BERTHING POLICY FOR DRY BULK CARGO FOR MAJOR PORTS

1. INTRODUCTION

1.1 The present policy paper lays down standardized guidelines for all major ports to compute performance norms for different dry bulk commodities, taking into account the infrastructure available at ports. It also recommends penalties & incentive structures to be instituted by all major ports based on the performance norms calculated. All major ports are required to adapt these guidelines for their own specific ports and institute penalties & incentives tied to the performance norms as part of the overall berthing policy. In addition, the paper also describes a method for re-rating capacity of berths as well as guidelines for levying anchorage charges to reduce turn-around times.

2. BACKGROUND

2. 1 Dry bulk cargo currently makes up >26% of the cargo handled at the 12 major ports. Furthermore growth in coastal shipping is expected to add ~100-150 MMTPA of additional dry bulk cargo at ports by 2020-25. Recent benchmarking of ports' performance across key dry bulk commodities has identified significant scope for improvement of productivities in-comparison to best-in-class peers. The low productivity has contributed to high turn-around times in addition to resulting in higher berth occupancy levels across major ports. Furthermore, low productivity prevents ports from being able to utilize the full capacity of exiting assets, thereby directly diminishing return on investment for ports. Significant productivity improvements are therefore necessary at major ports not only to ensure additional dry bulk cargo throughput, but also for avoidance of CAPEX in additional capacity creation.

2.2 Performance norms and penalties linked to performance norms are used by most international ports to improve overall productivity of operations. For instance, major international coal loading ports such as Newcastle and Dalrymple Bay specify number of hatch changes and draft surveys, de-ballasting rates as well as overall productivity with provisions for denied berthing and/or penalties. Penalties linked to non-compliance with productivity norms are also levied by ports to create the right incentive/dis-incentive structure and improve performance. Shown below are select examples of international ports that have penalties for ships not meeting productivity related norms.

		Operational control enforced	Penalties for non-compliance
Newcastle		**Norms imposed to reduce NWT** • Max. 2 passes / hatch • 2 trim passes not less than 1000MTs / pass • Max. 1 interim draft survey **Vessel size – wise avg. prod. norms**	$1000 per hour penal charges for non compliance with loading Repeat offenders can be denied berthing
Hay Point		**Norms to control NWT** • Hatch pours • De-ballasting rate **Vessel size wise productivity norms**	**Loading declined upon non-compliance to norms** **Non-acceptance of vessels for future trips**

2.3 Currently, however in many major ports it has been observed that performance norms are not being used optimally to improve productivity. Furthermore, currently, there is no standardized, systematic method for arriving at norms for different commodities. Also, in cases where norms have been prescribed, it is observed that these norms do not utilize the entire capacity of the best available equipment on berth. A guideline for calculation of performance norms for different commodities, taking into account the infrastructure available, is therefore important for enabling ports to use performance norms as a key lever to drive productivity improvement across ports.

3. OBJECTIVE

3.1 The berthing policy is drafted to regulate performance of vessels at berth with an intention to meet the objectives as stated below:

- Provide a standardized framework for calculation of norms, specific to the commodity handled and the infrastructure available on the berth
- Design norms with the objective of driving higher productivity and achieving near-design capacity of the available equipments/infrastructure in order to:
    - Reduce berthing time & overall turn-around time of ships; drive higher cargo throughput using the available infrastructure in the Major Ports
    - Improve utilization of port assets and create additional capacity without any significant capital investment.
    - Increase competitiveness of the Major Port by creating value for the trade through reduced logistics cost
- Re-assess the capacity of the berths based on the expected performance of the berth equipments and vessels derived from the performance norms
- Standardize anchorage charges across major ports to reduce turnaround time

3.2 The policy paper detailed below is intended to describe, amongst other aspects of berthing performance improvement, a standardized method for computation of performance norms for different dry bulk commodities through illustrative examples. The actual norms for each port will need to be calculated at a commodity level (eg: steam coal, coking coal etc.) taking into account the berth infrastructure available at each port.

4. GUIDELINES FOR CALCULATION OF PERFORMANCE NORMS

4.1 **Performance norms calculation for unloading of dry bulk cargo**

4.1.1 A method for calculation of normative unloading performance for different kinds of dry bulk cargo (coal, fertilizers, iron-ore, minerals, food-grains etc.) is described in detail below and in Annexure-I. All the ports are required to use the same approach for calculation of productivity norms for dry bulk unloading at their respective ports.

4.1.2 The approach, computes the normative productivity of unloading operations of dry bulk cargo (defined as tonnes of cargo unloaded per berth day) at a commodity specific level. The model calculates the normative productivity level for each dry bulk commodity by taking into the following variables:

- Density of commodity
- Size of grab available (in cbm)
- Picking factor for the particular commodity
- Number of cycles per hour: This value depends on the size and type of crane (ship/shore/HMC) and stage of operation (full-load vs. partial-load)
- Non-working time per shift
- % of total cargo that is covered by full-load or partial-load operation
- Vessel profile i.e. Size of the vessel, geared vs. gearless

A step-by-step illustration for calculation of performance norms are presented below with assumptions for crane/ vessel parameters detailed in Annexure 1.

4.1.3 Stepwise illustration of commodity specific performance norms calculation:

i. First, tonnes per grab lift is calculated for each commodity based on the density of commodity, grab-size and picking factor.

*Quantity/lift = Grab size (cbm) *Commodity density (tonnes/m3) *Grab pick %*

For example, for coking coal (density =0.85) transported through a 100 MT HMC with a grab-size of 37 cbm and picking factor of ~90% the quantity per lift is estimated as: 0.9*37*0.9= 28.3 T per lift

The prescribed grab-sizes for different commodities-crane combinations are detailed in Annexure-1. Ports can use the grab sizes available at their ports currently to compute norms. However, it is expected that ports will engage with crane operators to use optimal grab size for commodities.

ii. Second, tonnes moved per hour of crane operation is calculated by multiplying # of cycles for crane per hour and the quantity per lift. The cycles per hour of crane operation will vary based on whether the crane is working at full-load or partial load.

*Quantity per hour = Cycles/hour*Quantity per cycle*

For example, for coking coal transported through 100 HMC with 37 cbm grab, the quantity per hour for full-load operations i.e 30 cycles per hour will be 28.3T per lift * 30 cycles = 849 T per hour. For half-load operations this would be 566 T per hour- 28.3 T per lift * 20 cycles

Prescribed cycles per hour for full-load and partial load operations are detailed in Annexure-1.The amount of time for half-load vs. full-load depends on type of ship as detailed in Annexure I.

iii. Tonnes moved per hour of crane operation is next extrapolated to tonnes moved by crane per day by multiplying tonnes per hour calculated above with the number of working hours. It is assumed that typically 0.5 hr per shift will be idle translating to number of working hours of 22.5 per day.

*Quantity per day = Quantity per hour * # of hours per day*

For coking coal example, the tonnes per day = 849 T/hour *22.5 = 19,102 tonnes per day. Similarly for half-load operations, this would be 12,735 T per day

iv. Ship-specific performance norms for each commodity are calculate by taking into account the % of cargo used in full-load vs. half-load operations. This will depend on the size of ships, the nature of infrastructure at port i.e. availability of payloaders etc. and the type of cargo that is being unloaded. For example for Panamax vessels carrying coking coal, 70% of cargo is assumed to be used in full-load operations and balance in partial-load operations. For this, the number of hours used up in both partial-load and full-load operations are calculated as:

*# of hours (full-load) = % of full-load * Parcel size/Tonnes per day for full-load*

*# of hours (partial-load) = % of partial-load * Parcel size/Tonnes per day for partial-load*

Productivity = Parcel size/ (# of full-load hrs + # of partial- load hours)

Averaging of full load (top cargo) and half load (bottom cargo) is done to incorporate lower productivity at the time of half load. The % of cargo to be used for half-load and full-load operation as per size of vessel is specified below.

Figure 1: Full load & Half- load ratio across vessel classes

Class of vessel	% of cargo for full-	% of cargo for
Panamax & above	70%	30%
Supramax	60%	40%
Handymax	55%	45%

As an example for coking coal, for a Panamax vessel size of 70,000 MT, # of hours for full-load operation will be 70%* 70000 MT/19102 MT per day= 61.55 hours. Similarly, for partial load this would be 39.6 hours adding to a total operational time of 101 hours. Therefore, the productivity for a Panamax vessel for 1 HMC operation would be70000/ 101hours * 24 = 16633 T per day per HMC. Different scenarios commodity wise berth-day output per crane in Annexure 1.4.

v. Finally, norms are calculated by taking into account the best infrastructure that is available at the berth to determine commodity-wise productivity norms. This is to ensure that ports are able to maximize berth productivity, reduce TAT for customers and improve RoCE for ports assets. Furthermore, ports are directed to ensure that berth productivity is not reduced because of in-efficiency of ships discharging with ship-cranes through mandated use of HMCs wherever available. For berths across several ports, 2 HMCs per ship are routinely used whereas in the case of ship-cranes 4 cranes are used in conjunction.

For coking coal example, assuming 2 100 MT HMCs are used for ship un- loading, the berth day output would be 2*16633= ~33000 TPD. In case of combination of cranes (say 1 60MT and 1 100 MT HMC), the individual summative productivities will be used. Different scenarios for crane-commodity combinations are detailed in Annexure 1.5.

Process followed here has been used in detail to calculate berth-day outputs for different dry bulk commodities for certain commodity/ship/crane combinations as described in Annexure -1.

vi. For the calculation of berth-day productivities for different commodities, major ports are required to calculate based on the best available berth infrastructure so as to maximize productivity possible.

4.2 Performance norms calculation for loading of dry bulk cargo

4.2.1 A method for calculation of normative mechanized loading performance for coal is described in detail below. All the ports are directed to adapt the same approach for calculation of productivity norms for dry bulk loading at their respective ports.

4.2.2 The approach, computes the normative productivity of mechanized loading operations of dry bulk cargo (defined as tonnes of cargo loaded per berth day) based on:

- Existing berth infrastructure (loading rate possible)
- Actual loading rate during working time at berth (depending on ship-size): This is the rate at which coal is loaded into the ship. It has to be lower than rated capacity at berth and varies by ship-class. However, ports should over time make all efforts to ensure that loading rates are matched to existing capacity.
- Non-working time for loading (hatch-changes, draught surveys & pre-/post- loading)

4.2.3 The gross productivity is then calculated as

Productivity = Parcel size/ (# of working hours + # of non working hours)

Where:

# of working hours = Parcel size/ Loading rate requested

# of non-working hours is defined as the sum of time spent in hatch changes, draught surveys and pre/post commencement delays. Detailed benchmarks for non-working time for coal is described in the Annexure 2.

4.2.4 Prescribed berth-day productivities for different ship-classes for mechanized coal loading are shown below. All major ports are required to use this approach to calculate performance norms for dry bulk loading.

Figure 2: Ship-wise berth day productivity for mechanized coal loading

Parameter	Unit	Panamax	Supramax	Handymax
Vessel Capacity	MT	70,000	60,000	50,000
Theoretical berth capacity	MT/Hr	4,000	4,000	4,000
Loading Rate	MT/Hr	3,250	2,750	2,500
Working time expected	Hrs	21.53	21.82	20
Non Working time expected	Hrs	8.13	7.00	6.50
Total time at berth	Hrs	29.66	28.82	26.50
Target Gross Productivity	MT/day	56,635	49,968	45,283

4.2.5 Productivity for mechanized loading of bulk can be improved substantially through dual loading. Dual loading of dry bulk cargo utilizes two loaders at a time on a single vessel thus increasing productivity for the vessel. Second berth can be used to de-ballast subsequent ship. Ports should incentivize vessels with a de-ballasting rate of 1500 MT/ hr or higher to employ dual loading. For dual loading vessels the performance norms are calculated following the same method as describe above.

Figure 3: Ship-wise berth day productivity for dual loading

Parameter	Unit	Dual loading capable vessel
Vessel Capacity	MT	70,000
Theoretical capacity through 1 loader	MT/Hr	4,000
# of loaders employed	#	2
Loading Rate	MT/Hr	5,000
Working time expected	Hrs	14
Non Working time expected	Hrs	3.5
Total time at berth	Hrs	17.5
Target Gross Productivity	MT/day	96,000

5. GUIDELINES FOR RERATING OF BERTH CAPACITY

5.1 All major ports are required to use the productivity norms derived from the abovementioned approach to recalculate or rerate the capacity of available infrastructure at berth, thereby rerating the capacity of the berth itself. Norms will be calculated for each commodity for each type of infrastructure available at berth. These norms will then be used to define the capacity of the infrastructure available at the berth.

5.2 Method of calculating berth capacity

- Method for calculating the capacity of different berths under different scenarios are given hereunder-

Scenario 1: If there is one type of commodity and equipment

*Norm for a commodity * no of cranes * (days * 80% occupancy)*

Scenario 2: If there is one type of commodity and multiple types of equipment

The following will be calculated for **each type** of equipment –

*(Norm for a commodity * no of cranes * (days * 80% occupancy)* Multiple equipment ratio*

Where, *Multiple equipment ratio* is the estimated % of usage for each type of equipment. Sum of capacity for all equipments will equal to the capacity of the berth.

Scenario 3: If there are multiple types of commodity and one type of equipment

*Norm for a commodity * no of cranes * (days * 80% occupancy)* Multiple volume ratio*

Where *Multiple volume ratio* is the estimated volume distribution for each commodity.
Sum of capacity for all commodities will equal to the capacity of the berth

Scenario 4: If there are multiple types of commodity and multiple types of equipment

In case of multipurpose berths, capacity calculation will be a combination of all of the above.
*Norm for a commodity * no of cranes * (days * 80% occupancy)* Multiple equipment ratio * Multiple volume ratio*
Sum of capacity for all equipments & all commodities will equal to the capacity of the berth.
The following table illustrates method of calculation of berth capacities for multiple commodity & multiple equipment berths.

Figure 4: Multiple commodities and multiple equipments

Particulars	100/120 MT Crane			60/80 MT Crane			Ship Crane		
Cargo Type	Coal	Fertilizer	Salt	Coal	Fertilizer	Salt	Coal	Fertilizer	Salt
a. Norm for lowest incentive range	11500	9000	11500	7500	5500	7500	3972	2886	4089
b. No of Cranes	1			1			4		
c. Days (365) * 80% occupancy:	292			292			292		
d. Multiple equipment ratio	50%			25%			25%		
e. Multiple volume ratio	50%	30%	20%	50%	30%	20%	50%	30%	20%
f. Capacity for crane-commodity (a *b*c *d *e)	839,500	394,200	335,800	273,750	120,450	109,500	579,912	252,814	238,798
g. Total Capacity at berth (MT) (Summation of f.)	**3,144,723**								

5.3. Multiple commodity ratio should be calculated as the ratio of volumes of commodity handled in the past three years. Following points may also be factored in the ratio in case there is an anticipation of change in ratio due known market conditions like:

- Ban on some commodity,
- Upcoming new plant/industry,
- Gain/loss of large customer,
- Increase/decrease in demand/supply of some commodity etc.
- Others

The ratio should be aligned for each berth may be revised annually basis average of the past 3 year data.

6. GUIDELINES FOR LEVYING ANCHORAGE CHARGES

6.1 Anchorage charges are to be levied across all major ports for the purpose of reducing pre-berthing delay and hence the overall turn-around time for vessels. This will help streamline vessel scheduling for customers and lead to efficient usage of port anchorage

6.2 Ports are to create multiple slab rates for anchorage charges based on the time of waiting of the vessel in the anchorage. The slabs and the respective anchorage charges applicable in those slabs will adhere to the following guidelines

i. Ports are to provide a free waiting period for vessels during which no anchorage charges will be levied. The free waiting period should not exceed 48 hours of waiting in the anchorage.

ii. Post the free waiting period, a normal anchorage charge ranging from 10% to 25% of the berth hire charges is to be levied on the vessel for a period of 48-96 hours post expiry of the free period. Berth hire charges as per SoR are to be considered for the same.

iii. Post a waiting period of 96-144 hours, ports are to charge a high anchorage charge comparable to the daily charter rates of the vessel.

iv. Anchorage charges should not be higher than 50% of the berth hire charges at any point of time.

v. Anchorage charges will be higher for foreign vessels mirroring the berth hire charges for foreign vessels in the port

6.3 Port can exempt vessels from paying anchorage charges in exceptional circumstances including but not limited to lapses in port provided services (e.g. crane or equipment failure, unavailability of pilot etc.) causing waiting of vessels. Chairman of the Port Trust or an equivalent authority will require approving of any waivers in anchorage charges

7. GUIDELINES FOR ROLLING OUT PERFORMANCE NORMS

7.1 All major ports will have to use the approach detailed above adapting it based on their existing infrastructure to calculate performance norms for different dry bulk cargo commodities.

7.2 During the first year, ports are encouraged to roll out performance norms in a phased manner to reach the target levels achievable for each commodity given infrastructure available at berths. To this end, performance norms for different commodities along with anchorage charges will have to be computed every quarter by all ports in the first year until target norms are reached. Subsequently, the norms can be calculated every year or upon upgradation of infrastructure at berth, whichever is earlier. It is expected that in the case of ideal norms, most of ships will be able to achieve the norms with some ships performing better than norms. As a guideline, if more than 70% of ships are achieving the set-norms then the port should increase the norms. Ports are required to share target norms (1 yr targets) with end customers & agents at the beginning of the first quarter to allow them time to incorporate them into charter parties.

7.3 Performance norms have to be calculated as per the approach detailed above. In the exception that more than 70% of ships cannot meet norms, the Chairman in consultation with Board can relax the performance norms.

7.4 Performance norms calculated above will have to be notified by ports to each of the stevedores & shore handling agents at the respective ports wherever such parties are engaged in loading/unloading operations. The stevedores & shore handling agents will, as part of the daily performance report, track adherence to the performance norms as per the guidelines set in the Stevedoring & Shore Handling Policy (2016).

7.6 Ports will update the customers with performance norms for different commodity-crane combination upon every revision of the norm

7.7 In cases where performance norms are not met, ports are to explore scope for sharing of berth facilities (pipelines, cranes, storage facilities etc.) owned by the port or private operators among multiple users to improve performance or utilization of facilities

8. LINKING INCENTIVES AND PENALTIES WITH NORMS

8.1 The performance norms calculated by each port will be used to create a productivity linked incentive/dis-incentive structure for end-customers. The objective of the performance linked incentive/ dis-incentive structure is to continuously drive productivity improvements across ports and reward the vessels/ customers that are exceeding the norms, thus creating value for the port in addition to allowing customers and trade to bring down the cost of logistics.

8.2 The performance norm calculated for any particular commodity-infrastructure combination will be used as the base for the performance linked incentive/dis-incentive scheme. For each arrival ship, the actual berth stay is calculated based on the time between "end of inward pilotage" to sailing time. This berth stay is then compared to the stipulated berth stay for that ship-commodity combination (based on commodity specific productivity norm and parcel size of vessel).

i. If a ship stays within 5% (higher or lower) of the stipulated time for that commodity, then no penalty/incentive will be levied/paid.

ii. In cases where actual berth stay is more than 5% **higher** than the stipulated time, number of additional hours spent at berth will be penalized at 3X berth hire.

iii. In cases where actual berth stay is more than 5% **lower** than the stipulated time, number of additional hours saved will be incentivized at 1X berth hire.

As a guideline, ports should maintain penalty of at least 5% of the total cost per metric tonne to customer to ensure adherence to norms.

The process described above is to be used for calculation of the actual penalty/incentive as illustrated below:

Figure 5: lustration of penalty calculation

Illustrative example for a Supramax vessel carrying steam coal	
Parcel size (MT)	55000
Productivity norm for steam coal (TPD)	25000
Stipulated berth time (hrs)	53
Scenario I:	
Actual berth stay (hrs) as measured for ship	60
% variation from stipulated berth stay	13%
Berth hire slab to be used	**3X berth hire**
Hours to be charged at 3 X berth hire	**7**
Scenario II:	
Actual berth stay (hrs) as measured for ship	45
% variation from stipulated berth stay	-15%
Berth hire slab to be used	**1X berth hire**
Hours to be refunded at 1 X berth hire	**8**

For vessels employing **dual loading**, the performance norms shall be calculated assuming two loaders are simultaneously loading a single vessel as described in Figure 3. The incentives/ penalties will be levied as below.

i. If a ship stays within 5% (higher or lower) of the stipulated time for dual loading, then no penalty/incentive will be levied/paid.

ii. In cases where actual berth stay is more than 5 % **higher** than the stipulated time, number of additional hours spent at berth will be penalized at 1X berth hire.

iii. In cases where actual berth stay is more than 5% **lower** than the stipulated time, number of additional hours saved will be incentivized at 2X berth hire.

8.3 The Traffic manager of each major Port Trust will be responsible for setting up data recording and analysis mechanisms to identify adherence to norms and variations from norms. In addition, the Traffic department is responsible for co-coordinating collection of penalties and provision of incentives as per the policy designed at their respective ports.

8.4 In computing actual performance achieved by each ship for the purpose of calculating penalty/incentive, any stoppage of operations on account of port-related or weather- related issues will be discounted. Such exclusions will be limited to:

- Break-down/ non-availability of port provided equipment at berth
- Weather related stoppages
- Foreign material in manual shifting of cargo

- Shifting of ships between berths on account of port. Port is required to maintain a record of a historical data of the frequency of such cases.
- Any delays in sailing post vessel readiness to sail on account of port i.e. pilot/tug unavailability, tidal conditions
- Draft surveys within the prescribed norms for ships. As a guideline, maximum 30 mins per party for interim draft survey should be allowed. Any additional time incurred in draft surveys will be considered in berth stay. Ports should also make all attempts to ensure that in case of multi-party consignments, common surveyors are appointed so as to reduce time lost during interim draft surveys.

Any stoppages because of other reasons are not to be excluded for calculation of performance norms, unless specifically approved by Board of the Port.

8.5 Performance norms will be revised every quarter during the first year till target norms for commodity are reached. Subsequent revisions will be done yearly or upon upgradation of berth infrastructure. Ports are required to send a yearly update to IPA on status of performance norms & linked penalty/incentive structure in place including # of revisions to performance norms in year, % of ships paying penalties and total amount of penalties levied & collected.

8.6 All major ports are directed to roll-out a performance norms linked penalty/incentive structure as described above. However, in the exceptional case that the Chairman and Board of a major port trust feel that introduction of the penalty/incentive structure will adversely affect ability of the port to retain business, then the Port, can be a given a temporary relaxation from the penalty/incentive structure. Ports are expected to create a clear argument of the rationale for norms relaxation covering the following points:

- Illustrating the potential impact of suggested incentive structure vis-à-vis the recommended structure on ₹/MT for end –customer
- Demonstrating expected effect on competitiveness of the major port vis-à-vis private competitors for suggested penalty/incentive structure over recommended structure
- Highlighting the specific steps to be taken by port to ensure roll-out of incentives/penalties within 6 months

8.7 Port Trusts are responsible for sharing with the Ministry, on a monthly basis, summary of the ships under-performing and over-performing the stipulated norms in addition to total amount of penalties and incentives

9. SCOPE OF BERTHING POLICY

9.1 As described, one of the primary purposes of the berthing policy paper is to improve productivity of dry bulk loading/ un-loading operations at ports. To that effect, performance norms calculated here for different commodities will be used to design a productivity linked penalty & incentive structure for each port.

9.2 In addition, performance norms calculated as per approach detailed in section 4 will also be used for other productivity improvement measures including priority berthing, forced de-berthing, berthing denial to repeat offenders etc. For instance, in the case of loading of dry bulk, priority berthing can be accorded to vessels promising a load rate that is closer to the best-available equipment productivity available at berth. Similarly, in case of unloading operations, vessels not meeting a particular productivity target can be de- berthed or denied permission for future visits to ports as has been observed in other private ports in India and outside (refer Annexure 3)

9.3 Furthermore, ports are required to use performance norms calculated as per approach detailed in section 4 for calculating productivity norms for stevedoring & shore handling policy as detailed in Stevedoring & Shore Handling Policy (2016).

9.4 Ports are also asked to use the approach for performance norms detailed above for stipulating performance norms in future concession agreements for PPP/BOT projects.

9.5 Ports are to compute berth capacity for new BoT and PPP (captive) projects as per the performance norms. The capacity would also be considered for calculation of minimum guaranteed cargo for the BOT and PPP projects

Annexure-1: ASSUMPTIONS FOR DRY BULK UNLOADING PERFORMANCE NORMS

A1.1 Prescribed grab-size for different commodity-crane combinations is shown below. Ports may use the actual grab size available if it differs and plan for optimal grab procurement at a later stage in case available grab is lower than prescribed below.

Commodity	Density	Grab -size in cbm					
		100 MT HMC	60MT-80MT HMC	Ship-Cranes	25 MT ELL	16 MT ELL	12 MT ELL
Coal	0.85	35	22	12	18	11	9
Fertilizer (DAP+UREA)	0.8	35	22	12	18	12	9
Salt	1.2	28	18	10	14	9	7
Food Grains, Kaolin	0.6	35	22	12	22	14	10
Iron Ore, Mill Scale	2	20	12	8	10	6	5
Other Minerals	1.12	28	18	10	15	10	7
Dolomite	0.7	35	22	12	20	13	10

A1.2 Cycles per hour for full-load and partial load operations for HMC cranes & ship-cranes are provided. For ELL cranes, full load moves per hr. of 25 and partial load of 18 moves per hr. Ports are advised to measure actual performance of their ELL/ship-cranes and take steps to meet prescribed norms here

# of cycles per hour	HMC		Ship Crane	
	Full Load	Half Load	Full Load	Half Load
Coal	30.0	20.0	18.0	12.0
Fertilizer (DAP+UREA)	30.0	20.0	18.0	12.0
Salt	30.0	20.0	18.0	12.0
Food Grains, Kaolin	30.0	20.0	18.0	12.0
Iron Ore	30.0	20.0	18.0	12.0
Gypsum, Mill Scale, MOP	30.0	20.0	18.0	12.0
Dolomite	30.0	20.0	18.0	12.0

A1.3 Non working time for shift is assumed to be 0.5 hours per shift

A1.4 Commodity wise berth-day output per crane

Tonnes per day per crane	100MT HMC	60/80 MT HMC	Ship Crane
Coal	15000	9500	3000
Fertilizer (DAP+UREA)	11500	7500	2500
Salt	14000	9000	3000
Food Grains , Kaolin	8500	5500	2000
Iron Ore	17500	10500	4000
Gypsum, Mill Scale, MOP	13000	8500	3000
Dolomite	10500	6500	2000
# of cranes at berth	2.0		4.0

A1.5 Berth-day outputs for different crane-commodity combinations. Ports are directed to set **productivity norms at the best available berth infrastructure**

Berth-day output (TPD)	**Crane combinations**				
	2 100 MT HMCs	**2 60/80T HMCs**	**1 100T HMC + 1 60T HMC**	**Ship-cranes**	**60 MT HMC + Ship-cranes**
Coal	30000	19000	24500	12000	21500
Fertilizer (DAP+UREA)	23000	15000	19000	10000	17500
Salt	28000	18000	23000	12000	21000
Food Grains, Kaolin	17000	11000	14000	8000	13500
Iron Ore	35000	21000	28000	16000	26500
Gypsum, Mill Scale, MOP	26000	17000	21500	12000	20500
Dolomite	21000	13000	17000	8000	14500

A1.6 Pre-commencement and post-commencement non-working time are prescribed to be less than 1.5 hours each. This includes non-working time due to activities like waiting for pilot, draft check, documentation, hatch opening & closing, documentation & clearances, operations like gangway lowering.

Annexure-2: ASSUMPTIONS FOR DRY BULK LOADING PERFORMANCE NORMS

A2.1 Detailed assumptions for different contributors to non-working time at berth during coal loading are detailed below. Major ports can adopt same approach to calculate loading performance norms for different bulk commodities

A2.2 For hatch change times, a maximum of 2 hatch changes per hold plus 1 was used to calculate total number of hatch changes allowed. Average time per hatch change was assumed to be 15.

NWT due to hatch change	Unit	Panamax	Supramax	Handymax
No. of hatches	#	7	6	5
Normative hatch changes allowed	#	15	13	11
Time per hatch change	mins	15	15	15
Expected hatch change time	hrs	3.75	3.25	2.75

A2.3 A maximum of 2 draught surveys are allowed during loading

NWT due to draft check	Unit	Panamax	Supramax	Handymax
No of interim draft surveys	#	2	2	2
Time per draught survey	mins	30	30	30
Expected draught survey time	hrs	1.00	1.00	1.00

A2.5 Maximum of 1 hr is allowed for pre-commencement and post-loading activities

NWT before & after loading	Unit	Panamax	Supramax	Handymax
Target pre-commencement time	mins	1	1	1
Target post-commencement time	mins	1	1	1

A2.6 Maximum of 40 mins was allowed per ship call for stoppages related to stockpile changes