MAZAGON DOCK SHIPBUILDERS LIMITED

SCOPE OF WORK

FOR

SUPPLY, INSTALLATION, TESTING & COMMISSIONING (SITC) OF A PLM SYSTEM

AT MDL, MUMBAI, GRSE KOLKATA & IHQ MOD(N), DELHI AND SEVEN SHIPS OF P17A PROJECT

BY

A PLM SOFTWARE AND SOLUTION PROVIDER

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LIST OF ENCLOSURES:

1. PREAMBLE

1.1 Mazagon Dock Shipbuilders Limited(MDL) Mumbai intends to appoint a **'PLM Software and Solution Provider'** who would undertake all the tasks defined below as a turnkey solution. MDL and Garden Reach Shipbuilders and Engineers ltd (GRSE) Kolkata will place two separate orders for their respective deliverables on the PLM Software and Solution Provider who would be Original Equipment Manufacturer(OEM) of the PLM software. The OEM of the PLM software is at liberty to appoint a System Integrator (SI) who would play the key role of developing the solution blue print for the PLM solution and primarily implement the functional requirements set out in the scope of work. The functional requirements have to be met at three geographical locations viz MDL Mumbai, GRSE Kolkata and IHQ MoD(N)/DND(SSG) New Delhi, collectively called the 'Stakeholders' in this document. Further, the PLM Solution will have to be developed and implemented on board seven (07) ships that will be built between MDL and GRSE.

1.2 This document covers the technical requirements for installation, commissioning, roll-out, aftersales support of a Product Data Management/Product Lifecycle Management (PDM/PLM) system at MDL Mumbai, GRSE Kolkata and IHQ MoD(N)/DND(SSG) New Delhi and on board seven (7) ships of P17A Project. Four(4) ships shall be constructed at Mazagon Dock Shipbuilders Ltd(MDL), Mumbai, and three(3) Garden Reach Shipbuilders Ltd, (GRSE), Kolkata. It is envisaged that the PLM Software and Solution for P17A Project shall cover the Product Data Management(PDM) functionality also.

1.3 For P17A Project, the Basic and the Functional Design is prepared by IHQ MoD(N)/DND(SSG) and MDL is preparing the detailed design. The construction of P17A is by MDL (4 ships) and GRSE(3 ships) with separate Warship Ovreseeing Teams(WOTs) overseeing the construction at MDL and GRSE. The post commissioning activities are managed by the Indian Navy.

1.4 MDL is providing Lead Yard services to GRSE for construction of the ships that shall be built at GRSE. MDL as the lead yard shall provide the necessary inputs to GRSE, Kolkata.

1.5 The PLM Software and Solution Provider shall not alter the scope of supply or any other aspect governed by this document, without specific concurrence from MDL, even if any other authority seek such alterations.

2. BACKGROUND

2.1. Shipbuilding methodology: MDL and GRSE are currently following conventional method of construction which involves sequential planning, procurement and production. The construction of the P17A Project is envisaged to incorporate Integrated Construction (IC) Methodology, supporting concurrent and collaborative engineering.

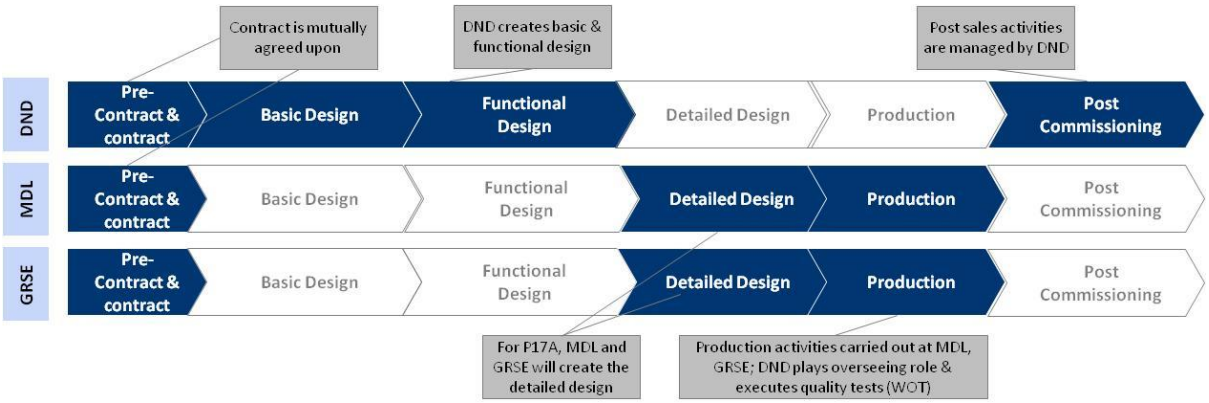
2.2. PLM requirement: A PDM/PLM solution based on Extended Ship Work Breakdown Structure (ESWBS) is mandated by the Indian Navy for P17A Project for implementation during design, construction and also during the post commissioning phase of the Project. The PDM/PLM solution will have to be implemented at five

geographic locations viz. Main Data Center(MDC) at Bengaluru, MDL(Mumbai), GRSE(Kolkata) and IHQ MoD(N)/DND(SSG)(Delhi) and Diaster Recovery(DR) Center(MDL, Mumbai) and also onboard the seven ships extending for their through life.The following high level benefits are expected from the implementation of the PLM:

(a) An integrated Product development Process incorporating better collaboration within engineering department and also across the corporate functions

(b) Building up the support capabilities for end-to-end Product Life Cycle management, to improve the level of integration and accuracy of forecasting, to enable multi-disciplinary concurrent engineering, to reduce re-design efforts using archive retrieval and to ensure traceability.

2.3. Stakeholders: There are three Stakeholders within the implementation and deployment of PLM solution for P17A Project. The operating model envisaged for the construction of P17A Project is as follows:



- Process is split between DND, MDL and GRSE and IC is currently not used for shipbuilding
- Multiple stakeholders need to be managed during the entire process including Indian Navy
- Each entity has specific set of capabilities and maturity at different levels

1 DND: IHQ MoD(N)/DND(SSG)

3. SCOPE OF WORK-OVERVIEW

1.1. The bidder shall supply, install, test and commission and provide aftersales support of a PLM system for seven (7) ships of P17A Project during basic design, functional design, detailed design, construction and post commissioning phase of the seven(7) ships.

1.2. The PLM software and Solution Provider shall act as the Prime Contractor for the entire scope of work. The PLM software and Solution Provider shall appoint a competent System Integrator with requisite domain expertise for implementation of the PLM Software Solution in MDL, GRSE and IHQ MoD(N/DND(SSG) and on-board seven(7) ships. PLM Software and Solution Provider shall be the Single point of contact for the Stakeholders. The PLM software supplied shall be a turnkey solution which shall include the following:

	Requirements	Activity
1.	Main Data Centre (MDC)	Setting up of a Main Data Centre (MDC) at Bengaluru with the hardware and software and connectivity within the racks of Main Data Centre at ITIL Bengaluru (Remote hosting site). The rack space shall be provided by MDL free of cost at ITIL, Bengaluru through an order placed by MDL on ITIL. LAN between the Racks and the ISP at MDC at ITIL shall be the responsibility of ITIL, Bengaluru including its warrantee and AMC.
2.	Disaster Recovery Centre (DR)	Establishment of DR along with Hardware and Software at MDL. The rack space for this purpose shall be provided by MDL free of cost to the PLM software and solution Provider. Supply Install Test and Commission (SITC) and warrantee and AMC of LAN for DR at MDL shall be the responsibility of the PLM Software and solution supplier
3.	WAN CONNECTIVITY	Establishing P2P (Pont to Point) wired connectivity between five(5) locations, viz. MDL, GRSE & IHQ MoD(N), MDC at ITIL, Bangalore and DR as detailed in this specifications including warrantee and AMC for the same
4.	LAN CONNECTIVITY	Establishing LAN for connecting the PLM Hard ware setup to the existing LAN at MDL,GRSE & IHQ MoD(N)/ DND(SSG) , Delhi including warrantee and AMC
5.	NON-FUNCTIONAL REQUIREMENTS AT STAKEHOLDERS PREMISES	Supply Install Test and Commission (SITC) and AMC of the PLM software solution at MDL, GRSE, IHQ MoD(N)/DND(SSG) and also on board seven commissioned ships of P17A with the assistance of a System Integrator (SI) in accordance with the Scope specified in this Specification. AMC includes Maintenance of Hardware, software
6.	FUNCTIONAL REQUIREMENTS IN THREE WAVES (WAVE 1,2 & 3)	Solution Blue printing & development of the PLM with a combination of 'out of box' and customised functionalities of the PLM software
7.		Integration of the PLM Software Solution with the Legacy systems at MDL, GRSE & IHQ MoD(N)/DND(SSG)
8.		
9.		Data Migration at MDL, GRSE & IHQ MoD(N)/DND(SSG)
10.		Training at MDL, GRSE & IHQ MoD(N)/DND(SSG)
11.	AMC FOR THE hardware software and LAN & WAN connectivity	AMC for NFR & FR for both software and hardware,P2P WAN and LAN for five locations MDL, GRSE, DND(SSG), MDC(Bengaluru) and DR(MDL) until delivery of the last ship of P17A from MDL and GRSE
12.	AMC FOR THE for the PLM Software Solution	AMC for the PLM Software Solution post warrantee at five locations MDL, GRSE, DND(SSG), MDC(Bengaluru) and DR(MDL) till delivery of the last ship of P17A from MDL and GRSE
13.	DATA ENTRY AT STAKEHOLDERS PREMISES	Data Entry for a duration of two years from the date of Roll-Out of Wave-1 at MDL, GRSE and IHQ MoD(N)/DND(SSG)
14.	ONBOARD	Installation of PLM Software and customised solution on

	SEVEN SHIPS OF P17A	board seven ships of P17A
15.		Training on board seven ships as part of installation
16.		AMC for the software on-board seven ships post delivery during the guarantee period of the ship(one year from delivery of each of the ships to Indian Navy)
17.		AMC for the software on-board seven ships post guarantee period of each of the ships (**optional:** PO to be placed by IN)

4. **WORK LOCATIONS AND PURCHASE ORDERS:**

4.1. While MDL is the Tendering Authority for the PLM Software and solution, there are three beneficiaries(stake holders) as follows:

(a) MDL, Mumbai,
(b) GRSE, Kolkata
(c) IHQ MoD(N)/DND(SSG), Delhi

4.2. Separate POs shall be placed as follows:

PO	Order placement Authority	Scope coverage for PLM SSP
#01	MDL	(a) MDC at ITIL Bangalore and associated warrantee and AMC (b) DR at MDL Mumbai and associated warrantee and AMC (c) P2P WAN Between five(5) locations and associated warrantee and AMC (d) PLM at MDL and associated warrantee and AMC (e) PLM at IHQ MoD(N)/DND(SSG) and associated warrantee and AMC (f) PLM LANs at MDL and IHQ MoD(N)/DND(SSG)and associated warrantee and AMC (g) AMC for PLM Software & hardware @ MDL (h) AMC for PLM Software & hardware @ DND (i) AMC post-delivery during guarantee period of the ship On-board Four ships at various locations to be decided by Indian Navy (j) PLM on-board four ships built by MDL and AMC thereof
#02	GRSE	(a) PLM at GRSE and associated warrantee and AMC (b) PLM LAN at GRSE and associated warrantee and AMC (c) AMC for PLM Software & hardware @ GRSE (d) AMC post-delivery during guarantee period of the ship On-board three ships at various locations to be decided by Indian Navy (e) PLM on-board three ships built by GRSE and AMC thereof

#03	IN	AMC post ship guarantee period (one year from delivery by MDL/GRSE) of seven ships (TBD/optional to INDIAN NAVY)

4.3. Location of execution of various activities in the Scope of Supply are as indicated below:

	Activity	Location
(a)	MDC(Remote Hosting)	ITIL Bengaluru
(b)	DR	MDL, Mumbai
(c)	WAN Connectivity	(a) MDL, Mumbai, (b) GRSE, 61 Park(CDO), Garden reach Road, Kolkata, (c) IHQ MoD(N)/DND(SSG), New Delhi, (d) MDC, Bengaluru, (e) DR at MDL Mumbai
(d)	LAN Connectivity for connecting the hardware setup to the existing LAN	(a) MDL, Mumbai, (b) GRSE, 61 Park(CDO), Garden reach Road, Kolkata, (c) IHQ MoD(N)/DND(SSG), New Delhi, (d) DR at MDL Mumbai
(e)	PLM software and solution for MDL, guarantee & AMC	MDL, Mumbai
(f)	PLM software and solution for GRSE guarantee & AMC	GRSE, 61 Park(CDO), Garden reach Road Kolkata
(g)	PLM software and solution for IHQ MoD(N)/DND(SSG) guarantee & AMC	A33 Kailash Colony, New Delhi
(h)	PLM software and solution On board four ships built by MDL along with guarantee	MDL, Mumbai
(i)	PLM software and solution On board three ships built by GRSE along with guarantee	GRSE, Kolkata
(j)	PLM software and solution AMC post-delivery(Optional)	On-board Seven ships at various locations to be decided by Indian Navy

5. **TASKS TO BE PERFORMED:**

5.1. he list of tasks that shall be performed by the PLM Software and Solution Provider at the five locations, i.e. MDL, GRSE & IHQ MoD(N)/DND(SG), ITIL, Bangalore & DR at MDL as part of the turnkey solution described above are placed at **Enclosure-1**.

6. TIME LINES FOR P17A PROJECT

6.1. P17A Project timelines:

MDL/GRSE	YARD NO	START OF PRODUCTION	DELIVERY
MDL	Y-12651	Feb-17	Aug-22
	Y-12652	Feb-18	Feb-23
GRSE	**Y-3022**	Feb-18	Aug-23
MDL	Y-12653	Feb-19	Feb-24
GRSE	**Y-3023**	Aug-19	Aug-24
MDL	Y-12654	Feb-20	Feb-25
GRSE	**Y-3024**	Aug-20	Aug-25

6.2. Shipbuilding time lines:

		START	DELIVERY	Build period
1.	Y-12651 (built by MDL)	Feb 17	Aug 22	66 months
	Y-12652 (built by MDL)	Feb 18	Feb 23	60 months
	Y-12653 (built by MDL)	Feb 19	Feb 24	60 months
	Y-12654 (built by MDL)	Feb 20	Feb 25	60 months
	Y-3022 (built by GRSE)	Feb 18	Aug 23	66 months
	Y-3023 (built by GRSE)	Aug 19	Aug 24	60 months
	Y-3024 (built by GRSE)	Aug 20	Aug 25	60 months

7. PLM TYPICAL MACRO FUNCTIONALITIES

7.1. A reference model has been developed in order to identify nine (9) typical PLM macro-functionalities across the entire shipbuilding lifecycle. The macro-functionalities are be described as follows:

7.1.1. Requirements Collection & Management: The functional area contains the requirements collection either from inside IHQ MoD(N)/DND(SSG)/ MDL/GRSE, or PDM/PLM Solution Provider side and its management and tracking. The requirements will get through a defined workflow and collaboration phase into the engineering process. The requirements will be connected to specific steps in the engineering process in order to trace its fulfilment.

7.1.2. Workflow and collaboration: The functional area of workflow and collaboration contains all requirements which drive through the engineering and non-engineering processes involving all Stakeholders. The share of work and the real- time handling and sharing of the data created in the different disciplines and different process stages are part of this functional area.

7.1.3. Project & Planning Management: The functional area consists of the project planning and management of the whole ship lifecycle, covering the complete value chain of the engineering and non-engineering task.

7.1.4. Document Management: The functional area describes the management of documentation created during the whole lifecycle of the ship, including automatically generated documents. The handling of different status possibilities are related to the approval process functional area. PDM/PLM Solution Provider shall give evidence of existing software certification for handling military classified documentation, if any.

7.1.5. Product Baseline Management & BOMs: The functional area consists of the product BOMs with its hierarchical build-up, the synchronizing of the different hierarchies and the provision to the different Stakeholders, depending on the status of each data item. The same applies to the bill of material (BOM) which is also covered by this functional area. The functional area covers also Baseline management to check the product evolution within changes during the product lifecycle.

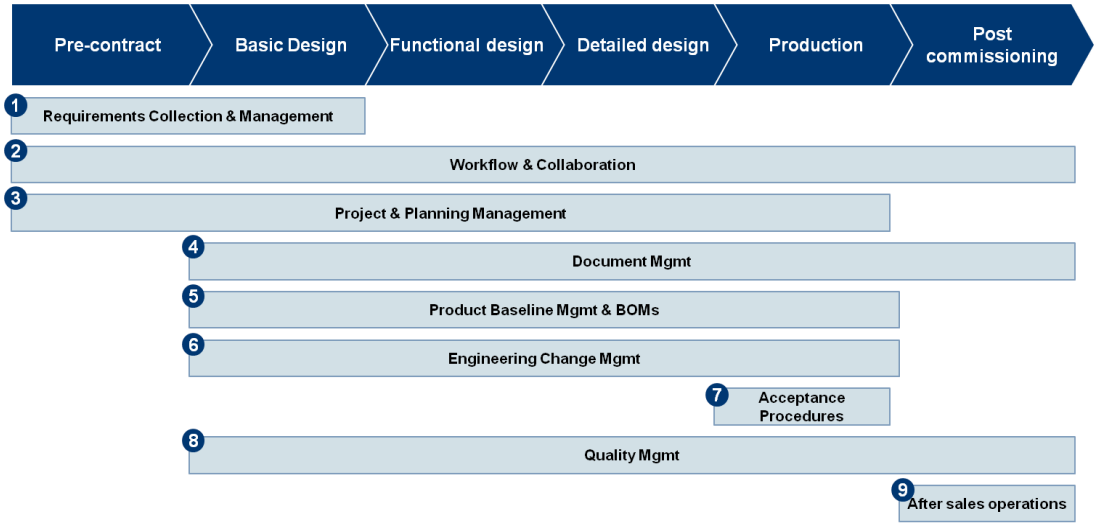
7.1.6. Engineering Change Management: The functional area describes the change management in the engineering domain. This includes all requirements which facing changes in a certain discipline and its provision to the other involved Stakeholders.

7.1.7. Acceptance Procedures: The functional area covers all requirements to support qualification and acceptance of the product, creating a direct link between Requirements Management, Documentation Management and Product Breakdown Structure data.

7.1.8. Quality Management: The functional area consists of all quality management and assurance requirements related to the engineering and non-engineering tasks of the whole ship lifecycle.

7.1.9. After Sales Operations: The functional area consists of all requirements related to the activities of after sales, including maintenance and other aspects.

7.2. The above macro functionalities are summarised over the lifecycle of the ship as follows:



8. KEY PROCESSES TO BE SUPPORTED BY PLM

8.1. Sixty four(64) key Integrated Construction(IC) processes in the shipbuilding spanning across six stages of lifecycle of the P17A Project that need to be supported by PLM have been identified and is listed at **Enclosure-2**. These IC processes list target processes that are envisaged to be in place at MDL, GRSE & IHQ MoD(N)/DND(SSG).The mapping of these processes within the current systems is placed at **Enclosure-3**.

9. AS-IS SITAUTION

9.1. **IC Processes coverage in MDL & GRSE:** The sixty four(64) key Integrated Construction(IC) processes in the shipbuilding that need to be supported by PLM are categorised into three groups as follows based on their current coverage by MDL and GRSE:

9.1.1. New Processes and roles: These are the new processes that need to be introduced at MDL & GRSE to support the IC methodology for construction of P17A

9.1.2. Different approach to existing processes and roles: These are the processes at MDL & GRSE that requires major changes to support the IC process

9.1.3. Minimal or no change processes and roles: These processes require minimal or no changes since these are already aligned to the IC methodology

9.2. The current coverage by MDL, & GRSE for the above three categories are as follows:

Coverage	IC processes
New process and roles (26)	IC05, IC06, IC08, IC10, IC12, IC13, IC14, IC15, IC16, IC19, IC25, IC28, IC29, IC30, IC31, IC33, IC34, IC42, IC43, IC46, IC47, IC48, IC49, IC57, IC63, IC64
Different approach to existing process and roles(10)	IC17, IC18, IC20, IC23, IC26, IC27, IC32, IC38, IC40, IC44

Minimal or no change to existing process and roles(28)	IC01, IC02, IC03, IC04, IC07, IC09, IC11, IC21, IC22, IC24, IC35, IC36, IC37, IC39, IC41, IC45, IC50, IC51, IC52, IC53, IC54, IC55, IC56, IC58, IC59, IC60, IC61, IC62

9.3. **PLM Functionalities – Current Coverage:** The Stakeholders are introducing PLM software for the first time. The macro functionalities identified at Para (7) are not presently covered by the existing systems in the Stakeholders premises. The extent of coverage of each of the macro functionalities at MDL & GRSE are elaborated in general as follows:

9.3.1. Requirements Collection and Management: In general there is no structured one- stop tracking of fulfilment of requirements. The requirements are created and tracked in hard copy formats and the monitoring of requirements is performed in an isolated way by different departments.

9.3.2. Workflow and collaboration: In general, workflows and collaborations are largely manual. More specifically, approvals are manually driven (signatures and stamps), inter/ intra department communication occurs through verbal/ written means and collaborative and concurrent engineering is absent.

9.3.3. Project & Planning Management: In general, there is a limited use of the planning suite. In fact, planning is done only for production stage, Primavera/ MS project is utilized for planning and creation of project plan while work-in-progress is monitored through physical examination and tracked in MS Excel.

9.3.4. Document Management: In general, a uniform, integrated information management system is absent. Most final documents are archived in hard copy formats, (only for some documents server folder structures are maintained), and SAP is used in a limited manner.

9.3.5. Product Baseline Management & BOMs: There is a limited interface between SAP and CAD (BOMs and related changes are manually updated). Moreover, there is no PBS data structure in place.

9.3.6. Engineering Change Management: The change management procedure is managed outside the system. Indeed, the change form is created to track cause/ request for change and change notifications are managed through verbal/ written means. Moreover, there is no one-stop archival of all revisions/ modifications

9.3.7. "Acceptance Procedures", "Quality Management", "After Sales Operations: For these three macro-functionalities, work-streams are manually driven with limited system involvement. The related activities involve multiple Stakeholders (MDL, DND, GRSE, external providers, etc.) and interactions are manually driven with verbal/ written communication.

9.4. **High level IT architecture:** The high level as-is IT Architecture set up at MDL, GRSE & IHQ MoD(N)/DND(SSG) is placed at **Enclosure-4**.

9.5. **Key Software applications:** MDL and GRSE have a straightforward application map, with a few software packages being used and integrated. MDL application landscape includes, eleven(11) main software and GRSE application landscape includes, eight (8) main software that are not integrated real time between each other. In IHQ MoD(N) the application landscape includes (twelve main

software) . The detailed application maps at three locations are elaborated at **Enclosure-05**.

10. TARGET OVERVIEW

10.1. **Overview:** The PLM Software and solution Provider shall provide a turnkey PDM/PLM solution that include the following:

(a) End to End PLM software, including support and maintenance
(b) DR Datacentre Hardware
(c) Main Datacentre Hardware
(d) Main Datacentre LAN
(e) Wide Area Network connectivity for the PLM Solution

10.2. **PLM Responsibility Matrix:** The responsibility matrix shall be as follows:

Domain	Activities				
	Define	Procure	Customize	Install & Test	Aftersales support
PLM Software	PLM Provider / Stakeholders	PLM Provider	PLM Provider	PLM Provider	PLM Provider
Main DC Hosting	Hosting Provider / Stakeholders	Hosting Provider	Include Data Migration	Hosting Provider	Hosting Provider
DR DC Hosting	Stakeholders	Stakeholders	*N/A*	Stakeholders	Stakeholders
Main DC hardware	PLM Provider / Stakeholders	PLM Provider	*N/A*	PLM Provider	PLM Provider
DR DC hardware	PLM Provider / Stakeholders	PLM Provider	*N/A*	PLM Provider	PLM Provider
WAN connectivity	PLM Provider / Stakeholders	PLM Provider	*N/A*	PLM Provider	PLM Provider
Main DC LAN	PLM Provider / Stakeholders	PLM Provider	*N/A*	PLM Provider	PLM Provider
DR DC LAN	PLM Provider / Stakeholders	PLM Provider	*N/A*	PLM Provider	PLM Provider
Clients (incl. LAN)	PLM Provider / Stakeholders	Stakeholders	*N/A*	Stakeholders	Stakeholders

Responsibilities keys
Stakeholders | PLM Provider | Hosting Provider

Note: PLM Software installation and testing activities include the data migration including the Product structure set up activities

10.3. Target Architectural principles: A full PLM suite (integrated solution) covering all requirements through off-the-shelf functionalities that shall be customised and integrated with existing applications is preferred. The following are the corner stones for the PLM Target Architecture:

(a) Number of applications should be limited. Ideally every user would only work in just one system in his daily operations

(b) The off-the-shelf capabilities of the PLM software shall be leveraged to the maximum

(c) The landscape of PLM shall support the effective definition and tracking of Engineering processes

10.4. The Stakeholders prefer an integrated solution with a few interfaces – being it a full suite covering all different requirements through off-the-shelf functionalities that need to be customized and integrated when necessary with existing applications to gather the required data and support end-to-end straight-through processes. Significant further details on non-functional requirements and IT Architecture is detailed at Para (13) on Target Non-Functional Requirements

11. **TARGET FUNCTIONAL REQUIREMENTS (FRs):** The list of Target FRs under the nine (9) typical PLM macro-functionalities across the entire shipbuilding lifecycle identified at Para (7) above with detailed description of each functionality is placed at **Enclosure 06**. In addition to this, an indicative list of Reports that need to be extracted from the PLM system is placed at **Enclosure-07**. The final list of Reports shall be derived from the requirement generated at the time of Solution Blue Printing. The PLM solution provided shall be capable of scheduling the generation of reports at given dates and times with a specific reference, with the possibility to specify the input parameters of the reports and the distribution list.

12. **TARGET KEY WORKFLOWS:** The PLM software and solution Provider shall implement ten(10) key work flows that are deemed mandatory in accordance with the functional requirements defined at Para (11) above. The target Key workflows are listed at **Enclosure-08**.

13. **TARGET NON FUNCTIONAL REQUIREMENTS(NFR)**

13.1. The PLM SSP shall take turnkey responsibility for meeting the non-functional requirements which involves the following:

(a) **P2P WAN**: Establish a P2P WAN wired connectivity with one year free warrantee, including hardware and software between MDL, GRSE,DND,DR & MDC with required security features. The required hardware and software shall also be provided at MDC & DR as part of the NFR. Being a turnkey project, the PLM SSP shall ensure that the total solution provided by them is meeting the desired functionality under NFR) and connectivity to the local setups at all locations. Any additional or up-gradation of Hardware / Software that may become necessary for achieving the desired functionality shall be included in the solution.

(b) **SITC of PLM software**: Supply, installation, testing and commissioning (SITC) of PLM software in server and LAN at five locations(MDL, Mumbai, GRSE, Kolkata, DND(SSG) , Delhi, Main Data centre Bengaluru and DR site at MDL Mumbai and on board seven ships along with the associated hardware, licensing, warrantee and AMC with required security features.

Establishing LAN connectivity including hardware and software independently at three locations with one year free warrantee MDL, GRSE, DND, DR with required security features.

13.2. **Target Users:** The system shall support at least 300 users with 200 of them

accessing the system simultaneously at any given time. The number of users at each of the three locations are as follows: The system will have to be designed for accommodating data authored by 300 personnel in the PLM. Therefore 300 is an indicator of the size/capacity of the system. However, the maximum number of users envisaged who would use the system is 250. Further, only 180 personnel is envisaged to concurrently log-in into the system and therefore 180 licenses will be procured. For the sake of clarity, the distribution of the users and licenses are tabulated as under:

Parameter	MDL	GRSE	DND	Total	Remarks
PLM System design capacity/size	-	-	-	**300**	This is the combined capacity hence no break-up is provided
No of users	100	100	50	**250**	50 users indicated against DND includes Wot(Kol) and WoT(Mbi)
No of licences	80	80	20	**180**	20 licences indicated against DND includes WoT(Kol) and WoT(Mbi)
No of users to be trained	100	100	50	**250**	This training will happen in all the three waves for 250 users in each wave. Users include personnel of WoT(Kol) and WoT(Mbi) also which is covered under the number indicated against DND.
No of key-users to be trained	50	50	20	**120**	This training will happen in all the three waves for 120 users in each wave. This number may or may not be a sub-set of the 250 users who would be trained. Key-users under the number indicated against DND includes personnel of WoT(Kol) and WoT(Mbi).

13.3. The PLM Software and Solution Provider should refer to the above list in formulating a proposal. It is expected that the PDM/PLM Solution Provider will provide 'user based' licences for the PLM system.

13.4. **Core IT System Requirements**

13.4.1. **Language:** The system shall present all the user interfaces and have all the end-user and technical documentation in English.

13.4.2. **Licensing:** The PDM/PLM Solution Provider is responsible for supply all the software licenses required to operate the system. This includes the Operating system, databases, PLM and any other software installed on the servers on Main Data Center, Disaster Recovery and any possible local sites considering the conditions stated under "Availability" at Para (13.4.14) The cost towards all the licenses except the licenses for PLM Software shall be built in as part of the SITC of

the PLM software and hardware.

13.4.3. The PDM/PLM Solution Provider shall also illustrate the PLM licensing scheme they would like to enact, as part of their technical offer. The Licensing structure for the PLM software shall be 'volume licensing' which shall operate independent of the number of modules for the PLM solution. The licensing structure would be such that all the users shall have full access to all the modules. The price quoted for the volume licensing considering the number of users for each origination shall be reckoned as the base line price for the purpose of the bid evaluation and L1 ranking.

13.4.4. The above not withstanding based on the number of modules that the bidder would as part of the solution and the per use per module rate that would be specified by the bidders in their commercial quote, MDL/GRSE reserves the right to place order for a module based licensing structure, the total number of user limited to 100 for MDL, 100 for GRSE an 50 for DND including the reps of WOT(Mb) & WoT(Kol).

13.4.5. All the user-based licenses should be either perpetual or long-term (with a minimum of twenty five(25 years)) in nature and shall be covered with subscription by PDM/PLM Solution Provider up till the end of the contract term. PDM/PLM Solution Provider will be responsible for license compliance in all respects during implementation.

13.4.6. Usage of internet connection for operation of the PLM solution shall not be permitted.

13.4.7. **Architecture**: A single central installation for the PLM, being accessible and usable for all Stakeholders with specific projects for each of the sister ships is preferred. The PLM Solution Provider shall provide the end to end solution, including but not limited to software licenses, HW for the main, DR and local sites and configuration of the production, testing and DR setup form the hardware level (including installation of the operating system, configuration of the database clusters, etc.). Hosting, rack space, and internal LAN connectivity to racks from termination of WAN at MDC will be provided by ITIL, Bangalore.

13.4.8. The Architectural principles shall be as follows:

Infrastructure Details	To be architecture (requirements)
Hosting	Primary DCs: • Outsourced PSU or government approved hosting PDM/PLM Solution Provider • CertifiedTier3 Geographical Disaster Recovery: On-premises in MDL Local setup for High Availability

Infrastructure Details	To be architecture (requirements)
Servers	• installation on physical servers (no virtual servers) • X86 architecture
Operating Systems	Preferred Microsoft WindowsServer2012, however other options can be considered
Databases	Preferred Microsoft SQL Server 2012,however other options can be considered
User Authentication	Preferred Microsoft Active Directory, it shall be possible for the DND,MDL and GRSE users to use their credentials to login into the PLM system

13.4.9. **Integration:** The licenses of PLM software if any required exclusively for integration and the implementation of the same shall be in the scope of the PDM/PLM Software Solution Provider. Two types of integration are foreseen viz. automated integration and manual integration(if not possible by automated integration). Regarding the manual integration, the PLM solution shall:

(a) Be able to import Microsoft Projects and Primavera files into the PLM project plan

(b) Be able to export parts or the whole project plan in Microsoft Project and Primavera formats

13.4.10. The solution shall integrate automatically with the following minimum systems leveraging service patterns in real time/near real time:

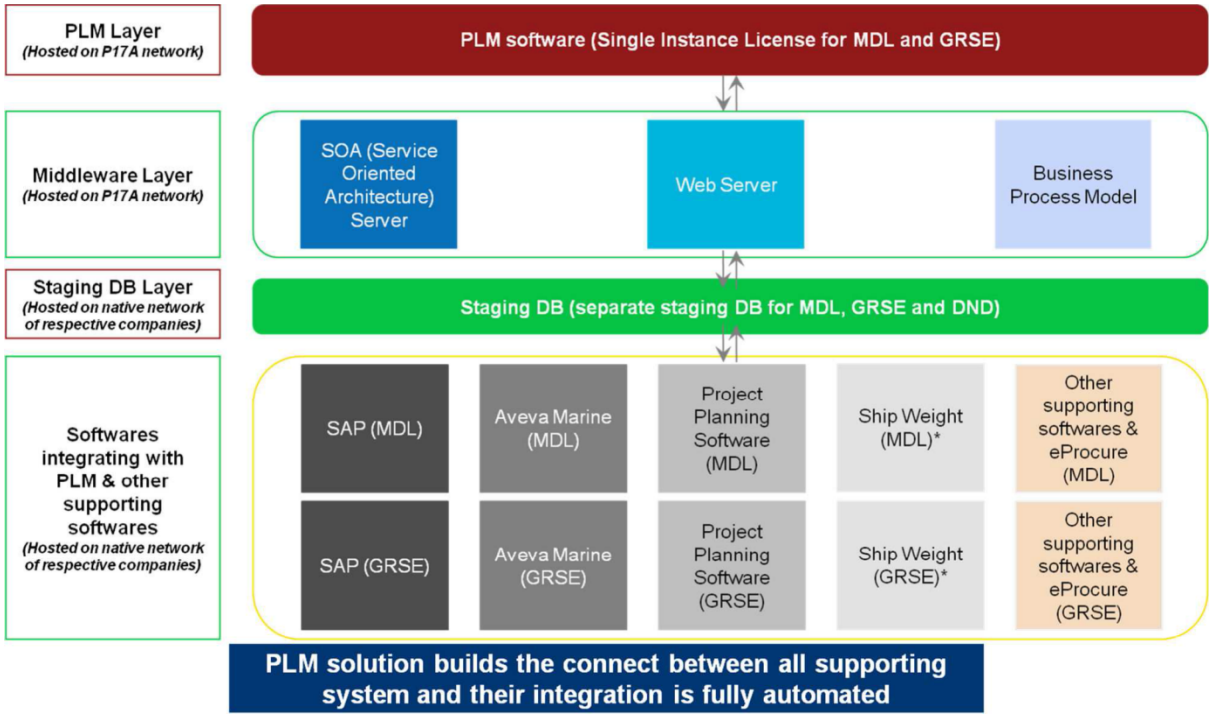
IT System	Stakeholder	Main purposes of integration (to be detailed and refined in the solution blueprinting)	Integration specificities
Email server	MDL,GRSE and Integration DD	Send email notifications from the PLM systems	As only outgoing emails shall be sent by the PLM, integration with an SMTP server is deemed sufficient.

IT System	Stakeholder	Main purposes of integration (to be detailed and refined in the solution blueprinting)	Integration specificities
SAP	MDL and GRSE	Bilateral integration to: • Link PBS with Cost Breakdown Structure (CBS) • Update SAP with WBS information including relative WBS • Update PLM with effort information on specific activities • Propagate changes generated in PLM to SAP (*e.g.* new BOMs, modified BOMs, etc.) • Ensure data integration between PBS and other data sources (*e.g.* SAP documentation management module) • Possibility of having evidence of the work in progress in term of Purchase Order Request, Order Request from SAP • Send cluster of design output to planning • Integration amongst different SAP modules to remain as is	• SAP is not directly integrated with any other system but through PLM -Both outgoing and incoming ports of SAP should be open -In case incoming port is closed, then data needs to be uploaded through a flat file integration -Port should be open for P17A only via static IP (between Integration layer & SAP) • SAP to continue to be hosted on the native network of MDL & GRSE; the integration layer and PLM solution would be hosted on the new P17A network
eProcure	GRSE	Bilateral integration to: • Update the PLM on procurement status and information • Allow eProcure to retrieve components / drawings information from PLM	• Procurement software would continue to be hosted on the native network of MDL & GRSE

IT System	Stakeholder	Main purposes of integration (to be detailed and refined in the solution blueprinting)	Integration specificities
Aveva Marine	MDL, GRSE and DND	• Integrate between PLM and Aveva Marine CAD at least: Drawing files, pallet drawing, 3D models all model attribute inputs, EBOM, metadata, layouts, templates library files, assembly configurations etc. • Associate other attributes COG, weight etc from CAD and store in PLM • Create automatically PLM product structure from CAD assembly • Manage cross linking relation of CAD Part/BOM with PLM Items, Documents, project deliverables, PBS, WBS (e.g. auto update BOM Table in drawing as per updated BOM in PLM) • Create neutral file for drawings like PDF and 3D Models with IGES, STEP, ST • Support engineering change and PBS data change back to BOM • Integration between Aveva Marine and different design software (Pipenet, Hyperworks, Nappa and AutoCAD etc.) to remain as is and no change (data transfer through flat files)	• The PLM shall integrate with the P17A specific Aveva Marine Global instance bi directionally • If bi- directional integration between Aveva and a PLM solution, is not possible, then a uni-directional integration from Aveva to the PLM is envisaged without any integration from the PLM to Aveva Marine. • PLM integrates with Aveva Marine through an integration layer that leverages Aveva Capabilities (e.g. PLM integration layer shall have capacity to connect AVEVA Engg and AVEVA Net) and integrates with a custom build layer into the PLM. • If Real-time integration is possible, Near Real time or Batch is acceptable; however in case of batch integration the users shall have the option to trigger the one- way update of the data from Aveva to PLM manually, this trigger shall not in any case affect the performances of either Aveva or the PLM solution • Collaboration on drawings to be completely managed by customization of Aveva Marine • Any additional license requirement arises for existing AVEVA Marine for integration, then it's the individual stake holder's responsibility.
MS Project **Primavera**	MDL and GRSE	•Project plan management	• Two way integration, to enable gathering of initial data from Ms project and two ways management of the additional activities added, progress made, resources employed, costs incurred, etc.

13.4.11. All standard/customized connectors, software with licenses are part of the solution. Offline export/ import integration shall be developed by the PLM SSP.

13.4.12. The PLM Software and solution provider shall illustrate how they will propose to satisfy the integration requirements possibly using a middle-ware as illustrated below:



13.4.13. The PDM/PLM Solution Provider shall evaluate also the impact of the integration on the external software licenses / HW upgrades / possible patches and provide solution to limit the cost impacts if there is any. All the costs triggered on the Stakeholders system to fulfill the pre-requisites for the integration of the PLM system shall be listed and included in the PLM Solution proposal. The PDM/PLM Solution Provider shall also highlight how they will implement the manual integration with the Project Planning software (Primavera and MS Project)

13.4.14. **Availability:** Offline ad-hoc basis synchronization is preferred. The PLM application and data must not be dependent on the online WAN Link. The overall system is expected to have the following:

(a) An overall availability of 99.982% measured on a 24/7/365 cycle, this availability shall exclude any planned maintenance downtime – however this shall be kept to the minimum.

(b) RPO: 4 hours

(c) RTO: 12 hours

13.4.15. The Stakeholders expects the DR solution to be readily usable by the end-users with data available according to the RPO and RTO defined, as the PLM provider is also responsible for the WAN, it is expected to take full responsibility of the DR Service.

13.4.16. The PDM/PLM Solution Provider is expected to describe the technical architecture that will enable them to meet the above requirements and also highlighting any particular limitation, dependency or constraint they see in meeting the stated availability target.

13.4.17. The description shall include the following aspects:

(a) Average system availability – end-to-end measurement, detailing the levels and the

(b) Constraints/requirements on each component (server, network, client, etc.)

(c) Procedures for scheduled updates

(d) High-Availability (HA) availability setup

(e) Disaster Recovery (DR) setup and operations, including methodologies used for data alignment (e.g. host based, array based, etc.)

(f) High-level data security including hardening of Servers, Network devices, storage level encryption, IPSec, Intrusion prevention, Hardware level MAC authentication.

(g) Business continuity in case of failure of links to remote hosted servers in single instance mode of operation. Proper synchronization after restoration of links with single version of truth. This may be achieved with local replication in a single instance design.

(h) MDL ,GRSE and DND shall not be dependent on the WAN Link. All PLM modules must be running in active and read-write mode even if the links are not active. Links down should not affect any instance of PDM/PLM application with Data. The PLM SSP shall include necessary licenses requirement and cater to the availability of the same.

13.4.18. **Performance (Service Level Agreement):** A sufficient performance of the IT solution is essential for proper operational usage. The PDM/PLM Solution Provider is expected to describe which performance levels can be guaranteed for PLM activities in terms of user sessions. The PDM/PLM Solution Provider shall therefore create a list of typical performance KPIs and the related guaranteed response times. The PDM/PLM Solution Provider is also expected to provide a viable method to measure the defined KPIs and to provide regular reports, whose structure will be jointly agreed, for the entire duration of the contract. SLAs are to be agreed by all stakeholders i.e, DND(SSG), MDL and GRSE.

13.4.19. **Indication** about performance shall include information on expected/assumed network bandwidth Stakeholder and latency, as shipyards operate from different geographical locations with the need to access data and documents in a central corporate system.

13.4.20. The PDM/PLM Solution Provider is expected to provide a proposal for the required hardware (number, architecture and sizing) and the required network capacities in order to meet the above mentioned guaranteed response times. If

different approaches to collaboration are enabled by the solution, the PDM/PLM Solution Provider shall describe all of them in terms of architecture, requirements and performance. The specific SLAs shall be agreed by the PDM/PLM solution provider before placement of the PO.

13.4.21. **Scalability:** The IT solution should be sized to fulfill the performance requirements based on the recommended architecture and foreseen volumes, but should be also scalable to support future business growth. The PDM/PLM Solution Provider proposal should include descriptions of how to support the following scalability dimensions:

(a) Horizontal scalability: The performance of the IT solution should be increasable by distributing functions across several servers. This includes both a workload distribution within the same location/cluster and the opportunity to distribute the environment with the addition of local servers, where needed. The solution proposal should contain descriptions showing if this is possible and how it could be implemented.

(b) Vertical scalability: The performance of the IT solution should be improvable by increasing the performance of a single server, e.g., by adding memory ,processors servers, storages or network components. The solution proposal should contain descriptions showing how to distribute jobs across multi-processor servers and how memory increase will impact the performance of the system.

(c) Virtualization capabilities: The solution proposed shall be able to run on a full virtualized environment. If not completely possible, the PDM/PLM Solution Provider shall highlight what are the limitations of the system in terms of virtualization

13.4.22. **Flexibility:** As not all future requirements might be foreseen at this point in time, flexibility of the solution is a core requirement. After the first practical experiences have been made, changes to the solution might be necessary. The system should therefore be designed in such a way that regular changes like the one listed below can be easily implemented without any code implementation and any specific support by the PDM/PLM Solution Provider:

(a) Addition / Deletion of Project

(b) Change/ addition / deletion of attributes for master data elements / PBS

(c) Change/ addition / deletion of document types

(d) Change/ addition / deletion of items in the WBS structure

(e) Addition / change of business rules / backend calculations

(f) Accessibility and authorization roles

(g) Flexibility in the configuration of workflows incl. hierarchical escalations

(h) Aesthetic modification to implemented reporting (not including new reporting fields)

(i) Add/ Remove / Modify users and user groups

(j) Additional reporting

13.4.23. The PDM/PLM Solution Provider is expected to describe how the above mentioned flexibility requirements can be supported. The PDM/PLM Solution Provider shall indicate by which methods the changes can be implemented; graphical configuration tool, configuration parameters, coding required (which programming language and process e.g. waterfall vs. agile), etc.

13.4.24. The PDM/PLM Solution Provider shall also describe how integration with new technologies (e.g. 3D scanning, 3D printing, RFID, CNC, ROBOT etc.) is going to be considered and included in the future within the proposed PLM Solution

13.4.25. **Data Management:** All data shall be stored on a commercial mainstream relational Database. All tables and columns names within the Database shall self-explanatory (when possible) to ensure that Administrator and Business Intelligence users can understand their content. It shall be possible to connect Business Intelligence tools to the PLM solution database to enable the Stakeholders to generate additional tables and reports.

13.4.26. The system needs to support a daily backup of the data and disaster recovery functionalities. In case of a non-functioning of servers due to unexpected reasons (e.g., fire within the data center) it should be possible to restore the system within a minimum timeframe, potentially in another data center. Further to the above, the PLM SSP shall also make provision for daily back up of data at the server rooms, locally at four locations viz. MDL, GRSE,DND & MDC. The hardware and the software required for facilitating the daily local back up of data shall be in the scope of the PLM SSP. Further the maintenance of the same shall be covered under the AMC for hardware. The PDM/PLM Solution Provider is expected to describe the proposed disaster recovery scenario (disaster recovery plan). The response shall also include further details on the possible backup mechanisms, data synchronization options between main and backup data center, etc.

13.4.27. Online and offline back up data must be available at individual locations. Necessary hardware, software and licenses shall catered for by the PLM SSP for back up of production server and storage.

13.4.28. In order to reduce the overall data volume, the system should support a data life cycle concept. This means that depending on specific date ranges data may be stored on different aggregation levels (e.g., last 3 years full details of all model and document data + last 5 years main model data and main document data for each ship). Data which is "older" than the defined date ranges will be archived and removed from the on-line system. The date ranges for the archiving should be configurable for specific data domains. It should be possible to restore the archived data in case specific detailed information is required after the data has been archived. The PLM Software Solution Provider is expected to describe the respective archiving concept and the fulfillment of the above mentioned requirements. Further to manage the duplicate data “Dedup” functionality should be applied to the data storage.

13.4.29. **After-sales**: The Stakeholders are envisaging to have one separated

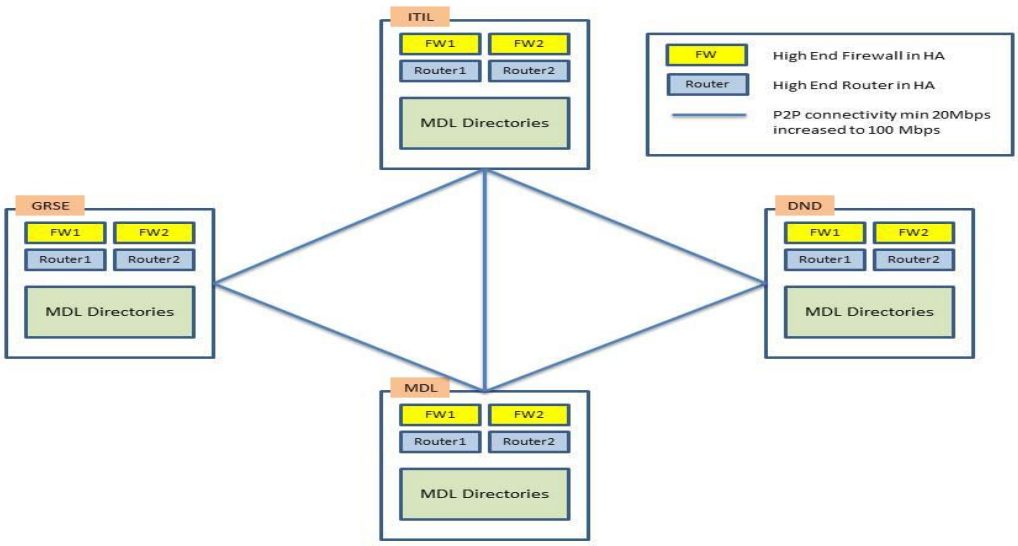
instance of the PLM on board of each of the seven(7) ship with the ability for synchronizing them on ad-hoc basis between each other and with the initial PLM instance for P17A in order to maintain data consistency and support after-sales tasks (e.g. analysis of MTBF on specific PBS, send alerts for specific components malfunctioning, etc.). The requirement of separate instance on each ship is as per the timelines specified in the document. The requirement of hardware and the proposed cost shall be indicated by the PLM Software and Solution Provider along with the bid however it will not be part of supply. A separate order will be placed by IHQ MoD(N)/DND (SSG) for the same if required. The PDM/PLM Solution Provider shall propose their suggested approach describing it in details and thus including, not only the technical description, but also for example:

(a) Quantitative and qualitative benefits
(b) Ship data management integration
(c) Integration requirements
(d) Network pre-requisites
(e) Hardware requisites
(f) License modeling
(g) Remote alignment modalities
(h) Etc.

13.4.30. **Data Security:** For security of data stored in the system, the storage devices shall be encrypted and boot level protection shall be applied. Hard disks of all servers and storages are to be retained with respective take holders incase of defect. No portable media/devices will be allowed without permission of respective IT security personnel. External devices like Laptop, ipad etc are not allowed to connect to the secured network of PLM. The IT security guidelines of the respective stake holders are required to be followed.

13.5. NETWORK REQUIREMENTS

13.5.1. **Wired P2P connectivity for WAN**: The wired connectivity diagram below illustrates the foreseen network to be implemented for P17A:



13.5.2. The supply installation, testing and commissioning of a WAN network is part of the scope of the PLM Software and Solution Provider. The PLM PDM/PLM Solution Provider is responsible to provide WAN connectivity between sites till the Datacenters in each location and the LAN at the Stakeholders and DR sites. Workstation and any other local hardware is Stakeholders responsibility.

13.5.3. LAN Requirements: The PLM Software solution Provider shall establish LAN at four locations. i.e. at MDL Mumbai, GRSE Kolkata, DND(SSG) Delhi, DR at MDL. The LAN at MDC ITIL Bengaluru shall be set up by MDL and is not in the scope of PLM SSP. The LAN shall meet the security requirements specified elsewhere in this document.

13.5.4. The WAN Network will have the following requisites:

(a) P2PLine: Network shall be configured in Active-Active or Active- Passive modes depending upon the preference and functionality of the software, and with IPSec Encryption end-to-end. The PLM software and Solution Provider is entirely responsible for supply, install, operate and maintain the link (leveraging a TelCo) and is solely responsible for the SLAs. The bandwidth of the WAN shall be of 35 Mbps with maximum 40ms and shall support P17A CAD collaboration using Aveva Global, IP Telephony, Video Conferencing as well as flat files transfer on top of the PLM requirements. Each line provided shall be capable to scale up to 100Mbps. Supplier shall upgrade the bandwidth of the P2P WAN/LAN to next higher size without any cost implication in case, the bandwidth of the Stakeholders' utilization in any one leg exceeds 70% at any given point of time. The P2P line PDM/PLM Solution Provider should be from MTNL or BSNL with agreement of 99.9% uptime SLA. If it becomes inevitable that any other service provider is to be selected, written prior consent of MDL shall be obtained by the PLMSSP before the selection. The P2P WAN shall become functional with the implementation of the security features. Project data will flow through the WAN only after the certification of the requisite security features. The P2P network shall connect together all sites as per the diagram at 13.5.1:

(i) MDL Datacenter
(ii) DR at MDL
(iii) GRSE Datacenter
(iv) DND Datacenter
(v) Hosting PDM/PLM Solution Provider Datacenter

(b) Last Mile Connectivity: the last mile connectivity shall be either copper or fibre. The wireless connectivity in any form is not permitted. The last mile connectivity shall allow the desired bandwidth free from any latency, resistance or noise issue.

(c) Use of Internet: The hard ware shall be updated /registered for any software/OS either by connecting to internet or by offline. Once connected to the LAN or WAN, any connection to internet is not permitted. Under no circumstance, the LAN/WAN shall be connected to the Internet directly or indirectly.

(d) Requirement of wired connectivity: In the entire set up of LAN and WAN, for the PLM, only wired connectivity shall be used. No wire-less connection is permitted in the entire setup

(e) Fire Wall: The PDM/PLM Solution Provider shall procure, install and operate firewalls in HA with log analyzer each location to secure the IPSeC connection and prevent intrusions. Stakeholder will have responsibilities over the firewalls rules, however the PDM/PLM Solution Provider should define a workable operating model to implement and monitor the firewall rules. The firewalls should be high end and from a known-PDM/PLM Solution Provider, e.g. Cisco, Checkpoint or Juniper, etc. The PDM/PLM Solution Provider shall seek the certification of the Firewall by an authority appointed by DND, in alternative the PDM/PLM Solution Provider could adopt a Firewall developed by the Navy. The need to guarantee high throughput (minimum 100 Mb)

(f) Routers: The PDM/PLM Solution Provider is responsible to procure, setup, operate and maintain the routers in HA configuration. Downstream connectivity from the router to switch / server / clients in MDL, GRSE are Stakeholders' responsibility and in the case of DND it shall be MDL's responsibility. The routers should be high end and know a known-PDM/PLM Solution Provider, e.g. Cisco, Checkpoint or Juniper.

(g) Hardware Encrypters: The PDM/PLM Solution Provider is responsible to procure, setup, operate and maintain the STQC certified Hardware Encrypter at all outgoing links at all Stakeholders and Hosting sites

(h) MAC authentication: The PDM/PLM Solution Provider is responsible to procure setup, operate and maintain the MAC authentication device at Hosting Datacenter to avoid unauthorized access to unknown device.

(i) Bandwidth Monitoring: Supplier should implement the bandwidth monitoring tools to monitor various parameters of links like bandwidth utilization – Average and Peak, Errors, Downtime, Topography etc. The monthly report should be submitted to all Stakeholders.

(j) Data Diode: A physical device of 'Data Diode' shall be placed at all places where the internal LAN is connected to WAN. This device is required for intrusion prevention in addition to fire walls.

(k) PDM/PLM Solution Provider should submit following document for Stakeholders approval before establishing the connectivity -

a) Physical Diagram with BOM
b) Logical Diagram with Topology
c) IT security configuration at each network component
d) IT security policy implementation plan and monitoring

13.5.5. VAPT Audit: MDL,GRSE& IHQ MoD(N) reserves the right to appoint an external entity to check the security of the network solution, any gap highlighted shall be covered by the PDM/PLM Solution Provider. The PLM Solution provider shall facilitate all arrangements to audit and check the system. In the absence of external agency, IDT team will audit the setup for security periodically.

13.6. **HOSTING REQUIREMENTS:**

13.6.1. General: A dedicated, secured and locked rack space in a Tier 3 datacentre shall be provided by MDL at ITIL Bangalore through a separate order and this rack space shall be made available to PLM Solution Provider to enable residing of the PLM data. The data pertaining to on board seven(07) ships will not be hosted in the MDC. The entire hardware and software and LAN required for the remote hosting at the MDC are in the scope of PLM Solution Provider. Two(2) rack spaces have been provided at ITIL, Bengaluru for the purpose. However the number or rack units required at ITIL Bangalore will be finalised during the PLM Solution Blueprinting phase, therefore it is required that the PLM Solution PDM/PLM Solution Provider includes the detailed list of hardware and equipment necessary to be installed in the main datacentre. Dual electricity power lines through UPS systems facilities shall be provided for all P17A PLM solution servers hosted at ITIL Bangalore.

13.7. MAIN DATA CENTRE HARDWARE:

13.7.1. The hardware shall be selected by the PLM Solution PDM/PLM Solution Provider based on the technical solution proposed; a detailed list of hardware required shall be included in the PLM Solution PDM/PLM Solution Providers quote. The PLM PDM/PLM Solution Provider is responsible for the provisioning of the Primary Datacentre Hardware and LAN equipment (Guaranteeing a minimum of 10Gbps connection within the servers in HA configuration) and in any case of all the centralized hardware that is needed to operate correctly the PLM Solution. The PLM PDM/PLM Solution Provider will be responsible to procure also the HW for "local" (in DND, GRSE, MDL premises) integration and staging servers and storage if they are required for the PLM solution proposed. The hosting requirement of the local servers shall be provided by respective stakeholders.

13.7.2. The hardware is expected to be in operation for 7 years. The hardware shall be remotely operated and with remote power recycle and management. It is advisable for all the servers to be from the same manufacturer and of the same series, for simpler maintenance and operations. All supply, installation, testing and commissioning and operations of the Servers in the Primary Datacentre shall be carried out by the PLM provider (services configurations e.g. DB, email, Active Directory including population of active directory with users). All hard drives of storage must be of hardware encryption enabled so that Data once written in the storage is encrypted instantly. Software encryption for such requirement is not accepted. Faulty hard disks will be retained by Stakeholders

13.7.3. The hardware requirement envisaged as per Stakeholders" understanding to be used as starting point for the PLM Solution PDM/PLM Solution Provider are listed below and are only to be used for reference and are to be considered as minimum requirements by the PLM solution Provider:

MDC HARDWARE

Item	Description
Production PLM and integration servers	At least 8 physical servers shall be provided to support the PLM application and the integration layer. Actual number of servers and their configuration shall be specified by the PLM solution PDM/PLM Solution Provider. The servers shall be configured to support Load Balancing and High Availability either via software or with dedicated hardware Configuration envisaged: • 2x Intel Xeon CPUs • 64 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies • Fiber Channel connectivity for SAN
Production Database	At least 4 physical servers shall be provided to support the overall database requirements (PLM and staging DB). The servers shall be configured Configuration envisaged: • 2x Intel Xeon CPUs • 128 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies • Fiber Channel connectivity for SAN
Production Service Server	At least 2 physical servers shall be provided to support the testing of the PLM solution, one for the integration testing environment and one for the pre-production environment. Configuration envisaged: • 1x Intel Xeon CPUs • 32 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies • Fiber Channel connectivity for SAN
Test PLM and integration servers	At least 1 physical server shall be provided to support the overall test database requirements. Although there will be at least 2 test environments, it is foreseen that the PLM provider can host different db instances for each of the testing environment on a single machine Configuration envisaged: • 2x Intel Xeon CPUs • 64 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies • Fiber Channel connectivity for SAN

MDC HARDWARE	
Item	**Description**
Test Database servers	At least 1 physical server shall be provided to support the overall test database requirements. Although there will be at least 2 test environments, it is foreseen that the PLM PDM/PLM Solution Provider can host different DB instances for each of the testing environment on a single machine Configuration envisaged: • 2x Intel Xeon CPUs • 64 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies • Fiber Channel connectivity for SAN
Primary Storage	The Stakeholders would prefer to host all the data on a SAN solution to be connected with Fiber Channels to the servers However the final configuration for primary storage shall be provided by the PLM solution provider (that can also evaluate the option of directly attached storage). Any storage solution shall guarantee an acceptable level of data redundancy with RAID 5 solution to be the minimum. Size of the SAN are depending on the data retention policies set in this document as well as the specific solution designed by the PLM solution provider – therefore details on the amount of storage needed will be provided by the PLM Solution Provider once the solution has been identified
Secondary Storage	A NAS solution for storing the backup shall be provided. Size of the NAS are depending on the data retention policies set in this document as well as the specific solution designed by the PLM solution provider – therefore specificities on the amount of storage needed will be provided by the PLM Solution Provider once the solution has been identified
Network	The Hosting PDM/PLM Solution Provider shall provide the LAN connectivity for the P17A solution within the racks of primary data center with the following requirements: • 1 Gbps connectivity across the board • 2x high-end switches for the production environment in failover HA • 1x high end switch for the testing environment • Necessary patch panels • Fiber connectivity between the racks • MAC authentication The rack space shall also consider the space required by network hardware required by the MPLS connectivity (2x firewalls and 2x routers). Connection between the routers and the switches are responsibility of the hosting PDM/PLM Solution Provider.

13.7.4. In case of enclosure life of Hardware, the respective stakeholders will replace it with advanced version. However the support to the new hardware shall be continued within the contract period. The re-installation of software on new hardware and data migration will be the responsibility of the PLM software solution Provider.

13.8. DISASTER RECOVERY DATA CENTER HARDWARE

13.8.1. The DR site for the entire PLM data except data pertaining to on board seven(07) ships shall be hosted by MDL at MDL premises. For this purpose the a maximum of one rack space will be provided by MDL to the PLM Solution provider free of cost. The hardware and software shall be selected by the PLM Solution PDM/PLM Solution Provider based on the technical solution proposed; a detailed list of hardware required shall be included in the PLM Solution PDM/PLM Solution Providers quote. The hardware and software is expected to be in operation minimum for the duration of the Project. The PLM PDM/PLM Solution Provider is responsible for the provisioning of the Hardware equipment to be positioned at Disaster Recovery Datacentre. It is advisable for all the servers to be from the same manufacturer and of the same series, for simpler maintenance and operations. For the Disaster Recovery, the PLM Solution PDM/PLM Solution Provider is required to purchase and installed the DR Hardware and software and supply, installation, testing and commissioning the same. As per the Primary Datacentre, the envisaged solution as per Stakeholders" understanding depicted in the table below is to be used as starting point for the PDM/PLM Solution Provider:

Item	Description
DR PLM and integration server	At least 4 physical servers shall be provided to support the PLM application and the integration layer. Actual number of servers and their configuration shall be specified by the PLM solution PDM/PLM Solution Provider. Configuration envisaged is a s follows: • 2x Intel Xeon CPUs • 64 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies • Data disks in Raid 5 configuration. Actual storage quantity needed will be determined by the PLM solution PDM/PLM Solution Provider
DR Data base servers	At least 2 physical server servers shall be provided to support the overall database requirements (PLM and staging DB). The servers shall be configured Configuration envisaged: • 2x Intel Xeon CPUs • 128 GB RAM • 2x SSD disks in Raid 1 for OS support (hot-swap) • 2x Gbit Ethernet pot • 2x hot swap power supplies Data disks in Raid 5 configuration. Actual storage quantity needed will be determined by the PLM solution PDM/PLM Solution Provider

Item	Description
Primary Storage	The Stakeholders would prefer to host all the data on a SAN solution to be connected with Fiber Channels to the servers However the final configuration for primary storage at DR shall be provided by the PLM solution PDM/PLM Solution Provider (that can also evaluate the option of directly attached storage). Any storage solution shall guarantee an acceptable level of data redundancy with RAID5 solution as a minimum requirement. The stored data should be in encrypted form Size of the SAN are depending on the data retention policies set in this document as well as the specific solution designed by the PLMsolution PDM/PLM Solution Provider–therefore details on the amount of storage needed will be provided by the PLM Solution PDM/PLM Solution vider once the solution has been identified

13.8.2. The enclosure life shall be as per Para 13.7.4 above.

13.8.3. **Local Hardware at Stakeholders premises:** The hardware and software shall be selected by the PLM Solution PDM/PLM Solution Provider based on the technical solution proposed; a detailed list of hardware required shall be included as part of the Technical offer. The hardware and software is expected to be in operation for 7 years.

HARDWARE	DESCRIPTION
PLM Staging server	At least1 physical server shall be provided to support thePLM application and the integration layer. Actual number of servers and their configuration shall be specified by the PLM solution PDM/PLM Solution Provider. Configuration envisaged: • 2xIntelXeonCPUs • 64GBRAM • 2xSSDdisksinRaid1forOSsupport(hot-swap) • 2xGbitEthernetpot • 2xhotswappowersupplies • Data disks in Raid 5 configuration. Actual storage quantity needed will be determined by the PLM solution PDM/PLM Solution Provider

Local PLMserver	At least 1 physical server servers shall be provided to support the overall databaserequirements(PLMandstagingDB).Theserversshallbeconfigured Configuration envisaged: • 2xIntelXeonCPUs • 128GBRAM • 2xSSDdisksinRaid1forOSsupport(hot-swap) • 2xGbitEthernetpot • 2xhotswappowersupplies • Data disks in Raid 5 configuration. Actual storage quantity needed will be determined by the PLM solution PDM/PLM Solution Provider
Workstations at DND for PLM	PLM LAN will be isolated from the existing LAN at DND. six(6) nos. of PLM high end workstations hall be provided as part of this scope for establishing the PLM LAN at DND. In the event that data needs to be transferred between the PLM LAN and the esisting LAN at DND , the same shall be effected through the secure medium of exchange which is part of the Scope of supply of PLM SSP.

13.9. **SUPPORT REQUIREMENTS**

13.9.1. General: The PDM/PLM Solution Provider shall at least be able to provide Second and Third level support for the solution implemented. The First level support shall be considered out of scope. The Second level support shall:

(a) Be available during business hours (9:00 Hrs-17:00 Hrs) on weekdays

(b) Be provided over the phone

(c) Cover all the tickets raised that are involving the PLM system, regardless of the originator Stakeholders

(d) Be contacted only by the Stakeholder's service desk

(e) Be able to solve medium to complex tickets

(f) One(1) residential engineer each shall be posted at MDL, GRSE, DND and MDC for 1st and 2nd level maintenance of the P2P WAN and Hardware and software at local sites. The PDM/PLM Solution provider should have support arrangement for hardware and Software at MDC. The local resident engineer will coordinate with support team at MDC for any support requirement The engineers shall be positioned at the three locations from the date of commissioning of the P2P WAN hardware and the services shall be rendered at respective locations until the tenancy of the AMC of the P2P WAN connectivity.

13.9.2. The third level support shall:

(a) Be available all days 24x7 with 4 hrs response time

(b) Be provided over the phone and on site when needed

(c) Be engaged only by the PDM/PLM Solution Provider 's second level support, however shall keep the Stakeholders' first level supported updated on the status of the tickets

(d) Be able to solve complex tickets that might also require software fixes and hardware repair / replacement

13.9.3. The PDM/PLM Solution Provider shall provide access to an on-line application to monitor the status of the tickets i real time as well as provide weekly and monthly status reports. The PDM/PLM Solution Provider support shall also be able to provide regularly Stakeholders' first level support with regular training, lessons learned and workarounds to increase the first level support response race. Detailed description of the Application Management Software (AMS) model and granted SLAs are provided as a response to this document is to be enclosed by the PDM/PLM Solution Provider..

13.9.4. Application Maintenance: The PDM/PLM Solution Provider is expected to describe the standard maintenance agreement of the IT solution including hardware and connectivity. P17A project demand is directed to at least the following questions:

(a) Engaging procedures and service request management workflow
(b) Average response time on software or installation errors
(c) Average time for problem and incident management and bug fixing, divided by impact of errors (critical error, main error, minor error)
(d) New requests for the P17A customization
(e) Escalation management
(f) Availability of general PDM/PLM Solution Provider development-roadmap (of P17A-project independent implementations)

13.9.5. Distribution Management: Use of USB media not permitted. CD/DVDs are permitted. The PDM/PLM Solution Provider has to provide a description of the standard distribution way of the software, in particular the PDM/PLM Solution Provider shall illustrate:

(a) Frequency of standard releases
(b) General update mechanism. i.e. is (automated offline) massive distribution is possible?
(c) Average package size of each update
(d) Patching system
(e) Availability of priority builds
(f) Test and approval stages for developer unit tests, integration tests and user acceptance tests
(g) Group-wide roll-out (including different entities MDL / GRSE) possible
(h) Success-check of roll-out
(i) Roll-back possibilities
(j) Non-Invasiveness of different versions in ecosystem
(k) Security rights-management for distributions

(l) Necessity of out-times (duration) and maintenance slots
(m) Possibility of delta-updates

13.9.6. The PDM/PLM Solution Provider has to provide a description about its own test procedure preceding the release of a new software version, especially regarding no regression tests. Any quality certification about this topic should be provided, if available.

13.9.7. Operations Reporting: During operations, the PDM/PLM Solution Provider is expected to produce at least monthly (but also on ad-hoc basic) technical reports highlighting:

(a) Total user experienced downtime and measure taken to limit it in the future
(b) Number of tickets raised, resolutions at 2nd and 3rd level – time for resolution (at 25%, 50% and 75% percentile), current backlog, etc...
(c) Number of technical faults incurred
(d) Number of change requests executed, vs. current backlog
(e) Description of the major change executed and of the ones planned for the next month
(f) Average and peak utilization of HW and network resources, e.g. RAM, CPUs, bandwidth
(g) User management
(h) Peak Load analysis
(i) Replication monitoring and warnings

13.9.8. The above list is indicative; the definitive list will be signed up after the Blueprint, there after the Change Management process will take place.

13.10. **SECURITY REQUIREMENTS**

13.10.1. The security requirement for the PLM software, P2P WAN and the LANs for the stakeholder locations have been stipulated in this document. Based on this requirement the PLM Software solution provider shall submit a compliance matrix as part of the tender document. Post receipt of the Purchase Order, and prior start of the work the PLM SSP shall submit a security document depicting how the security requirements are being met. This document shall be approved by the stake holders prior to implementation. A compliance report shall also be prepared after implementation post third party security audit.

13.10.2. **Overall core requirements**: The overall PLM systems shall support fully the following security requirements:

(a) Confidentiality: Confidentiality principles shall apply on data in transit, data processing and data storage. Confidentiality requirements shall be implemented with the use of standard encryption / hashing (FIPS 140) algorithms and strong access control mechanisms. Moreover the solution must provide mechanisms to label sensitive files/information on the basis of their classification level.

(b) Integrity: Prevent unauthorized modification, deletion of data, in terms of

system integrity (e.g. malware protection) and data integrity (e.g. transaction integrity).

(c) Authentication: Access to all services / application functions shall be granted after a user validation process. The users shall use their credentials for logging in into the system. The system shall have a provision to manage temporary users and external PDM/PLM Solution Provider users that might have the requirement to login into the system without being part of the Stakeholders user directory e.g. via a P17A Active Directory

(d) Authorization: After authentication, a Role-based access control (RBAC) / Attribute-based access control (ABAC) authorization process shall exist in order to check that claiming entities has the needed rights to access the resources. The in-scope resources are: systems, functionalities, reports and data. Changes in the authorization profile of an object, based on different production stages, shall also be taken into account and managed easily. It shall be possible to assign roles for specific projects, e.g. making the one stakeholder's resources only able to see and modify just a specific sister ship. It also shall be possible to assign access to specific data based on PBS). The solution should support a flexible authorization framework. Different roles will need different permissions within the system. The security concept should allow a flexible assignment of permissions to the defined roles. The software shall provide a solution covering, at least, the following requirements:

(i) Synchronization with P17A Active Directory (Authorization and Authentication information shall be defined only once and not in multiple places). The information on P17A Active directory shall be provided by the Stakeholders

(ii) Handling of permissions, which may be related to specific functionalities and to a certain data range; e.g., permission to access on military data (data range) or hull dimensioning calculations (functionality)

(iii) Definition of different roles/profiles for internal and external users, with a secure and restricted system access to external partners

(iv) Complete separation of military data shall be possible For access to backend processes / databases, the system shall require an additional level of authorization.

(e) Accountability: Every business operation shall be traced (audit trail) in order to build the historical record of user and system actions. Historical record shall contain, at least: the identity of the subject, the action, the object affected, the timestamp. Special mechanisms to guarantee integrity and reliability of timestamp and log information must be put in place.

(f) Non-repudiation: For sensitive transactions (e.g. approval workflows), the solution shall provide mechanisms to prevent repudiation of the operations (e.g. Digital signature coupled with hardware tokens and suitable terms and conditions).

(g) The sensitive transactions that require non-repudiation shall be easily configurable within the application by the end-user administrator and shall not require any intervention from the PDM/PLM Solution Provider's service support

13.10.3. **Secure software lifecycle**

(a) Design Security Concepts: According to ISC2, Project P17A recognizes that the following security principles have to be applied to the design of the solution:

(i) Defense in depth: multi-layers architecture (front-end/back end/middleware);

(ii) Economy of mechanisms: the software design and implementation shall be simple, in order to reduce the attack surface;

(iii) Least privilege: every process/service/person/entity shall be given only the minimum level of access rights;

(iv) Complete mediation: the solution must assure that security policies cannot be unintentionally or easily bypassed;

(b) The PDM/PLM Solution Provider. A security document indicating the security configuration and implementation plan in line with the requirements defined in this Scope of Work shall be submitted as a deliverable by the PLM SSP.

(c) Secure coding standards: A standard process to deliver secure and reliable software must be put in place. Specifically, during the test phase at least the following vulnerabilities will be tested and thus shall be prevented by the system:

- OWASP Top 10, for WEB modules (only for DND access via secure WAN network (https://www.owasp.org/index.php/Top_10_2013-Top_10);
- CWW/SAN Top 25 (http://cwe.mitre.org/top25/)

(d) The provider shall also illustrate what kind of code analysis is planning to perform in order to discover and address security vulnerabilities.

(e) Installation and deployment: The system shall be appropriately configured according the security principles before the operation phase, establishing, at least:

(i) Hardening baseline for each hardware and software (OS, DB, middleware, etc) component present according to industry and government best practices

(ii) Environment configuration: in order to ensure that the software required parameters/libraries/models are correctly configured

(iii) Release management: a process of ensure that all changes are

by:

made in a formal and approved manner

13.10.4. Security features of the PLM infrastructure: The Security guidelines of the PLM infrastructure shall be as per **Enclosure-9**. The following security features as per the guidelines that shall be provided for the PLM IT infrastructure by the PLM SSP are as follows:

Item	Parameter	SECURITY FEATURES REQUIRED
PLM Software	Use of pirated and unauthorized software	Use of pirated and unauthorized software should be strictly prohibited. Only original licensed software purchased from authorized vendors should be used. Ensure only legal software is loaded on the systems.
	Software updates	Operating System Software and Application software should be regularly updated with latest patches, service packs and hotfixes.
	Software accessibility	Operating System and business Application software should be accessible only after being authenticated by access control mechanism like a Username/Password & DSC if available
	Audit trails	Audit trails / system-event-logs should be enabled and provided on demand to find out unusual or doubtful activity.
	Administrator password protection	System/Application level administrator password should be held by the administrators of Stakeholders and kept with Project in charge of stakeholders in sealed envelope kept in a safe
	Password Policy	A uniform policy for Password shall be followed in the PDM/PLM network as per Enclosure-9
	Network services	all the network services shall be turned off if not needed
	Separate accounts	Every individual should have a separate account in the system/ application wherever possible, this will ensure individuals responsibility.
	Restriction of users rights	Users rights to files, folders, data & application programs to be restricted. The level of access should be provided to the users based on their roles and monitored for proper functioning of the system.
	Automatic timeout	Automatic timeout for terminal/session inactivity should be implemented
WAN Link	Connectivity to Internet	Connectivity to open unsecured networks like Internet should not be used for exchanging any information for any purpose
	Intrusion detection	Log analyzer for network utilization shall be introduced to check any intrusion incidence.
	Bandwidth Utilization	The periodic report shall be produced for maximum bandwidth utilization.

Item	Parameter	SECURITY FEATURES REQUIRED
	VAPT audit	3rd party VAPT audit will be arranged by the stakeholders as mentioned separately. The suggested measures shall be implemented by the vendor without any cost implication.
	Encryption	Entire communication in the PDM/PLM network shall be encrypted to ENS128 or hire equivalent approved by stakeholders
	Security Configuration	All devices in the network shall be configured to the highest security standard approved by stakeholders. A "Air Gap' shall be maintained between internal and external network. Where Air Gap is not possible use of one way communication devices like Data Diode shall be used. MAC Authentication devices shall be placed in the WAN network for un authorized access to the unknown devices
	Crises Management	A Crisis Management Plan shall be drawn-up by the PLM SSP and shall be submitted as part of the Security documentation for five locations. The crises shall be handled and reported as per Crises Management Plan
LAN and Hardware	Loading any floppy/CD/DVDs	Loading any floppy/CD/DVDs without permission is not allowed. Floppy/CD/DVD drives and USB ports are to be disabled to avoid unauthorized copying of data or loading of software.
	Use of USB Storage devices	Use of USB Storage devices (Pen drives/External HDD drives), CD-writers should be restricted unless specifically authorized by competent authority.
	Data copy	Copying, Deletion, modification of data or printing any information from the system should be done under proper authorization only.
	Virus protection	The system shall be virus protection and update it regularly. In order to protect the system/valuable data from viruses. Virus Infection checks should be incorporated in the Boot sequence of the system.
	static IP addresses	Access to the PLM's network is to be controlled through the allocation of static IP addresses. The respective stakeholder is responsible for the allocation of the IP addresses to the IT assets like Desktop, Servers, Network equipment etc. at respective location.
	Location of networking equipment	All networking equipment switches, hubs, routers and patch panels etc. are to be accommodated in networks racks or cabinets designed for that purpose
	Disabling of Ports	Ports, Services and similar facilities installed on computer or network facilities, which are not specifically used, for business functionality should be disabled or removed. Unused or vulnerable ports or services shall be disabled to prevent exploitation by any hacker.

Item	Parameter	SECURITY FEATURES REQUIRED
	Remote access	Access rights to sensitive systems and data to be restricted. “ftp and “telnet” on such systems should be disabled. Use secured tools like the SSH for remotely accessing the system
	Connection between LAN and WAN	The internal LAN and the public network / extended for PDM/PLM network shall be segregated and secured by means of secure gateway appliances like the Firewalls, IPS & NIDS
	communication between two remote locations	Effective Identification, authentication and encryption techniques should be used while communicating sensitive information over public network/extended network or between two remote locations
	Use of Wi-Fi Network	Wi-Fi Network Should not be used without permission
	Disaster recovery plans	The Disaster recovery plans for business critical systems should be formulated, implemented and maintained to ensure continued operations of these systems in case of their failure / Disaster. The DR Policy is placed at Enclosure-9
	labeling of hardware	All the hardware shall be labeled for easy identification.
	Configuration of Hardware	The vendor Shall configure the Servers and peripherals to connect them to relevant networks defining the required security configuration
	Hardware Policy	All hardware shall be maintained / replaced as per Hardware Policy Enclosure-9
	Storage level Encryption	All servers and Storage devices are configured for storage of data in encrypted form.
	Preventive maintenance	Preventive maintenance shall be carried out every three month by the vendor for up keeping the hardware.
	Server / desktop hardening	All servers and desktops shall be hardened to prevent un authorize access.
Common	Access Restriction	Access to data/information should be restricted to authorized users only.
	passwords security	Users shall keep their passwords secure and shall not share their account details. Users shall keep strong and secure passwords as per the password policy at Enclosure-9
	Deployment check	Check any software for virus before deployment
	Use of Laptop	Only authorize laptops are to be used to setup the hardware and software

Item	Parameter	SECURITY FEATURES REQUIRED
	Incident Handling	All Hardware, software, Virus and Network related problems are to be reported to the System administrators directly to the administrators. A system for recording, tracking and reporting the status of problems should be established for problem Maintenance. Handling of Security Incidents / Major Crisis should be done as per the Crisis Management Plan defined as per system requirement. The Crises Management Plan will be developed by the supplier and Stakeholders and the same shall be tested every 12 months and implemented by the vendor with allocation of resources.
	IT Audits	IT Audits to be carried out as per the schedule given at relevant Para
	Documentation	SOP for all operations shall be produced and the updated time to time with version control.

13.10.5. **Versioning / historic data recovery**: The solution shall provide an efficient versioning and data recovery mechanism and this mechanism should allow the support staff to access previous data versions in an easy and intuitive way... All documents and attachment shall be versioned, e.g.:

(a) Documents

(b) Drawings (2D and 3D)

(c) Planning and simulation versions

(d) Certificates

13.10.6. The PDM/PLM Solution Provider is expected to describe in their response how versioning and data recovery is going to be supported. This includes an overview on the business functionalities where versioning is being supported as well as a description of how end-users or support staff can access and restore previous documents / projects stored in the system.

13.10.7. It shall also be provided an indication of the backup space needed to store an entire project of size in accordance to the data storage policies described in this document. Major renovations of ships can be managed up to 15-20 years after the production date, and data should therefore be preserved for this amount of time at least.

13.10.8. **3rd Party Audit**: The Stakeholders can appoint a 3rdPartyCompany/Public Authority / Government body to execute a full Security Audit on the solution provided, covering the end-to- end technological and operations stack of the PLM solution. The PDM/PLM Solution Provider shall fully collaborate with the selected 3rd Party providing required material(e.g. documentation, credentials, certifications, etc)that the 3rd Party would need to carry on the Security Audit. The Security Audit will result in a series of recommendations to be implemented on the PLM solution; the PDM/PLM Solution Provider shall be responsible of all material and nonmaterial costs required to implement the

recommendations classified with Medium and High impact impacting its responsibility areas as identified in PDM/PLM solution responsibility matrix indicated at Para (10.2) above. The implementation of their commendation shall be completed no ntative to the PLM PDM/PLM Solution Provider.

13.10.9. SI Support team shall be responsible for total data migration during implementation and go-live phase which shall include development of migration tool, extraction of data from legacy system, extraction of necessary data from offline media or hard copy, and necessary SAP expert.

13.10.10. **Data Entry operators:** The PLM SSP shall position data entry operators at the premises of MDL, GRSE & DND for a period of two years from the date of roll out of Wave-1, based on the requirement that will be specified post placement of the order. The period of requirement will be extended if required. The payment for the data entry operators will be regulated pro-rata based on the man day rates quoted by the PLM SSP and the annual escalation that will be mutually agreed and number of persons certified by the competent authority at the three locations.

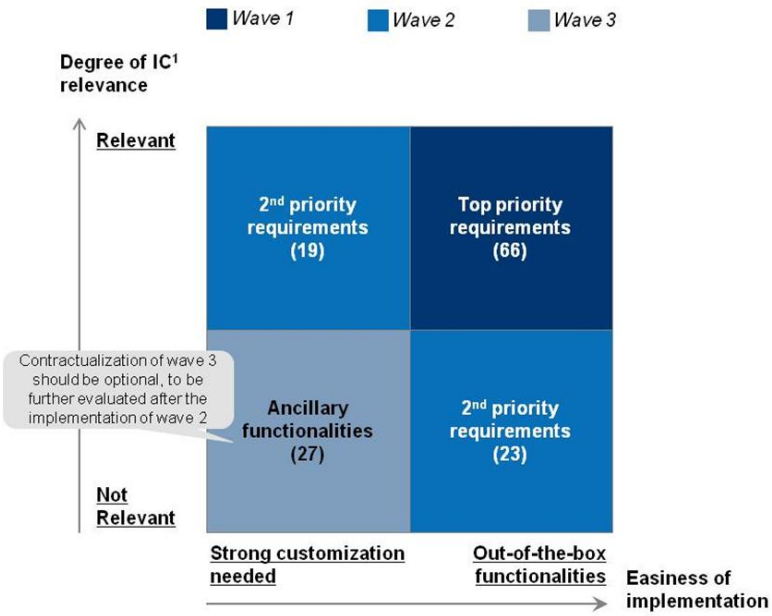
14. IMPLEMENTATION ROAD MAP AND TIMELINES

14.1. **Scope of implementation**: This section provides the preliminary guidelines on the expected approach for the PLM solution delivery, operations and maintenance activities. In the following sections all the parties involved are considered (Stake holders, software PDM/PLM software Solution Provider and System Integrator) in order to provide a clear view about roles, responsibilities and involvement of all the parties in the approach proposed. The PDM/PLM Software Solution Provider shall provide and describe in their proposal, the activities and all the related deliverables required implementing and rolling out the PLM.

14.2. **Prioritization of functional requirements for implementation**: The One hundred and thirty five(135) target functional requirements (FR) identified have been prioritised in three waves for the following:

(a) Hasten the implementation process, anticipating a partial release with high priority functionalities
(b) Enable business benefits already in early phases
(c) Ensure only relevant requirements are implemented
(d) Define most useful use cases for the demos

14.3. The Target functional requirements captured in three major (waves) is placed at **Enclosure- 10** and is summarised as follows:



14.4. Top priority requirements (Number of functional requirements: 66): They consist in requirements key for the Integrated Construction processes, and that are also founding the basis for a PLM solution (low implementation effort expected). They are key requirements has they support both IC and PLM needs.

14.5. Second priority requirements (Number of functional requirements: 42)They consist in either:

(a) requirements supporting the identified Integrated Construction processes, which might require significant customization to be done (higher implementation effort expected

(b) or, requirements that are not directly supporting the Integrated Construction process, but they are standard functionalities for a complete PLM system

14.6. Ancillary functionalities: (Number of functional requirements: 27): They consist in requirements which are neither fundamental for the Integrated Construction processes, nor necessary to have a fully functioning basic PLM solution. These requirements should be considered low priority. The above prioritisation is based on the following two variables:

(a) *'Easiness of implementation'*: It identifies whether the PLM requirement consists in an out-of-the- box functionality that should be available by any off-the-shelf PLM solutions or in an advanced functionality (High effort) that might require customization of the PLM product or particular integrations with other systems. This is a key factor as it affects both costs and implementation timeline.

(b) *'Degree of relevance to Integrated Construction':* It identifies whether the PLM requirement is supporting the adoption of Integrated Construction processes (Relevant) or not (Not Relevant). This is key factor given that with the P17A MDL and GRSE are expecting to fully adopt an Integrated Contraction process with the PLM being the IT backbone .

14.7. Considering the above, the number of requirements in these waves shall be considered as indicative and it's expected that the PDM/PLM Solution Provider will provide a reviewed version of the 'waving' as part of their proposal. PLM Solution PDM/PLM Solution Provider shall review the prioritization proposed to ensure that the lens "Easiness of implementation" is fully aligned with the PLM solution capabilities provided by the PDM/PLM Solution Provider. If there is any difference in the evaluation of the "Easiness of implementation" vs. what has been proposed, the PDM/PLM Solution Provider shall highlight those differences and explain how they would impact the implementation.

14.8. **Implementation Plan: suggested approach**: Based on the prioritized functional requirements, Stakeholders has envisaged the following three waves approach:

(c) Wave-1: Deployment of Top priority requirements: (66 nos) consisting of the following:

(i) Definition of PBS with related attributes
(ii) Tracking and monitoring of change requests
(iii) Collaborative information management
(iv) Basic planning functionalities
(v) Implementation of key interfaces (planning software, ERP, weight management and CAD). The CAD interface is expected to be batch and mono directional from CAD to PLM.
(vi) Data Migration (only for wave -1)

(d) Wave-2: Deployment of second priority requirements: (42 nos) consisting of the following:

(i) Implementation of full-fledged ESWBS. The linkage among the three data structures(PBS, WBS & OBS shall be fully operative at this stage.)
(ii) Linkage between different Project Plans
(iii) Configuration of PBS for for aftersales operation

(e) Wave-3: Deployment of Ancillary requirements: (27 nos) consisting of the following:

(i) Additional data visualisation functionalities
(ii) Configuration of additional dash boards/reports
(iii) Incremental document management functionalities
(iv) Analytical functionalities for aftersales operation

14.9. The mapping of implementation waves with PLM macro functionalities is as follows:

14.10. Prioritization of implementation for reports**:** The PLM reports shall be implemented within implementation waves identified above; Stakeholders has proposed below a potential grouping of the reports:

(f) Report groups to be deployed in the "Wave 1 Top priority requirements"

- Product reports
- Sourcing reports
- Program & portfolio reports

(g) Report groups to be deployed in the "Wave 2 Second priority requirements"

- Quality reports
- Compliance reports

14.11. **Implementation plan- Detailing of the waves:** Considering that agile approach is the key to respect the implementation timeline and obtain the envisioned business benefits, each of the waves shall be implemented in three steps viz. Business Process Re-engineering, Development and Testing, Roll out and change management as follows:

	Stage	Activities involved	Remarks
(a)	Business Process Re-engineering (BPR)	(i) Definition of target operational workflow (E2E view) for relevant processes to implement the new system • starting from native processes managed by the PLM software	Defined by PLM solution provider once at the beginning

	Stage	Activities involved	Remarks
		• Identification of Pain points and opportunities among “as-is” processes	
(b)	Development and Test	(i) Development of Technical specification at each step/ functionality (ii) Installation and Customisation of the PLM software (iii) Key users training on new functionalities and new processes (iv) Testing	Repeated for each wave
(c)	Roll out and change management	(v) Definition of communication plan and specific initiatives to create consensus on the PLM Project (vi) Production Roll out (vii) Control of change journey and effectiveness	Repeated for each wave

14.12. The PLM PDM/PLM Solution Provider shall submit detailed plan for each wave that shall include at least the following tasks:

(h) Support during the implementation of the re-engineered Business Processes (only for Wave 1)

(i) Development & Test
(ii) PLM System installation (only for Wave 1)
(iii) PLM Basic Customization (only for Wave 1)
(iv) Key users training on new functionalities and new processes
(v) Key Users testing
(vi) Gaps and defects prioritization
(vii) Definition of targets for the next release (Blueprint)
(viii) Development / defects fixing
(ix) Release preparation
(x) Technical Testing

(i) Rollout and Change management

(i) Change Management
(ii) User training
(iii) Pilot run
(iv) Roll-out
(v) Support
(vi) Post-go-live phase support
(vii) Operations and maintenance

14.13. Warrantee and AMC: The PDM/PLNM Software Solution Provider shall

provide warrantee and AMC for the following:

14.13.1. NFR: Warrantee for the hardware and software (NFR) shall commence from the SITC of the hardware and software at MDL, GRSE, DND(SSG), MDC MDC & DR. The AMC for the hardware and software (NFR) shall commence from the expiry of the warrantee period of the NFR up to the delivery of the last ship in the respective shipyards.

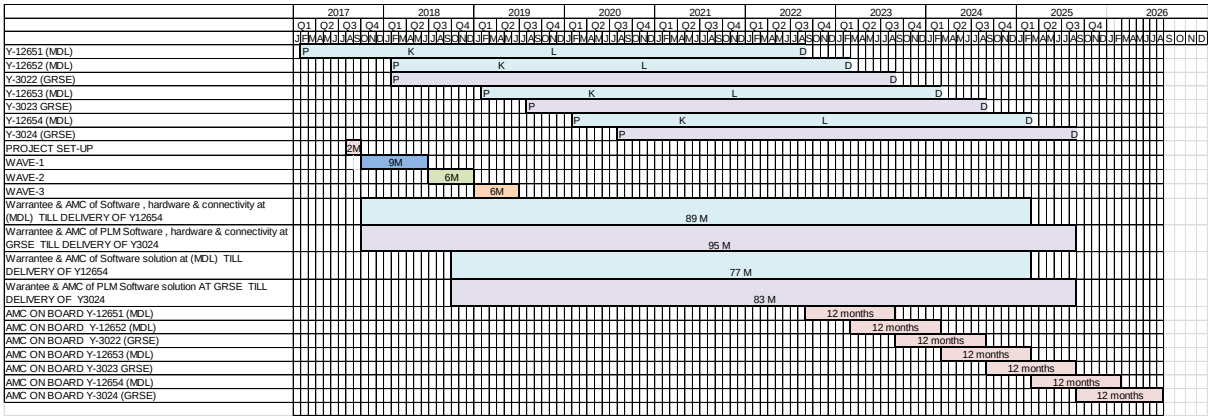
14.13.2. FR: The Warrantee for the PLM software solution (FR) shall commence from the roll out of each of the three waves (three waves). The AMC for the PLM software solution (FR)shall commence from the expiry of the warrantee period of the FR up the delivery of the last ship in the respective shipyards

14.13.3. WAN: Warrantee for the WAN commence from the SITC of the hardware and software at MDL, GRSE & DND (SSG). The AMC for the WAN shall commence from the expiry of the warrantee period of the WAN up the delivery of the last ship in the respective shipyards

14.13.4. LAN: Warrantee for the LAN start from the SITC of the hardware and software at MDL, GRSE & DND (SSG). The AMC for the LAN shall commence from the expiry of the warrantee period of the LAN up the delivery of the last ship in the respective shipyards

14.13.5. ONBOARD: The warrantee on board for the hardware and the PLM Software solution shall commence from the date of installation which is scheduled six(6) months prior to delivery the vessel and it shall be valid for eighteen months. The AMC shall commence thereafter.

14.14. Implementation Plan –Timelines**:** It is expected that the PO shall be placed on the PLM Software and Solution Provider in August 17 Prioritisation of the Target functional requirements shall be captured in the three waves for implementation. In case the PDM/PLM Solution Provider cannot commit to such deadline, a different starting date shall be proposed. The PDM/PLM Solution Provider shall explain why – from their perspective – it is preferable a different starting date due to functional or technical constraints. The main functionalities of the PLM supporting integrated construction shall be delivered by November 2018. The complete functionalities shall be delivered by the PLM vendor in three roll outs by November 2019. The PLM PDM/PLM Solution Provider may propose different duration for the waves respecting these milestones. The timeline for implementation is as follows:



14.14.1. Business Process Re-Engineering(BPR): No ab-initio BPR is envisaged as part of this scope. The key processes and workflow information that is required for the PLM functionality has been defined elsewhere in this document. The PLM SSP shall endeavour to implement a customised solution meeting across the functional requirements.

14.14.2. The PDM/PLM Software Solution Provider shall provide the Target Process Map for each workflow/processes listed in the Chapter Target Key Workflows of the PLM Requirement Definition Document and all the workflows that are native of the PLM solution proposed. The Target Process Map shall include at least:

(a) Detailed steps of each process and interactions with other processes

(b) IT system used on each step (if PLM or Stakeholders system)

(c) Input/ Output for each steps

(d) Best practices on Roles/Responsibilities for each steps

14.14.3. The PDM/PLM Software Solution Provider shall also provide a best practice document that illustrates what are the best practices in terms of PLM process definition, with a specific focus on Integrated Construction

14.14.4. The PDM/PLM Software Solution Provider shall work side by side with Stakeholders in this phase as the outcome of the BPR will be key for the customization required for the PLM system (e.g. modified processes and workflows).

14.14.5. Development And Test**:** It is expected that for the first Wave the PDM/PLM Solution Provider installs the "out-of-the-box" PLM solution on the IT infrastructure and proceed with a basic customization to setup an end-to-end functioning PLM system.

14.14.6. The PDM/PLM solution provider shall take an Agile approach to the development of the customizations and integrations needed for the implementation of the functional requirements defined in each of the waves. The stake holders envisage the following benefits by following the Agile approach:

(a) Flexibility: Teams will be able to change direction and react quickly

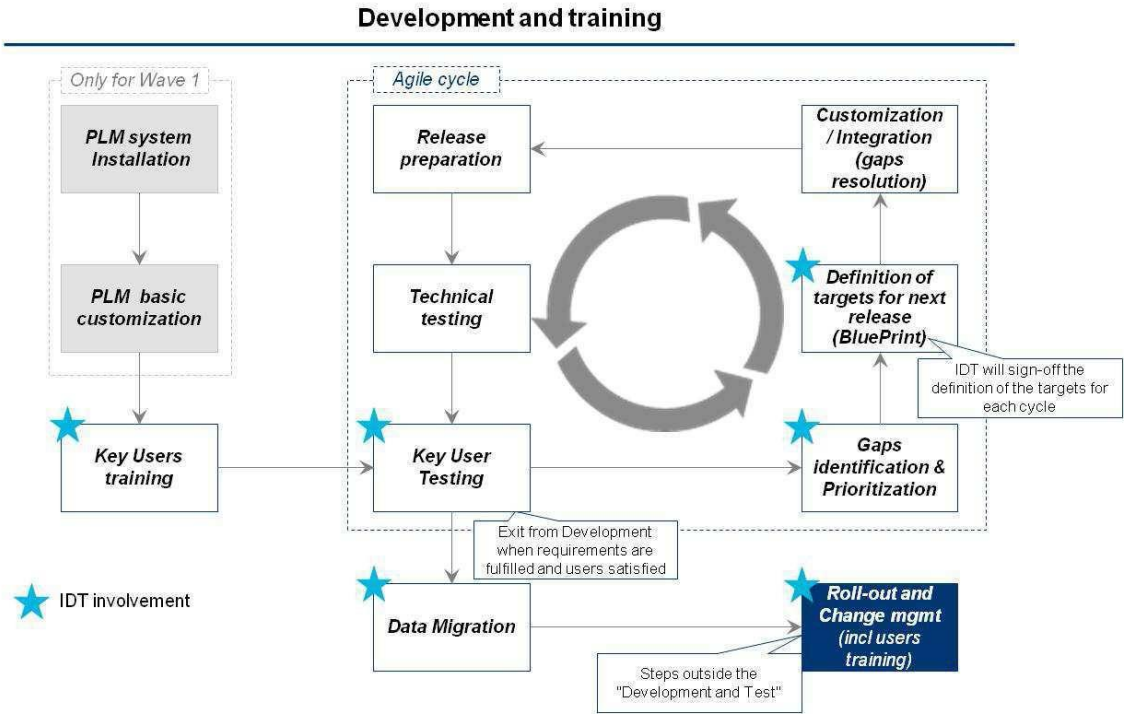
thanks to short cycles versus locking in requirements upfront

(b) Visibility: Progress will be visible and predictable thanks to stable velocity and bite-sized features versus black box between requirements and product delivery

(c) Delivery risk: Delivery risk will be progressively reduced thanks to small, frequent deliveries to "live" versus high risk until full release

(d) Business value: Value will progressively increase thanks to potentially-shippable products from short cycles versus waiting for release to begin accrual

14.14.7. The figure below details how the development and training is expected to function:



14.14.8. A single "Agile cycle" is expected to last 4 weeks at maximum. PDM/PLM Solution Providers are expected to describe the approach to the implementation detailing in their proposal how they would typically conduct the development phase (what team, which location, how to involve Stakeholders staff, etc.) and their adopted methodology/timelines. The PDM/PLM Solution Provider shall explain if – from his perspective – it is preferable a different approach. The PDM/PLM Solution Provider shall highlight the underpinning rationales for adopting a different methodology.

14.14.8.1. System Installation: PDM/PLM Solution Providers shall explain how they intend to execute the following activities, detailing process and deliverables for at least the below activities:

(a) IT infrastructure and network preparation

(b) Standard infrastructural SW installation

(c) Integration with the P17A Active Directory

(d) Standard PLM solution and users profiling installation

(e) Setup of the DR site

14.14.8.2. Basic customization: It is expected that the software that the PLM SSP would provide shall have 'out of the box' solution for the most of the required Functionalities. However, in case there is no out of the box solution available built in as part of the software, the PLM SSP shall provide the requisite customization to cater to the functionalities. The PLM SSP shall undertake customization for the entire functional requirements that does not have out of the box solution during Wave -1 of the implementation. Any gaps in the customization however shall be resolved during the three implementation waves. PDM/PLM Solution Providers shall explain how they intend to execute the following activities, detailing process and deliverables for at least the below activities:

(a) Standard SW customization/ configuration

(b) Basic interfaces with other IT systems

(c) Import of catalogues and main parameters

14.14.8.3. Key users training: Training activities will be required on "Out of the Box" and custom functionalities to selected resources. Around 50 key users shall be identified to which the PDM/PLM Solution Provider shall deliver the training. The training shall include modules regarding both the process enabled and the ones required by the adoption of the PLM solution. The final goal of this training is to enable the users to understand and use the "Out of the Box" solution to be able to test and identify the key gaps of the solution against the requirements. The Key users training shall be completed within a maximum of 45 calendar days after the start of the Implementation phase. The PDM/PLM Solution Provider shall explain how they intend to execute the above detailing the process, the material and the instrument that are going to be used in the training session.

14.14.8.4. Key users testing: The scope of the Key users testing is to identify:

(a) Any gap in the functional o the technical features of the PLM solution in respect of the Functional and non-Functional requirements defined for each wave

(b) Any defects of the PLM solution in in respect of the Functional and non-Functional requirements defined for each wave

14.14.8.5. This is a key step of the Agile process, where Stakeholders users get the ability to use and test the PLM Solution supporting the PDM/PLM Solution Provider in focusing the development on the right direction increasing Flexibility and Visibility while reducing the delivery risk.The Key User testing is the first step of the process, then

(a) Defects and gaps are going to be collected and prioritized

(b) Targets for the next release in terms of gaps to be fulfilled are defined together with Stakeholders

(c) The development to prepare the next release

(d) The next release will be packaged and run through a series of technical tests to be released to the key users for the more functional testing

14.14.8.6. It needs to be noted that the Key Users Testing is the end-user quality gate (and not only the starting point for the Agile Cycle), and therefore no solution can be deployed in production without a clear pass of the Key Users Test phase (or a sign off- from the Key Users that the solution can be deployed.)

14.14.8.7. It is expected that the Key Users Test strategy, Test plan, and Test cases to cover the requirements in each wave will be developed by PDM/PLM Solution Provider and agreed upon with Business and IT representatives from the Stakeholders.

14.14.8.8. Throughout all testing, defects and gaps (both from a functional and from a technical perspective) will be reported and classified immediately on the defect tracking system provided by PDM/PLM Solution Provider. Stakeholders shall have unlimited access to the defect tracking system provided by the PLM Solution PDM/PLM Solution Provider. PDM/PLM Solution Provider should create and maintain, in agreement with the Stakeholders, a defect dashboard reporting all the relevant information related to the problem monitoring. The PDM/PLM Solution Provider shall explain how they intend to execute the above, detailing the process and the technical instruments that are going to be used while also providing an example of the deliverables to showcase the end-to-end approach. PDM/PLM Solution Provider shall also state the requirements in terms of test data that Stakeholders would need to fulfill.

14.14.8.9. Gaps & defects prioritization: The PDM/PLM Solution Provider shall explain how they intend to execute this phase, detailing the processes they are going to put in place (e.g. Defects meetings), the governance and the documentation that is going to be created. Identified gaps and defects shall be classified and prioritized jointly between the PDM/PLM Solution Provider and Stakeholders, taking in account:

(a) Impact of the gap / defect on the end-to-end business functionalities

(b) Impact of the gap / defect on the subsequent testing (e.g. if the defect is a blocking one for a series of planned testing)

(c) Estimated time for the fix

14.14.8.10. Definition of targets for the next release (Blueprint): In this phase Stakeholders and the PDM/PLM Solution Provider defines together what is going to be developed / customized / integrated in the next release cycle within the wave. This should be aimed to close as many as possible of the identified and prioritized gaps / defects. Stakeholders and the PDM/PLM Solution Provider shall agree not only which defect/ gap is going to be addressed but also the high-level technicalities around that. The outcome is expected to be a short document that details what is going to be included in the next release cycle (thus determining the tests that are going to be run by the key users) agreed and signed- off by Stakeholders and the

PDM/PLM Solution Provider. In this phase the functional details about the functionalities that are going to be implemented shall be defined and agreed between Stakeholders and the PDM/PLM Solution Provider. PDM/PLM Solution Provider shall explain how they are going to setup the processes and the governance to define the targets (defects and gaps to be closed) for the next release in full alignment with Stakeholders considering:

(a) Development capacity available

(b) Ability to close all the gaps and defects by the end of each wave

(c) Availability of Stakeholders users for subsequent testing

14.14.8.11. Development / defects fixing: PDM/PLM Solution Provider shall describe how their development team will work and what are the development timelines and processes that are going to be implemented for the P17A PLM implementation. Especially they shall highlight the length of the development sprints, and how they are planning to align with Stakeholders IT resources over the integration. They shall also highlight the requirements in terms of IT resources and IT system that they would expect that will be fulfilled by Stakeholders. The PDM/PLM Solution Provider shall also identify which instruments of version control they are going to use, the related processes, and what are the security and backup policies.

14.14.8.12. Release preparation: The PDM/PLM Solution Provider shall describe the release management process, including the instruments that are going to be used and the deployment procedures. The PDM/PLM Solution Provider shall also highlight if any modern release management processes e.g. DevOps or Continuous Integration are going to be used, in which case it is expected that these are detailed in the proposal.

14.14.8.13. Technical testing: It is expected that the technical test phases are carried out before handing over the release to the Key Users Testing; in particular the following test phases are expected:

(a) Unit and system tests (during implementation phase)

(b) Manual or automatic code review

(c) Integration tests

(d) Performance tests (including test of failover scenarios etc.)

(e) No-regression tests

14.14.8.14. It is expected that the test strategy, test plan, and test cases for the above testing will be developed by the PLM Solution PDM/PLM Solution Provider and agreed upon with Business and IT representatives from Stakeholders. Throughout all testing, defects will be reported and classified immediately on the defect tracking system provided by the PDM/PLM Solution Provider. Stakeholders shall have unlimited access to the defect tracking system provided by the PLM Solution PDM/PLM Solution Provider. Stakeholders reserves the right to employ a platform for testing the code automatically (e.g. CAST, Fortify) and to define at its sole discretion one or more acceptance gates based on the results of these tests.

14.14.8.15. Data Migration: Before the roll-out of the wave, the PDM/PLM Solution Provider is expected to migrate the P17A data that have been generated outside the PLM. The required licenses for migration shall be provided and the same shall be implemented by the PDM/PLM Software Solution Provider. Stakeholders identified 5 key data stores that shall be migrated or loaded into the PLM before the roll-out. The data preparation, validation and migration shall be the responsibility of the PLM SSP. The PDM/PLM Solution Provider is expected to highlight their approach to data migration in accordance to the guidelines and responsibilities specified in the following table:

DATA MIGRATION RESPONSIBILITIES			
Data store	**Description**	**IDT data migration responsibilities**	**data migration responsibilities**
Aveva	Drawings, Model, BOM and related data stored on the Aveva system that needs to be linked with the PLM	• Ensure that the third level PBS is correctly linked to the drawings to facilitate the loading of the object into the PLM • Ensure that the Supplier has all the credentials necessary to make the integration • Manually review the loaded items to ensure functional correctness of the transfer	• Setup the one way integration between Aveva and the PLM • Load the data into the PLM • Ensure the correctness of the technical transfer and manage the exceptions with IDT • Support IDT in identifying functional errors / gaps and resolve them
SAP	Cost and accounting data for activities and PBS	• Ensure that third level PBS until the PDM/PLM is linked with costs items where possible • Ensure that the Supplier has all the credentials necessary to make the integration • Manually review the loaded items to ensure functional correctness of the transfer • Identify items that cannot be transferred or connected to the PLM to then either associate them a WBS / PBS code or identify with the Supplier a way to link and load them	• Setup the two-ways integration between SAP and the PLM • Load the data into the PLM • Ensure the correctness of the technical transfer and manage the exceptions with IDT • Support IDT in identifying functional errors / gaps and resolve them

DATA MIGRATION RESPONSIBILITIES			
Data store	**Description**	**IDT data migration responsibilities**	**data migration responsibilities**
Project/ Primavera	Full project plans	• Ensure that all activities level 1 2 and 3 activities are linked via a WBS code • Ensure that the Supplier has all the credentials necessary to make the integration • Manually review the loaded items to ensure functional correctness of the transfer • Identify items that cannot have not been transferred correctly and identify with the Supplier a way to link and load them	• Setup the two-ways integration between SAP and the PLM • Load the data into the PLM • Ensure the correctness of the technical transfer and manage the exceptions with IDT • Support IDT in identifying functional gaps and resolve them
Other documents centrally stored	Other documents (e.g. test procedures, excels, etc.) collected on central document management systems or on network disks	• Ensure that all the relevant files are named according to the "Document coding" described in the" P17A Allocation of the ESWBS based on system and location" • Identify the locations of all the relevant files • Ensure that the Supplier has all the credentials necessary to retrieve the files	• Develop a tool to import automatically the documents and insert them correctly within the PLM taking the information from the document coding embedded in the documents file names • Ensure the correctness of the technical transfer and manage the exceptions with IDT
Other documents locally stored	Other documents (e.g. test procedutres, excels, etc) that are stored on the local computers of the resources working on p17A	• Ensure that all the relevant files are named according to the “document coding’ described in the P17A allocation of ESWBS based on system and location” • Collect centrally the locally stored documents • Ensure that the Supplier has all the credential to retrieve the files	• Develop a tool to import automatically the documents and insert them correctly within the PLM taking the information from the document coding embedded in the documents file names • Ensure the correctness of the technical transfer and manage the exceptions with the Stake holders

14.14.8.16. If the PDM/PLM Solution Provider identifies other data stores that shall be included in the data migration they should be included in the proposal together with a migration approach for each of them. Furthermore, though the complete migration is included in wave-1, PDM/PLM Solution Providers shall describe how the migration requirements will be considered in each of the project phases/waves, including the necessary tests to check the correctness, integrity and completeness of

the migrated data.

14.14.8.17. Change Management and Rollout: The PDM/PLM Solution Provider shall illustrate how they will support the Stakeholders change management efforts, rollout the system and provide a post-go-live support, in particular, the following:

(a) Change Management: It is expected from the PDM/PLM Solution Provider a strong support on the Change Management activities that are going to be carried out by Stakeholders, in particular the PDM/PLM Solution Provider shall:

- Provide face to face end user training on all the functionalities of the PLM systems to the relevant users. The training shall be provided for each of the waves and intended on top to the Key User Training provided in Development and Test. A train the trainer approach can be used for the users of the 3rd party contractors employees by Stakeholders, however all PLM users that are also Stakeholders employees shall receive class training from the PLM PDM/PLM Solution Provider (directly, not outsourced)

- Provide demonstration environments that can be used by Stakeholders to make the users and employees familiarize with the system while it's not yet developed

- Share the Change Management best practices

(b) The PDM/PLM Solution Provider shall describe in the proposal how they are going to fullfil the above activities, in particular in relation to the training, for which, plan, example material, and approach followed (class vs. On The Job vs. hybrid approach) shall be described in detail.

(c) Roll-out: The Provider shall describe in details what will be the procedures he envisaged for both, PLM System rollout on Primary and DR Data centres (for each of the waves) and the PLM System rollout on the P17A Frigates once they are built, in particular the proposal shall include:

(i) Detailed rollout plan
(ii) Detailed roll-out approach and related processes
(iii) Responsibility matrix
(iv) Expected downtimes
(v) Foreseen risks
(vi) Resources required from Stakeholders in support to the rollout
(vii) Rollback plan and procedures
(viii) User Acceptance Testing Procedures (plan, scripts, etc.)
(ix) System maintenance plan at sea

(d) Whilst the rollout of the Wave 1 is expected to be straight-forward as the PLM system would not going to be already used live by the end users, for Wave 2 and 3 the PDM/PLM Solution Provider shall take fully in consideration all the risk involved with a rollout of the updates, as the system will be fully in use.

(e) Moreover, the PDM/PLM Solution Provider shall provide as part of the rollout procedures for the PLM system within the P17A frigates the following elements:

- Data migration procedures
- HW required
- SW required

(f) Post go-live support: The Provider is expected to describe in detailed how they are going provide to Stakeholders a close technical and functional support for the weeks after each of the roll-outs, in particular: Scope of the post go-live support (in terms of both location and functional/ technical depts. of the support)

- Size of the supporting teams
- Engagement process and relative governance

- Post go-live status meeting
- Early metrics

(g) Stakeholders expects the following duration of the post go-live supports:

- Wave 1: 8 weeks
- Wave 2: 4 weeks
- Wave 3: 4 weeks

(h) The CVs of the Support team members shall be produced to the stakeholders before deployment. The stakeholders shall have the full rights to accept or reject any team member before or during the support.

15. PROJECT MANAGEMENT APPROACH

15.1. Standard project management: PDM/PLM Solution Providers have to operate the Project Manager according to the standard practice set by industry best practices e.g. PMI, Prince 2, etc. (setting priorities, coordination, complex resource-allocation and management, collective management of risks and issues, etc.). Activities involve:

(a) Start-up the project e.g. create the detailed plan of the project, schedule and resource planning; assign the responsible person, etc.
(b) Keep an up to date plan, considering the milestones and the managerial decisions
(c) Ensure coordination and communication between subprojects and adjoining projects, including the adequate risk end priority management.
(d) Setup standard project PMO administration processes, e.g. meeting records, status reports, documenting project- and project management materials

15.2. Monitor and report project status on a regular basis to top management (at the adequate level of detail using industry best practice methodologies e.g. Earned Value. PDM/PLM Solution Providers are invited to point out which Project

Management methods would like to employ (e.g. PMI, Prince 2) and to highlight any related certification in the attached CVs.

15.3. **Risk Management**: PDM/PLM Solution Providers are required to describe their approach regarding risk management during the project. In the field of Risk Management PDM/PLM Solution Providers have the following tasks:

(e) Identify risks facing the project in terms of Time, Budget, Objective and Quality (in detail: economy, regulation, finance, legal, products-services, operational, personnel, strategy)

(f) Evaluate risks considering the probability, the impact and the interdependencies

(g) Support decision making process by the framework of risk analysis and evaluation, and proposal of appropriate solution, action and measures to manage the risks

(h) Provide a continuous monitoring and reporting of potential risks and undertaken actions to prevent the identified risks

15.4. Quality assurance: PDM/PLM Solution Providers shall ensure the quality of solution implementation by using structured methods. PDM/PLM Solution Providers have to describe the key quality assurance principles and approach they are intended to apply during the implementation of the project. Quality assurance is intended for all of all deliverables (documents, pieces of software, etc.) as well as processes (e.g., test management and execution). Stakeholders would like PDM/PLM Solution Providers to propose the possibility to use a test factory, decoupled from the implementation project team, in order to enhance the quality of the overall solution guaranteeing separation of roles.

15.5. Change management: The PLM implementation in MDL, GRSE and DND is part of an overall shift towards Integrated Construction, therefore it involves a significant amount of change, not only to the IT landscape and how user interfaces look like, but also on how business will work in the future and how business and IT will work together to further develop IT support. PDM/PLM Solution Providers should be aware that in their role as a general contractor for building the IT solution, Stakeholders expect pro-active involvement into these change management aspects as well. Therefore, in your proposal, please elaborate on how you engage in change management, including also communication and dissemination activities.

15.6. Tools and methods: PDM/PLM Solution Providers are expected to describe the tools and methods which will be used to support the implementation project. PDM/PLM Solution Providers is free to propose any further tools to support the implementation; however they shall be free of charges for the Stakeholders. Within the proposal PDM/PLM Solution Providers shall describe the tools which would use; e.g.

(a) Data / document exchange
(b) Defect tracking
(c) Project management
(d) Project reporting
(e) Budget planning & tracking

(f) Risk management
(g) Collaboration
(h) Functional requirement documentation
(i) Process documentation
(j) Source code versioning (e.g., Subversion, GIT, …)
(k) Technical design tools (e.g., UML, …)
(l) Test management and quality assurance

15.7. Stakeholders reserve the right, at its sole discretion, to mandate the use of specific tools that might be already used for the same purposes by the IT department.

16. PROJECT ORGANIZATION STRUCTURE AND PROJECT TEAM

16.1. We expect PDM/PLM Solution Providers to propose an appropriate project organization. As a general rule, PDM/PLM Solution Providers should assign resources at three levels of the project organization:

16.1.1. Steering level: At steering level, PDM/PLM Solution Providers shall assign a member of his management board to participate in regular – presumably monthly – steering committee meetings. In case of urgent needs this person is expected to be available for extraordinary steering committees in addition to the scheduled ones. The assigned resource is the reference point of contact for any top-management escalation.

16.1.2. Project management level: At this level the role of the PLM solution provider and the Stakeholders is to ensure that the solution gets implemented on time, budget and scope. PDM/PLM Solution Providers and Stakeholders needs to act as one unit, ensuring shared agreements on the management on ongoing issues are found and enacted. At project management level, at least two full time key resources have to be provided by PDM/PLM Solution Providers: A Project Manager and an IT Architect participating in the Design Authority. The Project Manager will lead the project on a day to day basis. A key task of the project manager will be the continuous alignment with Stakeholders' senior business and IT resources.

16.2. The Design Authority is a board which is responsible for making implementation decisions which will impact the business in the future. Stakeholders' will staff the Design Authority with an experienced IT architect and subject matter experts (SMEs) of the various business units.

16.3. The Project Management Office, responsible for maintaining the project plan and for preparing steering committee, project management meetings, status reports, etc will be fully staffed by PDM/PLM Solution Providers' staff and will be supported by Stakeholders' staff.

16.4. The following minimum requirements are set for the Project Manager to be

assigned by PDM/PLM Solution Providers:

(a) Track record of successfully leading at least two projects of similar size (resources, budget, scope) of the offered project

(b) Deep experience in alignment with senior business resources

(c) PMI / Prince 2 or equivalent certification

16.5. The Design Authority should consist of Stakeholders' IT and PDM/PLM Solution Providers' employees. In case the PLM software is not being provided by PDM/PLM Solution Providers, two resources shall be assigned full time to the Design Authority from PDM/PLM Solution Providers, one IT Architect from PDM/PLM Solution Providers themselves and an IT Architect from the PLM software vendor. Responsibility of the IT Architect(s) will be to officially validate any action performed on the solution, ensuring that company standards are fully met during customization and integration and therefore guaranteeing that the customized solution is fully compatibility with any future release of the PLM solution. PDM/PLM Solution Providers are considered fully economically liable if, in the future, (up to 7 years after the commissioning) the cost to adapt the PLM Solution to the new release of the PLM software is more than 10% of what originally paid for the customization. The following minimum requirements are set for the IT Architect of the Design Authority to be assigned by PDM/PLM Solution Providers:

(d) Experience with the PLM software used : > 5 years

(e) Expert knowledge of the architecture and customization capabilities of PDM/PLM Solution Provider solution, especially knowledge of cross-module implications of customizations

(f) Deep knowledge of software PDM/PLM Solution Provider's product strategy

16.6. A weekly project management meeting and a weekly Design Authority meeting will be set up during all phases of the implementation project. PDM/PLM Solution Providers have to provide skills descriptions and CVs for the resources it plans to staff at the project management level.

16.7. Work stream level: PDM/PLM Solution Providers shall propose a work steam structure for each wave of the implementation project. In the work stream structure, PDM/PLM Solution Providers shall assign resources (e.g., developers, consultants) to each work stream and name a work stream lead for steering PDM/PLM Solution Providers resources of the work stream. The work stream leaders will attend the weekly project management meeting. The following minimum requirements are set for the work stream leaders to be assigned by PDM/PLM Solution Providers:

(a) Experience with the PLM software used: > 1 year, preferably > 2 years

(b) Deep knowledge of customization and integration capabilities of the relevant solution module

(c) Track record of successfully leading at least one project module of similar size (resources, budget, scope)

16.8. PDM/PLM Solution Providers should make sure that staff at work stream level is not removed/replaced between core phases of the project unless otherwise requested by the stake holders, e.g., the team doing the first roll-out (assuming a phased approach) should be available in subsequent roll-outs as well. There should be software PDM/PLM Solution Providers' staff available for providing functional perspective, system integrator staff available for providing technical perspective and Stakeholders' staff available for providing user perspective.

16.9. CVs and detailed project records of the Project manager, the Design Authority member, and work stream leads must be provided as part of the proposal. Stakeholders expect to meet these team members already during the selection phase and to have a chance to interview them. Stakeholders will reserve the right, at its sole discretion, to reject upfront the proposed resources for leading positions, or that will be acting as overall solution architects, or to ask for their replacement during the project implementation.

17. QUANTIFICATION OF THE SUPPORT EXPECTED FROM Stakeholders

17.1. As stated above, Stakeholders are looking for a prime contractor who takes over responsibility for the design, implementation and delivery of a new PLM solution. Of course, this cannot happen without Stakeholders' know-how and resources.

17.2. It is expected that PDM/PLM Solution Providers provide a detailed description of the Stakeholders' resources needed to support this project. This does not only include a number of FTEs, but a detailed split of Types of resources (business or IT, maybe even specific background like logistics)

(a) Necessary experiences and skills that the staff is supposed to have

(b) Time the resources are needed (e.g., “during design phase and acceptance test”)

(c) Level of commitment required

17.3. PLM solution will have to be implemented in four geographic locations and for his purpose, it will be necessary to travel between Mumbai, New Delhi, Kolkata and the Hosting location, (Bengaluru). For AMC during the guarantee period of the ships, the geographical location of the deployment of the ships will be known only after commission of the ships. However, ship will be available for AMC activities either at the East Coast (under HQ ENC) or West Coast (or HQ WNC).

18. OPERATIONS AND MAINTENANCE

18.1. The PDM/PLM Solution Provider shall operate and maintain the solution on the provided infrastructure. It is the sole responsibility of the PDM/PLM Solution Provider to maintain and evolve the system so that it stays aligned with IT standards and national (Indian) laws. The detailed SoPs shall be provided for testing and applying the upgrades.The activities in charge to PDM/PLM Solution Provider are the following:

(a) Regular release updates 2nd and 3rd level problem and incident management

(b) Corrective maintenance and bug fixing

(c) Security tests and no regression tests

18.2. PDM/PLM Solution Provider will provide as part of the implementation a period of post-go live support after each wave. After this period the solution will be subject to standard maintenance activities. In this steady state PDM/PLM Solution Provider will provide the service desk for second and third level support (while the first level is managed by the Stakeholders). First level support will resolve as many as possible of the support requests. The Stakeholders will require PDM/PLM Solution Providers to agree in the final contract some specific SLAs. PDM/PLM Solution Provider shall make available both a service manager in Mumbai and supporting teams based in Mumbai, Kolkata and New Delhi: all of them English speaking. The service manager will be the main point of contact for the Stakeholders management while the solution will be in place.

18.3. The Stakeholders require PDM/PLM Solution Providers to provide regular reports about number of tickets, severity and solution times, and SLA compliance. The operations & maintenance solution proposed by PDM/PLM Solution Providers should detail the support organization, tools, escalation models, processes, turnover management, support maintenance, governance and handover approach, lessons learned and knowledge/ document management. A description and guideline for each of these elements are reported below:

(a) Support organization: PDM/PLM Solution Provider must detail the structure of the supporting organization that will be setup for the operations and maintenance activities, including list of known staff, their skills and responsibilities.

(b) Tools: The PLM Solution PDM/PLM Solution Provider shall provide the end-to-end technical instruments / tool to record, track and manage the tickets. Integration with the Stakeholders' ticketing systems is not required, however the Stakeholders' first level support shall have the possibility to insert tickets directly within the PLM PDM/PLM Solution Provider toll, receive updates on the status of the ticket, generate reports, etc.

(c) Escalation models: The escalation steps the support organization will follow have to be detailed. Stakeholders expect the following four levels:

(a) Service desk (when the system is in operation)

(b) Project management level

(c) Steering committee level

(d) Board/CEO level

(d) The last stage of escalation should be reached within 6 weeks at maximum.

(e) Turnover management: The management and procedures of the regular PLM Solution PDM/PLM Solution Provider's resources turnover on both the implementation project and the operations shall be detailed by PDM/PLM Solution Providers (including how the handover is done and the standard timelines).

(f) Support maintenance: PDM/PLM Solution Providers must detail the maintenance support processes and monitoring that will be in place.

(g) Governance & handover approach: The PLM Solution PDM/PLM Solution Provider shall provide the description of the Maintenance / Operations' governance structure. Moreover they shall detail the handover process that needs to be carried out to the Stakeholders' e.g. documentation to be handed over, timelines, availability of PDM/PLM Solution Providers for further questions, etc.

(h) Lessons learned & knowledge/ document management: The PLM Solution PDM/PLM Solution Provider shall document and present on regular basis the lessons learned from the implementation project and the operations of the system in order for the Stakeholders to take appropriate management decisions to improve service delivery. The PLM Solution PDM/PLM Solution Provider shall also provide detailed information on the way they would approach the document management and releasing processes for both the project implementation and the duration of the projects.

18.4. General Terms and Conditions of Maintenance

(a) Bidder has to provide the list of critical spares to be stocked for the smooth running of the VR Centre. The listed spares must be kept as stock at site.

(b) The system shall have to be repaired within a period of 48 hours from the time it is reported.

(c) In case of major breakdown, which require spares other than the stocked spares the system have to be repaired within a period of 120 hours from the time it is reported.

(d) The warranty and AMC will include preventive as well as corrective maintenance.

(e) The scope involves supply and replacement of all parts and components (including spares and consumables) damaged, malfunctioning & defective while operating

(f) Warranty and AMC will include supply of new releases of all software (including third party software).

(g) Warranty and AMC will also include migration of all software licenses in case of the hardware replacement (due to up gradation / replacement of the hardware or due to change in the operating system of the software).

(h) During the warranty and AMC period of Three (3) years, supplier will arrange for servicing and calibration of the display system and projectors quarterly i.e. every three months

(i) In case, during the warranty and AMC period of Three (3) years, there is a major problem in the main hardware like Servers or Storage, Supplier must depute its engineer within 24 hours of reporting through email / fax. This AMC includes all items supplied against this tender including their consumables.

(j) Any spare / replacement of systems required during the warranty and AMC period will be supplied free of cost by the supplier. No charges whatsoever (including customs duty, demurrages, if any, clearance fee/ charges, inland transport charges etc.) will be borne by the stakeholders

(k) Stakeholder will not provide accommodation and local transport to the supplier's maintenance / resident engineers. They shall be totally on Supplier's account.

(l) In case, any third party item is covered by warranty of more than one (1) year, Supplier must pass on the benefit arising out of the same to the stakeholders. However, the responsibility of maintenance will be with the Supplier.

(m)No cannibalization of any system will be permitted for carrying out maintenance services.

(n) Supplier will have to follow the preventive maintenance schedule of all the equipment supplied, during the warranty and AMC period.

(o) Supplier will provide all tools and equipment needed for carrying out the jobs under warranty and AMC.

(p) In case the contractor fails to repair the system during the warranty and AMC period within 48 hours from the time of reporting the breakdown either to the resident engineer or OEM (whichever is the earliest), then:-

(i) A deduction of pro-rata per day rate (AMC rate of corresponding year divided by 365) excluding the allowable period, shall be effected if the system is made operational within first seven (7) days from the time of reporting and

(ii) A deduction of twice the amount of pro-rata per day rate (AMC rate of corresponding year divided by 365) will be effected if the system is made operational beyond the first seven (7) days to the maximum of 30 percent of each item per incident.

(iii) Above deduction will be applicable during warranty period also wherein the pro-rata per day rate will be calculated based on the first year's AMC rate.

(iv) Above deduction will also be applicable for major breakdown if the system is made operational after 120 hours from the time of reporting.

(q) During the period of AMC, in case a new release of application software is launched which requires up gradation of hardware & / or Operating system, the Supplier need to upgrade the hardware, Operating Software as and when required. However the rates for such hardware up gradation will be on actual cost basis to be agreed by stakeholders in advance and the same will be reimbursed by the stakeholders. In such case, Supplier must pass on the benefit arising out of all warranties to the Company. However, the responsibility of maintenance will be with the Supplier.

(r) The downtime of the system would be considered as no service from the resident engineer and hence the deduction / penalty on the resident engineer charges would be levied on the basis explained at above para (22).

(s) In addition if the service engineer fails to be present at stakeholders premise the following penalty / deduction shall be applicable,

(i) A deduction of pro-rata per day rate shall be effected for days of absence of service engineer at stakeholders if the number of days of is up to 2 days per quarter.

(ii) A deduction of twice the pro-rata per day rate shall be effected for days of absence of service engineer at stakeholders if the number of days is more than 2 days per quarter.

(t) Bidders must confirm that Goods, materials or plant(s) to be supplied shall be new of recent make and of the best quality and workmanship and shall be guaranteed for aperiod of twelve months from the date of successful commissioning against any defectsarising from faulty materials, workmanship or design. Defective goods/materials or parts rejected by stakeholders shall be replaced immediately by the supplier at the supplier's expenses at no extra cost to MDL

(u) Monthly maintenance, inspecting any loose, or improper installation/intervention. And check for correct operation of each UPS module, proper labelling of elements of the system as per acceptance sheet. Inspection for operation within manufacturer recommended operating band.

19. **DELIVERABLES FROM THE PLM SOLUTION PROVIDER:** The deliverables from the PLM solution provider is placed at **(Enclosure- 11)** with timelines and certifying authority

20. **WORK COMPLETION CERTIFICATES:**

20.1. Approval of all the deliverables shall be by the Stakeholders. The deliverables shall be certified and WCCs issued as follows:

Sr No	Deliverables	Certifying Authority	WCC issuing authority
1	Common deliverables viz MDC, DRC, Network	IDT	MDL
2	MDL specific deliverables	MDL	MDL
3	GRSE specific deliverables	GRSE	GRSE
4	DND specific deliverables	DND	MDL
5	On board installation and AMC MDL ships	WOT(Mbi)/MDL	MDL
	On board installation and AMC GRSE Ships	WOT(Kol)/GRSE	GRSE
6	Data entry at DND	DND	MDL

21. **DOCUMENTS FROM PLM SOLUTION PROVIDER**

21.1. The PDM/PLM Solution Provider shall submit the following documents along with the technical bid:

(i) Target Process maps for the work flow

(ii) Work flows that are native to the PLM solution being offered

(iii) Proposal for integration of existing software

(iv) List of off-the-shelf functionalities of the software against the requirements specified in the SOW shall be submitted.

(v) Evaluation of integration on the external software licenses / HW upgrades / possible patches with a solution to limit the cost impacts if there is any

(vi) A list of cost elements triggered on the Stakeholders system to fulfill the pre-requisites for the integration of the PLM system

(vii) The plan for implementation of the integration with the Project Planning software (Primavera and MS Project)

(viii) Description of the technical architecture that will enable them to meet the Availability requirements at Para (13.4.14)

(ix) Description of performance levels guaranteed for PLM activities in terms of user sessions along with a list of typical KPIs and related guaranteed items and method to measure KPI.

(x) Details of how the requirements of flexibility is supported by the solution provided indicating the methods for implementation (graphical configuration tool, configuration parameters, coding required (which programming language and process e.g. waterfall vs. agile), etc.

(xi) Description of how integration with new technologies (e.g. 3D scanning, 3D printing, etc.) is going to be considered and included in the future within the proposed PLM Solution

(xii) Description of the archiving concept and the fulfillment of the requirements mentioned under data management.

(xiii) Description of a horizontal and vertical scalability and virtualization

(xiv) Description of flexibility

(xv) Description of Archiving concept

(xvi) Suggested approach of the vendors in the aftersales operations

(xvii) Requirement of hardware for the aftersales implementation of PLM

(xviii) Detailed requirement of hardware required for implementation of PLM including MDC & DR interalia

(xix) Standard maintenance agreements as per questionnaire at Para (13.9.4)

(xx) Standard distribution method of software

(xxi) Test procedure preceding the release of new version of the software with quality certification

(xxii) Compliance statement to security requirements

(xxiii) Review of prioritization of functionalities in the implementation plan aligned with the capabilities of the software

(xxiv) Commitment to the dates of the start of work and also to the key milestones. If not in agreement with TSP , then explanation as to why , in their perspective a different start date is required

(xxv) Detailed plan for each phase of each wave

(xxvi) Alternate approach to Agile cycle if any suggested by the PLM solution provider.

(xxvii) Description of Key user training, detailing the process, the material and the instrument that are going to be used in the training session

(xxviii) Physical and logical network diagram with details of IT security implementation and redundancy, bandwidth requirement calculation

Enclosure-1

TASK LIST AS PER THE SCOPE OF WORK

Note- 1: DND is IHQ MoD(N)/DND(SSG)

Note- 2: D is date of acceptance of the PO by the PLM SSP

Note- 3: The Key user training for 20 users and PLM users training for 50 users for DND include WOT(Mb) & WOT(Kol) reps

TASK NO.	DESCRIPTION	location	Time frame (months)	
			Start	Finish
	NON FUNCTIONAL REQUIREMENTS AT STAKE HOLDER PREMISES			
1	Supply, Install, Test and Commissioning(SITC) of hardware &licensing of PLM software in server & LAN at five(5) locations with one year free warrantee	MDL	D	D+11
2		GRSE		
3		DND		
4		MDC		
5		DR		
	NON FUNCTIONAL REQUIREMENTS ONBOARD SHIPS			
6	Supply, Install, Test and Commissioning(SITC) of hardware &licensing of PLM software onboard 7 ships including training for 20 personnel onboard with one year free warrantee	MDL-1	Feb 22	May 22
7		MDL -2	Aug 22	Nov 22
8		MDL -3	Aug 23	Nov 23
9		MDL -4	Aug 24	Nov 24
10		GRSE-1	Feb 23	May 23
11		GRSE-2	Feb 24	May 24
12		GRSE-3	Feb 25	May 25
	WAN CONNECTIVITY FOR PLM			
13	Establishing P2P WAN wired connectivity including hardware and software connecting five locations with one year free warrantee	MDL	D	D+3
14		GRSE		
15		DND		
16		MDC		
17		DR		
	LAN CONNECTIVITY FOR PLM			
18	Establishing LAN connectivity including hardware and software	MDL	D	D+3

19	independently at three locations with one year free warrantee	GRSE		
20		DND		
21		DR		
	SECURITY FEATURES			
22	Submission of Security Document indicating the security configuration in line with the Tender document for the entire connectivity for WAN and LAN for approval by MDL, DND & GRSE	MDL	D	D+2
23		GRSE		
24		DND		
25		MDC		
26		DR		
27	Implementation and Configuration of the Security requirements at the five locations as per the Security document approved by MDL, DND & GRSE	MDL	D	D+6
28		GRSE		
29		DND		
30		MDC		
31		DR		
	FUNCTIONAL REQUIREMENTS WAVE-1			
32	PLM Basic customization for the entire FR targets	MDL	D	D+11
33	PLM Basic customization for the entire FR targets	GRSE		
34	PLM Basic customization for the entire FR targets	DND		
35	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-1** , (including release preparation, technical testing, key user training (50 users), gap identification, definition of target for next release, customization & Integration (gap resolution))	MDL		
36	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-1** , (including release preparation, technical testing, key user training(50 users), gap identification, definition of target for next release, customization & Integration (gap resolution))	GRSE		
37	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-1** , (including release preparation, technical testing, key user Training(20 users), gap identification, definition of target for next release, customization & Integration (gap resolution))	DND		
38	Integration with complete Legacy systems at Wave-1	MDL		

39	Integration with complete Legacy systems at Wave-1	GRSE		
40	Integration with complete Legacy systems at Wave-1	DND		
41	Data Migration for the complete Project at **Wave-1**	MDL		
42	Data Migration for the complete Project at **Wave-1**	GRSE		
43	Data Migration for the complete Project at **Wave-1**	DND		
44	PLM users(100 nos) Training in **Wave-1**	MDL		
45	PLM users (100 nos) Training in **Wave-1**	GRSE		
46	PLM users(50 nos) Training in **Wave-1**	DND		
47	Roll out and change management for **Wave-1**	MDL		
48	Roll out and change management for **Wave-1**	GRSE		
49	Roll out and change management for **Wave-1**	DND		
	FUNCTIONAL REQUIREMENTS WAVE -2			
50	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-2** , (including release preparation, technical testing, key user training (50 users), gap identification, definition of target for next release, customization & Integration (gap resolution))	MDL	D+11	D+17
51	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-2** , (including release preparation, technical testing, key user training (50 users), gap identification, definition of target for next release, customization & Integration (gap resolution))	GRSE		
52	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-2** , (including release preparation, technical testing, key user training(20 users), gap identification, definition of target for next release, customization & Integration (gap resolution))	DND		
53	PLM users(100 nos) Training in **Wave-2**	MDL		
54	PLM users(100 nos) Training in **Wave-2**	GRSE		
55	PLM users(50 nos) Training in **Wave-2**	DND		
56	Roll out and change management for **Wave-2**	MDL		
57	Roll out and change management for **Wave-2**	GRSE		
58	Roll out and change management for **Wave-2**	DND		
	FUNCTIONAL REQUIREMENTS WAVE -3			

59	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-3** , (including release preparation, technical testing, key user training (50 users),, gap identification, definition of target for next release, customization & Integration (gap resolution))	MDL	D+17	D+23
60	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-3** , (including release preparation, technical testing, key user training (50 users),, gap identification, definition of target for next release, customization & Integration (gap resolution))	GRSE		
61	Solution Blue printing, Development and Testing for all the Process flows defined in **Wave-3** , (including release preparation, technical testing, key user training (20 nos), gap identification, definition of target for next release, customization & Integration (gap resolution))	DND		
62	PLM users (100 nos) Training in **Wave-3**	MDL		
63	PLM users (100 nos) Training in **Wave-3**	GRSE		
64	PLM users(50 nos) Training in **Wave-3**	DND		
65	Roll out and change management for **Wave-3**	MDL		
66	Roll out and change management for **Wave-3**	GRSE		
67	Roll out and change management for **Wave-3**	DND		
	ANNUAL MAINTENANCE			
68	Annual Maintenance Contract for PLM Software and licence (Non-functional Requirements) (post one year free warrantee after wave 3)	MDL	D+35	Feb 2025
69		GRSE		Aug 2025
70		DND		Aug 2025
71		MDC		Aug 2025
72		DR		Aug 2025
73	Annual Maintenance Contract for PLM Hardware(Non-functional Requirements) (post one year free warrantee)	MDL	D+23	Feb 2025
74		GRSE		Aug 2025
75		DND		Aug 2025
76		MDC		Aug 2025
77		DR		Aug 2025
78	Annual Maintenance Contract for WAN Connectivity including hardware	MDL	D+15	Feb 2025
79		GRSE		Aug 2025

80	and software (post one year free warrantee)	DND		Aug 2025
81		MDC		Aug 2025
82		DR		Aug 2025
83	Annual Maintenance Contract for LAN Connectivity including hardware and software(post one year free warrantee)	MDL	D+15	Feb 2025
84		GRSE		Aug 2025
85		DND		Aug 2025
86		DR		Aug 2025
87	Annual Maintenance Contract On-board ships beyond Delivery **(OPTIONAL Indian Navy Order)**	MDL-1	Aug 23	Aug 24
88		MDL -2	Feb 24	Feb 25
89		MDL -3	Feb 25	Feb 26
90		MDL -4	Feb 26	Feb 27
91		GRSE-1	Aug 24	Aug 25
92		GRSE-2	Aug 25	Aug 26
93		GRSE-3	Aug 26	Aug 27
	INTEGRATION ON- BOARD SHIPS			
94	Integration with the existing systems on-board, migration of legacy data and training on-board (OPTIONAL Indian Navy Order)	MDL-1	Feb 22	May 22
95		MDL -2	Aug 22	Nov 22
96		MDL -3	Aug 23	Nov 23
97		MDL -4	Aug 24	Nov 24
98		GRSE-1	Feb 23	May 23
99		GRSE-2	Feb 24	May 24
100		GRSE-3	Feb 25	May 25
	DATA ENTRY			
101	Positioning Personnel for Data entry and entering of data in the PLM environment as required	MDL	D+11	D+35
102		GRSE	D+11	D+35
103		DND	D+11	D+35

ENCLOSURE-2

KEY IC PROCESSES

1. Pre-contract phase

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
IC01	**Pre-contract**	Initiate the contract creation between company & customer; preparation of the draft document
IC02	**Pre-contract**	Execute feasibility studies for vessel geometry, general arrangement, top deck layout, weight estimation, performance characteristics and choice of main platform features
IC03	**Pre-contract**	Investigate information of past projects for data on lead time, costs and Supplier data for similar projects
IC04	**Pre-contract**	Execute the contract and terms & conditions
IC05	**Pre-contract**	Create level 1st level General Integrated Job Plan (GIJP)– Master Phasing Plan (MPP) for general planning of the whole project, reporting all of its essential milestones including, in particular, the work start, keel laying, launch and delivery dates
IC06	**Pre-contract**	Create the 1st level General Integrated Job Plan (GIJP) - Job Target Plan to report, for every zone of the ship the stages/appointments preparatory to the start of production activities (Ship Target)
IC07	**Pre-contract**	Create a Quality Assurance Plan for the project
IC08	**Pre-contract**	Create the Risk Management Plan detailing the risks from the incomplete definition of technical, contractual and cost configuration
IC09	**Pre-contract**	On approval of the contract, the tendering process for major equipment (which are unique & large items that have a huge lead time) is initiated
IC10	**Pre-contract**	Definition of PBS, WBS and OBS structure for the project

Table 1: IC processes for the Pre-Contract phase

2. Basic/ Functional Design phase

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
IC11	**Basic/ Functional Design**	Analyse and categorise contractual requirements - collect, process and structure all the requirement typologies
IC12	**Basic/ Functional Design**	Refine the 1st level (GIJP) - Master Phasing Plan & Job Target
IC13	**Basic/ Functional Design**	Formulate 2nd level PGIC, which represents the synthesis of all the activities of the design plan, of the purchases and of the plant
IC14	**Basic/ Functional Design**	Formulate service negotiation document to endorse commitments concerning the achievement of explicit and agreed targets - costs, times, performance and quality levels - between the PM and the key technical functions (Functional Design, Procurement, Production)
IC15	**Basic/ Functional Design**	Formulate level 3rd level (GIJP) which integrates detailed plan of Design, Purchase and Production departments
IC16	**Basic/ Functional Design**	Create a Main-Minor items planning list, subdivided by the PBS, of most important equipment that needs to be installed on board
IC17	**Basic/ Functional Design**	Execute design/models for basic and functional design: - Hull shape definition - Issue of watertight subdivision, tank plan & capacities - Power predictions - Hydrostatics and stability - Sea keeping study - Propeller design - Maneuverability studies - General arrangement - Weight estimation* - Preliminary electric power balance - Prelim fluid balance - Ship main auxiliaries systems definition - Functional calculation of auxiliary machinery - Guidance layout drawings pertaining to hull, engineering, electrical & weapons system

		*Includes activity to search and retrieve weight-related data from a historical database. Allow filtering by project, block/ module, type of ship, PBS group, type of document

Table 2: IC processes for the Basic and Functional design phases

3. Detailed Design phase

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
IC18	**Detailed Design**	Create PTS document
IC19	**Detailed Design**	Setup of the pre-outfitting process to help define correct outfitting sequence of every unit of the ship
IC20	**Detailed Design**	Detailed design: Create 3D Model
IC21	**Detailed Design**	Tender for the equipment i) Setup: Budgeting, planning, procurement support ii) Tendering: Accuracy, validation, approval & submission iii) Bid evaluation: TNC, CNC, negotiation, approval & PO creation
IC22	**Detailed Design**	Tender for services i) Setup: Budgeting, planning, procurement support ii) Tendering: Accuracy, validation, approval & submission iii) Bid evaluation: TNC, CNC, negotiation, approval & PO creation
IC23	**Detailed Design**	Detailed design: Create 2D Drawings
IC24	**Detailed Design**	Send cluster of design output to planning
IC25	**Detailed Design**	Review indicators of design output i) Document showing number of drawings issued & not issued ii) Ship silhouettes showing progress of documents iii) Curves/ charts indicating released amount respect to expected one
IC26	**Detailed Design**	Manage revisions and modifications to existing requirements: Structured change mgmt. procedure is executed within the system (change request, notification, execution, approval, closure) to record revisions and changes
IC27	**Detailed Design**	Create EBOM

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
		- Procurement related: Min – Max BOM (re-order point / amount to order), Marked material BOM, Stock BOM - Production related: Pallet BOM
IC28	**Detailed Design**	Initiate palletisation: Pallets need to be issued along with the drawings to list materials (for warehouse) and labour effort required to perform installation activities on board for specific block / ship zone
IC29	**Detailed Design**	Create procurement plan
IC30	**Detailed Design**	Setup of project management team comprising of a Project Manager, Lead Project Engineer, Project Controller, Coordinator for Purchases, Work Package Manager
IC31	**Detailed Design**	Setup ESWBS for the project and outline the activities with the dates. The following activities need to be executed to: i) Target definition showing the dates, for every zone/ring (as part of the ship target plan) ii) Master Phasing Plan indicating the contractual milestones that represents the principal aims iii) Shop programs defining the shop budget iv) General Integrated Job Plan integrating programs of several functions and shops to verify the coherence of timelines (Each division creates their own individual plans & needs to be integratedby project planner to create the ship / job target plan)
IC32	**Detailed Design**	Create procurement schedule/ procurement plan - A procurement plan needs to be created that tracks all procurement with timelines, and are linked with document release or TSP timelines release - Key items of the procurement plan are created form the detailed target plan after contract is signed
IC33	**Detailed Design**	Material to phase mapping: All the ship materials listed in PBS are linked to the appropriate phase of the shipbuilding process much in advance
IC34	**Detailed Design**	Multiple reviews to track progress of project: i) Job Progress Reviews periodically verify the condition of the activities in progress at that date

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
		ii) Design Reviews verify the quality of technical content and takes into account entire design process iii) Phase Reviews verify the job development plans to manage its realization process for complete shipbuilding

Table 3: IC processes for the Detailed Design phase

4. Production phase

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
IC35	**Production**	Receive equipment, inspect equipment & update quantity in system
IC36	**Production**	Execute invoicing & payments: i) Material receipt ii) Stage inspection iii) Invoice receipt iv) Verification & payments
IC37	**Production**	Invoicing (Supplier invoice receipts) & payments: i) Invoice receipt ii) Verification & payments
IC38	**Production**	Setup of the COP (Control of Production) department: Production control is independently executed by the COP dept. & controls a large number of IC activities. A production execution schedule (based on the master schedule plan) is followed and coupons are created for activities
IC39	**Production**	Generate production order
IC40	**Production**	Create material reservation slip
IC41	**Production**	Detail the erection schedule & feedback to design
IC42	**Production**	Manpower planning: i) Detailed budgeting and tracking of man-hours for internal and service contract activities at ship unit level is done ii) Work completed is recognized on regular basis

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
IC43	**Production**	Productivity control to measure productivity of workers
IC44	**Production**	Update materials consumption
IC45	**Production**	Withdraw material after approval from shop and update the system
IC46	**Production**	Shipyards can procure minor supply items and other items in case of specific emergency/ extraordinary events even during the production phase and not only the trial phase
IC47	**Production**	Execute pre-assembly and pre-outfitting
IC48	**Production**	Execute activities for laying, assembly and launch
IC49	**Production**	Execute production assembly and outfitting activities
IC50	**Production**	Execute stage inspection
IC51	**Production**	Execute inspections, harbour trials and report update
IC52	**Production**	Establish ISO definition and quality management system
IC53	**Production**	Record final weight
IC54	**Production**	Close work order for cutting & forming
IC55	**Production**	Close work order for assembly
IC56	**Production**	Close production order
IC57	**Production**	Close activity in WBS (ESWBS)
IC58	**Production**	Commissioning of the ship: - Includes storing of weight-related, design data, planning data, ESWBS data etc. into historical database
IC59	**Production**	Delivery: Document distribution Management Documents that need to be handed over during trial (to surveillance agencies) and commissioning (navy and other naval agencies)
IC60	**Production**	Manage account receivables (post delivery of ship to the client)

Table 4: IC processes for the Production phase

5. Across phases

S. No.	Shipbuilding lifecycle phase	Key integrated construction process
IC62	**Across phases**	MOD (Modification requested by the customer): - New requests that are raised by the customer - Based on input, design prepares the budgetary quote (with data from production & procurement) - On approval, the entire process of planning, production & quality is executed again
IC63	**Across phases**	Design Standard: The use of design standard for outfitting in combination with special order convention based on standardized material assure best price and just in time availability
IC64	**Across phases**	Weight management: i) Input weight, coordinates for centre of gravity, design margins, block number, allocation ratios, flag for weight category for each PBS item, allowing to choose which source of data to use ii) Store weight-related data into PLM recorded from CAD interface with modelling software, functional drawings and e procurement interface with offers from Suppliers

Table 5: Cross phases IC processes

MAPPING OF IC PROCESSES IN CURRENT SYSTEM

1 NON-FUNCTIONAL REQUIREMENTS AS- IS ASSESSMENT

1.1 MDL

1.1.1 *Infrastructure and Non-Functional As-Is analysis –MDL*

Infrastructure Details	As-Is assessment
Hosting	Primary DCs – on-premises hosting within MDL in Mumbai (Tier 2) • One data centre supporting the ERP and Central IT applications • One data centre supporting the Design applications Disaster Recovery (only for ERP and Central IT): • Local: backup site on-premises within MDL (different building from primary one) (Tier 2) • Geographical: outsourced to ITI Bengaluru (Tier 2)
Infrastructure	• Standard rack mounted servers (X86) with systems running on physical machines, no virtualization used • No cloud infrastructure used
Operating Systems	Various versions of Linux and Microsoft Windows Servers are in use on the server side. Clients are all Microsoft Windows
Databases	• Oracle • IBM DB2 • Microsoft SQL Server
User Authenticatio	Fully based on Microsoft Active Directory

Main Business application supported	The main application used by the business are: Aveva Marine (CAD), SAP, Primavera, e-Procure, Weight Management tool and MS Office • Applications are not integrated on real-time with each other; integration is either manual or offline (via flat file transfer) • Design applications are not integrated with Aveva Marine; the integration is offline data is transferred via flat files
Network	• Local LAN connectivity • MPLS connection for Data, Voice and Video between MDL and DND for the purposes of projects not related with P17A • No wireless is used across the organization • Systems are not accessible from outside MDL (No internet\ VPN access)
Security	• Back up on a daily basis • Data encryption exists for current applications

1.1.2 *As-Is Application mapping to business processes – MDL*

	Project Phase	Key Business Process	Departments involved	Supporting IT systems	Comments
1	Pre-Contract & Contract Approval	Contract create & approve	Project Management Team	Creation: MS Word Storage: DMS Server (no version control)	All approvals are offline
2		Procurement: Estimations based on historic data	Procurement		Research done on paper files and historic computer records
3		Finance: Finalize contract terms	Finance		

	Project Phase	Key Business Process	Departments involved	Supporting IT systems	Comments
4		Quality Assurance Plan for	Quality		
5		On contract approval: Procurement: Tendering for major equipment	Procurement	Creation: SAP MM modul e Procurement tool	Tenders are raised in e Procurement Tool
6	Basic Design	Executed by DND	DND		
7	Functional Design	Executed by DND	DND		
8	Detailed Design	Create TSP document	Design	Creation: MS Word	
9		Create 2D drawings	Design	Creation: Aveva Marine CAD & supporting integrated applications Storage: DMS Server (no version control)	The supporting applications are not integrated with Aveva Marine
10		Create 3D models	Design		
11		Cluster of Production	Design		
12		Create EBOM	Design		
13	Production	Tendering for equipment	Procurement	Creation: SAP MM module, MS Excel file Bidding platform: e Procurement Storage: DMS Server (no version control)	
14		Bid evaluation & vendor selection (for equipment)	Procurement		
15		Tendering for services	OTS		
16		Bid evaluation & vendor selection (for services)	OTS		

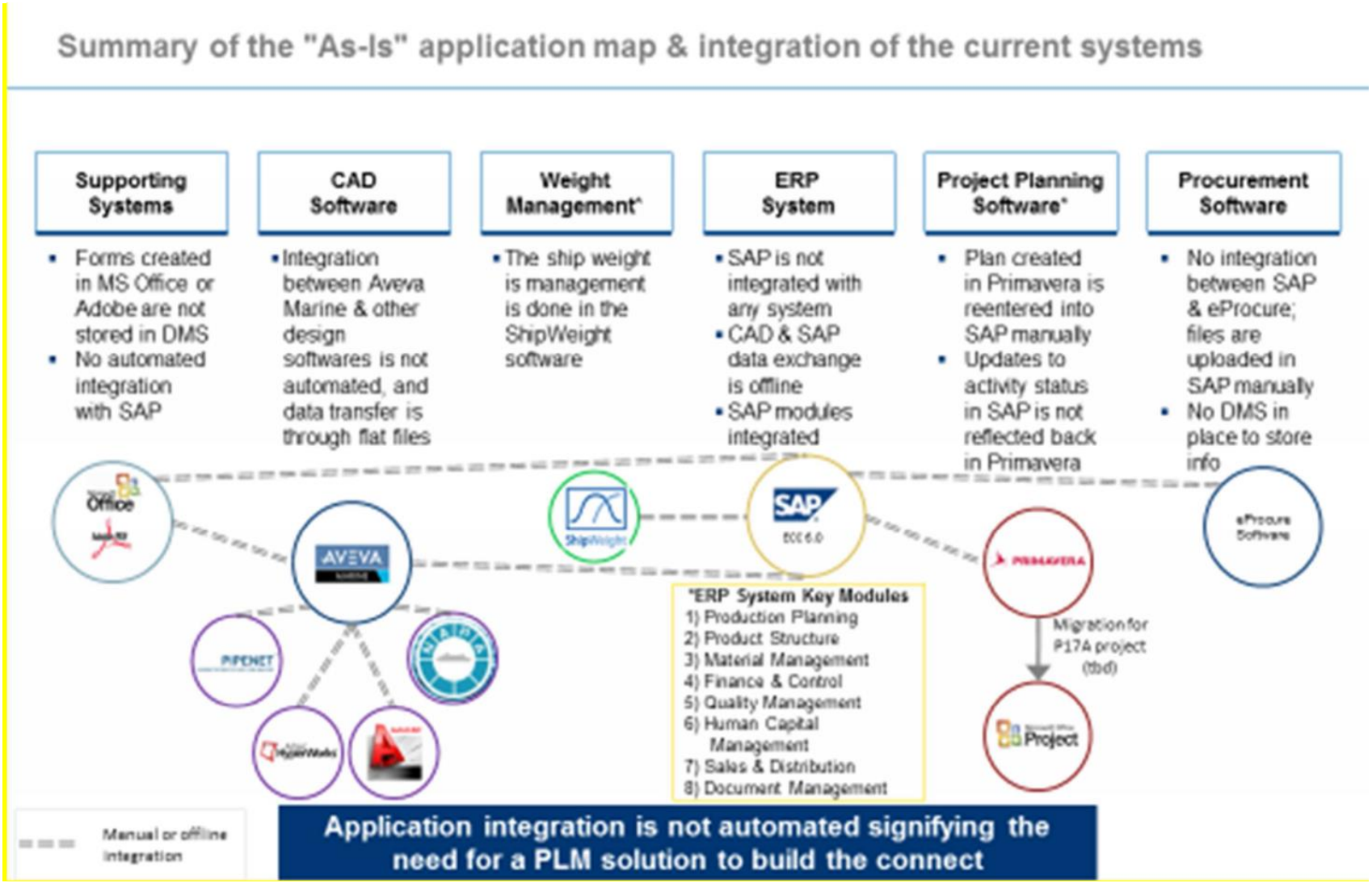
	Project Phase	Key Business Process	Departments involved	Supporting IT systems	Comments
17		PERT or project structure definition	Planning	Creation: Primavera Transfer to: SAP PP Module	The plan is again updated manually into SAP after creation in Primavera
18		Create procurement schedule	Planning	Creation: MS Excel	Not in SAP
19		Inspection Stores: Equipment receipt	Stores	Creation: SAP MM Module	
20		Inspection Stores: Equipment inspection	Stores		
21		Inspection Stores: Equipment	Stores		
22		Procurement & Finance:	Finance & Stores	Creation: SAP MM & FICO Modules	
23		Finance: Invoicing (vendor invoice receipts) & payments	Finance & vendors		
24		Generate production order	Planning	Creation: SAP PP Module	
25		Create material reservation	Planning		

	Project Phase	Key Business Process	Departments involved	Supporting IT systems	Comments
26		PSC: Create production execution schedule	PSC (Planning)	Creation: MS Project	
27	Production	Detail the erection schedule	Planning & Production	Creation: SAP MM & PP Modules	
28		Manpower planning	Planning	Creation: SAP MM & PP Modules	
29		Materials consumption	Planning		
30		Berth & shops: Execute the	Berths & Shops	Creation: SAP PP, HR, PS, FICO Modules	
31		Stores: Material withdrawal & system update	Stores		
32		Quality: Stage inspection	Quality	Creation: SAP PP Module, SAP QA Module (not used)	QA module exists but is not used
33		Quality (& WOT / external agencies): Inspection, harbour trials & Inspection		Creation: MS Word	There are many templates & checklists created in MS Word
34		ISO definition & QMS (quality management systems)			

	Project Phase	Key Business Process	Departments involved	Supporting IT systems	Comments
35		Planning & Quality: Final weight recording	Planning & Quality	Creation: SAP Weight Management Module & Ship Weight tool	Weight is entered into SAP and then transferred to Ship Weight for analysis & reporting purposes
36		Planning & Quality: Close work order for cutting & forming	Planning & Quality	Creation: SAP PP Module	
37		Planning & Quality: Close work order for assembly	Planning & Quality	Creation: SAP PP Module	
38		Production: Close production order	Production	Creation: SAP PP Module	
39		Planning: Close activity in PERT	Planning	Creation: SAP PS Module	
40		Planning: Close activity in progress monitoring xls		Creation: Primavera Storage: DMS Server	
41		Finance: Account receivables (post delivery of ship to the client)	Finance	Creation: SAP SD Module, MS Excel	

	Project Phase	Key Business Process	Departments involved	Supporting IT systems	Comments
42	After Sales	Handover document - Distribution Management	Design	Creation: In following format: .DOC .PDF .Excel .CAL .PPT (These are all hard copies / IETM – Interactive Electronic Technical Manual documents) Storage: Local	
43		Maintenance & Support			
44	Change Management	MOD (Modifications requested by customer)	Design & Production departments		Is setup across the ship building process to accommodate client change requests / modifications

1.1.2.1 As-Is application map & integration with current systems - MDL



1.2 DND

1.2.1 *Infrastructure and Non-Functional As-Is analysis –MDL*

Infrastructure	As-Is assessment
Hosting	Primary DCs – on-premises hosting within DND in Delhi Disaster Recovery: N/A
Infrastructure	• Standard rack mounted servers (X86) with systems running on physical machines, no virtualization used. • No cloud infrastructure used
Server Operating Systems	Microsoft Windows 2003 Enterprise Edition
Databases	Microsoft SQL Server
User Authentication	Fully based on Microsoft Active Directory
Main Business application supported	The main application used by the business are: Tribon (CAD), SHIP EDF (Electromagnetic features), Pipenet (pipe flow analysis), ANSYS (FEM analysis), Altair Hypermesh (Heavy duty calculations for ex. Explosions etc.), Napa • Design applications are not integrated with Aveva Marine; the integration is offline data is transferred via flat files

Network	• Dated local LAN connectivity hat is planned to be upgraded • Separate MPLS connection for Data, Voice and Video between MDL and DND for the purposes of projects not related with P17A • Separate MPLS connection for Data, Voice and Video between GRSE and DND for the purposes of projects not related with P17A • No wireless is used across the organization • Systems are not accessible from outside DND (No internet \ VPN access)
Security	Back up on a daily basis Data encryption exists for current applications

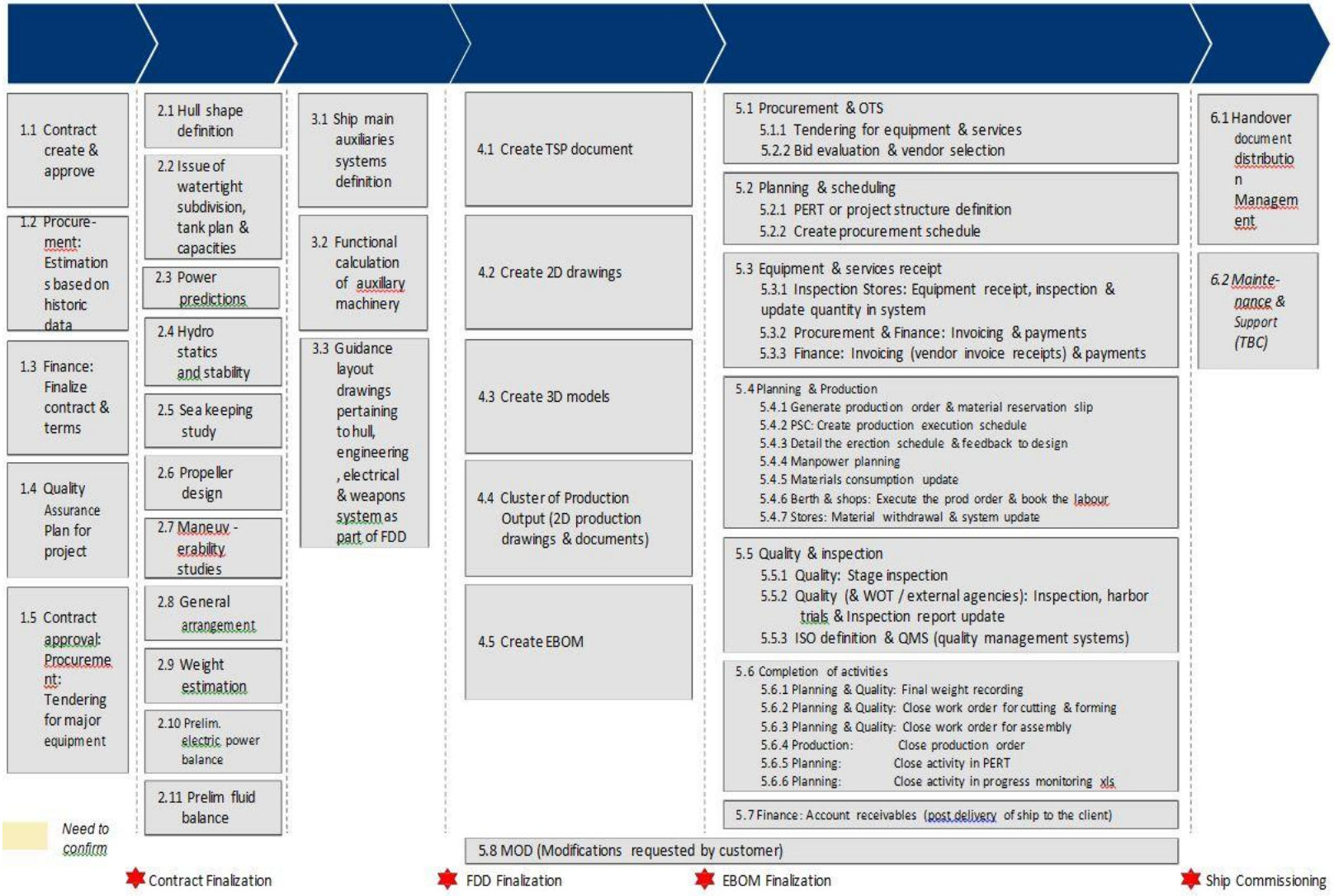
1.2.2 *As-Is Application mapping to business processes for DND – (Design Phases Only)*

S. No.	Project Phase	Key Business Process	Departments Involved	Supporting IT Systems	Comments
1	Basic Design	Hull shape definition	DND	Creation: Napa, Tribon Storage: Local storage	
2		Issue of watertight subdivision, tank plan & capacities			
3		Power predictions			
4		Hydro statics and stability			
5		Sea keeping study			
6		Propeller design			
7		Maneuverability studies			
8		General arrangement		Creation: Tribon	

9		Weight estimation	Design Teams	Creation: Excel Storage: Local Storage	
10	Functional Design	Preliminary electric power balance		Creation: Excel Storage: Local Storage	
11		Ship main auxiliaries systems		Creation: Napa, Tribon	
12		Functional calculation of auxiliary machinery			
13		Guidance layout drawings pertaining to hull, engineering, electrical & weapons system as part of FDD		Creation: AutoCAD, MS Office Storage: local storage	

2 Functional requirements: as-is assessment

2.1 As-is assessment: High level shipbuilding approach and process steps supporting each step



1.2 List of existing (PLM) functionalities and supporting systems

Backup: list of existing functionalities

Only 15 out of 114 functionalities are currently available

Macro PLM requirements	Detailed PLM requirements	Current coverage
Workflow and collaboration	To store drawings in various formats (pdf; tif; hpg; office formats ...)	Aveva Marine, SAP
	To attribute ownership and ability to change ownership	SAP, Aveva Marine
	To manage different authorizations rules in document access	SAP
	To print different document formats (TIF; HPG; PDF; Office ...)	SAP
	To manage high configurability of the information (high resolution)	Aveva Marine
	To manage compression of format files	SAP
	To output stamp certification about the originality of document and manage info in the stamp	Aveva Marine
Project & Planning Management	Management of different product views, based on users category and privileges	Aveva Marine
	Manage and track data ownership changes and related privileges	SAP, Aveva Marine
	To create, review and report BOMs including changes propagation	SAP
	To manage BOMs for group of sister ships (Series of Ships)	SAP
	To manage Massive Upload of BOMS	SAP
	To manage change for BOMs in Series or single BOM	SAP
Document Management	Project management application should support resource allocation for different tasks	Primavera/ MS project
	For each Events/activities/ deliverables shall be associated several fields of durations and dates	Primavera

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1.3 As-is assessment: Differences between MDL and GRSE (Key Processes)

There are certain differences between the MDL and GRSE processes which will need to be factored in the final solution. Some of these processes may need to be harmonized during the PLM implementation to ensure data consistency. The table below gives a few illustrations on the differences between MDL & GRSE.

Component Sub-Section	MDL Approach	GRSE Approach	Key Insights & Implications
Project Management Team	PMT exists for the project (project focused approach)	No PMT exists for the project; department heads responsible	Access management: Roles and access definition to be different in PLM
Project Planning	Primavera[1] used for planning & the plan is then manually updated in the SAP PP Module	No project planning software[1] used; plan is created directly in the SAP PS Module	Impact on requirement definition - planning tool integration with PLM, and in turn PLM integration with SAP
WBS Definition	Maintained at level 6 of WBS definition	Maintained at level 4 of WBS definition	WBS information across companies needs to be on the same level
Procurement Schedule & Material Code Definition[2]	Procurement managed in MS excel; 18-digit material code is maintained	Procurement managed in SAP; 12-digit material code is maintained	Procurement schedule needs to be aligned to be entered in SAP GRSE to use the field "Old material no" to map to MDL material code
Procurement indents & creation of material reservation slip	Created primarily by planning	Procurement indents are raised by design; Material reservation slip primarily created by production	Workflows for procurement and material reservation will be different in PLM

2.2 GRSE

2.2.1 *Infrastructure and Non-Functional As-Is analysis – GRSE*

Infrastructure Details	As-Is assessment
Hosting	Primary DCs – on-premises hosting within GRSE in Kolkata (Tier 2) Disaster Recovery (only for ERP and Central IT, excludes Design software): • Local: backup servers exist in the same location (Tier 2) • Geographical: outsourced Crtl-S in Mumbai (Tier 2)
Infrastructure	• Standard rack mounted servers (X86) with systems running on physical machines, no virtualization used. • No cloud infrastructure used
Operating Systems	Various versions of Linux Suse and Microsoft Windows Servers are in use on the server side. Clients are all Microsoft Windows
Databases	• Oracle 10g
User Authenticatio	Fully based on Microsoft Active Directory
Main Business application supported	The main application used by the business are: Aveva Marine (CAD), SAP, MS Project, e- Procure, Weight Management tool and MS Office • Applications are not integrated on real-time with each other; integration is either manual or offline (via flat file transfer) • Design applications are not integrated with Aveva Marine; the integration is offline data is transferred via flat files
Network	• Local LAN connectivity • MPLS connection for Data, Voice and Video between GRSE and DND for the purposes of projects not related with P17A • No wireless is used across the organization • Systems are not accessible from outside GRSE (No internet \ VPN
Security	• Back up on a daily basis • Data encryption exists for current applications

2.2.2 *As-Is Application mapping to business processes – GRSE*

S. No.	Project Phase	Key Business Process	Departments	Supporting IT	Comments
1	Pre-Contract & Contract Approval	Contract create & approve	PM and heads of relevant divisions	Creation: MS Word Storage: DMS Server (no version control)	All approvals are offline
2		Procurement: Estimations based on historic data	Procurement		Research done on paper files and historic computer records
3		Finance: Finalize contract terms	Finance		
4		Quality Assurance Plan for project	Quality		
5		On contract approval: Procurement: Tendering for major equipment	Procurement	Creation: SAP MM module e Procurement tool	Tenders are raised in e-Procurement Tool
6	Basic Design	Executed by DND	DND		
7	Functional Design	Executed by DND	DND		
8	Detailed Design	Executed by MDL	MDL		
9		Tendering for equipment	Procurement	Creation:	

S. No.	Project Phase	Key Business Process	Departments	Supporting IT	Comments
10	Production	Bid evaluation & vendor selection	Procurement	SAP MM module, MS Excel file Bidding platform: eProcuremen	
11		Tendering for services	OTS		
12		Bid evaluation & vendor selection (for services)	OTS		
13		PERT or project structure definition	Planning	Creation: SAP PS Module	There is project management tool implemented in GRSE
14		Create procurement	Planning	Creation: SAP	No excel used
15		Inspection Stores: Equipment	Stores	Creation: SAP	
16		Inspection Stores: Equipment inspection	Stores	MM Module	
17		Inspection Stores: Equipment	Stores		
18		Procurement & Finance: Invoicing	Finance & Stores	Creation: SAP MM & FICO Modules	
19		Finance: Invoicing (vendor invoice receipts) &	Finance & vendors		
20		Generate production order	Planning	Creation: SAP PP Module	
21		Create material reservation slip	Production & Planning		
22		PSC: Create production execution	PSC (Planning)	Creation: MS Project	

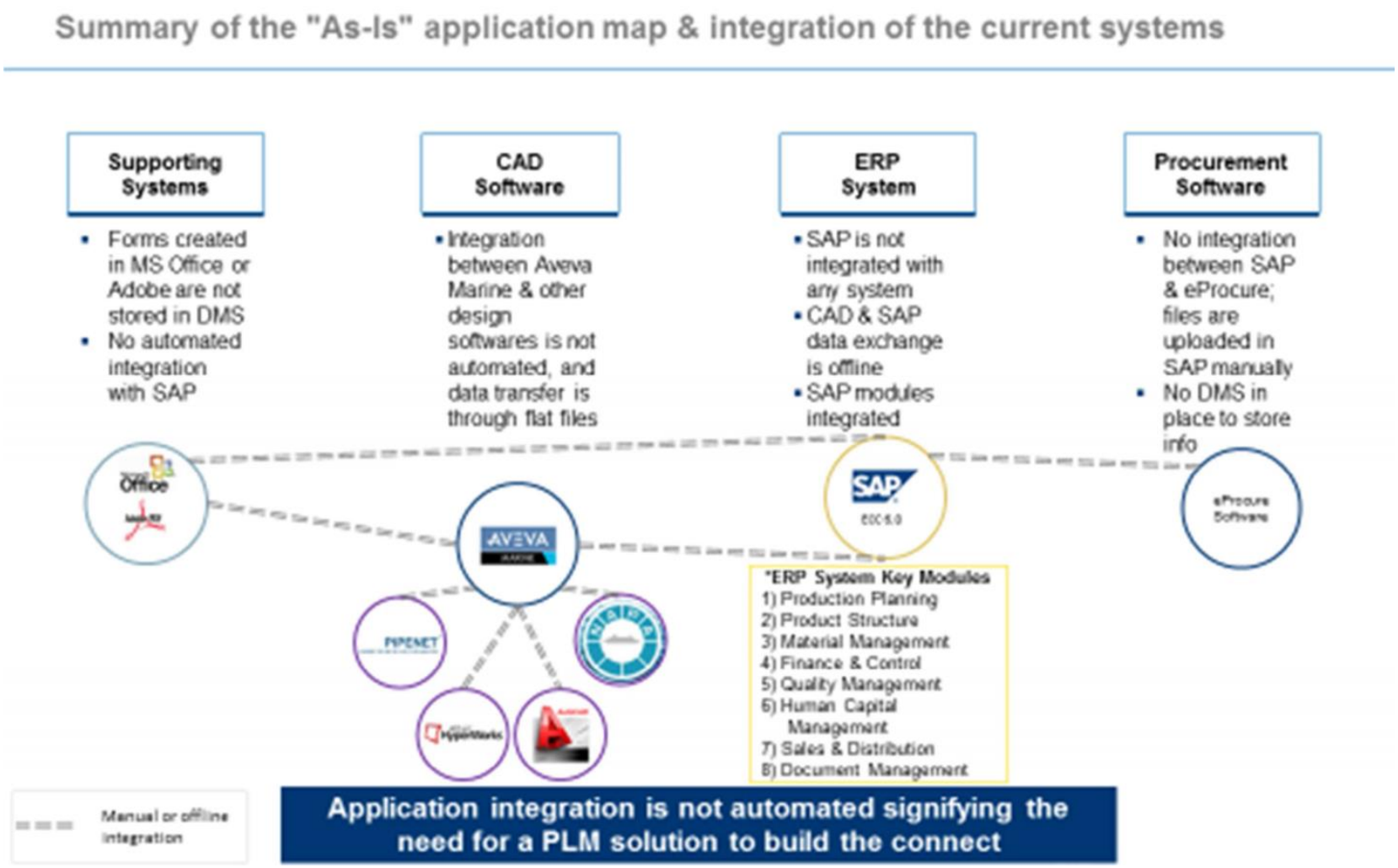
S. No.	Project Phase	Key Business Process	Departments	Supporting IT	Comments
23	Production	Detail the erection schedule & feedback to	Planning & Production	Creation: SAP MM & PP Modules	
24		Manpower planning	Planning	Creation: SAP MM & PP Modules	
25		Materials consumption update	Planning		
26		Berth & shops: Execute the prod order & book the labor	Berths & Shops	Creation: SAP PP, HR, PS, FICO Modules	
27		Stores: Material withdrawal & system update	Stores		
28		Quality: Stage inspection	Quality	Creation: SAP PP Module, SAP QA Module (not used)	QA module exists but is not used
29		Quality (& WOT / external agencies): Inspection, harbour trials & Inspection report update		Creation: MS Word	There are many templates & checklists created in MS Word
30		ISO definition & QMS (quality			

S. No.	Project Phase	Key Business Process	Departments	Supporting IT	Comments
31		Planning & Quality: Final weight recording	Planning & Quality	Creation: SAP Weight Management Module	Weight is entered into SAP; GRSE does not use the tool ship weight
32		Planning & Quality: Close work order for cutting & forming	Planning & Quality	Creation: SAP PP Module	
33	Production	Planning & Quality: Close work order for assembly	Planning & Quality	Creation: SAP PP Module	
34		Production: Close production	Production	Creation: SAP PP Module	
35		Planning: Close activity in PERT	Planning	Creation: SAP PS Module	
36		Planning: Close activity in progress monitoring xls		Creation: Primavera Storage: DMS Server	
37		Finance: Account receivables (post delivery of ship to the client)	Finance	Creation: SAP SD Module, MS Excel	

S. No.	Project Phase	Key Business Process	Departments	Supporting IT	Comments
38	After Sales	Handover document - Distribution Management	Design	Creation: In following format: .DOC .PDF .Excel .CAL .PPT (These are all hard copies / IETM – Interactive Electronic Technical Manual documents) Storage: Local server	
39		Maintenance & Support			

S. No.	Project Phase	Key Business Process	Departments	Supporting IT	Comments
40	Change Management	MOD (Modifications requested by customer)	Design & Production departments		Is setup across the ship building process to accommodate client change requests / modifications

2.2.3 *As-Is application map & integration with current systems – GRSE*



HIGH LEVEL IT ARCHITECTURE

3.3.1 MDL high-level IT Architecture

Infrastructure Details	As-Is assessment
Hosting	Primary DCs – on-premises hosting within MDL in Mumbai (Tier 2) • One data centre supporting the ERP and Central IT applications • One data centre supporting the Design applications Disaster Recovery: • Local: backup site on-premises within MDL (different building from primary one) (Tier 2)(Only for Design Data) • Geographical: outsourced to ITI Bengaluru (Tier 2) (Only for ERP and SAP)
Infrastructure	• Standard rack mounted servers (X86) with systems running on physical machines, no virtualization used • No cloud infrastructure used
Operating Systems	Various versions of Linux and Microsoft Windows Servers are in use on the server side. Clients are all Microsoft Windows
Databases	• Oracle • IBM DB2 (DB2 hosts SAP DB - to be migrated to SAP HANA) • Microsoft SQL Server • Dabacon (Aveva marine)
User Authentication	Fully based on Microsoft Active Directory (saperate for Design and CIT) Users are isolated from accessing both subnets.

Infrastructure Details	As-Is assessment
Main Business application supported	The main application used by the business are: Aveva Marine (CAD), SAP (details regarding the specific modules implemented are referenced in chapter 3.4.1), Primavera, e-Procure, Weight Management tool and MS Office • Applications are not integrated on real-time with each other; integration is either manual or offline (via flat file transfer) • Design applications are not integrated with Aveva Marine; the integration is offline datais transferred via flat files
Network	• Local LAN connectivity • MPLS connection for Data, Voice and Video between MDL and DND for the purposes of projects not related with P17A • No wireless is used across the organization • Systems are not accessible from outside MDL network(No internet\ VPN access) • Emails are not accessible from outside MDL network, P2P for DR
Security	• Back up on a daily basis as per corporate policy • Data encryption exists for current applications

Table 7: MDL high-level IT architecture setup

3.3.2 GRSE high-level IT Architecture

Infrastructure Details	As-Is assessment
Hosting	Primary DCs – on-premises hosting within GRSE in Kolkata (Tier 2) • ERP in Main Datacentre (in GRSE main office) • Design Software in Design Datacentre (in GRSE branch office - CDO) Disaster Recovery (only for ERP and Central IT, excludes Design software): • Local: backup servers exist in the same location (Tier 2) • Geographical: outsourced Crtl-S in Mumbai (Tier 2)
Infrastructure	• Standard rack mounted servers (X86) with systems running on physical machines, no virtualization used. • No cloud infrastructure used
Operating Systems	Various versions of Linux Suse and Microsoft Windows Servers are in use on the server side. Clients are all Microsoft Windows
Databases	• Oracle 10g
User Authentication	Fully based on Microsoft Active Directory
Main Business application supported	The main application used by the business are: Aveva Marine (CAD), SAP (details regarding the specific modules implemented are referenced in chapter 3.4.2), MS Project, e-Procure, Weight Management tool and MS Office • Applications are not integrated on real-time with each other; integration is either manual or offline (via flat file transfer) • Design applications are not integrated with Aveva Marine; the integration is offline data is

Infrastructure Details	As-Is assessment
Network	Local LAN connectivity MPLS connection for Data, Voice and Video between GRSE and DND for the purposes of projects not related with P17A No wireless is used across the organization Systems are not accessible from outside GRSE (No internet \ VPN access)
Security	Back up on a daily basis Data encryption exists for current applications

Table 8: GRSE high-level IT architecture setup

3.3.3 DND high-level IT Architecture

Infrastructure Details	As-Is assessment
Hosting	Primary DCs – on-premises hosting within DND in Delhi Disaster Recovery: N/A
Infrastructure	• Standard rack mounted servers (X86) with systems running on physical machines, no virtualization used. • No cloud infrastructure used
Server Operating Systems	Microsoft Windows 2003 Enterprise Edition
Databases	Microsoft SQL Server
User Authentication	Fully based on Microsoft Active Directory
Main Business application supported	The main application used by the business are: Tribon (CAD), SHIP EDF (Electromagnetic features), Pipenet (pipe flow analysis), ANSYS (FEM analysis), Altair Hypermesh (Heavy duty calculations for ex. Explosions etc.), Napa • Design applications are not integrated with Aveva Marine; the integration is offline data is transferred via flat files

Infrastructure Details	As-Is assessment
Network	• Dated local LAN connectivity hat is planned to be upgraded • Separate MPLS connection for Data, Voice and Video between MDL and DND for the purposes of projects not related with P17A • Separate MPLS connection for Data, Voice and Video between GRSE and DND for the purposes of projects not related with P17A • No wireless is used across the organization • Systems are not accessible from outside DND (No internet \ VPN access)
Security	• Back up on a daily basis • Data encryption exists for current applications

Table 9: DND high-level IT architecture setup

MAPPING OF IT APPLICATION LANDSCAPE

3.4.1 MDL as-is application map: MDL application landscape includes 11 main software packages, that are not integrated real-time between each other (depicted in Figure 4).

(a) **Microsoft Office**: General personal and office productivity, documents generated are not stored centrally on a Content Management System.

(a) **Aveva Marine**: The basic CAD tool in MDL. This tool is fully used in all MDL design departments from the generation of the 3D ship model to the definition of 2D drawings (generally extracted from the 3D model). Aveva Marine is the "reference environment" where the other design tools, used in MDL, transfer data.

(b) **AutoCAD:** Used to complement Aveva Marine capabilities

(c) **Napa:** System used for early design

(d) **SAP:** ERP platform, with the following modules implemented:

- Production Planning
- Product Structure
- Material Management
- Finance & Control
- Quality Management
- Human Capital Management
- Sales and Distribution
- Document Management

(e) **eProcure:** Government of India procurement platform

(f) **Hyperworks:** Tool used for FEM calculations and Structural scantling

(g) **Pipenet:** Software used for pipe functional calculation of auxiliary machinery

(h) **ShipWeight:** Platform used to calculate weight and centre of gravity

(i) **Primavera:** Current project management tool

(j) **Microsoft Project:** Project management tool that is going to be adopted in the near future

(k) **Hyperworks**

(l) ActCut

(m) Shaft Design

MDL is in process of implementation of SAP HANA (ver. 1.0SP12) migration from existing database DB2, Three more application FIORI, FLM and Simple finance are under implementation.

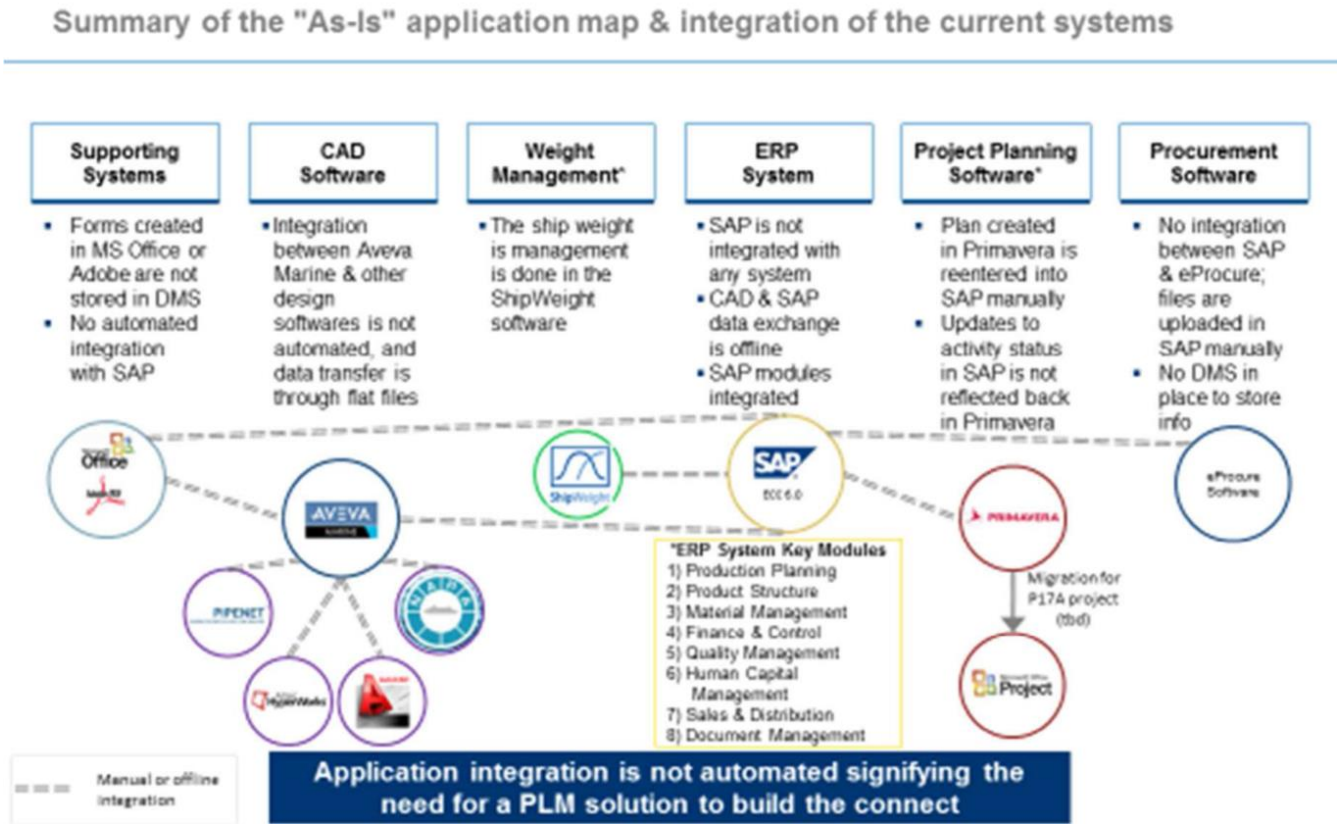


Figure 4 - MDL high-level as-is application landscape

3.4.2 <u>GRSE as-is application map:</u> GRSE application landscape includes 8 main software packages, that are not integrated real-time between each other (depicted in Figure 5) as follows:

(a) **Microsoft Office:** General personal and office productivity, documents generated are not stored centrally on a Content Management System.

(b) **Aveva Marine**: The basic CAD tool in GRSE. This tool is fully used in all GRSE design departments from the generation of the 3D ship model to the definition of 2D drawings (generally extracted from the 3D model). Aveva Marine is the "reference environment" where the other design tools, used in GRSE, transfer data.

(c) **AutoCAD:** Used to complement Aveva Marine capabilities

(d) **Napa:** System used for early design

(e) **SAP:** ERP platform, with the following modules implemented:

- Production Planning
- Product Structure
- Material Management
- Finance & Control
- Quality Management
- Human Capital Management
- Sales and Distribution
- Document Management

(f) **eProcure:** Government of India procurement platform

(g) **Hyperworks:** Tool used for FEM calculations and Structural scantling

(h) **Pipenet:** Software used for pipe functional calculation of auxiliary machinery

(i) **Microsoft Project:** Current project management tool

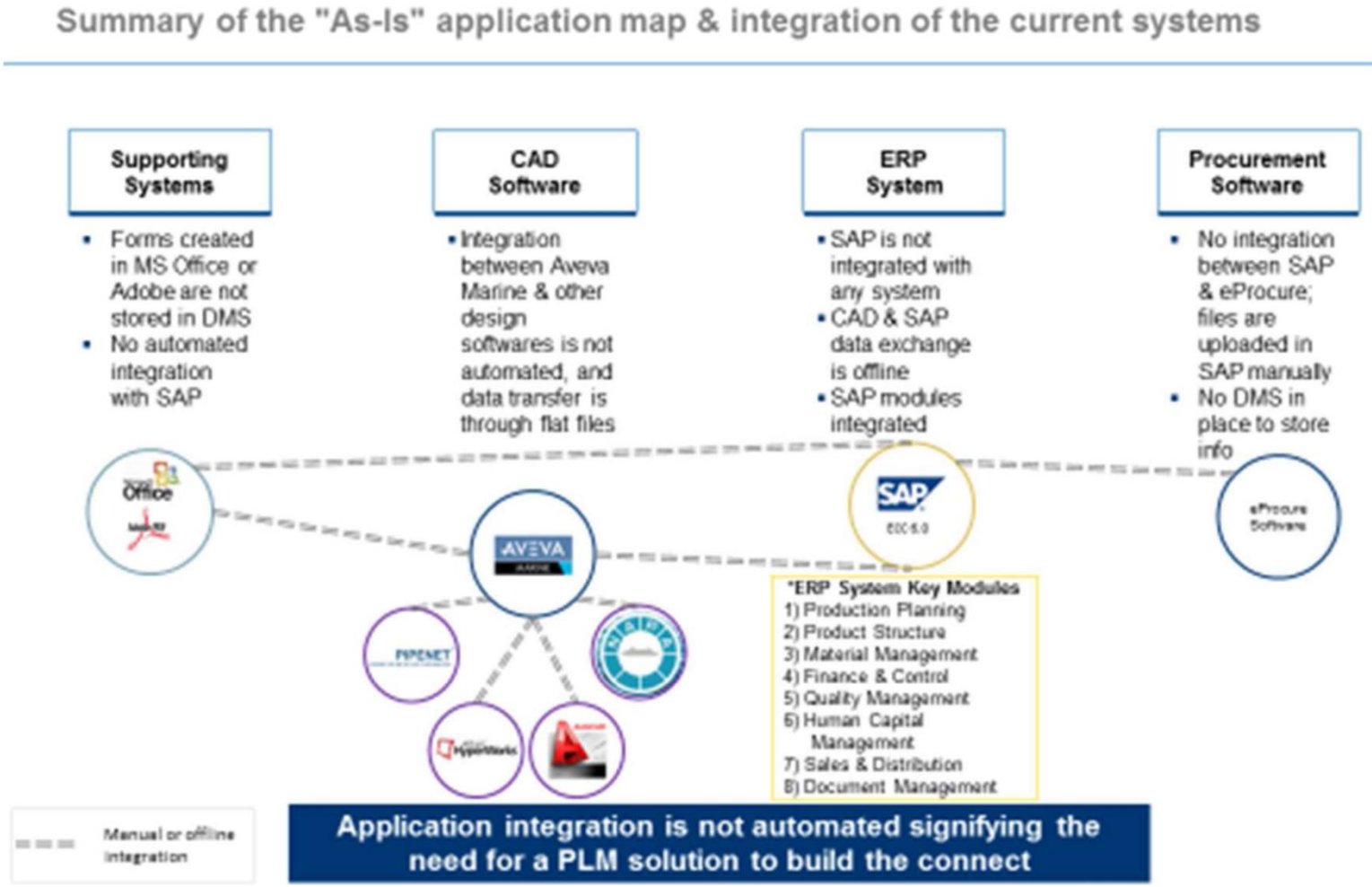


Figure 5 - GRSE high-level as-is application landscape

3.4.3 DND as-is application map: DND application landscape includes eleven (12) main software packages, that are not integrated real-time between each other. The details are as follows:

(a) **Microsoft Office**: General personal and office productivity, documents generated are not stored centrally on a Content Management System
(b) **Tribon**: The basic CAD tool in MDL. This tool is fully used in all MDL design departments from the generation of the 3D ship model to the definition of 2D drawings (generally extracted from the 3D model).
(c) **Napa Steel:** System used for early structure definition
(d) **Altair Hypermesh:** System used for the final element pre-processing (starting from the CAD drawings)
(e) **SHIP EDF:** System used for the electromagnetic design of naval vessels supporting concurrent electromagnetic design and assisting the optimization of naval platforms.
(f) **ANSYS:** System used for the finite element analysis and structural analysis
(g) **Microsoft Project:** Project management tool that is going to be adopted in the near future
(h) Psychrometric analysis
(i) AutoCAD
(j) Pipenet
(k) Autosea 2
(l) NAVIS Work
(m) Freedom

TARGET FUNCTIONAL REQUIREMENTS

1. Requirements Collection & Management

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
RM01	Requirements Collection & Management	To create and manage Requirements along the whole lifecycle considering changes from various Stakeholders
RM02	Requirements Collection & Management	To manage a list of master requirements for ship type to be then re- used derive ship-specific requirements
RM03	Requirements Collection & Management	To classify requirements with specific attributes and structure them by functional and operating hierarchical trees. Therefore shall be possible for the users to: • associate to each requirement a PBS or a set of PBS • create specific attribute trees to be used for the classification of the requirements • associate to each requirement more than one attribute
RM04	Requirements Collection & Management	To manage link between Requirement structure, pallet list, PBS or other PLM structured data / object (e.g. test cases)
RM05	Requirements Collection & Management	To manage the approval workflow of requirements list (including change management approvals)
RM06	Requirements Collection & Management	To manage change and version control of the requirements

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
RM07	Requirements Collection & Management	To create and manage the relationship between a requirement and the objects that “fulfil" the requirement itself e.g. documents that must be issued (e.g. design documents, pallet list, etc.) , tests that must be fulfilled, etc. . This to enable the creation of the chain: Requirements ↔ PBS- elements ↔ Audit/Test ↔ Deliverables
RM08	Requirements Collection & Management	To monitor the requirements fulfilment progress through the evolution of compliance objects (e.g. test), highlighting those tests / evidence” that are not still completed and thus refrain the requirement to be marked as fulfilled
RM09	Requirements Collection & Management	To manage the possibility for the sisterships to have specific / different / additional requirements for sister ships (having inherited all the requirements from the first ship o the class)

2. Workflow and collaboration

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
WC01	Workflow and collaboration	To enable creation of workflows allowing: • Definition of involved tasks and decision-making rules via a graphic user interface to simplify the process description • Assignment of users and user groups • Configuration of workflow statuses as per business need • Attachments of affected object (documents, parts, assemblies etc) • End users to update the workflow processes against new or changed needs • Role base access control according to the user profiles • Execution of parallel workflow's branches and multiple instances of workflows to support activities that should be executed at the same time

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
WC02	Workflow and collaboration	To enable status monitoring of the workflows: • Audit and display the workflow progress • Record status of all workflows executing steps to enable traceability of the processes giving the users the ability to analyze workflow execution history; • Provide the ability to the users to search for specific workflows • Provide run-time information (e.g. participants status, waiting on dependency, completion status, start and finish time, elapsed time, etc.) with the ability for the user to export these information on a standard file format (e.g. doc, excel, pdf)
WC03	Workflow and collaboration	• To enable tracking and monitoring of change requests and converting it to change orders through engineering change management procedure • E-mail notifications involving concerned departments • Tracking and auditing mechanism • Visible change log after every update • Graphical representation of status

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
WC04	Workflow and collaboration	To enable collaborative and integrated management of processes and information (documentation, BOMs, 2D and 3D model, TSP, GRAQ, etc...) by: • Sending notification to remind them of the required/ pending actions e.g. via E-mail, SMS • Providing change log after every update • Providing the ability to view and download relevant documents, bill of material etc. with permission control • Providing the ability to allow backtracking in the workflow if the review suggests re-work (i.e. the initial request is modifiable until it is approved) • Providing the ability to manage collaboration with multiple entities (*e.g.* engineering subcontractors, Suppliers, ship- owner, classification societies, etc.) complying with data security policies • Providing the ability to allow PLM access to approved third parties (partial access) only from within MDL, GRSE and DND premises. • Providing the ability to restrict and control specific dataset or portion of PBS

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
WC05	Workflow and collaboration	To provide an authorization / approval system and to handle approval remarks with specific authorization rules facilitated through electronic signature (or at least electronic recording). PLM should have: • Predefined approvers and also ad-hoc approvers at each stage of workflow • Ability to assign the correct owner for the relevant activity • Ability to add mandatory or optional approvers in each stage of the process • To manage the approval process of the document releasing (workflow)

3. Project & Planning Management

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PP01	Project & Planning Management	To create a bilateral link between the external Project Management tools (Primavera and MS Project) to be able to import / export project plans with stages, milestones, timelines, progress to date, assignment of activities to internal or external partners, estimated costs and final costs. The system shall be able to manage imports and exports of subsequent versions of the plan as an update to the plans' information within the PLM / external systems system, in particular information that have been added either on the PLM or on the Project Management software (e.g. completion of certain activities, assignment of WBS codes) shall not be lost during the update phase.
PP02	Project & Planning Management	To manage the creation and the linking of different plans example: Master Phasing Plan, Job Target Plan, Configuration plan, Quality control plan, Risk management plan, Production, Procurement plan, Maintenance plan etc and link/aggregate them with ship master schedule plan.
PP03	Project & Planning Management	To manage the master Activity Breakdown Structure (ABS) and Organization Breakdown Structure (OBS) lists, including creation and change management workflows
PP04	Project & Planning Management	To link activities on the plan to a WBS (link between PBSs, ABS and OBS) and enrich the related WBS with user defined attributes e.g. estimated effort, actual effort, notes, etc.

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PP05	Project & Planning Management	To assign to each activity (and to the related WBS) the internal and external efforts both estimated and actual. It shall be possible to relay these information back to the accounting system (e.g. SAP)
PP06	Project & Planning Management	To provide the chance to restrict the possibility to read/write/modify information for each activity at user /user group level.
PP07	Project & Planning Management	To allow the assignment of custom attributes to each activity. Attribute list shall be manageable by the PLM users (subject to user right management)
PP08	Project & Planning Management	To enable tracking and managing progress of activities in terms of % completion *e.g.* document advancement, technical bid evaluation, approval process management, BOM release
PP09	Project & Planning Management	To track all events/activities/deliverables milestones with connection to requirements management module *e.g.* connection with contractual requirements
PP10	Project & Planning Management	To enable activities to be associated with target/actual start and end dates. To manage delay by remainders, escalation etc

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PP11	Project & Planning Management	To enable a configurable alert system which shall warn the planners and end users about relevant events e.g. milestones to be reached in 24h, activity delayed, etc. The type and nature and granularity of events to be tracked shall be selected by the planners
PP12	Project & Planning Management	To enable reminders, escalations and automatic updates required for workflows/approvals
PP13	Project & Planning Management	To enable Supplier collaboration, allowing them to update directly the status of the activities they are responsible of within the project plan
PP14	Project & Planning Management	To allow configuration and usage of preconfigured dashboards and reporting for viewing portfolio analytics, project or program status, health check-up etc.

4. Document Management

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM01	**Document Management**	To have "Role based" access/authorizations for accessing different types of PLM objects and related attributes and documents
DM02	**Document Management**	To manage different classifications/ categories of documents. Categories shall be fully configurable by the end users. To manage a master set of documents that includes all the relevant document template, possibly allowing for specific document set per ship type
DM03	**Document Management**	To create and manage possible relationship between defined standard document lists and specific PBS / WBS elements
DM04	**Document Management**	To have simple, advance and Personalized searches across all PLM objects or documents (*e.g.* by attribute, by part of the code, etc.)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM05	**Document Management**	To create different types of document starting from templates *e.g.* Specifications, quality, risk sheets, pallet list, tenders, drawings, manuals, datasheets, checklists etc. the system should also allow the user to add / modify / manage the templates
DM06	**Document Management**	To define and manage custom attributes for the documents
DM07	**Document Management**	Establish and manage a "Responsibility Matrix" to indicate departments which contribute to each document
DM08	**Document Management**	To assign automatically the identification number and name for BOMs, documents, etc. based on a set of configurable rules (different for each type of document)
DM09	**Document Management**	To manage ownership related to different PLM objects / documents and related attributes
DM10	**Document Management**	Enable management of hierarchical links for documents *e.g.* link between "RFP", "TPS" and "PO", BoD - Bill Of Document)
DM11	**Document Management**	To enable revision/version control for the documents, design data and other objects (e.g. TSP, BOM, ship's model, etc.)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM12	**Document Management**	To manage check in and checkout of documents / files
DM13	**Document Management**	To enable automated flag/alert to the users in case the user is using a old version of the file or if the files are checked out
DM14	**Document Management**	To manage the status of the document from creation to release
DM15	**Document Management**	To manage collaboration: • To route the documents using workflow • To mange version control for the documents, assemblies etc • To allow Check in and checkout of files e.g.: drawing files, 3D models, assemblies, metadata etc... • To allow for checked in files need to be downloaded as read only • To mange relations between CAD assemblies and BOM in PLM • To prevent duplication of data
DM16	**Document Management**	To define checklist and enable quality control checks before document release
DM17	**Document Management**	To store comments, discussion points and summaries for documents/objects at all stages of release

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM18	**Document Management**	• To manage the document release / issue via a specific workflow • To notify the document release/issue to respective departments (workflow)
DM19	**Document Management**	To generate distribution list of different departments once the release happens, basis predefined distribution rules
DM20	**Document Management**	To store drawings and other documents in various formats example: pdf; tif; hpg; office, CAD formats, MS office
DM21	**Document Management**	To print different document formats (TIF; HPG; PDF; Office ...) and allow for high resolution file printing
DM22	**Document Management**	To manage compression of format files (for reducing the size of files; for example ".zip" format)
DM23	**Document Management**	To provide stamp certification establishing the originality of document

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM24	**Document Management**	To manage in the stamp the following information: • Documents status and date • Document's code and title • Type of document • Printing date • Blocks for which the document is currently valid • User printing the document • Number of copies printed
DM25	**Document Management**	To manage the upload / download of large size documents (e.g. 100 MB)
DM26	**Document Management**	To manage the upload / download of a large number documents (e.g. 200 documents)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM27	**Document Management**	To enable viewer with following functions • view 2-D Drawings, 3D models, documents, images etc without using source application in PLM view geometric and non-geometric information and meta data (item number, weight, attributes etc.) • measure distance between points in viewed item, visualization (rotate, pan, zoom, "flythrough", "walkthrough", sectional views etc) • create and display cross sections using any plane • check for interferences between items in an assembly • mark-up drawings, assemblies and route them on a change
DM28	**Document Management**	To store the historical change of data of selected PBS attributes such as weight, COG, etc and enable their extraction for further analysis (e.g. to create an historical database of the weight evolution history for a specific PBS)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
DM29	**Document Management**	To allow creating reports • out of the box standard report, e.g.: ○ # late documents ○ Average approval time (by OBS) o Average time to close an excerpt o ○ Etc. • customizable reports from the PLM interface itself Reports shall be available in different formats *e.g.* word, excel, pdf etc. and include at least username and timestamp
DM30	**Document Management**	To compare changes between different versions (stored in the PLM version management) of the same document. For documents are intended all the types of documents stored in the PLM, e.g. requirements, Word documents, Excel documents, BOMs, 2D drawings, 3D drawings, etc. If the type of documents that are possible to compare are limited, the Supplier shall provide the list of the document types for which comparison is possible
DM31	**Document Management**	To manage documents for sister ships, e.g.: • Once documents for the first of class ship has been defined the system must support changes for a single ship, a set of ships or for the whole class • Ability to assess if a document is valid for all the ship of the series or for one or some of them; • Provide a list of valid documents for a given ship: list of valid documents

5. Product Baseline Management & BOMs

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PB01	Product Baseline Management & BOMs	To support and manage the definition of the hierarchical product composition of the ship to represent the physical, logical and topological composition of the ship (Product Breakdown Structure). Every node of the tree is exploded iteratively in a set of multiple nodes, as a PBS, where each node can represent a single item, product or main item.
PB02	Product Baseline Management & BOMs	• To support the development of the Product Breakdown Structure (PBS) using a standard library / inventory. • To support adoption of WBS (link between PBS, Organization Breakdown Structure and Activity Breakdown Structure) • To enable and manage data inheritance among parent and children
PB03	Product Baseline Management & BOMs	To support the PBS creation with a specific approval workflow and to manage the PBS along the whole lifecycle considering changes from various stakeholders;
PB04	Product Baseline Management & BOMs	To manage aggregation / de-aggregation of product tree data / attributes from children nodes to parent ones (*e.g.* to evaluate weight, centre of gravity, absorbed electrical power, heat dissipation, etc.)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PB05	Product Baseline Management & BOMs	To manage the link of documents with the PBS
PB06	Product Baseline Management & BOMs	To manage PBS attributes such as: planned delivery date, final delivery date, revised delivery date, installation date, estimated hours, final hours, estimated costs, actual costs, competences needed, coordinates for centre of gravity, design margins, block number(s), block allocation ratios, alternate declaration/substitute parts, flag for weight category, warning on delay, etc. The users shall be able to manage end to end these attribute (e.g. read, modify, mark as not modifiable, etc.) based on their roles and permissions. The list of the attributes shall be customizable by the end users with appropriate rights without the intervention of the Supplier.
PB07	Product Baseline Management & BOMs	To manage product views and access control based on user roles and privileges
PB08	Product Baseline Management & BOMs	To assign and manage data ownership as per roles and authorization rules. To track data ownership changes and related privileges

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PB09	Product Baseline Management & BOMs	• To enable reuse of data, e.g. • to replicate, the linked PBS, activities, and OBS(resulting in a WBS) of one ship, for another • to manage and maintain master templates of PBS, WBS for reuse.
PB10	Product Baseline Management & BOMs	To enable use of formulas instead of text only into some attributes of a PBS node (*e.g.* calculate the weight as the sum of other elements etc.)
PB11	Product Baseline Management & BOMs	Search and retrieve weight-related data from a historical database. Allow filtering by project, block/ module, type of ship, PBS group, and type of document.
PB12	Product Baseline Management & BOMs	Allow for the versioning of the PBS nodes, including its attributes (or a configurable subset of them) (*e.g.* weight related attributes) and support specific naming (list of standard + custom defined) for the versions
PB13	Product Baseline Management & BOMs	To allow to selectively protect from user changes PBS branches, PBS elements or PBS attributes
PB14	Product Baseline Management & BOMs	To provide look-up capabilities to search objects across PLM databases (e.g. by attribute, by part of the code, etc.)
PB15	Product Baseline Management & BOMs	To manage items views according to user profile
PB16	Product Baseline Management & BOMs	To Support to manage items views (Functional, Physical/Functional, Physical, etc.).

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PB17	Product Baseline Management & BOMs	To allow import and export of PBS branches, e.g. • Import PBS branches from external PBS structures (e.g. to import in ship PBS the engine PBS provided by a Supplier or a 2°level configuration). • Export PBS branches to external CAD or PLM system (e.g. to an external collaboration partner to implement a portion of CAD model or to implement a 2°level configuration)
PB18	Product Baseline Management & BOMs	To allow users to look at the product data through different views, for example: • System configuration (all systems of a selected PBS (e.g.200) composing the product with related data) • Physical configuration (all components included in a selected zone, block, etc.)
PB19	Product Baseline Management & BOMs	To manage creation of item, document, BOM (both EBOMs and MBOMs with automatic material codes assignment were possible e.g. Pipes diagrams), etc, using automated numbering and associating different lifecycles stages to object, example - Design, Production, etc.
PB20	Product Baseline Management & BOMs	To manage different classifications/categories of items, BOM's, documents etc.

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PB21	Product Baseline Management & BOMs	To define and manage Manufacturing BOMs / pallet management basis EBOM (including approval and change management workflows for the BOMs)
PB22	Product Baseline Management & BOMs	To manage relations between items e.g. drawings, documents, BOMs etc. with respect to the associated PBS and the scheduled activities in the project plans
PB23	Product Baseline Management & BOMs	To allow data (3d models, drawings, BOM, purchase list/parts & fabrication details, weight etc) extraction from CAD system to PLM.
PB24	Product Baseline Management & BOMs	To manage and propagate appropriately (without any data loss) to the relevant documentations the changes done on the CAD system (e.g. change in the drawing affecting the EBOM)
PB25	Product Baseline Management & BOMs	To allow the management of “Sister Ships” (including re-use of model parts and the propagation of modifications applicable to different ships)
PB26	Product Baseline Management & BOMs	To support BOMs approval and changes by approval and change management workflow
PB27	Product Baseline Management & BOMs	To manage the link between BOM and technical documents / drawings

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
PB28	Product Baseline Management & BOMs	To allow partial release and versioning/ revision of the BOM's. Example: Bought out items in BOM to be released earlier before the final BOM release
PB29	Product Baseline Management & BOMs	To manage BOMs for group of sister ships (Series of Ships)
PB30	Product Baseline Management & BOMs	To manage massive uploads of BOM's large in size and number by means of import or data load.
PB31	Product Baseline Management & BOMs	To manage change and synch of BOMs which are common across sister ships
PB32	Product Baseline Management & BOMs	To enable "Thumbnails" supporting visualization and mark-ups for Items, BOM etc. in PLM system

6. Engineering Change Management

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
EC01	Engineering Change Management	To create a new change request / order with: • Automated numbering depending on the predefined rules (with the ability to overwrite of automated numbering for any special needs • Type of change request • Reason and description for the change request/order • Identification of the object(s) affected by the change including any information that could impact on safety, quality, schedule, cost and profit • Custom attributes, example: cost impact on additional changes • Involve and notify predefined users and groups
EC02	Engineering Change Management	To enable: • To view pending engineering changes • To view history • To associate change orders with change requests • To associate change request with problem reports • To have graphical representation of Workflows • To classify and route change requests (e.g. design change request, production change request, component substitution, etc.) based business rules • To allow for different levels of changes, e.g. "Excerpt" that do not require to re-issue and version the full document / drawing and "Change" that requires the versioning of the changed document at the end of the process

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
EC03	Engineering Change Management	To support the evaluation of the requested change impacts automatically identifying all the objects that will be involved in the change starting from the primary change object (e.g. if it would be necessary to modify a part, the system should put in evidence all related parts and documents, with their own status).
EC04	Engineering Change Management	To manage engineering change impact on affected objects (example drawings, BOM etc.) in different cases: • Change effective for all ships • Change effective for one or more sister ships (To be regulated through appropriate workflows)
EC05	Engineering Change Management	To automatically send notifications and reminders to concerned users on the change request for approvals, delays and handle escalations.
EC06	Engineering Change Management	To allow for modification on the affected objects (*e.g.* documents, BOMs etc.) on the change request/order
EC07	Engineering Change Management	To enable sending accompanying documents (e.g. to-do-list, change log, comments) along with the modified objects to the involved functions on the change
EC08	Engineering Change Management	To enable automated closure of the change order when all involved departments have closed their respective action

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
EC09	Engineering Change Management	To allow the identification of items (PBS) that are subject to "Configuration Management"
EC10	Engineering Change Management	To support the definition of the Configuration Items Baselines (fixed reference configuration established by defining and recording the client approved configuration documentation for a systems at a milestone event or at a specified time), including correct versioning of all the documents that are defining or related to the configuration; any updated and approved revision of the Configuration Baseline for a specific items becomes the actual Baseline following a "change" approval workflow. To support the comparison between different reviews Configuration baselines
EC11	Engineering Change Management	To link Configuration to expected performances (physical and functional) and then to testing and results that are fulfilling the expected performances. To verify the respect of the performances of components, of physical and functional product attributes against the product requirements and the efficiency of the products along its lifecycle

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
EC12	Engineering Change Management	To record the Configuration Items related PBS tree with the attached Planning and Design documents (of the Company and/or Third parties) formally valid at time *"t"* To list all the modification requests on a specific Configuration Item including the relevant status (examined, approved, implemented, rejected) at time *"t"*
EC13	Engineering Change Management	To support Configuration Audit through a formal review of testing data and control reports concerning a Configuration Item, to ensure that the CI has achieved the performance and functional characteristics specified in its current approved configuration documentation

7. Acceptance Procedures

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AP01	**Acceptance Procedures**	Ability to define and manage test stages and test procedures connecting them to specific PBSs (that could include the whole ship in case of the sea trials) linking them to the requirements in order to validate the product against requirements by tests

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AP02	**Acceptance Procedures**	Ability to: • Report specific defects / non conformities against the defined test stages • Assign description, object affected (if relevant link it with PBS or WBS affected), specific priority and criticality to each of the defects / non conformities • Classify the defects / non conformity based on a customizable classification table • Let the appropriate users (based on user profile and role base access control) to Manage end to end the defect / non conformity (close, re-route, change status, etc.) • Generate change requests and change orders starting from the defects / non conformities
AP03	**Acceptance Procedures**	Ability for the end-users to define specific approval workflows for the test stages (without requiring intervention from the PLM Solution Supplier). These workflows shall take in account the status of the defects as well as users approvals. The workflow shall end when all the requirements are marked as "solved" or "being solved but not stopper for test stage approval"
AP04	**Acceptance Procedures**	Ability to view the status of each of the test stages defined and the defects assigned the each of the phase (with all the defects details). It shall be possible to filter these by PBS and requirement

8. Quality Management

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
QM01	**Quality Management**	To provide the ability to define and manage Quality Tests connecting them to specific PBSs (that could include the whole ship in case of the sea trials) linking them to the requirements in order to validate the product against requirements by tests
QM02	**Quality Management**	To define and manage the Quality Plan
QM03	**Quality Management**	To allow creation of problem reports and link them to preventive and corrective actions
QM04	**Quality Management**	To configure with specific PBS quality parameters (e.g. max tolerances for steel plates)
QM05	**Quality Management**	To support corrective and preventive action based on relevant quality norms. Manage NCR - Non-Conformance Reports, QCR - Quality Change Requests, Audit, CAPA in a closed loop
QM06	**Quality Management**	To manage periodic and preventive maintenance and inspections providing automated notifications to the interested users while ensuring to keep a solid history track

QM07	**Quality Management**	To enable support of inspection process: • Two types must be supported: Internal checks and Classification society checks • Track of quality check information (*e.g.* FAT Factory acceptance test) in the PBS attributes
QM08	**Quality Management**	To manage compliance data for hazardous materials as per international standards and regulatory bodies Example: US: US Administration Regulations, Europe: ROHS, WEEE, China: China ROHS, WEEE, JAPAN: JGPSSI
QM09	**Quality Management**	To produce quality reports and indicators to highlight the situation of a specific PBS / PBS tree from the quality point of view (e.g. how many parts have to be tested/accepted, how many parts failed the acceptance test, etc.)

9. After Sales Operations

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS01	**After Sales Operations**	Manage all the relevant information for the operation and Maintenance of the ship, including operations manual, maintenance manuals, training documentation, list of items that have an expiration date (e.g. fire extinguishers), safety items list, etc... It is required to have a way to version and maintain up to date documents across all the ship in case of document updates or parts substitutions
AS02	**After Sales Operations**	Manage the As-Built PBS list all components from the ship (up to the Last Reparable Unit)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS03	**After Sales Operations**	Ability to add / modify the PBS following ship configuration changes and regular / extraordinary maintenance thus creating an As- Maintained PBS.
AS04	**After Sales Operations**	Manage the As-Maintained PBS list all components from the ship (up to the Last Repairable Unit) providing the appropriate workflows to support approval, authorization and change management processes
AS05	**After Sales Operations**	Manage the link between PBS elements and related maintenance and Operative documentation e.g.: • Maintenance manuals and plan • Spare parts list and remaining shelf life • Other material needed for maintenance (e.g. tools, grease, etc.) • Part number (if applicable) and Supplier • MTBF (possible dependent on the placement of the item in specific areas e.g. MTBF for a laptop is 2000h, however if placed in an area at more than 50C it will be of 500h) • MTTR • Scheduled maintenance intervals • Skills required for maintenance • Tools required for maintenance • etc.

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS06	**After Sales Operations**	Record the maintenance story of a specific PBS component in terms of events (e.g. repairs, substitution, regular maintenance) and date they occurred
AS07	**After Sales Operations**	Ability to mark which component has been substituted or repaired and for which reason (e.g. failure, standard maintenance, etc)
AS08	**After Sales Operations**	To manage maintenance documentations (including operations manual, maintenance manuals, training documentation) across all the ship in case of document updates To support document issue and changes by approval and change management workflow
AS09	**After Sales Operations**	To manage any obsolescence in the ship PBS as well as in sister ships PBSs, and in any other data structure stored in the system; To underline obsolete components and consequent resolutions actions (e.g. alternative components to be used, etc.)
AS10	**After Sales Operations**	Have the ability report on which ships a specific component (by PBS or by part number) is used, in which number it is used, how many times they have been substitute and recall their specific maintenance story

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS11	**After Sales Operations**	Have the ability to raise an alert to a specific ship or to all / subset of the sister ships on a specific PBS elements and specific component model (e.g. in case of multiple failures of the same component). The alert needs to follow a specific approval workflow before being raised
AS12	**After Sales Operations**	Support the definition and the implementation of standard and extraordinary maintenance plans to be executed to one or a subset of the sister ships (including alerts to the relevant support people and up to management level)

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS13	**After Sales Operations**	To have the capability to: • support maintainability analysis with definition and reporting of critical parts that are going to be obsolete; • manage interactive schedule to underline maintenance operations to be executed and to close those that have executed; • manage the schedule of maintenance reservation and owners technical intervention requests; • manage the Ownership of each maintenance task; • manage resources according to expertise; • manage of forms, documents, authorization, etc. for resources access to intervention site; • assign maintenance operation to internal or external resources; • issue work-orders in alignment with the maintenance plan together with the specific work and safety instructions
AS14	**After Sales Operations**	Capability to manage: • Request of technical intervention for corrective actions; • Reports of technical intervention; • Alerts and information in electronic format (e.g. email, SMS, etc.) • Periodical operations reports

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS15	**After Sales Operations**	Ability to run reports on specific ships or a subset of all sisters ships to understand critical situations around the maintenance, including: • PBS or part numbers with low MTBF (mean time between failures) • Recurrent Failures • Regular maintenance tasks that have not been carried out
AS16	**After Sales Operations**	Link with the logistic system spare parts to ensure availability of spare parts for schedule maintenance and raise alerts in case spare parts are low or missing for a specific planned maintenance activity.
AS17	**After Sales Operations**	Ability to run "Logistic reports" to collect the type and quantity of spare parts / material required by for the scheduled maintenance occurring on a specified time frame – this to ensure that all the relevant items are boarded when in port.

S. No.	PLM Macro-functionality	Detailed PLM functional requirements
AS18	**After Sales Operations**	Ability to collect and store information coming from equipment that have measurements instruments installed on them in order to: • Trigger alerts to relevant users (configurable) if set thresholds (configurable) are reached • Collect ship operations data e.g. operating hours for a given period of time, vibrations, etc.

ENCLOSURE-7.

LIST OF REPORTS

1. Fifty nine (59) reports under the following Categories are expected to be included in the PLM solution as "out of the box" (readily available) from the PLM solution, with no customization of the solution necessary to implement them:

(a) Product Reports/data extractions
(b) Program & Portfolio reports
(c) Sourcing reports quality reports
(d) Compliance reports

2. The PLM solution Supplier shall highlight whether each of the fifty nine report is "out of the box" or does require customization. The reports shall be available in English. The PLM solution shall be capable of scheduling the generation of report at given dates and times with a specific recurrence, with the possibility to specify the input parameter of the reports and the distribution list.

3. An indicate list of the reports is given below, which shall be fine-tuned before the sign-off of the Solution Blueprint after which any changes shall follow the Change Request process:

(a) Product reports / data extractions

S. No.	Report name	Description
R01	Assembly Cost (Item Master) Report	This report generates a cost rollup by determining the cost and quantity of each component and assembly and calculating the total cost.
R02	BOM Comparison Report	The BOM (Bills of Material) Comparison report shows the differences between two or more bills of material. It compares the first-level BOM of the selected items to the BOMs of the other items on the report and shows you which components are not common to both.
R03	BOM Detailed Report	The BOM Detailed report displays the items that are in the bill of material for a specified assembly, up to the desired number of levels.

S. No.	Report name	Description
R04	Consolidated BOM Report	The Consolidated BOM report takes the bill of material for a specified assembly and consolidates it into a single-level bill, computing the total quantity of each item. It shows a summary of all parts for a given assembly, regardless of level, including total quantities in the whole assembly.
R05	Effective BOM Detailed Report	The Effective BOM Detailed report displays the report based on effective date of parts in the BOM.
R06	Item Activity Report	The Item Activity report shows the items that were processed during a specified period of time.
R07	Attribute comparison report	It allows comparing item attribute values of multiple items or items revisions. Attributes with change controlled can be compared to get their old values in a form of report. Example: Weight attribute for a part or a BOM can be pulled in a form of report giving different values in different versions/ revisions.
R08	Item Suppliers report	The Item Suppliers report displays a list of all the items matching a query with the Supplier (internal, *e.g.* workshop, or external) associated to them. The report could be done on single items / assemblies or BOMs.
		Blank
R10	Where Used Report	The Where Used report shows where the specified component or subassembly is used, up to the specified number of levels. It can show just the highest level of the assembly, all levels, or any number of levels in between.

S. No.	Report name	Description
R11	Monthly weight production report	Monthly weight production report including weight data during the production phase. Weekly weight production in % and MT(Yard wise)
R12	Final weight report	Final report including all estimated data at the end of the production phase and results from inclining test
R13	Weight dashboard	Monthly dashboard showing the weights for the main PBS components broke down by weight category
R14	Weight control graph	Monthly weight control graph plotting the latest dry light ship weight against time
R15	IP Transfer Report	The IP Transfer report show the objects sent to a given destination and when they were sent.
R16	Change Activity Report	The Change Activity report shows the changes (requests and orders) that were processed during a specified period of time optionally they can be filtered by BOMs, Assemblies, WBS, PBS, OBS, etc.
R17	Change Backlog Report	The Change Backlog report counts the changes (requests and orders) that are still pending, optionally they can be filtered by date, BOMs, Assemblies, WBS, PBS, OBS, etc.
R18	Change details	You can print the Change details report to view the information about a change in an easy-to-read format.
R20	Change KPIs reports	The Change KPIs report generates indicators to track the performances of the Change process (all of them, requests, order, quality, etc), *e.g.* Average processing time for each of the change steps, number of changes raised, backlog, etc. for a given timeframe provided. It should also compare these KPIs with historical performances

S. No.	Report name	Description
R21	Program Cost	Cost report of all the root tasks to which the user has access. Root tasks are the main activities that lead to key milestones
R22	Program Cross tasks Dependency	Report of all the activities that have external dependencies. Activities are single operations that need to be carried out as part of a root task. Root tasks that are Complete or Cancelled are not listed in the portfolio.
R23	Program Deliverable Gate	Report of all the Gates and their dependent activities and deliverables in the portfolio of root tasks. Root tasks that are Complete or Cancelled are not listed.
R24	Program Priority Discussions	Report of all the open discussions in your portfolio of programs.
R25	Program Status	Status report of all the root tasks to which you have access.
R26	Program Open Action Items	Report of all the open action items associated with discussions and activities of the selected root task. Root tasks that are Complete or Cancelled are not listed.
R28	Program Documents	Report of all the documents of the selected Root tasks. Root tasks that are Complete or Cancelled are not listed.
R29	Program Off Track Activities	Report of all the activities based on the selected health status within the selected root tasks. Root tasks that are Complete or Cancelled are not listed for selection.
R30	Program Schedule	The schedule report of all the activities of the selected root task. Root Programs that are Complete or Cancelled are not listed for selection.
R32	Program User Assignments	Report of assignments of a selected user within a selected root tasks. Root tasks that are Complete/ Cancelled are not listed.

S. No.	Report name	Description
R33	Baseline Comparison	Report of comparison of the baselines for the selected program. Programs that are Complete or Cancelled are not listed for selection.
R34	Actual vs. Budgeted Cost	Report of the Actual Cost and Budgeted Cost for the selected tasks (can be the full root tasks).
R35	Actual vs. Budgeted Time	Report of the Actual Time and Budgeted Time for the selected tasks (can be the full root tasks). Report on Actual time and budgeted time for production/assembly/erection acivities
R36	Resource Pool Member Report	Report of all the resources of the selected resource pool.
R37	Resource Pool Utilization	Report of all your task assignments for all root tasks and programs except those that are Complete or Cancelled.
R38	Resource Pool Consumption	Report of the resource pool consumption during the specified time period.
R39	Design Progress Reports	Report showing: • # design documents issued to date vs. total (possible to be split up per PBS / Block) • Curve showing the design document issued to date vs. planned to date (possible to be split up per PBS / Block)

(b) Sourcing reports

S.	Report	Report name	Description
R40	**Sourcing**	Anti Money laundering (AML) Differences Report	Displays changes made to the AML through validation or from Supplier responses.
R41	**Sourcing**	Assembly Cost Report	Establishes a total cost for BOM, including material and non-material costs, and displays assembly-level and component-level breakdowns.
R42	**Sourcing**	Cost Pareto	Identifies the items or commodities in a project that have the greatest impact on total cost; also known as the 80/20 analysis.
R43	**Sourcing**	Effective Cost Comparison	Compares the effective extended cost accounting for minimum order and package quantity requirements.
R45	**Sourcing**	Supply Base Analysis	Evaluates the price differences between multiple Suppliers and applies discounts to strategic Suppliers for further analysis.
R46	**Sourcing**	Budgeting and costing reports	Support for budget management in PLM needed: • Budget managed from product description • Extract updated BOM from system to do cost estimates • Compare the same line of cost breakdown structure and associate orders to it

(c) Quality reports

S.	Report	Report name	Description

R47	**Quality**	Failure Trend Report	Identifies trends in failure modes over time. Based on the results, you can focus corrective efforts on those items that have the greatest effect on product quality.
R48	**Quality**	Quality Activity	Lists all the quality incidents (product service requests and quality change requests) that were processed during a specified period
R49	**Quality**	Quality Backlog	Counts the quality incidents (product service requests and quality change requests) that were at a specified status but have not moved to another specified status during a specified time period.

(d) Compliance reports

S.	Report	Report name	Description
R52	**Compliance**	BOM Compliance Report	This report gives the user a complete view of compliance throughout a BOM for the given specifications. The report displays the AML of items (that have an AML) as well.
R53	**Compliance**	Declaration Workflow Metrics Report	This report returns metrics for declaration workflows, that is, how long it took for the declaration to advance from one specified status to another.
R54	**Compliance**	Missing Substances Report	This report returns compositions for selected parts for which specified substances are missing, from a selected Supplier or from all Suppliers. Note that substances with blank values for Declared Compliance, Mass, or Declared PPM attributes from selected specification are considered “missing” – even if the substance exists in the active composition.

S.	Report	Report name	Description
R55	**Compliance**	Part Compliance Report	This report returns compliance rollup state (Result Compliance) per specification for selected items or manufacturer parts, based on which layout is used for the report. You can run a compliance rollup before running the report.
R56	**Compliance**	Parts with Compliance Issues Report	This report returns all compositions (part–specification–Supplier) with compliance state (Result Compliance) set to Blank, Not Compliant, or Missing Info. There are layouts available for items and for manufacturer parts.
R57	**Compliance**	Parts with Substances Report	This report returns all parts that contain the selected substances in the active compositions, for items or manufacturer parts.
R58	**Compliance**	Supplier Compliance Report	This report returns compliance state (Result Compliance) of all parts from the selected Suppliers.
S.	**Report**	**Report name**	**Description**

S.	Report	Report name	Description
R59	**Compliance**	Parts with Substance over PPM Report	This report returns all parts that contain the selected substance above the given PPM value, by part or material. If an active composition containing the selected substance has a Declared PPM value that is higher than the given PPM value, the part associated to the composition is returned. If an active composition containing the selected substance has the Declared PPM field blank, and Calculated PPM is higher than the given PPM value, the part associated to the composition is returned. For a part-level specification, in order to get the calculated PPM value of the substance, the Mass value of the part and substance must be present. For a material-level specification, in order to get the calculated PPM value of the substance, the Mass value of the material and substance must be present.

R60		Production assembly, erection process(in % & MT) for hull units/blocks	
R61		Production Program	
R62		Labour booking for work orders	

ENCLOSURE-8

TARGET WORK KEY FLOWS

S. No.	Workflow name	Workflow high-level description
W01	**Requirement management**	Manage the end-to-end lifecycle of the requirements for a given project, starting from requirement drafting to internal and external approvals to change requests management, proof of validation and reporting
W02	**Change request**	Manage the creation, review, approval cycle and transformation to change order of a change request to specific document / items *e.g.* BOMs, part of BOMs, AML, drawings, etc. The workflow should take care of managing the propagation (or not) of the proposed changes to the sister ship, including in the review and approval cycle the appropriate department in charge of these sister ships. Change requests can be generated by Engineering, Production, or manufacturers. Approval cycles and requests routing depends on multiple factors, *e.g.* who has generated the request, what has been asked to be changed, on which ship, at which stage of the development, etc. It is intended that these routing factors can be dynamic and that it should be possible for a Business user to be autonomous in changing them without requiring specific intervention from the PLM Supplier.
W03	**Change order**	Manage the creation, review, approval cycle, implementation and reporting of a change order on drawing products, parts, single items, documents, etc.. As per the change requests, the change order affects single or sister ship, can be generated by a number of departments and its approval and implementation is depending by multiple factors. It is intended that these routing factors can be dynamic and that it should be possible for a Business user to be autonomous in changing them without requiring specific intervention from the PLM Supplier.
W04	**Deviation**	Manage the situation when a substitute part needs to be used in production instead of the original one (*e.g.* original broke down, low supply and production cannot be stopped, etc.)

S. No.	Workflow name	Workflow high-level description
W05	**Stop ships**	Alerts every part involved in production / manufacturing / design to stop to use or produce a specific part as there is a fault in that object.
W06	**Project management**	Allow the end to end management of a project, *e.g.* setup a project, insert activities linked with the WBS, links activities to deliverables, requirements, test gates, due dates etc. Manage the alerts, warning and assignment of activities as per Functional Requirements
W07	**Product service request**	Manage the end to end lifecycle of a defect / quality incident that is reported by anyone working on the project. It has to have the ability to link the request to any specific item / PBS / document present in the PLM and route it appropriately to the defined responsible for resolution
W08	**Non-conformity reports**	Manage the end to end lifecycle of a non conformity from a customer, field service representative, or Supplier to report a material deviation from specifications or requirements in one or more products. Non-conformance reports can be routed for investigation and resolution
W09	**Audit and quality change requests**	Manage the end to end lifecycle of audits and Corrective And Preventive Actions (CAPAs). Audit is the proactive process of verifying compliance with quality requirements. The CAPA is a formal process of addressing any generic quality problems and analyzing the root causes so you can implement corrective and preventive actions.
W10	**Maintenance plan**	Manage the end to end lifecycle of the ordinary and extraordinary maintenance plans, form creation to execution. It should also link with the material availability of the items that are interested by the plan, in order to ensure everything is available from the maintenance team to execute the plan

A. DISASTER RECOVERY POLICY FOR PDM/PLM

1. **Introduction**: PDM/PLMs are critical Business Processes and highly dependent on Information Technology (IT) systems i.e. Business application software, Networking systems, Computers /Servers etc. These IT systems are vulnerable to variety of disruptions ranging from mild (short term power outages) to severe (equipment destruction, fire) there by affecting the business functions. There may be vulnerabilities, which may be minimized or eliminated using technical or managerial controls but it is practically impossible to eliminate all risks. A Disaster Recovery management process for IT systems should be in place to minimize the impact of any Disaster on the organization

2. **Purpose**: The purpose of the Disaster Recovery policy is to establish the rules, guidelines and framework for creation of Disaster Recovery Plans for IT Systems at MDC located at ITI Ltd, Bengaluru.

3. Scope: This policy is applicable to all the IT Systems in MDC.

4. Definitions:

a. Recovery Point Objective (RPO): The acceptable loss of data

b. Recovery Time Objective (RTO): The time to recover the system after emergency for the Business information system.

c. Disaster Recovery Plan (DRP): It is plan which incorporates procedures for handling the contingency during the occurrence of any Disaster

d. Disaster Recovery Group (DRG): The team responsible for implementation of Disaster Recovery plan for Business information system.

5. Policy

5.1 Disaster Recovery management Process: A Disaster Recovery Managed process should be developed for ensuring Disaster Recovery of critical IT Systems. The process should take into consideration the following:

- Identification of IT Systems for which the contingency planning is required.
- Identify and assess potential risks that may affect the functioning of these systems.

- Identification of appropriate controls and the level of protection required.
- Provision for sufficient financial, technical, organizational and environmental resources.

5.2 Disaster Recovery and Risk Assessment: Events that can cause interruptions to IT systems should be identified and their probability of occurrence, impact and their consequences on Disaster Recovery should be evaluated by carrying out risk assessment of these systems.

5.3 Developing and Implementing Disaster Recovery Plan: Disaster Recovery plans for the identified IT system shall be developed and implemented to maintain / restore operations and ensures availability of information at required level and timelines following the disruption or failure of these systems. While developing or implementing the plan the following aspects are to be considered.

- Determining Recovery Point Objective (RPO) i.e. the acceptable loss of data and Recovery Time Objective (RTO) i.e. time to recover the system after emergency for the Business information system under consideration for Disaster Recovery Plan (DRP).
- Determining the type of contingency required, based on the criticality of the system i.e. only backup required, remote site (hot or cold)
- Developing the DRP for the IT system with all the relevant procedures for handling contingency of the system. There should be a separate Disaster Recovery Plan for each of the IT Systems.
- Formulation of Disaster Recovery Group for each of the DRP's. The personal in the group should have necessary skills and knowledge to handle the role/responsibility assigned to them. Each DR group shall have DR Manger responsible for the Implementation of the Plan.
- Training of the personnel involved in the DRP as per their roles / responsibilities.
- Testing and Updating of plans on regular basis.

5.4 Disaster Recovery Management Framework: A single policy framework for developing Disaster Recovery Plans should be in place and maintained to ensure all plans are coherent and consistently address all the security concerns. Some of the minimum

requirements which should constitute in the Disaster Recovery Plans are as follows:

- Conditions for activating the plans should be defined.

- Identification of key personnel in the DR group who would be responsible for emergency handling and subsequent recovery for particular Disaster Recovery plan. Roles/responsibilities of these personnel should be clearly defined and documented with respect to the DRP plan involved. If external / Third party vendors are involved in the Continuity process for the IT system, proper agreement should be formulated with these vendors clearly defining their role/responsibilities in the entire process and the same should be documented in the Plan.

- Contacts of key personnel (internal users and external/third party vendors) should be documented.

- Emergency procedures, which describe the actions to be taken following an incident, which jeopardizes operations of the information system.

- Fall back procedures which describe the actions to be taken to move essential business activities or support services to alternate location and to bring the business processes back into operations in required time lines (RTO).

- Resumption procedures, which describe the actions to be taken to return to normal operations.

- Maintenance / Test Schedule which specifies how and when the plan will be tested.

5.5 Testing Maintaining and re-assessing Disaster Recovery plans: Disaster Recovery plans must be tested and updated regularly to ensure that they are up to date and effective. Following guidelines are to be followed.

- The DRP should be tested at least annually for ensuring its smooth working during event of emergency. The observations during the test are to be recorded and reviewed. In case of any issues found, the Plan should be updated.

- The plans should also be updated whenever there are changes in

  a. Information system i.e. new hardware / software upgrade

  b. Personnel

  c. Address and Telephone numbers of the Personnel involved in the DRP

d. Location

e. Facilities & resources

f. Legislation

g. Contractors, Suppliers & Key Customers

h. Business processes

i. Risk (Operational and Financial)

6. Reviews and Revision: This policy will be reviewed as it is deemed appropriate, but no less frequently than every 12 months.

7. Documentation / Records: The following records should be maintained with reference to this Policy.

- Disaster Recovery Plan for each of the identified IT systems with their associated procedures
- Observation Sheets of the DRP Tests conducted

B. HARDWARE POLICY FOR PDM/PLM

1. Introduction

IT Hardware given to stakeholders for performing business functions, should meet the working requirements of the stakeholders. Proper Lifecycle management of IT hardware is important for the continuity of the business functions

2. Purpose

The purpose of the Hardware Policy is to establish rules, guidelines and standards for IT hardware lifecycle management.

3. Scope

This policy is applicable to all Users regardless of role, capacity, or function who use the IT Hardware at MDL, DR at MDL, GRSE and IHQ.

4. Definitions

IT Hardware: In the context of this policy, is defined as Desktop/ Laptop/ Workstation/ Servers/ Printers/ Storage/Network Switches/Scanners/Projectors, etc.

5. Policy

5.1 General

i. The configuration for Desktops/ Laptops/Workstations and Printers to be standardized as far as Possible.

ii. Desktop/laptop/Servers/Workstations to be supplied with licensed operating systems.

iii. The hardware should be under maintenance (Warranty / AMC) at all times for continued working.

iv. New printers which are procured shall be preferably network printers. The printers to be deployed for the usage of Department/Group of users rather than individual.

v. The Network Switches and other network devices which are to be procured should be compliant to latest standard. At present its IPV6

vi. Asset List and the details of all the IT hardware to be maintained.

vii. Any unutilized working hardware at locations defined in the Scope shall be reported to administrators of respective Stakeholders.

viii. Users of Stakeholders are responsible for the hardware under their possession and any misuse shall be the sole responsibility of the user.

5.2 Hardware Life

i. Factors considered for Lifespan determination

a. Unavailability of spares: AMC (Annual maintenance contract) sometimes does not support complete solution due to hardware items unavailability because of technology changes.

b. Hardware compatibility with latest technology

c. Technology obsolescence

d. Frequent breakdown due to ageing.

ii. Life Span of IT Items

Sr.No.	Item Description	Lifespan in Years (Yrs)
1	Desktop	5
2	Printer - Mid and Small (Inkjet, DMP &	3
3	Printer - High End (Laser & Line Printers)	5
4	Laptop	5
5	Scanner	5
6	Servers	7
7	Storage (SAN/NAS Storage)	7
8	Backup / Tape drives	7
9	Network Switches	7
10	Firewalls, Routers and other Network Devices	5
11	Projector	3

5.3 Hardware Retirement

a. IT hardware which attains Lifespan indicated above shall be retired from the usage. However hardware even before completing lifespan shall be retired due to beyond economic Repairs (BER) / has attained technology obsolescence and shall be retired from the usage with the due approval of stakeholders. IT hardware retired, shall be disposed of as per government guidelines or shall be Buyback against supply of new hardware

b. HDD of Desktops/Laptops/Servers which are disposed / given under buyback shall be retained and records for the same shall be maintained. These HDD shall be physically destroyed / crushed by the stakeholders. Similarly devices such as IPADs shall be physically destroyed/crushed after BER.

6. Reviews and Revision

This policy will be reviewed as it is deemed appropriate, but no less frequently than every 12 months.

7. Documentation / Records

The following records should be maintained with reference to this Policy.

- Records for User hardware specifications.

- Records of Hardware Retirement

PASSWORD POLICY PDM/PLM SETUP

1. Introduction

Password is a primary means to provide secured access to IT system. A poorly chosen password may result in unauthorized access and exploitation of the system. Hence a effective password management and its enforcement is a key to reduce the risk of compromise of any IT System**.**

2. Purpose

The purpose of the Password policy is to establish rules, guidelines and standards for creation, management and protection of passwords in IT Systems in MDL.

3. Scope

This policy is applicable to all IT Systems & Users regardless of role, capacity, or function who use or access of the IT systems for PDM/PLM viz all employees and third party contractors having access to IT Systems.

4. Policy

4.1 Password Creation

i. Certain minimum quality standards for password shall be enforced. The following requirements shall be met while constructing a password:

a. Passwords must be minimum 8 characters in length.

b. Passwords should be alphanumeric in nature.

c. Passwords should contain upper case as well as lowercase characters.

d. Passwords can also have special characters like !@$%^& etc.

e. Password should not contain words based on dictionary words, personal information, names of family, pets, friends, fantasy characters, and birthdays.

4.2 Password management

i. Password retries shall be limited to a maximum of five attempted logons (Three in case of critical systems), after which the user ID shall then be locked.

ii. Password should be stored in IT systems in encrypted format to prevent unauthorized disclosure.

iii. All system level passwords (e.g. root, application administration accounts) shall be changed every 60 days and user level passwords shall be changed every 30 days.

iv. A request for change in password in an IT system should be received from the user before it can be changed.

4.3 Password Protection

i. Passwords shall not be shared with/disclosed to anyone.

ii. Passwords should not be written down on paper or saved in computers/ laptops/ any soft form.

iii. Protecting the Passwords is individual's responsibility and any misuse is sole responsibility of the individual owning the account.

iv. Do not use the "Remember Password" feature of any application.

5. Reviews and Revision

This policy will be reviewed as it is deemed appropriate, but no less frequently than every 12 months.

6. Documentation / Records

The following records should be maintained with reference to this Policy.

- Records for password change request.

IMPLEMENTATION WAVES

PLM Functional Requirements - Implementation waves

S. No.	PLM Macro-functionalities	Detailed PLM functional requirements	Extent of implementation	Degree of IC relevance	Prioritization group	Implementation wave
RM01	**Requirements Collection & Management**	To create and manage Requirements along the whole lifecycle considering changes from various Stakeholders	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
RM02	**Requirements Collection & Management**	To manage a list of master requirements for ship type to be then re-used derive ship-specific requirements	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
RM03	**Requirements Collection & Management**	To classify requirements with specific attributes and structure them by functional and operating hierarchical trees. Therefore shall be possible for the users to: • associate to each requirement a PBS or a set of PBS • create specific attribute trees to be used for the classification of the requirements • associate to each requirement more than one attribute	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
RM04	**Requirements Collection & Management**	To manage link between Requirement structure, pallet list, PBS or other PLM structured data / object (e.g. test cases)-	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
RM05	**Requirements Collection & Management**	To manage the approval workflow of requirements list (including change management approvals)	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
RM06	**Requirements Collection & Management**	To manage change and version control of the requirements	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
RM07	**Requirements Collection & Management**	To create and manage the relationship between a requirement and the objects that "fulfil" the requirement itself e.g. documents that must be issued (e.g. design documents, pallet list, etc.) , tests that must be fulfilled, etc. . This to enable the creation of the chain: Requirements ←→PBS- elements←→Audit/Test←→Deliverables	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
RM08	**Requirements Collection & Management**	To monitor the requirements fulfilment progress through the evolution of compliance objects (e.g. test), highlighting those tests / evidence" that are not still completed and thus refrain the requirement to be marked as fulfilled	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
RM09	**Requirements Collection & Management**	To manage the possibility for the sisterships to have specific / different / additional requirements for sister ships (having inherited all the requirements from the first ship o the class)	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements

WC01	**Workflow and collaboration**	To enable creation of workflows allowing: • Definition of involved tasks and decision-making rules via a graphic user interface to simplify the process description • Assignment of users and user groups • Configuration of workflow statuses as per business need • Attachments of affected object (documents, parts, assemblies etc) • End users to update the workflow processes against new or changed needs	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
WC02	**Workflow and collaboration**	To enable status monitoring of the workflows: • Audit and display the workflow progress • Record status of all workflows executing steps to enable traceability of the processes giving the users the ability to analyze workflow execution history; • Provide the ability to the users to search for specific workflows • Provide run-time information (e.g. participants status, waiting on	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
WC03	**Workflow and collaboration**	To enable tracking and monitoring of change requests and converting it to change orders through engineering change management procedure • E-mail notifications involving concerned departments • Tracking and auditing mechanism • Visible change log after every update • Graphical representation of status	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
WC04	**Workflow and collaboration**	To enable collaborative and integrated management of processes and information (documentation, BOMs, 2D and 3D model, TSP, GRAQ, etc...) by: • Sending notification to remind them of the required/ pending actions e.g. via E-mail, SMS • Providing change log after every update • Providing the ability to view and download relevant documents, bill of material etc. with permission control • Providing the ability to allow backtracking in the workflow if the review	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
WC05	**Workflow and collaboration**	To provide an authorization / approval system and to handle approval remarks with specific authorization rules facilitated through electronic signature (or at least electronic recording). PLM should have: • Predefined approvers and also ad-hoc approvers at each stage of workflow • Ability to assign the correct owner for the relevant activity • Ability to add mandatory or optional approvers in each stage of the process • To manage the approval process of the document releasing (workflow)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP01	**Project & Planning Management**	To create a bilateral link between the external Project Management tools (Primavera and MS Project) to be able to import / export project plans with stages, milestones, timelines, progress to date, assignment of activities to internal or external partners, estimated costs and final costs. The system shall be able to manage imports and exports of subsequent versions of the plan as an update to the plans' information within the PLM / external systems system, in particular information that have been added either	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PP02	**Project & Planning Management**	To manage the creation and the linking of different plans example: Master Phasing Plan (MPP), Job Target Plan, Configuration plan, Quality control plan, Risk management plan, Production, Procurement plan, Maintenance plan etc and link/aggregate them with ship master schedule plan.	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PP03	**Project & Planning Management**	To manage the master Activity Breakdown Structure (ABS) and Organization Breakdown Structure (OBS) lists, including creation and change management workflows	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP04	**Project & Planning Management**	To link activities on the plan to a WBS (link between PBSs, ABS and OBS) and enrich the related WBS with user defined attributes e.g. estimated effort, actual effort, notes, etc.	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP05	**Project & Planning Management**	To assign to each activity (and to the related WBS) the internal and external efforts both estimated and actual. It shall be possible to relay these information back to the accounting system (e.g. SAP)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP06	**Project & Planning Management**	To provide the chance to restrict the possibility to read/write/modify information for each activity at user /user group level.	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

PP07	**Project & Planning Management**	To allow the assignment of custom attributes to each activity. Attribute list shall be manageable by the PLM users (subject to user right management)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP08	**Project & Planning Management**	To enable tracking and managing progress of activities in terms of % completion e.g. document advancement, technical bid evaluation, approval process management, BOM release	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP09	**Project & Planning Management**	To track all events/activities/deliverables milestones with connection to requirements management module e.g. connection with contractual requirements	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
PP10	**Project & Planning Management**	To enable activities to be associated with target/actual start and end dates. To manage delay by remainders, escalation etc	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PP11	**Project & Planning Management**	To enable a configurable alert system which shall warn the planners and end users about relevant events e.g. milestones to be reached in 24h, activity delayed, etc. The type and nature and granularity of events to be tracked shall be selected by the planners	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
PP12	**Project & Planning Management**	To enable reminders, escalations and automatic updates required for workflows/approvals	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PP13	**Project & Planning Management**	To enable supplier collaboration, allowing them to update directly the status of the activities they are responsible of within the project plan	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PP14	**Project & Planning Management**	To allow configuration and usage of preconfigured dashboards and reporting for viewing portfolio analytics, project or program status, health check-up etc.	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
DM01	**Document Management**	To have "Role based" access/authorizations for accessing different types of PLM objects and related attributes and documents	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM02	**Document Management**	To manage different classifications/ categories of documents. Categories shall be fully configurable by the end users. To manage a master set of documents that includes all the relevant document template, possibly allowing for specific document set per ship type	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM03	**Document Management**	To create and manage possible relationship between defined standard document lists and specific PBS / WBS elements	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM04	**Document Management**	To have simple, advance and Personalized searches across all PLM objects or documents (e.g. by attribute, by part of the code, etc.)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements

DM05	**Document Management**	To create different types of document starting from templates e.g. Specifications, quality, risk sheets, pallet list, tenders, drawings, manuals, datasheets, checklists etc. the system should also allow the user to add / modify / manage the templates	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM06	**Document Management**	To define and manage custom attributes for the documents	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM07	**Document Management**	Establish and manage a "Responsibility Matrix" to indicate departments which contribute to each document	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM08	**Document Management**	To assign automatically the identification number and name for BOMs, documents, etc. based on a set of configurable rules (different for each type of document)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM09	**Document Management**	To manage ownership related to different PLM objects / documents and related attributes	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM10	**Document Management**	Enable management of hierarchical links for documents e.g. link between "RFP", "TPS" and "PO", BoD - Bill Of Document)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM11	**Document Management**	To enable revision/version control for the documents, design data and other objects (e.g. TSP, BOM, ship's model)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM12	**Document Management**	To manage check in and checkout of documents / files	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM13	**Document Management**	To enable automated flag/alert to the users in case the user is using a old version of the file or if the files are checked out	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM14	**Document Management**	To manage the status of the document from creation to release	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM15	**Document Management**	To manage collaboration: • To route the documents using workflow • To mange version control for the documents, assemblies etc • To allow Check in and checkout of files e.g.: drawing files, 3D models, assemblies, metadata etc.. • To allow for checked in files need to be downloaded as read only	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM16	**Document Management**	To define checklist and enable quality control checks before document release	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

DM17	**Document Management**	To store comments, discussion points and summaries for documents/objects at all stages of release	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
DM18	**Document Management**	To manage the document release / issue via a specific workflow To notify the document release/issue to respective departments (workflow)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM19	**Document Management**	To generate distribution list of different departments once the release happens, basis predefined distribution rules	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM20	**Document Management**	To store drawings and other documents in various formats example: pdf; tif; hpg; office, CAD formats, MS office	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM21	**Document Management**	To print different document formats (TIF; HPG; PDF; Office ...) and allow for high resolution file printing	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM22	**Document Management**	To manage compression of format files (for reducing the size of files; for example ".zip" format)	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
DM23	**Document Management**	To provide stamp certification establishing the originality of document	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM24	**Document Management**	To manage in the stamp the following information: • Documents status and date • Document's code and title • Type of document • Printing date • Blocks for which the document is currently valid	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM25	**Document Management**	To manage the upload / download of large size documents (e.g. 100 MB)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM26	**Document Management**	To manage the upload / download of a large number documents (e.g. 200 documents)	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM27	**Document Management**	To enable viewer with following functions: • view 2-D Drawings, 3D models, documents, images etc without using source application in PLM • view geometric and non-geometric information and meta data (item number, weight, attributes etc.) • measure distance between points in viewed item, visualization (rotate, pan, zoom, "fly through", "walk through", sectional views etc)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
DM28	**Document Management**	To store the historical change of data of selected PBS attributes such as weight, COG, etc and enable their extraction for further analysis (e.g. to create an historical database of the weight evolution history for a specific PBS) o	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements

DM29	**Document Management**	To allow creating reports • out of the box standard report, e.g.: o # late documents o Average approval time (by OBS) o Average time to close an excerpt o Etc. • customizable reports from the PLM interface itself	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
DM30	**Document Management**	To compare changes between different versions (stored in the PLM version management) of the same document. For documents are intended all the types of documents stored in the PLM, e.g. requirements, Word documents, Excel documents, BOMs, 2D drawings, 3D drawings, etc. If the type of documents that are possible to compare are limited, the supplier shall provide the list of the document types for which comparison is possible	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
DM31	**Document Management**	To manage documents for sister ships, e.g.: • Once documents for the first of class ship has been defined the system must support changes for a single ship, a set of ships or for the whole class • Ability to assess if a document is valid for all the ship of the series or for one or some of them; • Provide a list of valid documents for a given ship: list of valid documents	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB01	**Product Baseline Management & BOMs**	To support and manage the definition of the hierarchical product composition of the ship to represent the physical, logical and topological composition of the ship (Product Breakdown Structure). Every node of the tree is exploded iteratively in a set of multiple nodes, as a PBS, where each node can represent a single item, product or main item.	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB02	**Product Baseline Management & BOMs**	To support the development of the Product Breakdown Structure (PBS) using a standard library / inventory. To support adoption of WBS (link between PBS, Organization Breakdown Structure and Activity Breakdown Structure) To enable and manage data inheritance among parent and children	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB03	**Product Baseline Management & BOMs**	To support the PBS creation with a specific approval workflow and to manage the PBS along the whole lifecycle considering changes from various stakeholders;	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB04	**Product Baseline Management & BOMs**	To manage aggregation / de-aggregation of product tree data / attributes from children nodes to parent ones (e.g. to evaluate weight, centre of gravity, absorbed electrical power, heat dissipation, etc.)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB05	**Product Baseline Management & BOMs**	To manage the link of documents with the PBS	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB06	**Product Baseline Management & BOMs**	To manage PBS attributes such as: planned delivery date, final delivery date, revised delivery date, installation date, estimated hours, final hours, estimated costs, actual costs, competences needed, coordinates for centre of gravity, design margins, block number(s), block allocation ratios, alternate declaration/substitute parts, flag for weight category, warning on delay, etc. The users shall be able to manage end to end these attribute (e.g. read, modify,	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB07	**Product Baseline Management & BOMs**	To manage product views and access control based on user roles and privileges	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
PB08	**Product Baseline Management & BOMs**	To assign and manage data ownership as per roles and authorization rules. To track data ownership changes and related privileges	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements

PB09	**Product Baseline Management & BOMs**	To enable reuse of data, e.g. • to replicate, the linked PBS, activities, and OBS(resulting in a WBS) of one ship, for another • to manage and maintain master templates of PBS, WBS for reuse.	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB10	**Product Baseline Management & BOMs**	To enable use of formulas instead of text only into some attributes of a PBS node (e.g. calculate the weight as the sum of other elements etc.)	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB11	**Product Baseline Management & BOMs**	Search and retrieve weight-related data from a historical database. Allow filtering by project, block/ module, type of ship, PBS group, and type of document.	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB12	**Product Baseline Management & BOMs**	Allow for the versioning of the PBS nodes, including its attributes (or a configurable subset of them) (e.g. weight related attributes) and support specific naming (list of standard + custom defined) for the versions	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB13	**Product Baseline Management & BOMs**	To allow to selectively protect from user changes PBS branches, PBS elements or PBS attributes	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
PB14	**Product Baseline Management & BOMs**	To provide look-up capabilities to search objects across PLM databases (e.g. by attribute, by part of the code, etc.)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB15	**Product Baseline Management & BOMs**	To manage items views according to user profile	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB16	**Product Baseline Management & BOMs**	To Support to manage items views (Functional, Physical/Functional, Physical, etc.).	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB17	**Product Baseline Management & BOMs**	To allow import and export of PBS branches, e.g. • Import PBS branches from external PBS structures (e.g. to import in ship PBS the engine PBS provided by a supplier or a 2°level configuration). • Export PBS branches to external CAD or PLM system (e.g. to an external collaboration partner to implement a portion of CAD model or to implement a 2°level configuration)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB18	**Product Baseline Management & BOMs**	To allow users to look at the product data through different views, for example: System configuration (all systems of a selected PBS (e.g. 200) composing the product with related data) Physical configuration (all components included in a selected zone, block, etc.)	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB19	**Product Baseline Management & BOMs**	To manage creation of item, document, BOM (both EBOMs and MBOMs with automatic material codes assignment were possible e.g. Pipes diagrams), etc, using automated numbering and associating different lifecycles stages to object, example - Design, Production,etc.	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB20	**Product Baseline Management & BOMs**	To manage different classifications/categories of items, BOM's, documents etc.	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements

PB21	**Product Baseline Management & BOMs**	To define and manage Manufacturing BOMs / pallet management basis EBOM (including approval and change management workflows for the BOMs)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB22	**Product Baseline Management & BOMs**	To manage relations between items e.g. drawings, documents, BOMs etc. with respect to the associated PBS and the scheduled activities in the project plans	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB23	**Product Baseline Management & BOMs**	To allow data (3d models, drawings, BOM, purchase list/parts & fabrication details, weight etc) extraction from CAD system to PLM.	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB24	**Product Baseline Management & BOMs**	To manage and propagate appropriately (without any data loss) to the relevant documentations the changes done on the CAD system (e.g. change in the drawing affecting the EBOM)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB25	**Product Baseline Management & BOMs**	To allow the management of “Sister Ships” (including re-use of model parts and the propagation of modifications applicable to different ships)	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB26	**Product Baseline Management & BOMs**	To support BOMs approval and changes by approval and change management workflow	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB27	**Product Baseline Management & BOMs**	To manage the link between BOM and technical documents / drawings	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB28	**Product Baseline Management & BOMs**	To allow partial release and versioning/ revision of the BOM's. Example: Bought out items in BOM to be released earlier before the final BOM release	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
PB29	**Product Baseline Management & BOMs**	To manage BOMs for group of sister ships (Series of Ships)	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB30	**Product Baseline Management & BOMs**	To manage massive uploads of BOM's large in size and number by means of import or data load.	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB31	**Product Baseline Management & BOMs**	To manage change and synch of BOMs which are common across sister ships	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
PB32	**Product Baseline Management & BOMs**	To enable "Thumbnails" supporting visualization and mark-ups for Items, BOM etc. in PLM system	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

EC01	**Engineering Change Management**	To create a new change request / order with: • Automated numbering depending on the predefined rules (with the ability to overwrite of automated numbering for any special needs • Type of change request • Reason and description for the change request/order • Identification of the object(s) affected by the change including any information that could impact on safety, quality, schedule, cost and profit • Custom attributes, example: cost impact on additional changes	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
EC02	**Engineering Change Management**	To enable: • To view pending engineering changes • To view history • To associate change orders with change requests • To associate change request with problem reports • To have graphical representation of Workflows	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
EC03	**Engineering Change Management**	To support the evaluation of the requested change impacts automatically identifying all the objects that will be involved in the change starting from the primary change object (e.g. if it would be necessary to modify a part, the system should put in evidence all related parts and documents, with their own status).	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
EC04	**Engineering Change Management**	To manage engineering change impact on affected objects (example drawings, BOM etc.) in different cases: • Change effective for all ships • Change effective for one or more sister ships (To be regulated through appropriate workflows)	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
EC05	**Engineering Change Management**	To automatically send notifications and reminders to concerned users on the change request for approvals, delays and handle escalations.	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
EC06	**Engineering Change Management**	To allow for modification on the affected objects (e.g. documents, BOMs etc.) on the change request/order	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
EC07	**Engineering Change Management**	To enable sending accompanying documents (e.g. to-do-list, change log, comments) along with the modified objects to the involved functions on the change	High effort	Relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
EC08	**Engineering Change Management**	To enable automated closure of the change order when all involved departments have closed their respective action	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
EC09	**Engineering Change Management**	To allow the identification of items (PBS) that are subject to "Configuration Management"	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
EC10	**Engineering Change Management**	To support the definition of the Configuration Items Baselines (fixed reference configuration established by defining and recording the client approved configuration documentation for a systems at a milestone event or at a specified time), including correct versioning of all the documents that are defining or related to the configuration; any updated and approved revision of the Configuration Baseline for a specific items becomes the actual Baseline following a "change" approval workflow.	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
EC11	**Engineering Change Management**	To link Configuration to expected performances (physical and functional) and then to testing and results that are fulfilling the expected performances. To verify the respect of the performances of components, of physical and functional product attributes against the product requirements and the efficiency of the products along its lifecycle	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

EC12	**Engineering Change Management**	To record the Configuration Items related PBS tree with the attached Planning and Design documents (of the Company and/or Third parties) formally valid at time “t” To list all the modification requests on a specific Configuration Item including the relevant status (examined, approved, implemented, rejected) at time “t”	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
EC13	**Engineering Change Management**	To support Configuration Audit through a formal review of testing data and control reports concerning a Configuration Item, to ensure that the CI has achieved the performance and functional characteristics specified in its current approved configuration documentation	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AP01	**Acceptance Procedures**	Ability to define and manage test stages and test procedures connecting them to specific PBSs (that could include the whole ship in case of the sea trials) linking them to the requirements in order to validate the product against requirements by tests	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
AP02	**Acceptance Procedures**	Ability to: • Report specific defects / non conformities against the defined test stages • Assign description, object affected (if relevant link it with PBS or WBS affected), specific priority and criticality to each of the defects / non conformities • Classify the defects / non conformity based on a customizable classification table	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
AP03	**Acceptance Procedures**	Ability for the end-users to define specific approval workflows for the test stages (without requiring intervention from the PLM Solution Supplier). These workflows shall take in account the status of the defects as well as users approvals. The workflow shall end when all the requirements are marked as "solved" or "being solved but not stopper for test stage approval"	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
AP04	**Acceptance Procedures**	Ability to view the status of each of the test stages defined and the defects assigned the each of the phase (with all the defects details). It shall be possible to filter these by PBS and requirement	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
QM01	**Quality Management**	To provide the ability to define and manage Quality Tests connecting them to specific PBSs (that could include the whole ship in case of the sea trials) linking them to the requirements in order to validate the product against requirements by tests	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
QM02	**Quality Management**	To define and manage the Quality Plan	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
QM03	**Quality Management**	To allow creation of problem reports and link them to preventive and corrective actions	Low effort	Relevant	Top priority requirements	Wave 1: Deployment of top priority requirements
QM04	**Quality Management**	To configure with specific PBS quality parameters (e.g. max tolerances for steel plates)	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
QM05	**Quality Management**	To support corrective and preventive action based on relevant quality norms. Manage NCR - Non-Conformance Reports, QCR - Quality Change Requests, Audit, CAPA in a closed loop	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
QM06	**Quality Management**	To manage periodic and preventive maintenance and inspections providing automated notifications to the interested users while ensuring to keep a solid history track	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

QM07	**Quality Management**	To enable support of inspection process: • Two types must be supported: Internal checks and Classification society checks • Track of quality check information (e.g. FAT Factory acceptance test) in the PBS attributes	Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
QM08	**Quality Management**	To manage compliance data for hazardous materials as per international standards and regulatory bodies Example: US: US Administration Regulations, Europe: ROHS, WEEE, China: China ROHS, WEEE, JAPAN: JGPSSI	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
QM09	**Quality Management**	To produce quality reports and indicators to highlight the situation of a specific PBS / PBS tree from the quality point of view (e.g. how many parts have to be tested/accepted, how many parts failed the acceptance test, etc.)	High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS01	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS02	**After Sales OperatIons**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS03	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS04	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS05	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS06	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS07	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS08	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS09	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

AS10	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS11	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS12	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS13	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS14	**After Sales Operations**		Low effort	Not relevant	Second priority requirements	Wave 2: Deployment of 2nd priority requirements
AS15	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS16	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS17	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities
AS18	**After Sales Operations**		High effort	Not relevant	Ancillary functionalities	Wave 3: Deployment of ancillary functionalities

LIST OF DELIVERABLES FROM PDM/PLM SOFTWARE SOLUTION PROVIDER TO BE CERTIFIED BY MDL

1. **Note**: For deliverables at DND, MDL will certify the receipt of the deliverables post obtaining the completion report from DND
2. For deliverables at MDC and DR, MDL will certify the receipt of the deliverables except for deliverable No. M9 for which Completion report to be obtained from DND and GRSE.
3. D is date of acceptance of PO by the PLM SSP
4. The Key user testing for 20 users and PLM users training for 50 users for DND include WOT(Mb) & WOT(Kol) reps

TASK No.	DELIVERABLE NO.	DESCRIPTION	Time frame(months)	
			From	To
NON FUNCTIONAL REQUIREMENTS AT MDL				
1	M1	Report on completion of nonfunctional requirements with one year free warrantee at MDL comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software in server & LAN	D	D+11
NON FUNCTIONAL REQUIREMENTS AT DND				
3	M2	Report on completion of nonfunctional requirements at DND with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software in server & LAN	D	D+11
NON FUNCTIONAL REQUIREMENTS AT MDC				
4	M3	Report on completion of nonfunctional requirements at MDC with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and	D	D+11

TASK No.	DELIVER ABLE NO.	DESCRIPTION	Time frame(months)	
			From	To
		Commissioning(SITC) of hardware (b) Completion report of licensing PLM software in server & LAN		
NON FUNCTIONAL REQUIREMENTS AT DR				
5	M4	Report on completion of nonfunctional requirements at DR with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software in server & LAN	D	D+11
NON FUNCTIONAL REQUIREMENTS ON- BOARD SHIPS BY MDL				
6	M5	Report on completion of nonfunctional requirements onboard ship MDL-1 with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software (c) training	FEB 22	MAY 22
7	M6	Report on completion of nonfunctional requirements onboard ship MDL-2 with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software (c) training	AUG 22	NOV 22
8	M7	Report on completion of nonfunctional requirements onboard ship MDL-3 with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software (c) Training	AUG 23	NOV 23
9	M8	Report on completion of nonfunctional requirements onboard ship MDL-4 with one year free warrantee comprising of the following:	AUG 24	NOV 24

TASK No.	DELIVER ABLE NO.	DESCRIPTION	Time frame(months)	
			From	To
		(a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software (c) Training		
WAN CONNECTIVITY FOR PLM				
13, 14, 15, 16 & 17	M9	Completion report of establishing P2P WAN wired connectivity with one year free warrantee, including hardware and software between MDL, GRSE,DND,DR & MDC	D	D+3
18	M10	Completion report of establishing LAN connectivity at MDL with one year free warrantee including hardware and software	D	D+3
20	M11	Completion report of establishing LAN connectivity at DND including with one year free warrantee hardware and software	D	D+3
21	M12	Completion report of establishing LAN connectivity at DR with one year free warrantee including hardware and software	D	D+3
22,23, 24,25, 26	M13	Security Document (to be certified by MDL, GRSE & DND) indicating the security configuration in line with the Security Policy for the entire connectivity for WAN and LAN at MDL, DND, GRSE, DR & MDC	D	D+2
27	M14	Completion Report (to be certified by MDL) on Configuration and setting up of security features in the PLM WAN and LAN connectivity at MDL as per the approved security document	D	D+6
29	M15	Completion Report (to be certified by DND) on Configuration and setting up of security features in the PLM WAN and LAN connectivity at DND as per the approved documentation	D	D+6
30	M16	Completion Report (to be certified by MDL, GRSE & DND) on Configuration and setting up of security features in the WAN and LAN connectivity at MDC as per the approved document	D	D+6
31	M17	Completion Report (to be certified by MDL, GRSE & DND) on Configuration and setting up of security features in the PLM WAN and LAN connectivity at DR as per the approved documentation	D	D+6

FUNCTIONAL REQUIREMENTS WAVE-1 AT MDL				
32	M18	Report on PLM Basic customization for the entire FR targets at MDL	D	D+11
35	M19	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-1 at MDL comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(50 nos) training (d) Report on gap identification and definition of target for next release (e) Report on basic customization & Integration (gap resolution)	D	D+11
38	M20	Report on Integration with complete Legacy systems at Wave-1at MDL	D	D+11
41	M21	Report on Data Migration for the entire Project at Wave-1 at MDL	D	D+11
44	M22	Report on PLM Users(100 nos) Training in Wave-1 at MDL	D	D+11
47	M23	Report on Roll out and change management at Wave-1 at MDL	D	D+11
34	M24	Report on PLM Basic customization for the entire FR targets at DND	D	D+11
37	M25	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-1 at DND comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(20 nos) training (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D	D+11
40	M26	Report on Integration with Legacy systems at Wave-1at DND	D	D+11
43	M27	Report on Data Migration for Wave-1 at DND	D	D+11
46	M28	Report on PLM users(50 nos) Training in Wave-1 at DND	D	D+11
49	M29	Report on Roll out and change management including users training for Wave-1 at DND	D	D+11
FUNCTIONAL REQUIREMENTS WAVE -2 AT MDL				

50	M30	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-2 at MDL comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(50 nos) training (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D+11	D+17
53	M31	Report on PLM users(100 nos) Training in Wave-2 at MDL	D+11	D+17
56	M32	Report on Roll out and change management including users training for Wave-2 at MDL	D+11	D+17
FUNCTIONAL REQUIREMENTS WAVE -2 AT DND				
52	M33	Consolidated report on on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-2 at DND comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(20 nos) training (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D+11	D+17
55	M34	Report on PLM users(50 nos) Training in Wave-2 at DND	D+11	D+17
58	M35	Report on Roll out and change management for Wave-2 at DND	D+11	D+17
FUNCTIONAL REQUIREMENTSWAVE-3 AT MDL				
59	M36	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-3 at MDL comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(50 nos) testing (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D+17	D+23
62	M37	Report on PLM users (100 nos) Training in Wave-3 at MDL	D+17	D+23

65	M38	Report on Roll out and change management including users training for Wave-3 at MDL	D+17	D+23
FUNCTIONAL REQUIREMENTS WAVE-3 AT DND				
61	M39	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-3 at DND comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(20 nos) testing (d) Report on gap identification and definition of target for next release Report on customization & Integration (gap resolution)	D+17	D+23
64	M40	Report on PLM (50 NOS) users Training in Wave-3 at DND	D+17	D+23
67	M41	Report on Roll out and change management including users(50 nos) training for Wave-3 at DND	D+17	D+23
ANNUAL MAINTENANCE FOR WAN CONNECTIVITY				
78,79, 80,81, 82	M42	Report on Annual Maintenance Contract for WAN Connectivity between MDL, GRSE, DND, DR & MDC including hardware and software at the end of each year of AMC, post completion of free warrantee period	D+15	Aug 2025
ANNUAL MAINTENANCE AT MDL				
68	M43	Report on Annual Maintenance Contract for Software and license (Non-functional Requirements) at MDL at the end of each year of AMC, post completion of free warrantee period	D+35	Aug 2025
73	M44	Report on Annual Maintenance Contract for hardware (Non-functional Requirements) at MDL at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
83	M45	Report on Annual Maintenance Contract for LAN Connectivity at MDL including hardware and software at the end of each year of AMC, post completion of free warrantee period	D+15	Aug 2025
ANNUAL MAINTENANCE AT DND				
70	M46	Report on Annual Maintenance Contract for Software and license (Non-	D+23	Aug 2025

TASK No.	DELIVER ABLE NO.	DESCRIPTION	Time frame(months)	
			From	To
		functional Requirements) at DND at the end of each year of AMC, post completion of free warrantee period		
75	M47	Report on Annual Maintenance Contract for Hardware(Non-functional Requirements) at DND at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
85	M48	Report on Annual Maintenance Contract for LAN Connectivity at DND including hardware and software at the end of each year of AMC, post completion of free warrantee period	D+15	Aug 2025
ANNUAL MAINTENANCE AT MDC				
71	M49	Report on Annual Maintenance Contract for Software and license (Non-functional Requirements) at MDC at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
76	M50	Report on Annual Maintenance Contract for Hardware(Non-functional Requirements) at MDC at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
ANNUAL MAINTENANCE AT DR				
72	M51	Report on Annual Maintenance Contract for Software (Non-functional Requirements) at DR at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
77	M52	Report on Annual Maintenance Contract for Hardware(Non-functional Requirements) at DR at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
86	M53	Report on Annual Maintenance Contract for LAN Connectivity at DR at the end of each year of AMC, post completion of free warrantee period	D+15	Aug 2025
DATA ENTRY AT MDL				
101	M54	Report on positioning of personnel for data entry at MDL	D+11	D+35
DATA ENTRY AT DND				
103	M55	Report on positioning of personnel for data entry at DND	D+11	D+35

Submission Format : Report
Submission Medium: Hard Copies-3 nos and Soft copy in pdf format in CD- 3 nos

LIST OF DELIVERABLES FROM PDM/PLM SOFTWARE SOLUTION PROVIDER TO BE CERTIFIED BY GRSE

TASK No.	DELIVERABLE NO.	DESCRIPTION	Time frame	
			From	to
NON FUNCTIONAL REQUIREMENTS AT GRSE				
2	G1	Report on completion of nonfunctional requirements at GRSE with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software in server & LAN	D	D+11
NON FUNCTIONAL REQUIREMENTS ON- BOARD SHIPS BY GRSE				
10	G2	Report on completion of nonfunctional requirements at onboard ship GRSE-1 with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software (c) Training	Feb 2023	May 2023
11	G3	Report on completion of nonfunctional requirements at onboard ship GRSE-2 with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC) of hardware (b) Completion report of licensing PLM software (c) Training	Feb 2024	May 2024
12	G4	Report on completion of nonfunctional requirements at onboard ship GRSE-3 with one year free warrantee comprising of the following: (a) Completion report of Supply, Install, Test and Commissioning(SITC)	Feb 2025	May 2025

TASK No.	DELIVER ABLE NO.	DESCRIPTION	Time frame	
			From	to
		of hardware (b) Completion report of licensing PLM software (c) Training		
LAN CONNECTIVITY FOR PLM AT GRSE				
19	G5	Completion report of establishing LAN connectivity at GRSE with one year free warrantee including hardware and software	D	D+3
SECURITY FEATURES AT GRSE				
28	G6	Completion Report on Configuration and setting up of security features in the PLM WAN and LAN connectivity at GRSE as per the approved documentation	D	D+2
FUNCTIONAL REQUIREMENTS WAVE-1 AT GRSE				
33	G7	Report on PLM Basic customization for the entire FR targets at GRSE	D	D+11
36	G8	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-1 at GRSE comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(50 nos) testing (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D	D+11
39	G9	Report on Integration with complete Legacy systems at Wave-1at GRSE	D	D+11
42	G10	Report on Data Migration for the entire Project at Wave-1 at GRSE	D	D+11
45	G11	Report on PLM users(100 nos) Training in Wave-1 at GRSE	D	D+11
48	G12	Report on Roll out and change management for Wave-1 at GRSE	D	D+11

51	G13	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-2 at GRSE comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(50 nos) testing (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D+11	D+17
54	G14	Report on PLM users(100 nos) Training in Wave-2 at GRSE	D+11	D+17
57	G15	Report on Roll out and change management for Wave-2 at GRSE	D+11	D+17
60	G16	Consolidated report on Solution Blue printing, Development and Testing for all the Process flows defined in Wave-3 at GRSE comprising the following: (a) Report on release preparation (b) Report on technical testing (c) Report on key user(50 nos) testing (d) Report on gap identification and definition of target for next release (e) Report on customization & Integration (gap resolution)	D+17	D+23
63	G17	Report on PLM users(100 nos) Training in Wave-3 at GRSE	D+17	D+23
66	G18	Report on Roll out and change management for Wave-3 at GRSE	D+17	D+23
ANNUAL MAINTENANCE AT GRSE				
69	G19	Report on Annual Maintenance Contract for PLM Software (Non-functional Requirements) at GRSE at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
74	G20	Report on Annual Maintenance Contract for Hardware(Non-functional Requirements) at GRSE at the end of each year of AMC, post completion of free warrantee period	D+23	Aug 2025
84	G21	Report on Annual Maintenance Contract for LAN Connectivity at GRSE at the end of each year of AMC, post completion of free warrantee period	D+15	Aug 2025
DATA ENTRY AT GRSE				
102	G22	Report on positioning of personnel for data entry at GRSE	D+11	D+35