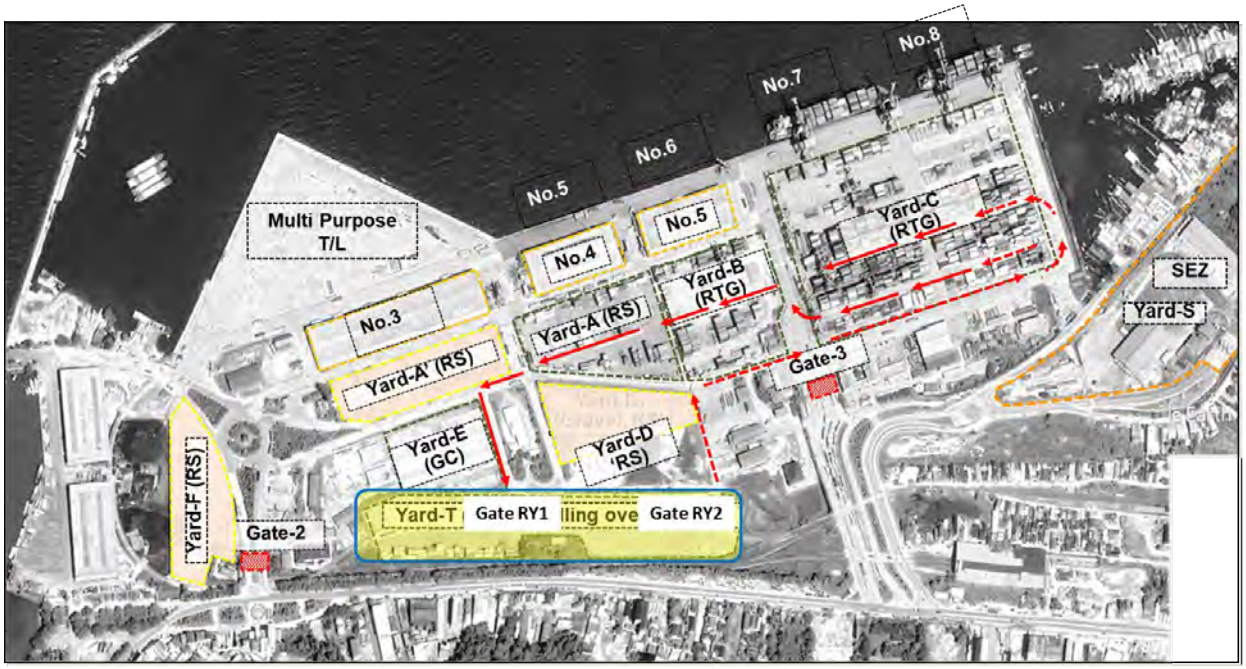


Figure 2.3-7 Transportation routes for Import containers from Lanes temporarily stocked in Yard C to the Railway Yard (RY)

3. Rail Yard Operation Plan

3.1. Rail Yard Operation Plan

Based on the newly stipulated regulations for railway yard operation, operation plan for the rail yard will be created and typical cargo handling trial will be performed in actual operation.

3.1.1. Trial schedule and cargo handling pattern of Operation plan

1) Trial schedule

2) Trial cargo handling pattern of Operation plan

Roles and placement of personnel involved in the typical cargo handling trials should be planed and determined in prior of the trial.

The roles and placement of personnel are shown in Table 3.1-1.

Number of containers transported to Loading storage lane in Yard C from Rail Yard

Number of containers imported from Yard C (storage lane) to Rail Yard to transport to Phnom Penh

Number of RTGs used and Registered No.

Number of Yard-trailers used

Number of Reach Stackers used

Number of workers (Workers in charge of the rail yard operation)

Table 3.1-1 Roles and placement of personnel

Item	Unit	Quantity required	Allocation of workers (Location)	Remarks
Lane No. of Yard C Bay No./Row No.				
Quantity of containers to be loaded	Box			
Quantity of containers carried to Phnom Penh to be transported to Rail Yard	Box			
Quantity of RTG and registered No.	unit			
Quantity of Yard-trailers	unit			
Quantity of Reach Stacker and registered No.	Unit			
Quantity of Trial worker(Workers involved in Rail Yard operation)	Person			

3.1.2. Implementation procedure for trial of Rail Yard operation

1) 1) Trial staff planning

2) Trial implementation personnel plan

Work instructor

Safety administrator

Work supporter regarding “From / To”)

Instructor in charge of quay handling

Worker at quay, at CY of Yard C, at Rail Yard, etc.)

Recorder of Trial operation (2 or 3 persons)

* Operation trial record sheet should be prepared.

The record sheet of Trial implementation of Rail Yard operation is shown in Table 3.1-2.

Table 3.1-2 Record sheet of Trial implementation of Rail Yard operation

* Name of target container Ship:

* Date of Trial implementation of Rail Yard operation

* Time; (From: am/pm to am/pm)

Container	Container No..	Case No.	Export/Import （Yard C to Rail Yard） (Rail Yard to Yard C)		Turnaround Time (Transporting time between Rail Yard and Yard C) (min)
			From	To	
Loaded container					
Unloaded container					

G. Proposal for Countermeasures against Mitigating the Congestion by Utilization of Off-dock Yard

Proposal for Countermeasures against Mitigating the Congestion by Utilization of Off-dock Yard

December 2021

JICA Expert Team

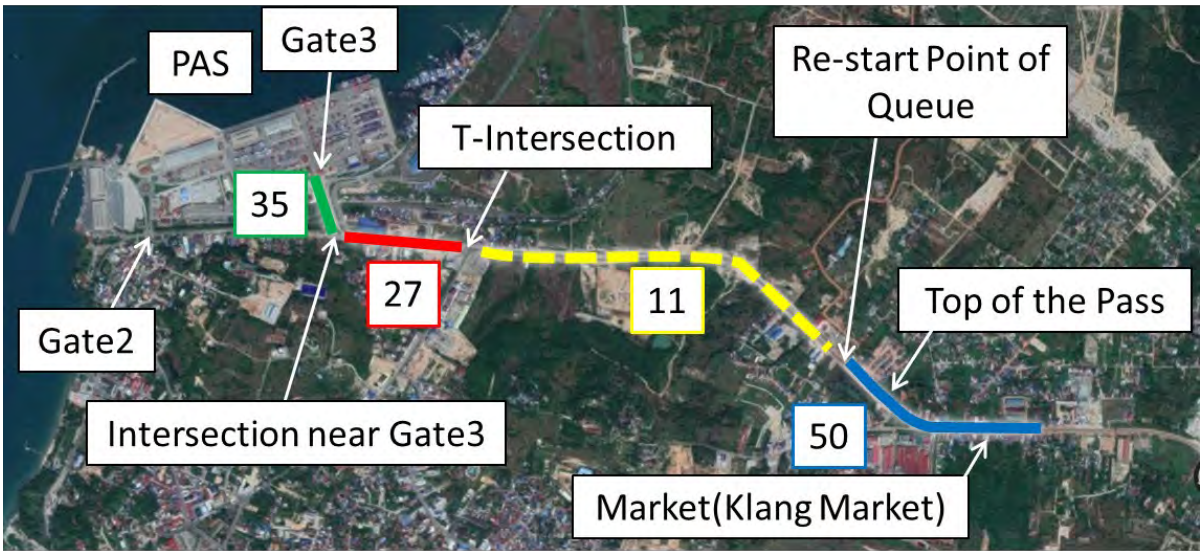
Contents

1. Current status of traffic congestion and off-dock yards

1.1. Congestion at the gate 3 of Sihanoukville port

1.1.1. Initial status of the project

The cargo handling volume at Sihanoukville Port has continued to increase together with the development of the economy which has led to congestion in the port, especially on weekends when garments and leather goods are brought to the port for export. On Saturday mornings, queuing trailers at Gate 3 extend to the Klang Market in the direction of Phnom Penh on Route 4. Figure 1.1-1 shows queuing trailers on Saturday, May 12, 2018, when the longest queue of 123 trailers was observed. The queue extended to the market located on the top of the pass of NH No.4. This congestion impeded traffic of local residents and businesses.



Source: The Team based on Google map

Figure 1.1-1 Queuing trailers on Saturday, May 12, 2018

Picture 1.1-1 Queuing trailers at Gate 3 on Saturday, May 12, 2018

Picture 1.1-2 Queuing trailers at the intersection near Gate 3 on Saturday, May 12, 2018

Picture 1.1-3 Queuing trailers at the top of the hill on Saturday, May 12, 2018

1.1.2. PAS special team for mitigating gate congestion

Based on the recommendation of the study team during the second dispatch, PAS created a congestion management team in October 2018 to implement countermeasures for mitigating the gate congestion. Since then, the queuing trailers have not been observed to extend to national road No.4. The members of the congestion management team are shown in Table 1.1-1. The measures implemented are as follows.

・All 6 lanes of Gate3 will be operated as Gate-In lanes from 6:00 AM. (Switch between Gate-In and Gate-Out as necessary depending on the situation.)

・Gates is operated 24 hours a day on Friday (until Saturday morning).

・Weighing the container at the gate (truck scale) is prohibited on Saturday morning (with some exceptions).

・Gate clerks and gate checkers are placed around the gate for giving instructions to trailer drivers.

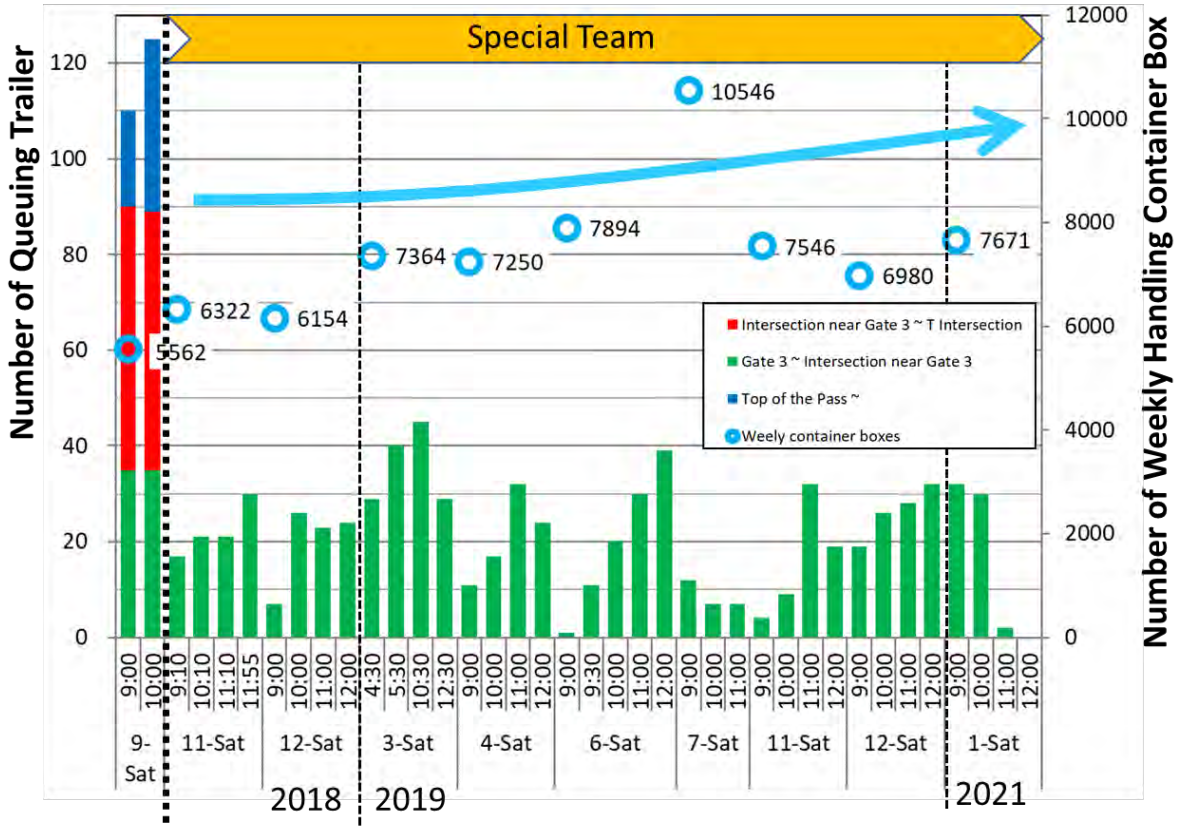
・IDT will be pre-checked before reaching Gate 3, and such trailers will be turned back. However, in case of congestion, the vehicles are temporarily allowed to pass through the gate and wait at the Yard-C backyard in the port for further processing.

・To shorten the gate processing time at the gate.

Table 1.1-1 Members of the Congestion Management Team

1	Dr. Chhun Hong	Deputy Director of Administration	Management Director
2	Mr.Ty Sakun	Director of Technical Material –Construction	Deputy Director
3	Mr. Thong Viro	Director of Harbor Master Dept	Deputy Director
4	Mr. Rath Sela	Director of Admin-Human Resource	Member
5	Mr. Heang Sophal	Deputy Director of Container Terminal Operation	Member
6	Mr. Thay Mengly	Deputy Director of Container Terminal Operation	Member
7	Mr.Nhim Pisey	Chief of Security Office, Admin-HR Dept.	Member
8	Mr. Ouk Sovannarith	Chief Office of General Cargo Operation Dept.	Member
9	Mr. Chan Kang	Deputy Director of Construction and Engineering Department	Member
10	Mr. Sorm Karoney	Chief of IT Section, Admin-HR Dept.	Member
11	Mr. Nong Sinal	Officer of Gate Clark, Security Section	Member
12	Mr. Chan Minea	Officer of Security and Safety	Member
13	Mr. Kong Thach	Deputy cheif of machinery office, container terminal operation department	Member

Figure 1.1-2 summarizes the traffic congestion in front of Gate 3 on Saturdays during this project (left axis) and the weekly container handling volume at the time of the traffic congestion survey. Although the weekly container handling cargo volume has been increasing year by year, there has been no congestion extending to National Road 4 since the establishment of the Congestion Management Team for mitigating the gate congestion.



Source: The Team based on PAS's data and the results of baseline survey

Figure 1.1-2 The status of congestion at Gate3 on Saturday

1.2. PAS's off-dock yard

1.2.1. Types and locations of off-dock yards

Interviews with PAS staff revealed that the following PAS-owned land is available for off-dock yard utilization.

(1) 54ha, 25 km from Sihanoukville Port

(2) 12ha in SEZ

(3) 4ha of Parking yard near Gate 3

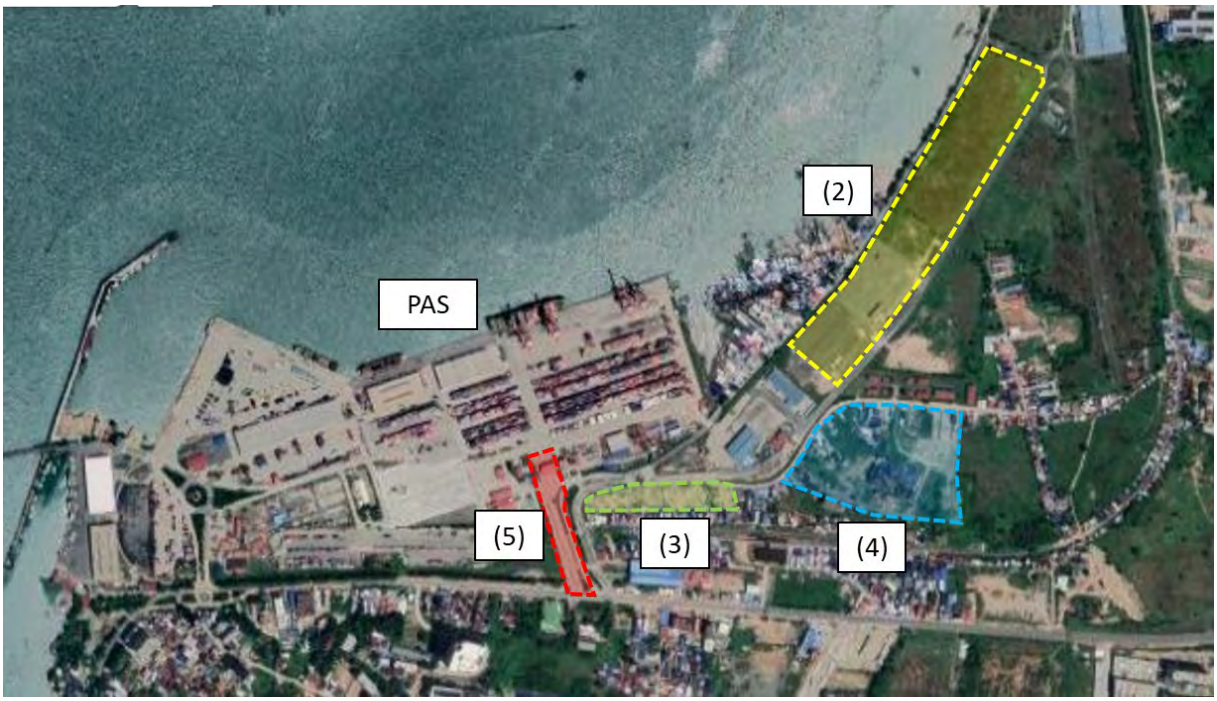
(4) The Land near SEZ

(5) The Land near Gate 3

(6) Land owned by PAS in Moat Pean

Source: The Team based on Google map

Figure 1.2-1 Location map of off-dock yards



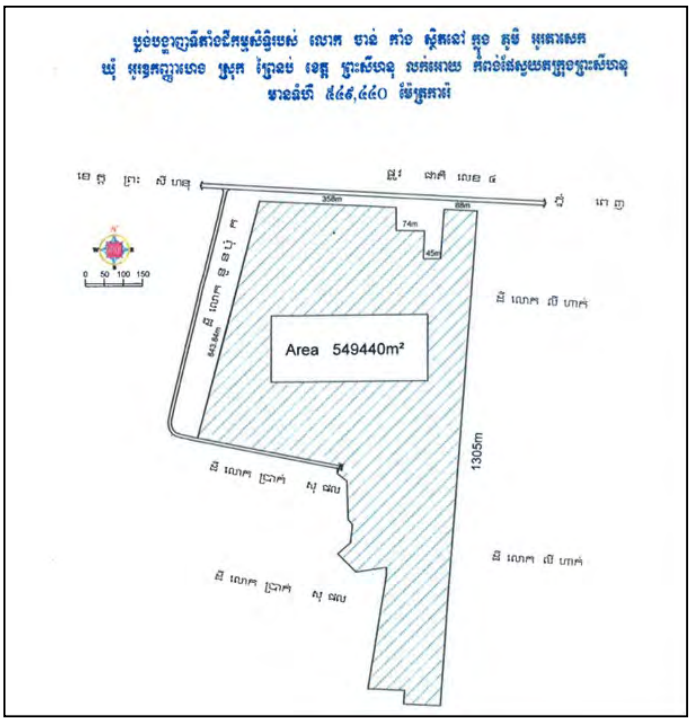
Source: The Team based on Google map

Figure 1.2-2 Location map of off-dock yards near PAS

(1) 54 ha, 25 km from Sihanoukville Port

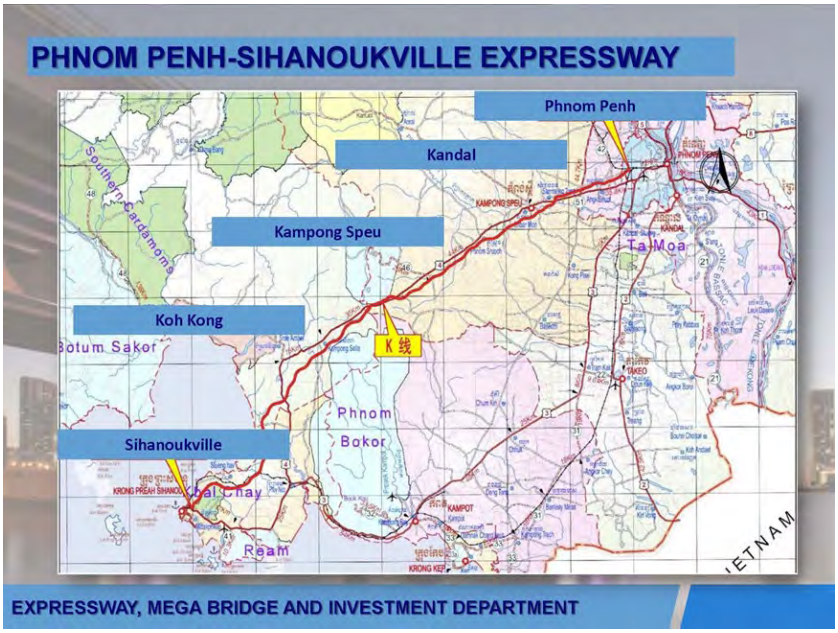
The off-dock yard is located along National Road 4, about a 40-minute drive from PAS. It is a vacant lot with trees growing wild. At the beginning of the project, it was planned to use the off-dock yard as a pre-gate to prevent traffic congestion, however PAS was not willing to implement concrete measures at that time because of the mitigation of gate congestion and the plan to build an expressway between Phnom Penh and Sihanoukville (Figure 1.2-4).

Picture 1.2-1 Current situation of 54ha



Source: PAS

Figure 1.2-3 54ha plot of land



source：https://mpwt.gov.kh/kh/public-works/expressways

Figure 1.2-4 The planned expressway between Phnom Penh and Sihanoukville

(2) 12ha in SEZ

12 ha area in the SEZ, which is close to the existing container terminal at PAS, has been used as an empty container yard since the fall of 2020, and some of the empty containers that had been handled inside PAS will be moved to this area. The remaining 8 hectares will be utilized by companies moving into the area or as material yard when the new container terminal is constructed.

Picture 1.2-2 Empty Container depot in SEZ

(3) The Land near Gate 3

The land is located on the National Road 4 side of the PAS office, and according to the interview with PAS staff, it is expected to be used as a construction material storage area to cope with the rapid construction of hotels and casinos in Sihanoukville.

Picture 1.2-3 Parking yard near Gate 3

(4) The land near SEZ

From the interview with PAS staff, it was found that there is a property next to the SEZ, however it is difficult to utilize as an off-dock yard because the access road is a local road which is difficult for trailers to pass through. Moreover, this land is also being used as a construction material storage area.

Picture 1.2-4 The land7ha near SEZ

Picture 1.2-5 Current situation at the lard near SEZ

(5) The Land near Gate 3

As countermeasures to mitigate the congestion at Gate 3, the utilization of the area around Gate 3 will be considered for the operation of booths, lanes and waiting zones in the gate as an off-dock yard. Gate 3 has six lanes and four PAS's booths as well as customs and police booths.

Picture 1.2-6 Gate3 and trailers waiting area

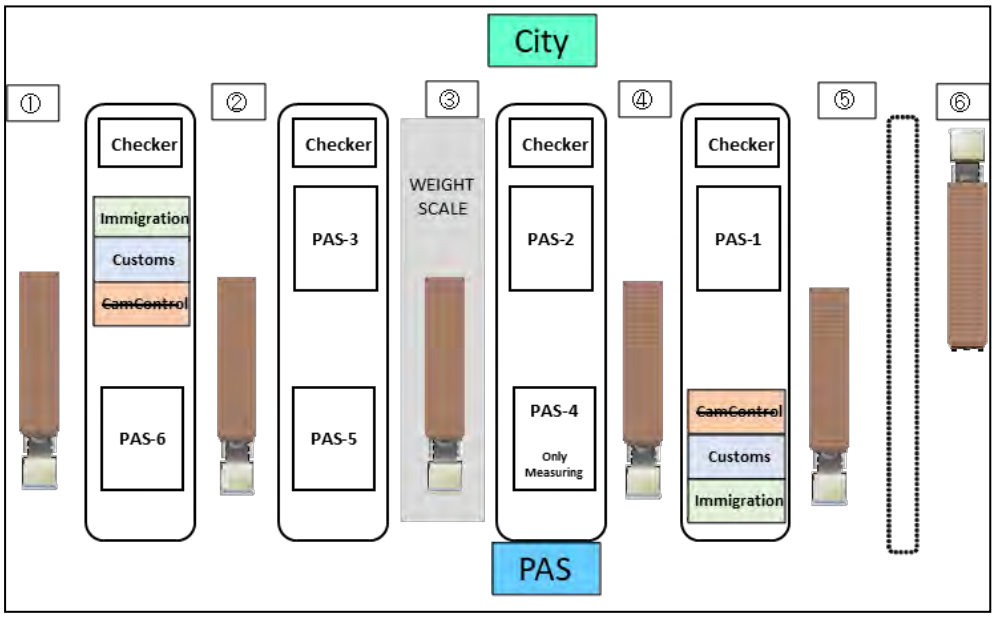


Figure 1.2-5 layout of Gate3

(6) **Land owned by PAS in Moat Pean**

According to an interview with PAS staff, there is 150ha of land owned by PAS in Moat Pean, 10km away from PAS. Although it faces the sea, the water depth is almost zero close to the shore (refer to Picture 1.2-7）. In addition, at the time of the field survey in May 2018, it was judged that it would be difficult to use the land as an off-dock yard for trailers because the road connecting National road 4 to this land was unpaved and sloped (refer to Picture 1.2-8）. However, with the road widening project starting around 2020, the road in front of the land has been developed (refer to Picture 1.2-9), and it may be possible to use this land as an off-dock yard in the future.

Picture 1.2-7 150 ha of PAS land facing the sea in Moat Pean

Picture 1.2-8 Access road from National road 4 to the land area in Moat Pean (May 2018)

Source: Google map

Picture 1.2-9 Access road from National road 4 to the land area in Moat Pean (June 2021)

1.2.2. Summary of off-dock yard

Regarding the utilization of the off-dock yard owned by PAS, there are off-dock yards with a large area as shown in (1) and (6), however it is necessary to proceed with caution due to the traffic flow of trailers after the completion of the planned expressway. As for (2) and (5), they are already in use while (3) and (4) are well located but are currently used as material storage areas.

Table 1.2-1 Options for off-dock yards

Location of candidate off-dock yard site	(1) 54ha, 25km from Sihanoukville Port	(2) 12ha in SEZ	(3) 4ha of Parking yard near Gate 3	(4) The land near SEZ	(5) The land near Gate 3	(6) 150ha parcel of land in Moat Pean
Advantages	・Large Area	・Empty container storage area is used , other yards can be utilized	・ Close to PAS	・ Close to PAS	・Implementation cost is low	・Large Area ・Access road has been improved and can be utilized
Issues	・ Utilization of the site will depend on the traffic flow of trailers after the completion of the planned expressway	・Construction costs are required for yard utilization	・Preferential use as a general cargo storage area for construction materials, etc.	・Difficult for trailers to go through the access road	Additional booths will need to be constructed while the gate is operated	・ Utilization of the site will depend on the traffic flow of trailers after the completion of the planned expressway
Feasibility	△	○	×	×	◎	△

2. Traffic congestion forecast

2.1. Forecasting congestion at Gate 3

2.1.1. Forecast method

Using the results of the last project survey in January 2021, which included gate passing time and traffic surveys, The team forecast the throughput of the gates and the volume of trailer traffic that will use the gates in the future to see if the congestion that occurs at Gate 3 will extend to National Road 4.

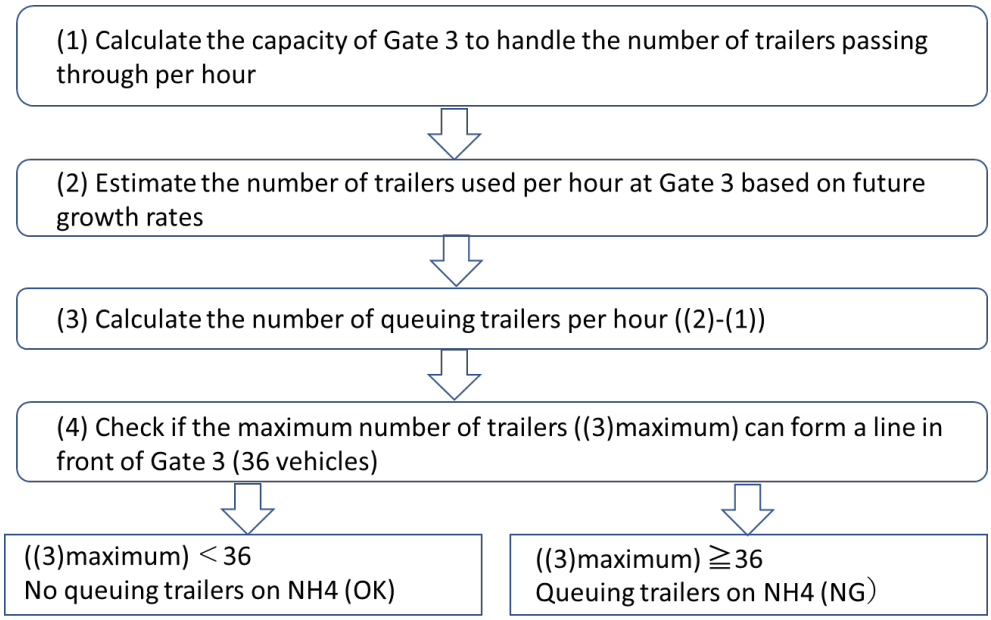


Figure 2.1-1 Forecast method for grasping gate congestion

2.1.2. Forecast results

(1) Processing capacity of the number of trailers passing through Gate 3 per hour

From the results of the baseline survey (number of trailers passing through the Gate 3), the number of trailers passing through the Gate 3 per hour on Saturday morning is 161 on January 16, 2021. Compared to 2018 and 2019, before and after the formation of the PAS congestion management team, the results have not changed significantly.

Table 2.1-1 Number of trailers passing through Gate 3 per hour

Survey date	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Total	(time)
8th, Sep.2018	13	16	18	25	28	10	110	3m18s
29th, Jun,2019	21.5	18	15	22.5	16.5	12	105.5	3m24s
16th, Jan.2021	27	33	19	29	29	24	161	2m14s

(2) Number of trailers per hour using Gate 3

From the results of the baseline survey, the traffic volume on Saturday, January 21, 2021 is shown in Figure 2.12 2. It can be seen that more trailers are coming to the gate in the morning and more trailers are leaving the gate in the afternoon.

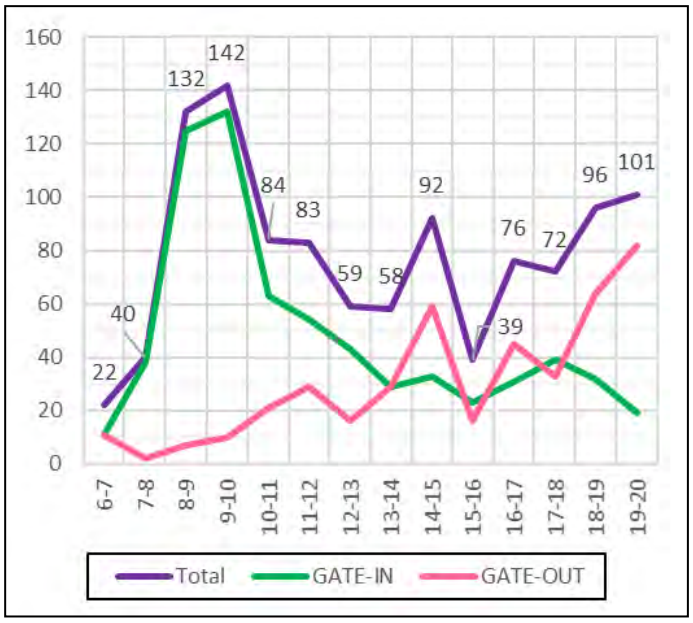


Figure 2.1-2 Number of trailers at Gate 3 on January 16, 2021

(3) Number of queuing trailers per hour at Gate 3 in the future with 800,000 TEU

The traffic volume in January 2021 shall be multiplied by the future growth rate (assuming the future container handling volume will reach 800,000 TEUs) to estimate the future traffic volume at Gate 3. If the future number of trailers exceeds the capacity that can be processed at gate 3 (161 vehicles per hour), congestion can be expected to occur.

Estimated 800,000 TEU Container Handling Volume / Estimated Container Handling Volume in 2020 =800,000TEU/641,842TEU=124.6%

Traffic volume when handling 800,000 TEU containers (trailers) = Traffic volume in January 2021 (trailers) x 124.6%

Figure 2.1-3 shows that in the future, when 800,000 TEUs are handled, up to 19 trailers will be queuing at Gate 3, exceeding the gate handling throughput of 161 trailers per hour, but since the number of trailers lined up in front of Gate 3 will be 36, it is assumed that congestion will not extend

to National Road 4.

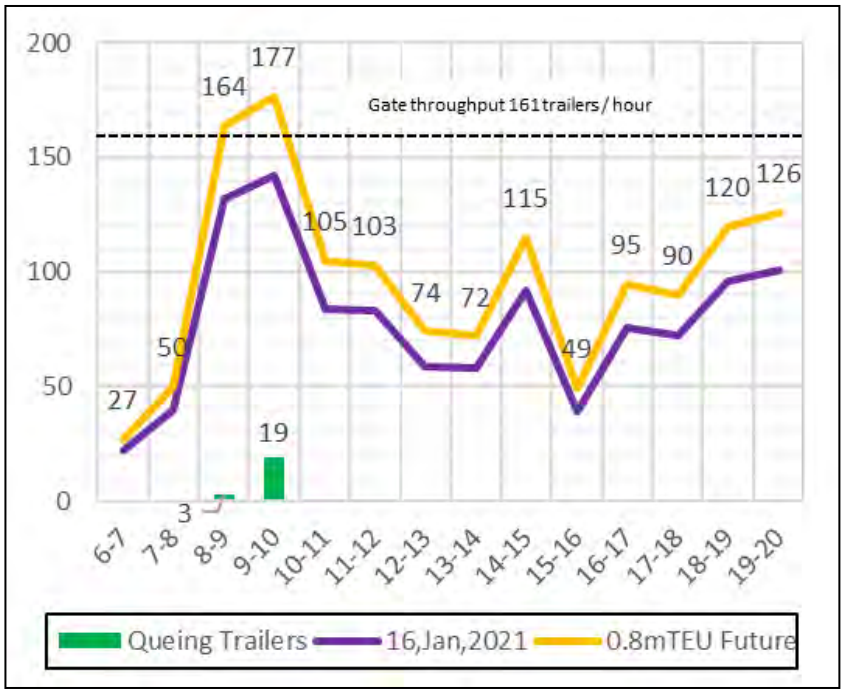


Figure 2.1-3 Number of queuing trailers per hour at Gate 3 when handling 800,000 TEU

(4) Number of queuing trailers per hour at Gate 3 in the future (in 2024)

The traffic volume in January 2021 shall be multiplied by the future container handling growth rate in 2024, when the new container terminal will be operation, to estimate the future traffic volume at Gate 3. If the future number of trailers exceeds the capacity that can be processed at gate 3 (161 vehicles per hour), congestion can be expected to occur.

Estimated Container Handling Volume in 2024／Estimated Container Handling Volume in 2020
=878,000TEU/641,842TEU=136.8%

Traffic volume in 2024 (trailers) = Traffic volume in January 2021 (trailers) x 136.8%

Figure 2.1-4 shows that up to 53 trailers will be queuing at Gate 3 in 2024, exceeding the gate throughput of 161 vehicles per hour. Moreover, the congestion will extend to National Road 4 as 17 more trailers than previously will be queuing.

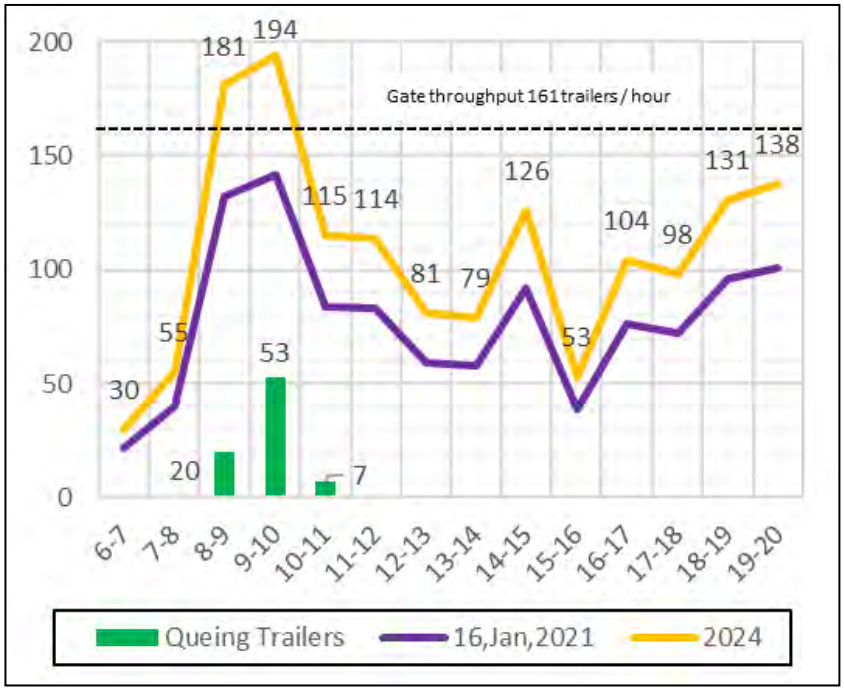


Figure 2.1-4 Number of queuing trailers per hour at Gate 3 in 2024

2.2. Forecasting congestion at the intersection

2.2.1. Forecast method

Using the results of the traffic survey conducted in September 2018 it is possible to forecast future traffic volumes and the level of congestion in front of Gate 3 and at the T-intersection of National Road 4. Results of the traffic survey on Saturday morning on congestion occurring at Gate 3 will also be utilized.

The traffic capacity of intersections without traffic signals will be calculated using the method prescribed in "Planning and Design of Plane Intersections, Revised, Basic Edition, Volume 3 (Japan Society of Traffic Engineers).

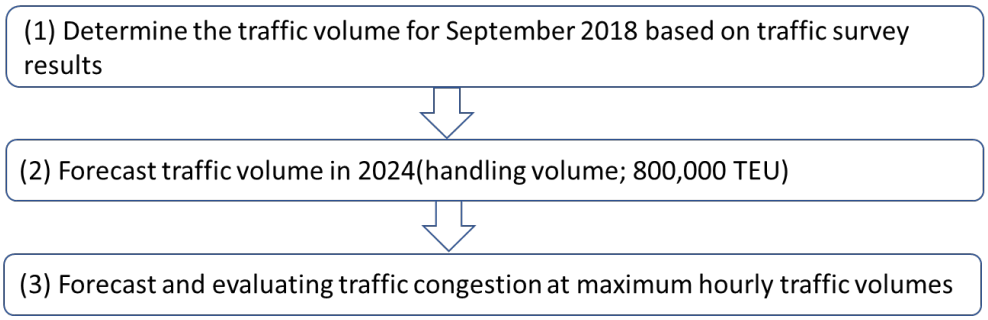


Figure 2.2-1 Forecast method of congestion at intersection

2.2.2. Forecast results

(1) Determine the traffic volume for September 2018 based on traffic survey results

Table 2.2-1 shows the traffic volume by direction from the results of the traffic survey on Saturday, September 8, 2018 in which peak traffic occurred between 8:00 and 9:00 a.m. The number of vehicles obtained from the traffic survey was multiplied by a passenger car conversion factor to calculate "pcr", with a factor of 1.0 for passenger cars, 0.5 for motorcycles, and 1.5 for trucks and trailers.

Hour／Direction	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
6:00-7:00	1,632	107	218.5	341.5	24.5	228	28.5	7.5	0	184	1.5	5	4.5	159	5	161	0	101.5	55
7:00-8:00	2,491	232.5	263	408	61	336	39	14.5	1.5	249	105	6	9.5	231.5	12.5	246.5	0	189	86
8:00-9:00	**2,505**	**245**	**263**	**335**	**68**	**334**	**44**	**20**	**5**	**218**	**146**	**14.5**	**5**	**270**	**35**	**267**	**0**	**165**	**72.5**
9:00-10:00	2,387	154.5	229	322.5	70	280.5	47.5	38	8	183.5	154.5	23.5	6	287	28.5	267	0	217.5	69
10:00-11:00	2,417	160.5	273.5	265	79.5	206	31.5	47.5	4.5	146	117	48.5	7.5	272.5	15.5	369	0	279.5	93
11:00-12:00	2,173	234.5	181	219	20.5	219.5	30	88	53	123	103.5	62	18.5	139	13.5	340.5	1	262.5	63.5

Table 2.2-1 Traffic volume at T-intersection in front of Gate 3 in September 2018 (pcr)

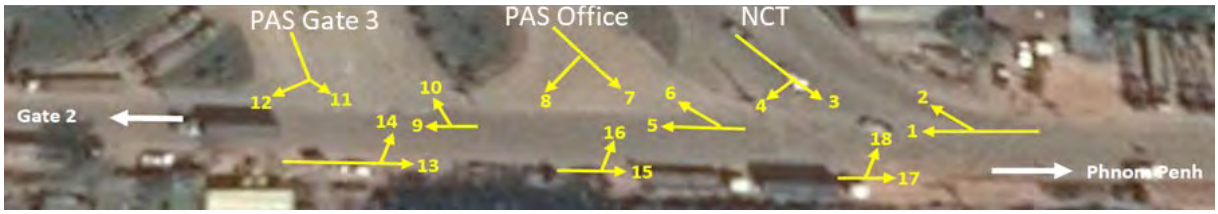
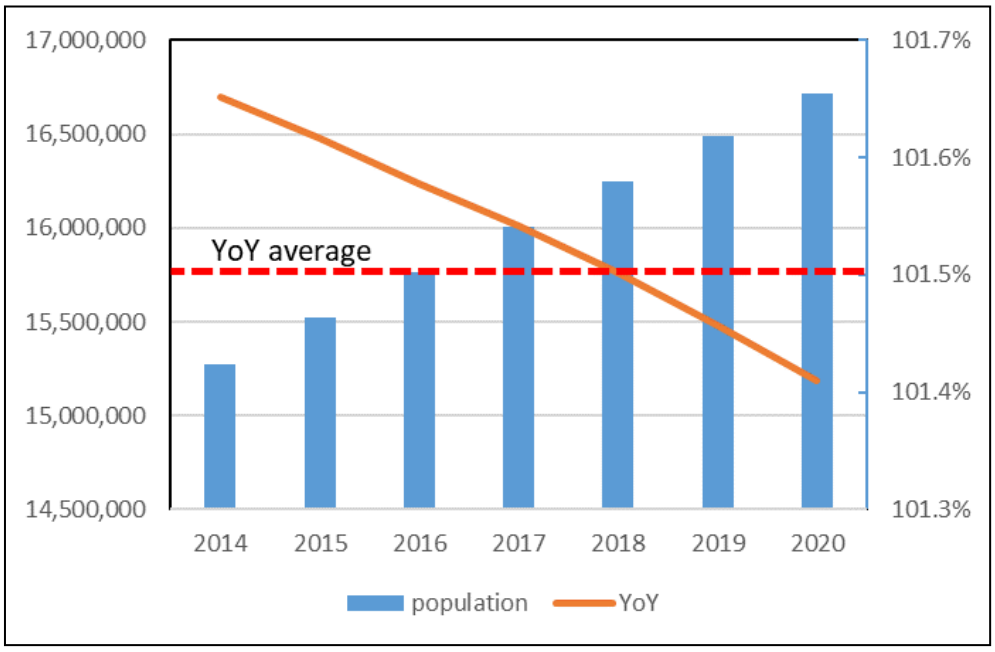


Figure 2.2-2 Location map of traffic survey by direction

(2) Forecast traffic volume in 2024

To estimate the traffic volume in 2024 using the results of traffic volume in September 2018, trailers were multiplied by the 1.478 (=800,000 TEU/541,228 TEU (2018)) of the volume handled in 2018 and 800,000 TEU, while passenger cars and motorcycles were estimated by multiplying Cambodia's 6-year population growth rate of 1.5% (refer to Figure 2.2-3). The maximum hourly traffic volume between 8:00 and 9:00 in the Saturday morning traffic volume by direction (refer to Table 2.2-2) is shown in the figure (refer to Figure 2.2 4).



source: The team based on https://data.worldbank.org/indicator/SP.POP.TOTL?locations=KH

Figure 2.2-3 Cambodia's population and its growth rate

Table 2.2-2 Traffic volume at T-intersection in front of Gate 3 in future (pcr)

Hour／Direction	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
6:00-7:00	1,808	119	239	376	27	252	31	8	0	202	2	6	5	178	8	180	0	115
7:00-8:00	2,877	281	288	449	70	399	43	16	2	274	155	7	12	267	17	283	0	217
8:00-9:00	**2,936**	**294**	**290**	**369**	**76**	**411**	**48**	**22**	**5**	**246**	**215**	**18**	**5**	**307**	**51**	**307**	**0**	**188**
9:00-10:00	2,820	193	251	358	82	344	52	42	9	201	228	31	7	335	42	308	0	254
10:00-11:00	2,877	196	303	297	91	261	35	52	5	162	173	68	8	317	23	440	0	337
11:00-12:00	2,606	287	201	242	24	277	38	96	58	142	153	87	22	160	20	405	1	319

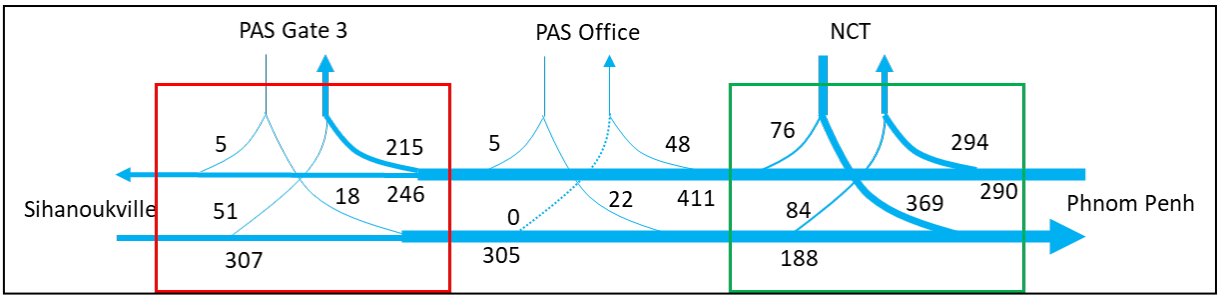


Figure 2.2-4 The maximum hourly traffic volume at T-intersection in front of Gate 3 (pcr)

(3) Forecasting and evaluating traffic congestion at maximum hourly traffic volumes

The study of the crossing capacity of the intersections was omitted in front of the PAS office, where the volume of crossing traffic is small. Instead, The team examined traffic at the T intersection toward New Container Terminal (NCT) in the green frame in Figure 2.2-4 and the T intersection in front of

Gate 3 in the red frame. The traffic capacity is within the range of the actual traffic volume and thus no problems are identified. In addition, the maximum estimated queue length is 73.8m from the NCT in direction 3 to Phnom Penh (refer to Table 2.2-3). The queue length will fit into the intersection (refer to Figure 2.2-5), however since a similar amount of traffic is expected before and after the study time, it may be necessary to deploy traffic guides to control the traffic.

Table 2.2-3 Evaluation of traffic capacity and queue length at intersections

The T intersection toward NCT

No	Traffic volume(A)	Capacity(B)	(B)-(A)	(A)/(B)	Evaluation
18	84	1000	916	0.084	OK
4	76	748	672	0.102	OK
3	369	439	70	0.841	OK

No	pcr	Queue Length(m)
18	84	15.2
4	76	73.8
3	369	16.8

The T intersection in front of Gate 3

No	Traffic volume(A)	Capacity(B)	(B)-(A)	(A)/(B)	Evaluation
14	51	1112	1061	0.046	OK
12	5	799	794	0.006	OK
11	18	414	396	0.043	OK

No	pcr	Queue Length(m)
14	51	10.2
12	5	1
11	18	3.6

Source: The Team based on Google map

Figure 2.2-5 Location map of the queue length in direction 3

3. Proposals for countermeasures against mitigating the congestion

3.1. Utilization of off-dock yard

3.1.1. Gate operation rules

When the container handling volume reaches 878,000 TEU in 2024 as described in section 2.1.2(4), it is predicted that there will be 17 queuing trailers on National Road 4.

(1) Prohibition of gate out on Saturday morning

By allowing only gate-in operations on Saturday mornings, it is possible to mitigate traffic congestion outside the premises. The left side of Figure 3.1-1 shows the number of trailers at Gate 3 in 2021 and 2024. By changing the operation rule to gate-in only, the number of trailers can be reduced to 30 and can be accommodated in the waiting zone in front of Gate 3.

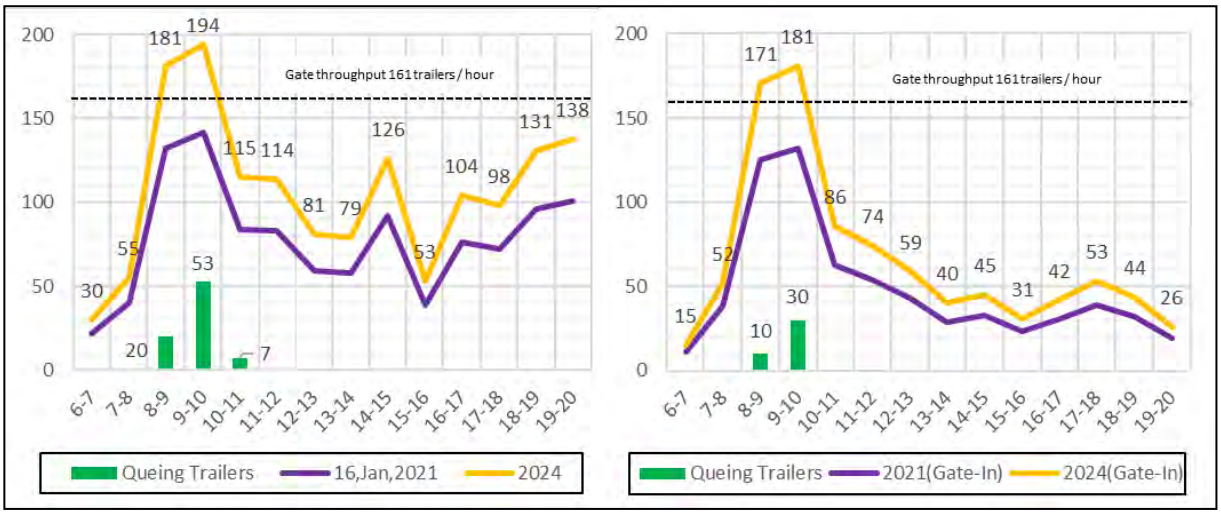


Figure 3.1-1 Queuing trailers before (left) and after (right) changing the gate rule

(2) Prevent lanes from being inoperative for more than 10 minutes

All lanes are in service due to the activities of Congestion Management Team, however the gate passing time survey revealed that some lanes were not in use for more than 10 minutes three times during the morning on January 16, 2021, and the number of processed units at these lanes was lower than other lanes. The processing capacity of the gates can be improved by having traffic guides direct trailers into the lanes where they will complete procedures (Refer to Table 3.1-2).

Table 3.1-1 Record of lanes not in use for more than 10 minutes

Lane 3	19m45s
Lane 3	33m55s
Lane6	13m40s
Total	67m20s

Table 3.1-2 Comparison of the number of trailers passing the gate on January 16, 2021 and the target number

Survey date	Lane1	Lane2	**Lane3**	Lane4	Lane5	**Lane6**	**Total**
16th,Jan. 2021	27	33	**19**	29	29	**24**	**161**
Target	27	33	**27**	29	29	**27**	**172**
Balance	0	0	**8**	0	0	**3**	**11**

(3) 4-row formation in the waiting lane in front of Gate 3

If an additional waiting lane is added (outside of Gate 3) to the existing three-row formation as shown in the red dotted line in Figure 3.1-2, it would be possible for 48 trailers to queue in this four-row formation instead of only 36. This formation will be used during periods of congestion.

Figure 3.1-2 Image of a four-row formation in front of gate 3

(4) PAS booth added at Gate 3

The existing gates have a queue of drivers for procedures at the PAS booth when operating all six lanes (Refer to Figure 3.1-3、Picture 3.1-1). This is a time-consuming and inefficient process. The number of gate transactions could be increased and drivers would not waste as much time with gate procedures if a PAS booth were installed between lanes 5 and 6 (refer to

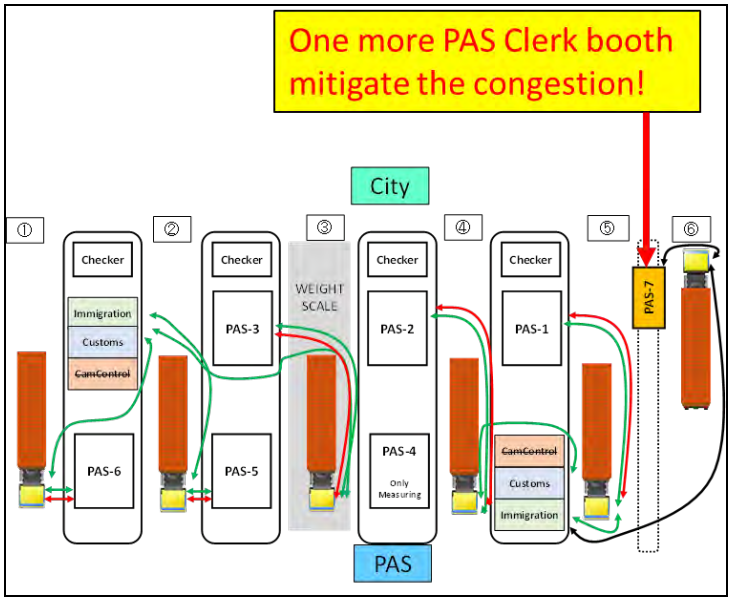


Figure 3.1-4).

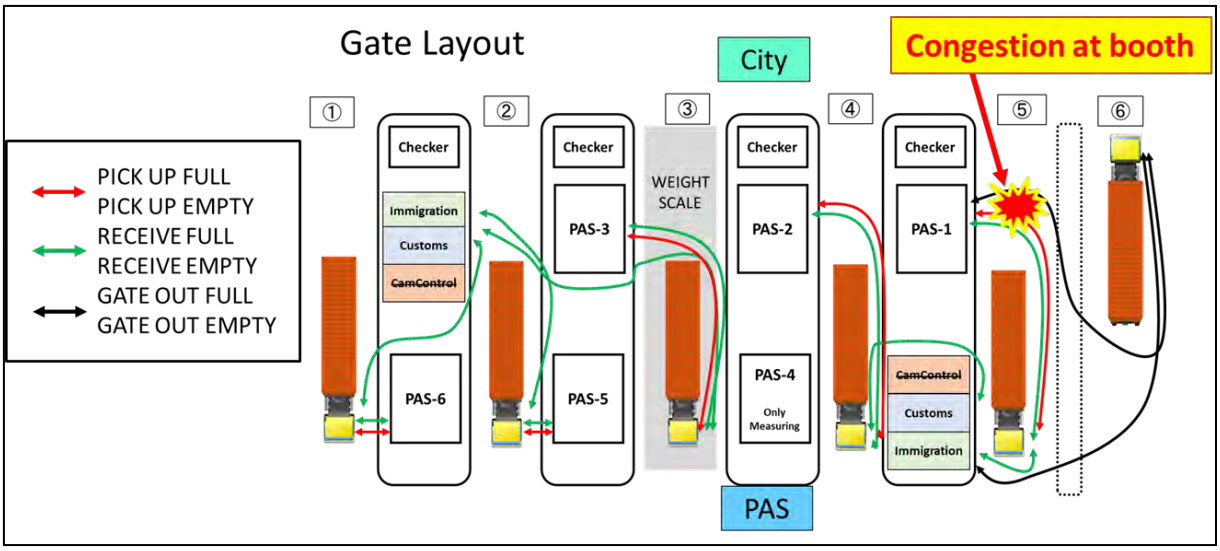


Figure 3.1-3 Trailer drivers flow and procedural congestion areas in the booth at Gate 3

Picture 3.1-1 Queue of drivers for the procedure at the PAS booth (July 2019)

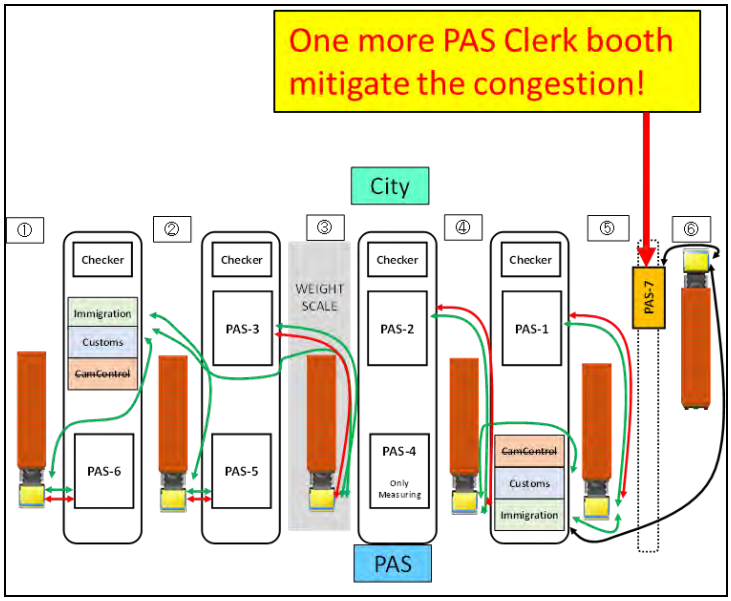


Figure 3.1-4 Location map of added PAS booth

(5) Effects of the proposal

In the proposal for gate operation, (1) for efficient operation of the increasing volume of containerized cargo, gate-in operation will cause the congestion of trailers in the container terminal, and (4) needs the cost of adding booths. The effects of the measures (2) and (3) are as follows.

If the gate throughput is 172 units per hour as shown in Table 3.1-2, and if 48 trailers can form a line in front of the gate as shown in (4), it is estimated that Gate 3 can handle 1.43 times the number of trailers in January 2021, which is 1.43 times the 641,842 TEUs, or about 917,000 TEUs.

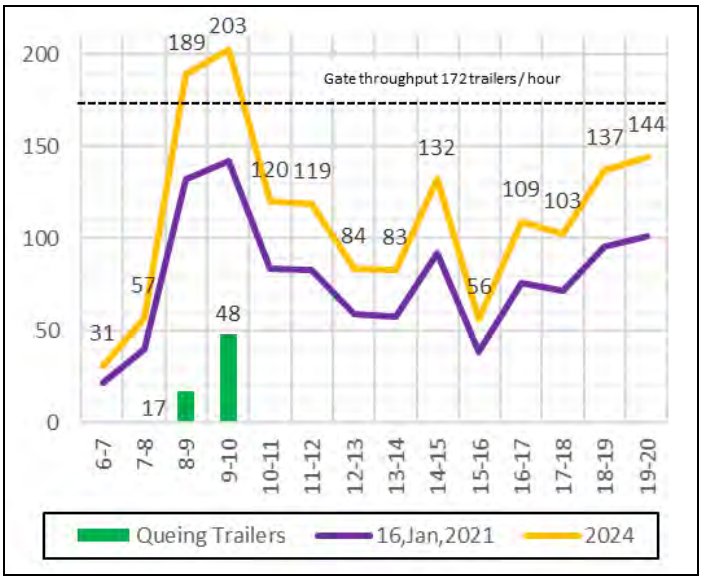


Figure 3.1-5 Forecast of queuing trailers assuming a container handling volume of 917,000 TEUs

3.1.2. Utilization of off-dock yard in SEZ

Since the end of 2020, with the expansion of the RTG yard in the container terminal, a new 4ha empty container yard has been constructed in the SEZ (refer to Figure 3.1-6). Empty containers do not require customs procedures and can be placed outside the container terminal, contributing to the reduction of congestion at Gate 3 by avoiding the use of Gate 3 when returning and picking up empty containers. According to the survey results on Saturday morning in December 2019 and January 2021, trailers for empty containers are down from the overall usage rate of 11.9% for bring-in and 0.9% for pick-up (refer to Table 3.1-3).

Source: The Team based on Google map

Figure 3.1-6 Empty container depot in SEZ

Table 3.1-3 Comparison of Saturday morning gate usage for December 2019 and January 2021

Type of trailers	2019/12/7			2021/1/16			Balance（2021-2019)		
	average time	trailers/hour	%	average time	trailers/hour	%	average time	trailers/hour	%
In-Full	02:28	41.50	34.3%	01:58	63.67	38.7%	00:34	22	4.4%
In-Empty	02:35	24.00	19.8%	01:38	13.00	7.9%	00:57	(11)	-11.9%
In-chassis only	01:07	44.50	36.8%	01:17	69.00	41.9%	00:10	25	5.1%
Out-Full	02:38	8.00	6.6%	01:40	16.33	9.9%	00:58	8	3.3%
Out-Empty	02:05	3.00	2.5%	02:07	2.67	1.6%	00:02	(0)	-0.9%
Total	02:00	121	100.0%	01:38	165	100.0%	00:22	44	0.0%

3.1.3. Utilization of off-dock yard for 54ha and 150ha

(1) Pre-Gate

At the beginning of this project, it was assumed that a pre-gate would be installed to prevent trailers with incomplete documentation in advance, however the results of the survey showed that the number of trailers with incomplete documentation turning back in front of Gate 3 was very small (0.5%), so it was determined to be unnecessary.

(2) Yard for laden imports containers

On weekends, when a trailer brings an export container to PAS, passes through Gate 3 (first time), exits Gate 2, passes through Gate 3 to load an import container (second time), picks it up, and exits Gate 3 (third time), it will use Gate 3 three times. However, if the import container can be loaded at the off-dock yard after the export container is transported to the PAS, Gate 3 would only be used once.

Figure 3.1-7 shows an image of a planned 5 ha for laden imports containers on 54 ha. Some issues need to be resolved for operation.

[Issues]

-Installation of X-inspection facilities for imported containers

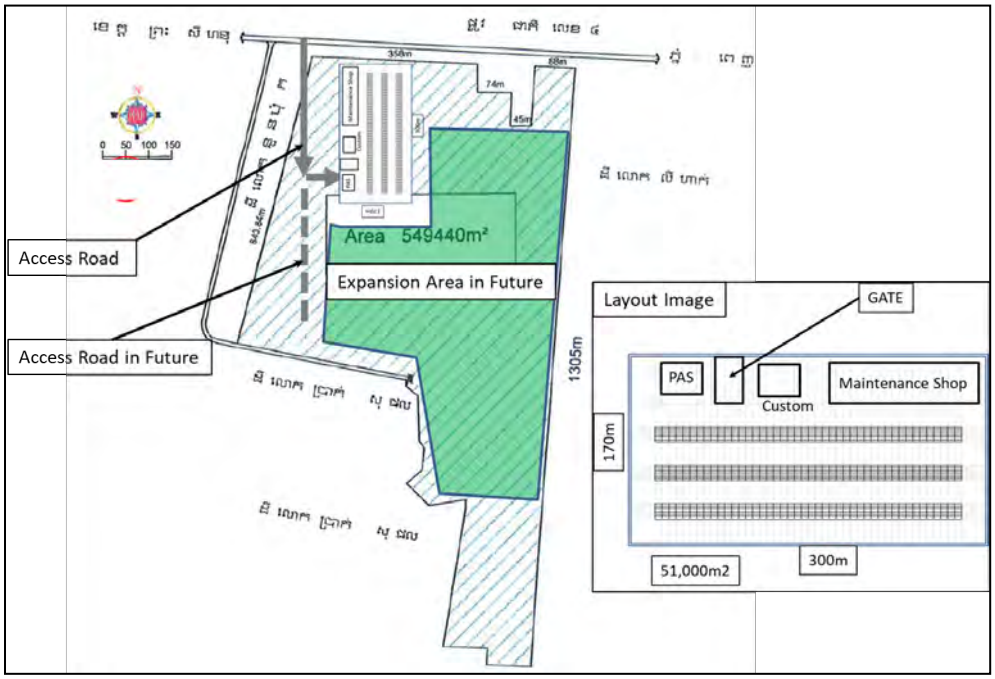
-Designation of SEZ for bonded area of imported containers

-Modification of TOS to allow its use in off-dock yards

- Construction and procurement of required facilities/equipment (logging, paving, construction of PAS and customs office, cargo handling machinery, maintenance store, etc.)

-Operation as an off-dock yard (operation hours, trailers operation for transporting containers to and from PAS, reach stacker operation for loading and unloading containers)

-Safety measures for entering and exiting trailers from National Road 4



Source: The Team based on PAS

Figure 3.1-7 Image of the 54-ha off-dock yard utilized as an import container yard

3.1.4. Others

In addition to the above measures (1) through (6), PAS could also act as an agent (or sub-agent) for container leasing companies.Specifically, PAS could set up Inland Container Depots (ICDs) for empty containers in the vicinity of areas where exporters are concentrated, such as Phnom Penh and Sihanoukville, and accept empty containers from importing shipping companies after they have been debarked, cleaned and repaired, and then leased to exporting shipping companies.One of the conditions is that both shipping lines must sign a contract with the same leasing company and use the same leased containers, however since the container leasing industry is an oligopoly, this should not be a problem. This is expected to reduce the number of empty container exports at Sihanoukville Port and help to mitigate congestion at Gate 3 and CY of PAS.

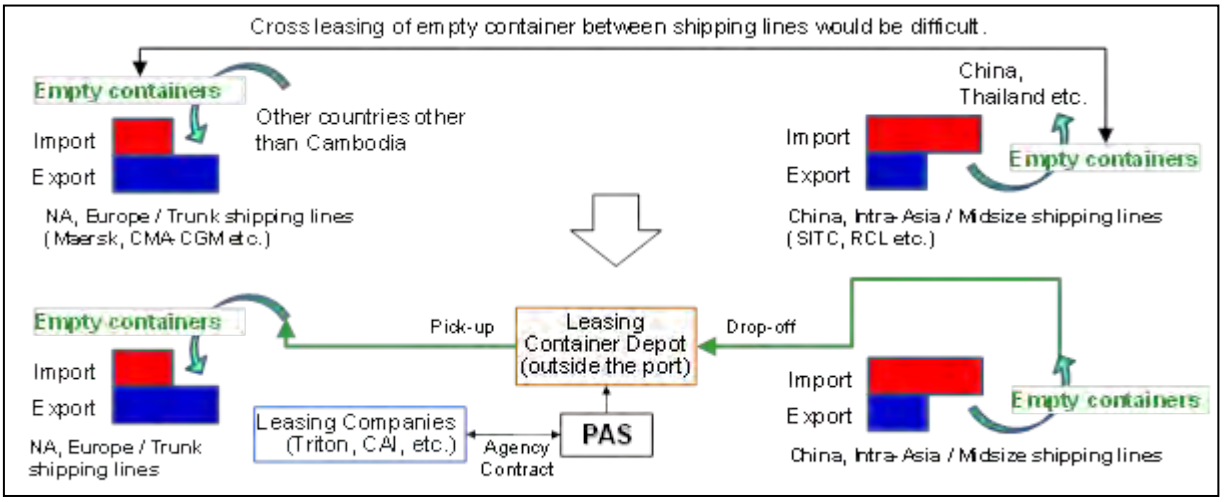


Figure 3.1-8 Image of inland depot operation for empty containers

3.2. Summary

Since the implementation of measures by the PAS Congestion Management team, congestion in front of Gate 3 has continued to improve. However, the situation of congestion in front of PAS Gate 3 and in the terminal is expected to change in the future due to the increase in the volume of cargo handled, improvement of the existing terminal (quay extension work and RTG yard expansion), operation of the new expressway, changes to the traffic flow of trailers, and the development of the new container terminal. It is hoped that this proposal will be useful when examining future congestion countermeasures.

H. Guideline to Compile Calling Vessel Statistics via Port EDI System

Guideline to Compile Calling Vessel Statistics via Port EDI System

December 2021

JICA Expert Team

Table of Contents

Reference Materials of Workshops

1. Port Entry/Departure Clearance Procedures and Port EDI (29 May 2018)
2. Port EDI System and Port related procedures (20 December 2019)
3. Guidance on the compilation of cargo statistics by use of Port EDI (8 February 2021)
4. Output 5 of the Project (28 July 2021)
5. Preparation for Ship Clearance Formality Implementation by Port EDI System (Explanation in Final Assignment)

1 Port Statistics

1.1 Basic Framework

Port Statistics of PAS shall consist of Primary Statistics and Individual Statistics.

Primary Statistics provide basic information on port activities monthly and annually. It will not require a large workload to compile these statistics as common formats among ports in Cambodia can be utilized. At present, the Ministry of Public Works and Transport (MPWT) is developing a Port EDI system for processing entry and departure data of vessels calling at the ports of Sihanoukville and Phnom Penh. It manages data on all foreign vessels as well as cargo and passengers transported by vessel. Statistical reports are prepared based on handled data. The Port EDI System can be effectively used by PAS to maintain the Primary Statistics. When data cannot be obtained from the Port EDI System, data from other from other sources will be collected to complete statistics.

Individual Statistics are prepared for corresponding to the requests from PAS's management and daily operation. PAS currently prepares several kinds of statistics tables. Department of Planning, Procurement and Statistics (DPPS) which is responsible for managing PAS statistics gathers data from responsible departments for vessel operation management, general cargo handling, container terminal operation and others and compiles them into monthly statistics tables. When the Port EDI System is placed in operation, some of this data can be obtained from the system in digitized form automatically and be used for statistics works.

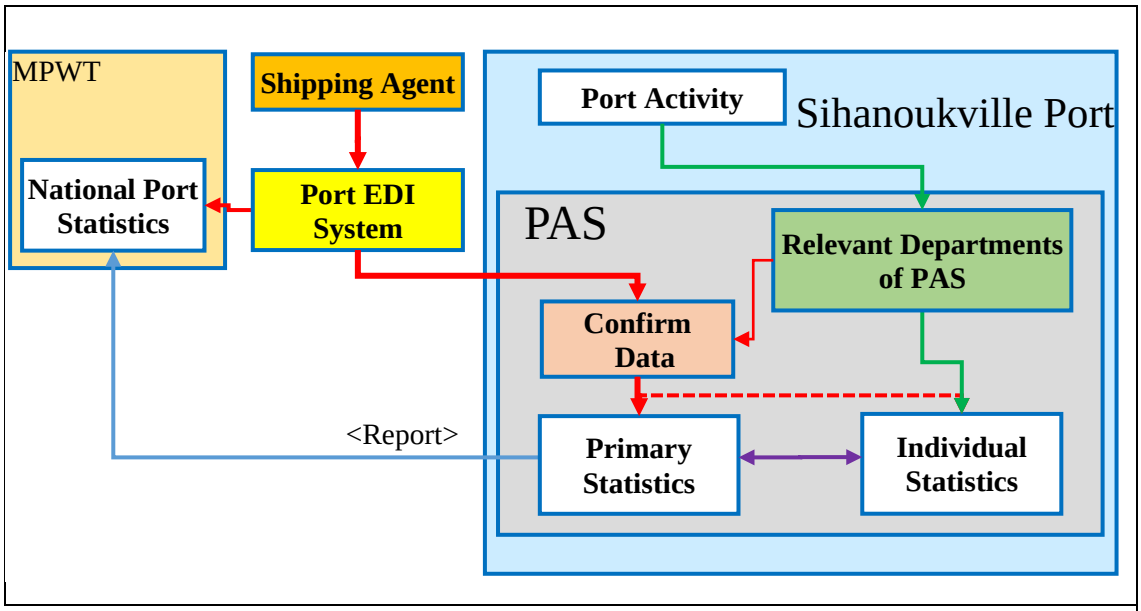


Figure 1 Basic Framework of PAS Port Statistics

Contents of statistics and how they are used will change depending on the situations of surrounding ports. In addition, the technology related to collecting and processing data is advancing year by year. Against such background, it is necessary for PAS to tackle the establishment of a new framework for statistics when the Port EDI System is introduced.

1.2 Statistics Function of Port EDI System

1.2.1 Cambodia Port EDI System

Cambodia Port EDI System has two functions: ship clearance management and statistical management. The shipping lines or shipping agents enter required data for formality of vessel entry/departure to/from ports in Cambodia to the system. MPWT, PAS, PPAP and CIQ authorities receive applications and give responses through the Port EDI system. It has interfaces with Cambodia National Single Window (CNSW) which is under development at present, shipping companies and other systems of MPWT.

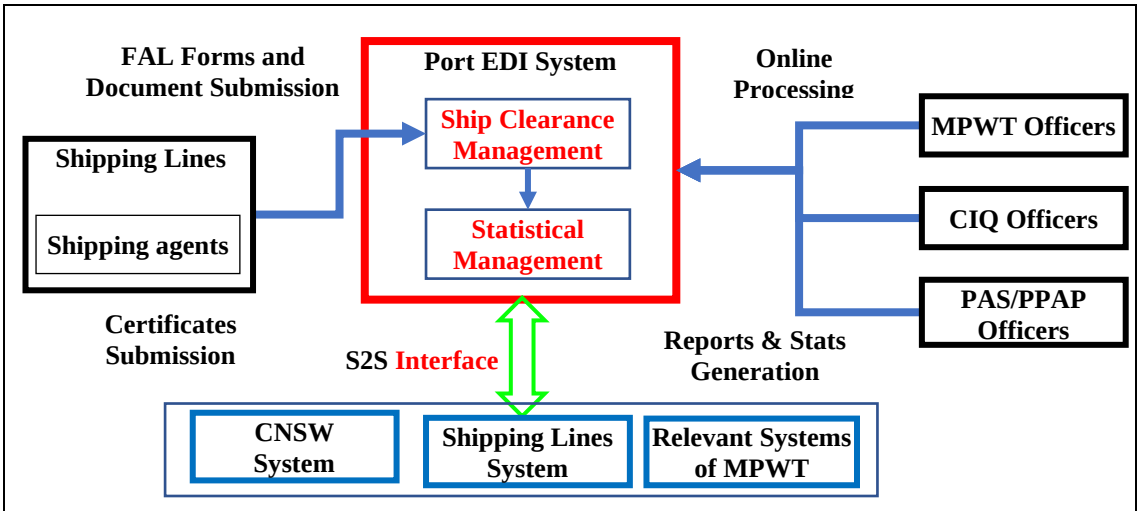


Figure 2 Outline of Cambodian Port EDI System

The system is basically designed based on international standards, namely, in compliance with the FAL convention. It means that entered data to the Port EDI System follows FAL Forms: FAL form 1/IMO General Declaration; FAL form 2/Cargo Declaration; FAL form 3/ Ship's Stores Declaration; FAL form 4/Crew's Effects Declaration; FAL form 5/Crew List; FAL form 6/ Passenger List; and FAL form 7 Dangerous Goods. These seven (7) Forms are attached in APPENDIX.

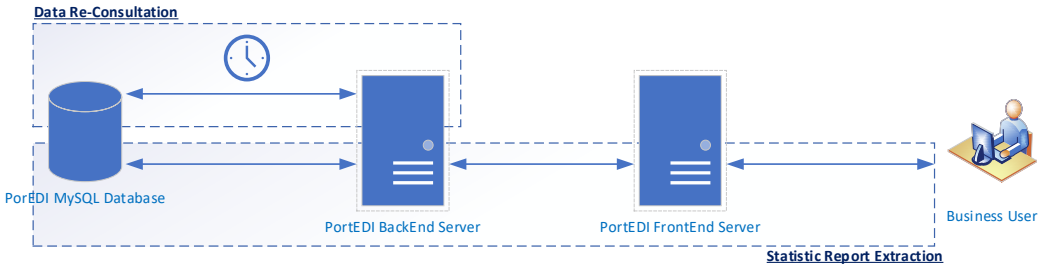
The system also has a function for receiving information which is necessary for PAS business but not included in FAL forms.

1.2.2 Statistics Function

According to Architecture Design Document PORT EDI VERSION 1.06 (Oct 2021), Port EDI System provides Statistical Report Function to allow Business Users (PAS is one of the Business Users) to collect the statistical information from the system. The Business User can filter the statistical information by entering the selection criteria. He can view (On Screen) or extract (Download) the statistical information into Excel or CSV format via the Port EDI Portal Report Page.

To retrieve the statistical information related to the organization, the Business User needs to be granted by the organization, department, and functional level (View on-screen / download).

Details have not been finalized at present, however, the following diagram depicts the overview of the statistic report to be generated.



Source: Architecture Design Document PORT EDI VERSION 1.06 (Oct 2021): KYOWA EXEO CORPORATION

Figure 3 Statistic Report Generation overview

Statistics tables on the following information shall be created by the Port EDI system.

- Information On Vessel Calls
- Import Cargo Statistics by Vessel and Commodity
- Export Cargo Statistics by Vessel and Commodity
- Import Containers by Vessel and Origin
- Export Containers by Vessel and Origin
- International Passengers
- Cargoes and Passengers

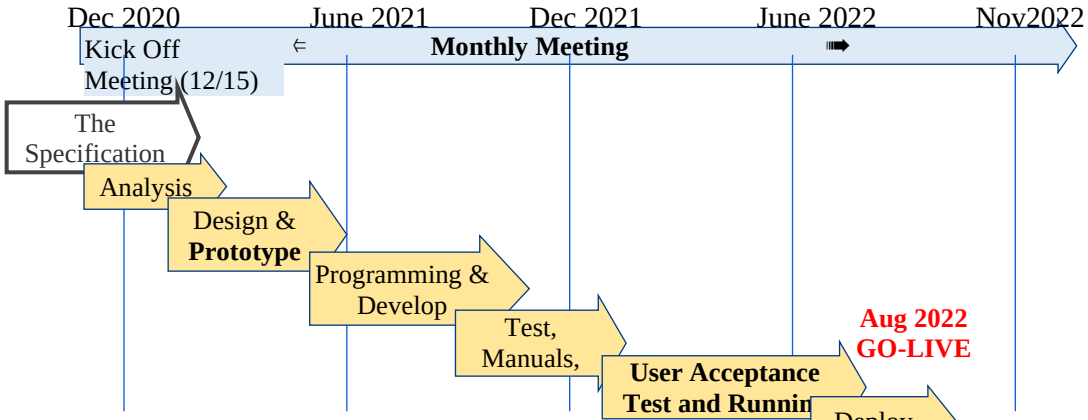
In addition, the following tables shall be created.

- Application Performance Report
- Chargeable Certificate Transaction

1.3 Development of Port EDI System

The development of the Port EDI system started in 2019 and Go-Live is scheduled in August 2022. Details of statistics function including concrete items and format of data to be entered and

extracted shall be decided through implementation of UAT. The Port EDI System will be 100% utilized for ship clearance procedures for vessel entry/departure three years after the completion of the Port EDI Development project.



Source；Materials of Taskforce Meeting for Port EDI Development Project

Figure 4 Timeline of Port EDI System Development

The establishment of a new statistics framework by using data from the Port EDI System shall go forward step by step. Not only data on vessels, but also data of cargo, containers and passengers are entered and treated in the system. In the first stage, the main focus will be on improvement procedures of vessel entry and departure. Accordingly, guidelines for Calling Vessel Statistics via Port EDI data shall be drafted. As more experience in using the system is acquired, targets of statistics shall be expanded to cargo, container, and passenger.

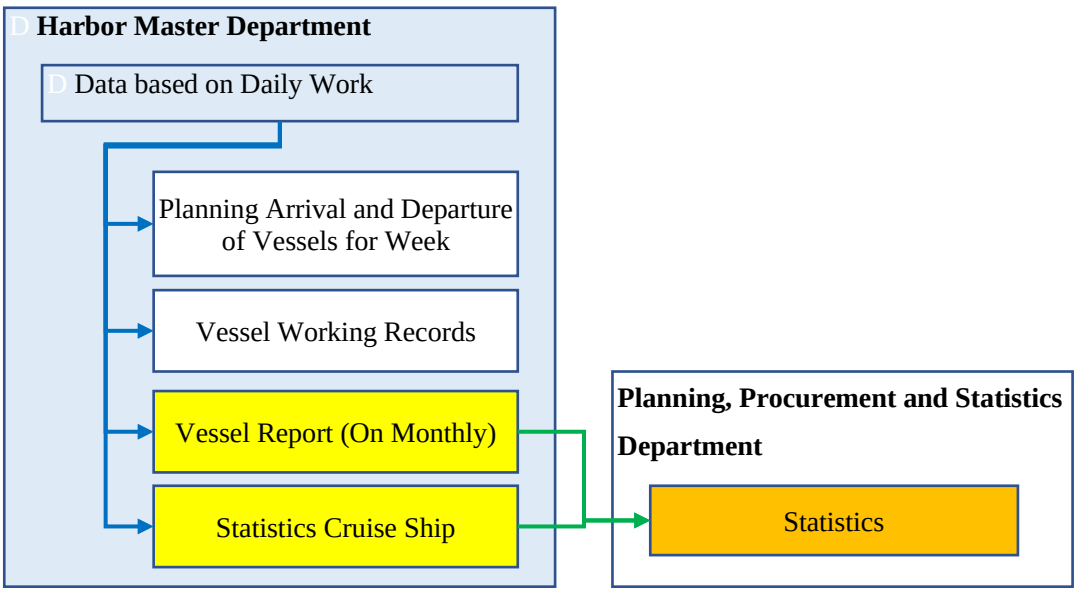
2 Calling Vessel Statistics via Port EDI data

2.1 Statistics on vessels at present

2.1.1 Data compiled by the Harbor Master

Vessel data are managed by the Harbor Master Department. Harbor Master Department compiles data into tables named as Planning Arrival and Departure of Vessels for Week, Vessels Working Records, Vessel Report (On Monthly) and Statistics Cruise Ship.

Among them, Vessel Report (On Monthly) and Statistics Cruise Ship are submitted to Planning, Procurement and Statistics Department (PPSD) every month.



JICA project Team

Figure 5 Data Compiled by Harbor Master Department

Data Items in Vessel Report (on Monthly) and Statistics Cruise Ship are shown below.

I. BERTHED VESSEL(S): 1.1. Oil Tankers,1.2. Gas Tankers,1.3. Bitumen Vessel, 1.4. Container Vessel, 1.5. General Cargo Vessel, 1.6. Yacht, 1.7. Tug (7)- Barge (5), 1.8. Passenger Vessel, 1.9. Navy vessel,1.10. Moto Boat, 1.11. Domestic Vessel, 1.12. Supply Boat,1.13. Research, **II. DEPARTURED VESSEL(S), III Total of import Cargo Oil**, Gas, Ethanol, **IV Country** Lase Port, Net Port, **V Name of Vessel(s), VI Types of Vessel(s), VII Country Code, VIII Nationality, IX Owner/SHIPPER, X Agent, X1 Attributes of vessel** DWT, GT, NT, LOA, **XII. DRAFT:** 12.1. Arrival ,12.2. Departure, **XIII. BERTHING INFORMATION:** 13.1. IMO,13.2. Name of Vessel(s),13.3. ETA,13.4. Arrival, 13.5. Berthing, 13.6. Free Practice,13.7. Berth No.,13.8. No. of Crew, **XIV.DEPARTURE INFORMATION**: 14.1. Port Clearance Date, 14.2. Certificate No.,14.3. Departure Date, **XV. DISCHARGE/HANDLING**: 15.1. Start Discharge,15.2. Complete Handling, **XVI. NAME OF VESSEL(S), XVII. COUNTRY CD, XVIII. LAST PORT, XIX. NEXT PORT, XX. COUNTRY CD**, **XXI. IMPORT CARGO,** 21.1.DO, 21.2. EA, 21.3.JET A-1, 21.4. FUEL, 21.5.GAS, **XXII. EXPORT CARGO**: 22.1. Ethanol

Cruise Ship

1.1 Vessel, 1.2 Flag ,1.3 LOA,1.4 B, 1.5 GT ,1.6 NT, 1.7 DW, 1.8 Last Port, 1.9 Next Port ,1.10 Crew, 1.11 Number of Passenger By Manifest, By Port ,1.12 Date/Time, In, Out

2.1.2 Vessel Statistics

PPSD prepares overall statistics table in which monthly records of cargo handling volumes by main commodity, number of laden/empty containers by size, and numbers of vessels by type and total gross tonnage are shown. The following table shows a form of vessel statistics.

Table 1 Vessel Statistics of PAS

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec	Total
Calling Vessel (Units)	159	106	131	133	152	146	124	125	108	127	134	137	1,582
Total (GT)	2,229,452	1,600,145	1,320,510	1,267,406	1,458,876	1,427,275	1,368,844	1,211,831	1,133,680	1,192,542	1,255,301	1,319,115	16,784,979
Container (Unit)	58	37	54	57	60	61	64	56	55	52	57	59	670
GT	874,123	537,028	809,158	845,819	915,486	970,526	1,029,091	899,643	834,464	798,648	829,288	845,310	10,188,585
Tanker (Unit)	61	52	56	46	56	58	43	41	40	46	42	46	587
GT	250,058	203,892	225,711	180,287	273,652	246,165	168,383	130,104	134,539	165,158	173,175	210,920	2,362,044
Conventional (Unit)	30	10	20	30	36	27	17	28	13	29	35	32	307
GT	345,520	206,256	229,764	241,301	269,738	210584	171,370	182,084	164,677	228,737	252,838	262,885	2,765,753
Passenger (Unit)	10	7	1	0	0	0	0	0	0	0	0	0	18
GT	759,751	652,969	55,877	0	0	0	0	0	0	0	0	0	1,468,597
Person	11,083	6,071	635	0	0	0	0	0	0	0	0	0	17,789

Source: PAS statistics Table 2020

2.2 Primary Statistics

2.2.1 Statistics Table

(1) Statistical Data Table of Vessel

Basic information of vessels which called at Sihanoukville Port is organized in the Statistical Data Table of Vessel which is prepared on a monthly basis. Name of vessel, gross tonnage, vessel type, berthing place, berthing hours and, names of last port and next port are shown by calling vessel. In the bottom row of the column of Vessel no., total number of calling vessels in the month is input.

Table 2 Form of Vessel Statistical Table

Vessel Serial No.	Name of Vessel	GT	Vessel Type	Name of Last Port	Berthing Place	Berthing Hours	Name of Next Port
<Sum>							

Source: Project Team

(2) Monthly/Annual Statistics Table

Number of calling vessels and the total gross tonnage in a month by vessel type are shown in Vessel Statistics Table as Primary Statistics. It is preferred that the same classification used in the statistical report of the port EDI system is adopted. According to Architecture Design Document PORT EDI VERSION 1.06 (Oct 2021), vessels are classified into fourteen (14) categories such as Container, General Cargo, Passenger Cruise, Tanker, Tugboat with Barge, Roro and Other by conventional type and non-conventional type.

Number and total gross tonnage of calling vessels in the same month of the previous year is attached for comparison in the table. In addition, accumulated values up to the current month are also included to grasp annual activity.

Table3 Form of Primary Statistics on Number of Calling Vessel (monthly)

	Month			Accumulation up to the month		
	The month	Previous year	Year over Year	Up to the month	Previous year	Year over Year
Conventional						
Container						
General Cargo						
Passenger Cruise						
Tanker						
Tugboat with Barge						
Roro						
Other						
Non-Conventional						
Container						
General Cargo						
Passenger Cruise						
Tanker						
Tugboat with Barge						
Roro						
Other						

Note: Category of Vessel Type is from ANNEX D1 of ADD (1.06)
Source: JICA Project team

Table 4 Form of Primary Statistics on Total Gross Tonnage of Calling Vessel (monthly)

	Month			Accumulation up to the month		
	The month	Previous year	Year over Year	Up to the month	Previous year	Year over Year
Conventional						
Container						
General Cargo						
Passenger Cruise						
Tanker						
Tugboat with Barge						
Roro						
Other						
Non-Conventional						

Container						
General Cargo						
Passenger Cruise						
Tanker						
Tugboat with Barge						
Roro						
Other						

Note: Category of Vessel Type is from ANNEX D1 of ADD (1.06)
Source: JICA Project team

Data of monthly statistics are summarized in Annual statistics. The form of the table of Annual Statistics is designed as shown below. Data of each quarter and previous year shall be attached to understand quarterly changes from the previous year.

Table 5 Form of Primary Statistics on Number of calling Vessel (Annual)

Activities	The Year					Previous year	Year over Year ratio
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Total		
Total							
Conventional							
Container							
General Cargo							
Passenger Cruise							
Tanker							
Tugboat with Barge							
Roro							
Other							
Non-Conventional							
Container							
General Cargo							
Passenger Cruise							
Tanker							
Tugboat with Barge							
Roro							
Other							

Note: Category of Vessel Type is from ANNEX D1 of ADD (1.06)
Source: JICA Project Team

Table 6 Form of Primary Statistics on Total Gross Tonnage of calling Vessel (Annual)

Activities	The Year					Previous year	Year over Year
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Total		
Total							
Conventional							
Container							
General Cargo							
Passenger Cruise							
Tanker							
Tugboat with Barge							
Roro							
Other							
Non-Conventional							
Container							

General Cargo							
Passenger Cruise							
Tanker							
Tugboat with Barge							
Roro							
Other							

Note: Category of Vessel Type is from ANNEX D1 of ADD (1.06)
Source: JICA Project Team

2.2.2 Compiling Statistics

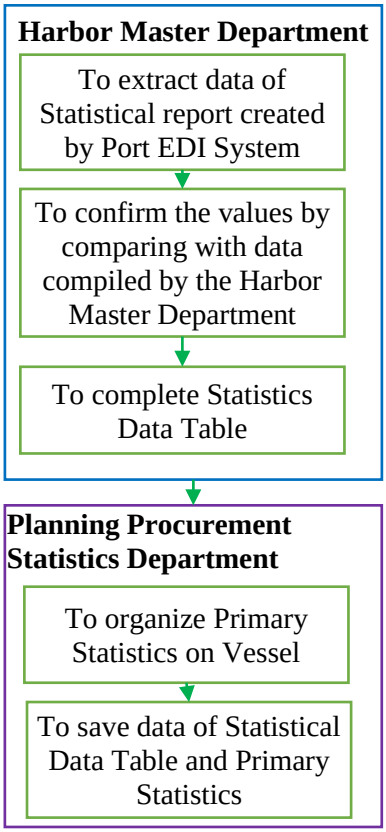
(1) Preparing Statistical Data Table

Statistical Data Table is prepared according to the following steps. Steps 1, 2 and 3 shall be conducted by the Harbor Master Department while Step 4 and 5 are conducted by PPSD. The steps and table forms to be prepared at each step are shown in Figure. 6

1. To extract data of Statistical report created by Port EDI System
2. To confirm the values by comparing with data compiled by the Harbor Master Department
3. To complete Statistics Data Table
4. To Organize Primary Statistics on Vessel

5 To save data of Statistical Data Table and Primary Statistics

IT Department shall support the Harbor Master Department and PPSD with data processing including the development of compiling programs.



Vessel ID	Voyage Type	Vessel Name	Gross Tone	Vessel Type	Last Port Call	Load/Unload Terminal	Berthing hours	Next Port Call
Total								

Source: prepared based on Architecture Design Document PORT EDI VERSION 1.06/ Oct 2021: KYOWA EXEO CORPORATION

Vessel Serial No.	Name of Vessel	GT	Vessel Type	Name of Last Port	Berthing Place	Berthing Hours	Name of Next Port
Total							

	Month			Accumulation up to the month		
	The month	**Previous year**	**Year over Year**	**Up to the month**	**Previous year**	**Year over Year**
Conventional						
Container						
General Cargo						
Passenger Cruise						
Tanker						
Tugboat with Barge						
Roro						
Other						
Non Conventional						

Source: JICA Project Team

Figure 6 Steps in preparing Statistical Data Table

(2) To extract data from the Port EDI System

Harbor Master Department shall extract data from the statistical report on Call Vessel of Port EDI System at the end of every month. Data in the month appears on the display by filtering the range of dates of the first day of the month and the last day. By inputting “PAS” in the cell for port and” All” in other cells, all vessels which called at PAS port appear with information of Vessel ID, Voyage Type, Vessel Name, Gross Tonnage, Vessel Type Last Port Call, Load/Unload Terminal, Berthing hours and Next Port Call. These data can be extracted in the form of MS-Excel or CSV by clicking the designated button on the monitor.

Information On Vessel Call
Printed by Port EDI on 20**/** /** ** :** :**

ETA/ETD Date	01/**/20**	**To**	31/**/20**
Voyage Type	All	**Vessel Type**	All
Port	PAS	**Terminal**	All
Las Port	All	**Net Port**	All

Call		Call	

Vessel ID	Voyage Type	Vessel Name	Gross Tone	Vessel Type	Last Port Call	Load/Unload Terminal	Berthing hours	Next Port Call
Total								

Source: prepared based on Architecture Design Document PORT EDI VERSION 1.06/ Oct 2021: KYOWA EXEO CORPORATION

Figure 7 Statistical Report for Information on Vessel Call

Forms of Statistical Reports of Port EDI are described in Architecture Design Document PORT EDI (latest version as of Oct 2021) and data items between Statistical report of Port EDI and PAS Port Statistical Table are compared. All data items of the Statistical Data Table are covered by the Statistical Reports of Port EDI basically.

Vessel ID	**Voyage Type**	**Vessel Name**	**Gross Tone**	**Vessel Type**	**Last Port Call**	**Load/Unload terminal**	**Berthing hours**	**Next Port Call**
Vessel Serial No.		**Name of Vessel**	**GT**	**Vessel Type**	**Name of Last Port**	**Berthing Place**	**Berthing Hours**	**Name of Next Port**

Upper: Data items in statistical report of Port EDI
Lower: Data Items of PAS Port Statistical Data Table
Source; JICA Project team

Figure 8 Comparison Data Item (Vessel)

Extracted data is transferred to corresponding cells in the sheets designed in the forms of the Port Statistical Table.

(3) To confirm the values by comparing with data compiled by the Harbor Master Department

There is a possibility that data extracted from Port EDI System differs from that compiled by the Harbor Master Department. It is necessary to confirm the accuracy of extracted data.

(4) To complete Statistics Data Table

By amending the incorrect data, Statistics Data Table shall be completed as data base of vessel. Harbor Master Department sends the table to PPSD.

(5) To organize Primary Statistics on Vessel

PPSD shall count the number of calling vessels and sum up total gross tonnage in the month based on the Statistical Data Table.

PPSD shall take data of the same month in the previous year from the past data files for calculating year-over-year ratio and put them in the table. In addition, PPSD shall calculate accumulated values up to the current month and the year-over-year ratio and put them in the table.

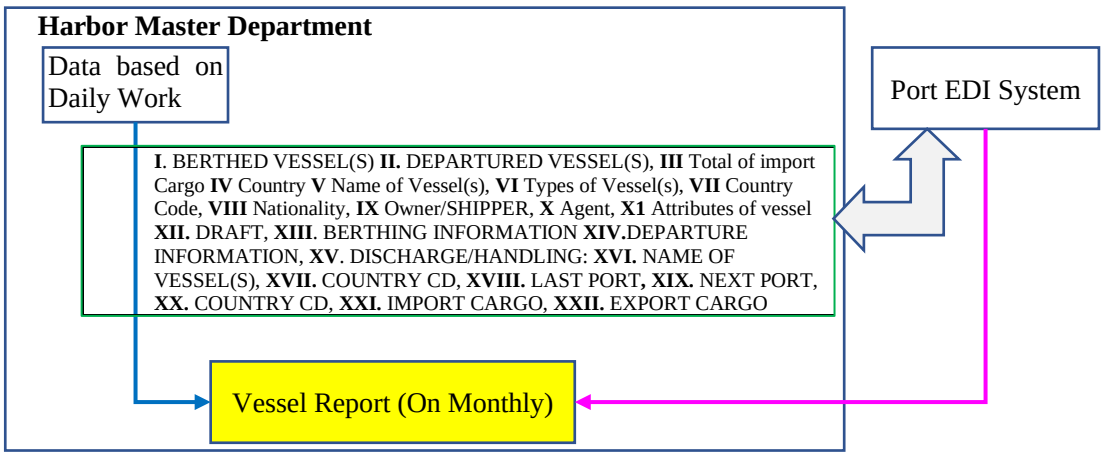
(6) To Save Data of Statistical Data Table and Primary Statistics

PPSD shall save all data of Statistical Data Table and Primary Statistics in the database and manage the database.

2.3 Individual Statistics

Some information included in Vessel Report (On Monthly) which is created by the Harbor Master Department such as Name of Vessel(s), Types of Vessel(s), Country of Last Port/Next Port could be obtained from Port EDI System (See 2.1.1).

Harbor Master Department could partially use data from Port EDI for creating the vessel report. At present, it is not clear what kinds and types of data can be extracted from Port EDI. When the details of the Port EDI system emerge, it is recommended to examine whether data from Port EDI could be used for creating individual statistics such as the Vessel report.



Source: JICA project Team

Figure 9 Image of Compiling Individual Statistics

2.4 Action Plan

Continuity of statistical data needs be ensured when the statistics framework is changed. It is necessary for PAS to have a transitional period before officially shifting to a new framework.

Port EDI system is planned to start operation in August 2022. The period from August 2022 to the end of the year 2023 is considered as trial stage during which time the statistics at present and new statistics are prepared in parallel. PAS shall assess the usability of data from Port EDI as data of PAS statistics during the trial period and make improvements as necessary.

Year	2021	2022	2023	2024	2025	2026 -
Port EDI system		Aug. Go live			Aug. Full Operation	
Vessel Statistics		Trial Implementation		Actual Implementation		
Individual Statistics	Preparing required statistics tables as necessary					

Source: JICA Project Team

Figure 10 Roadmap for a new framework of Vessel Statistics

3 Analysis based on Statistical Data Table

3.1 Size of Calling Vessels

3.1.1 Size of Calling Vessel

Distribution of vessel size gives information on average or maximum size of vessels which use the port and indicates the size of the port. PAS can easily obtain data on vessel size in GT from Port Statistical Data. A sample form of vessel distribution by size is shown in Table 8. Vessel size is classified by 1000 GRT in the sample but this could change depending on the future prospect of calling vessels at the port.

Table 7 Sample Form of Distribution of Size of Calling Vessels

	-999	1000-1999	2000-2999	3000-3999	4000-4999	5000-5999	6000-6999	7000-7999	8000-8999	9000-9999	10000-19999	20000-	Total
Month													

3.1.2 Terminal Use of Vessels

(1) Terminals Used by Vessel Type

Data of number of calling vessels at each terminal by vessel type appear on the display in the statistical report by filtering. The statistical report is displayed by each filtering item. A table which shows the relation between vessel types and terminals can be prepared based on data of Statistical Data Table.

Table 8 Terminal Use by Vessel Type

	Conventional								Non-conventional								Total
Vessel Type (*1) / Terminal (*2)	Container	General Cargo	Passenger	Tanker	Tugboat Barge	Roro	Others	Sub Total	Container	General Cargo	Passenger	Tanker	Tugboat Barge	Roro	Others	Sub Total	
PAS																	
CIDG Jetty Port																	
Cel Jetty																	
Tela Terminal																	
Sokimex Terminal, Sihanoukville																	
PTT Ream Jetty, Terminal																	
LHR Terminal																	
Total																	
Note:(*1)																	

(*2)

Source: JICA Project Team

(2) Status of Terminal Usage

Status of terminal use by calling vessels may be grasped by analyzing Vessel Statistical Data. Number of berthing vessels and Total Berth hours can be obtained by summing up data of Vessel Statistical Data. Berth occupancy ratio which is one of the most basic indicators for conditions of port use shall be calculated by dividing berthing hours by 365 x 24. Sample form of the table is shown in Table 10.

Target terminal names shall be finalized during UAT stage.

Table 9 Vessel Use Conditions

Terminal (*)	Number of berthing vessels	Total Berth hours	Average Berth Hours	Berth Occupancy Ratio
PAS				
CIDG Jetty Port				
Cel Jetty				
Tela Terminal				
Sokimex Terminal, Sihanoukville				
PTT Ream Jetty, Terminal				
LHR Terminal				
Total				
Note: (*1) Terminals which are listed in ANNEX K of ADD are used for this table				

Source JICA Study Team

3.1.3 Connection with other ports by Vessel

Statistical Data Table includes the name of last and next port. Number of vessels which come from or go to each port appears by filtering data by name of last or next port on MS Excel sheet.

Table 10 Last Port and Nest Port

Last Port				Next Port		
Name of Port	Country	Number of vessels		Name of Port	Country	Number of vessels
A port				X Port		
B port				Y Port		
C Port				Z Port		
***				***		
***				***		
Others				Others		
Total				Total		

Source JICA Project Team

Table 11 Last Port and Next Port

Name of Port	A port	B port	C Port	***	X port	Y port	Z Port	others	Total
A port									

B port									
C Port									
***									
X Port									
Y Port									
Z Port									
Others									
Total									

Source JICA Project Team

3.1.4 Secular change

It is important for relevant organizations to understand tendency of port activities in a certain period.

By saving annual data PAS can easily grasp long-term changes in vessel activities of Sihanoukville port. For example, tables can be prepared which show the tendency of number and gross tonnage of calling vessels with year-over-year rate, change of composition of type and size of calling vessels over a 10-year period.

Table 12 Change of Ship Call and GRT

Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of Vessels										
year-over-year ratio										
Total Gross Tonnage										
year-over-yearratio										

Source JICA Project Team

Table 13 Change of Type of Calling Vessels

Size	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 10
Total									
Conventional									
Container									
General Cargo									
Passenger Cruise									
Tanker									
Tugboat with Barge									
Roro									
Other									
Non-Conventional									
Container									
General Cargo									
Passenger Cruise									
Tanker									
Tugboat with Barge									
Roro									
Other									

Source JICA Project Team

Table 14 Change of Size of Calling Vessel

Size		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	-999										
1,000	1,999										
2,000-	2,999										
3,000-	3,999										
4,000-	4,999										
5,000-	5,999										
6,000-	6,999										
7,000-	7,999										
8,000-	8,999										
9,000-	9,999										
10,000-	19,999										
20,000-											
Total											

Source JICA Project Team

4 Way Forward

4.1 Expansion of Statistic

4.1.1 Statistics for Cargo, Container and Passenger

At Present, PAS prepares an overall statistics table for the following items every month. Primary Statistics shall be designed to basically cover all data of overall statistics at present. Primary Statistics shall be composed of vessel statistics, cargo, container statistics, and passenger statistics.

Cargo Throughput (Tons)
Total Import (Tons)
General Cargo
Machinery
Steel
Fuel
Steam coal
Containerize Cargo
- Rice
- Fabric
- Garment
- Machinery
- General Cargo
Total Export (Tons)
General Cargo
Containerize Cargo
- Rice
- Garment
- Rubber
- General Cargo

Cont. Throughput (TEUs)
Cont. Throughput (box)
Import Cont. (TEUs)
- Full (TEUs)
- Empty (TEUs)
Export Cont. (TEUs)
- Full (TEUs)
- Empty (TEUs)

Calling Vessel (Units)
Total (GT)
- Container (Unit)
GT
-Tanker (Unit)
GT
- Conventional (Unit)
GT
- Passenger (Unit)
GT
Persons

Source: prepared based on PAS statistics Table

Figure 11 Items in PAS statistics

The concept of statistics for general cargo and container is the same as in the case of vessels. However, several issues need to be address before compiling such statistics.

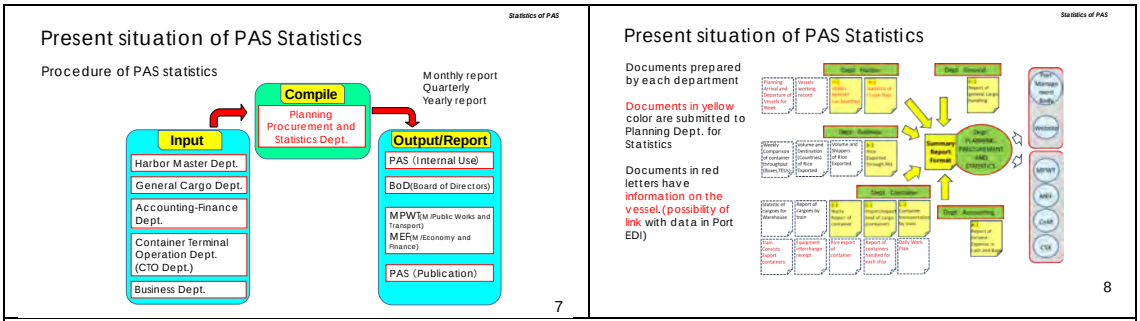
For example, regarding statistics for cargo, it is necessary to unify the cargo names and decide classification of the commodities for statistics. The unified names and the classification shall be discussed and decided based on the actual situation of ports in Cambodia. National standards should be established for the classification of cargo in future. In addition, unified cargo names should be compatible with the HS Code because the Port EDI system is planned to be connected with a National Single Window in which HS codes shall be used for cargo identification.

Container cargo is counted by box and/or TEU depending on the purpose. The conversion rate also has to be decided; for example, a 40-foot container is generally equivalent 2 TEUs. In case of a 45-foot container, the formula for converting to TEUs is generally “number of 45-foot boxes x 2.25.”

There are other points to be examined. After acquiring experience by implementing Statistics on Vessel by using data from Port EDI, it is expected that Overall Statistics of PAS will eventually be compiled using data from Port EDI.

4.1.2 Implementation Structure

PPSD is the responsible department for Statistics and compiling data for statistics. Harbor master, General cargo department Accounting and Finance Department, Container Terminal Operation Department and Business Department submit relevant data to PPSD every month. which organizes statistics. The statistics are internally used by each Department of PAS. In addition, statistical reports are reported to the Board of Directors. MPWT. MEF and Council of Ministers. Implementation structure and departments in charge are shown in the Figure below.



Source: JICA

Figure 12 Structure of Statistics Implementation at Present

In the stage of implementation of New Overall Statistics, PPDP needs to manage total statistics of PAS more effectively, efficiently, and systematically including playing a role as a focal point regarding statistics function of Port EDI. The following chart shows a sample of the expected

implementation structure.

Step	Responsible Dept.	Dept. in charge
To extract data from Port EDI System	Dept. of Planning Procurement and Statistics (DPPS)	
To deliver Statistical Data Table to Departments in charge	DPPS	
To confirm accuracy of data compared to information owned in Dairy Tasks		Harbor Master Dept. Container Dept. General Cargo Dept.
To send table to Planning, Procurement and Statistics Department		Relevant Dept.
To complete Statistical Data Table and storage data	DPPS	

Source: JICA Project Team

Figure 13 Statistics Implementation Structure

4.1.3 Phase Plan

The establishment of a new statistics framework shall be implemented step by step.

Three-phased plan is drafted.

Phase I: The existing statistics in parallel with trial statistics by using data from port EDI.

Phase II: A part of the existing statistics is replaced by the statistics prepared using data from port EDI.

Phase III: New statistics management relying mainly on data from the Port EDI System is established. The quality of statistics will be improved through implementation of new statistics works.

Year	2021	2022	2023	2024	2025	2026 -
Port EDI sys		Aug/Go live			Aug/Target	
Phase		Phase I		Phase II		Phase III
Vessel Statistics		Trial		Actual		
Cargo Statistics				Trial		Actual
Container Statistics				Trial		Actual
Passenger Statistics				Trial	Actual	
Individual Statistics						

Source: JICA Project Team

Figure 14 Road Map

4.1.4 Way Forward

Port management and operation by making full use of IT technology is a sweeping trend in the world. Many ports have tackled digitization aggressively in recent years such as introducing Port EDI system, aiming to become smart ports, establishing a single window, building a port community system, constructing Data Platform, operating terminals under key performance

indicators etc.

It is expected that PAS shall make efforts to furth promote digitization such as by introducing the Port EDI system

I. Facility Investment Plan for Medium/long-Term

Development Timeframe up to 2025 (Draft)

: Preparation Work
: Development / Construction
: Operation for Container Handling
: Operation for GC handling

20/Dec/2021

Facility		Ground Slots/Units	Description	Remarks
Quay No.6			Extension of QC Rail	JICA Yen Loan
Quay No.5 / Multi-Purpose Berth				
Yard including outside	Yard C (7.7ha)	2,300	for Laden C (RTG)	
	Yard B (2.6ha)	800	for Laden C (RTG)	
	Yard A (2.8ha)	450	for Laden C (RS) ⇒ RTG yard	Pavement Improvement PAS Finance
	Yard D (1.8ha)	600	for Laden C (RTG)	
	Yard A' (1.6ha)	450	for Laden C (RS) ⇒ RTG Yard	
	Yard E (1.8ha)	-	for General Cargo	
	Yard F (1.5ha)	400 ⇒ 0	for Long-stay C (RS) ⇒ for General Cargo	
	Yard B' (No.5 W/H) (0.7ha)	220	for Laden C (RTG yard)	PAS Finance
	Yard-T (Rail terminal)	80	for Railway / Long-stay C (RS)	
	Yard in Multi-purpose Terminal	-	for General Cargo / Long-stay C (RS)	
	Yard S (SEZ) (4ha-->6ha)	1,100	for Empty C (RS)	(PAS Finance) Cross-mixing pavement
Handling Equipment	QC # of operable QCs	4⇒5⇒6	Installation of additional QCs	PAS Finance
	RTG # of operable RTGs	14⇒16⇒20	Installation of additional RTGs	PAS Finance
	MHC (Mobile Harbor Crane)	2⇒4	1 unit is out of order.	Grant Aid
	Reach Stacker	19		PAS Finance
	Yard-Trailer	34⇒38		PAS Finance
Vessels	Tug Boat	6	3200HP(1), 1900HP(1), 1600HP(2), 800HP(2)	PAS Finance
New Container Terminal 1		Civil	1 berth (350m)	JICA Yen Loan
		Equipment	3 QCs, 9 RTGs, 16 Yard-trailors, 2 RSs	JICA Yen Loan
New Container Terminal 2 & 3		Civil	NCT2: 1 berth (400m) NCT3: 1 berth (430m)	JICA Yen Loan
		Equipment	NCT2: 3 QCs, 10 ARTGs, 17 Yard-trailors, 2 RSs NCT3: 3 QCs, 10 ARTGs, 17 Yard-trailors, 2 RSs	
Technical Cooperation Project		Improve management and operation of the Container Terminal		JICA Grant